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TRAINING NEEDS IN THE ENERGY SECTOR

A Report submitted to

USAID/Dhaka

by Lyn Muench  
Dhaka, June 1983

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This report is submitted in fulfillment of the scope of work for a report on training needs in the Energy Sector commissioned by USAID, Dhaka, in April 1983.

In addition to the persons and organizations listed in the report, much help was given by officers of USAID, in particular Graham Thompson, Ralph Bird, Susan Downs and Milt Chatman.

The views expressed are the author's own.

Lyn Muench  
Dhaka  
June 1983

ABBREVIATIONS AND ACRONYMS

ADB	:	Asian Development Bank
AID	:	United States Agency for International Development
BACE	:	Bangladesh Association for Community Education
BARC	:	Bangladesh Agricultural Research Council
BCSIR	:	Bangladesh Council for Scientific and Economic Research
BDG	:	Bangladesh Government
BEL	:	Burmah Eastern Limited (motor spirit)
BGFCL	:	Bangladesh Gas Field Company Limited
BGSL	:	Bakhrabad Gas System Limited
BPDB	:	Bangladesh Power Development Board
BPI	:	Bangladesh Petroleum Institute
BUET	:	Bangladesh University of Engineering and Technology
CIDA	:	Canadian International Development Agency
CNG	:	Compressed Natural Gas
DANIDA	:	Danish International Development Agency
ERD	:	External Resources Division, BDG.
FAO	:	Food and Agriculture Organization, UN.
FRG	:	Federal Republic of Germany
IDA	:	International Development Association (World Bank)
JOL	:	Jumnah Oil Company Limited (motor spirit)
LPG	:	Liquid Propane Gas
MPL	:	Meghna Petroleum Limited (motor spirit)
NGO	:	Non-Governmental Organizations, sometimes referred to as PVOs
ODA	:	Overseas Development Agency (British aid)
PBS	:	Pally Bdiyut Samity, local organization for rural electrification
REB	:	Rural Electrification Board
SAOL	:	Standard Asiatic Oil Company Limited (lube blending)
TGTDC	:	Titus Gas Transmission and Development Corporation
UN	:	United Nations
UNDP	:	United Nations Development Program
UNCHS	:	United Nations Center for Human Settlements
USAID	:	United States Agency for International Development

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TRAINING NEEDS IN THE ENERGY SECTOR

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## SUMMARY OF RECOMMENDATIONS

Specific recommendations are included in each description of an energy-related organization or subject surveyed in this study. This summary indicates only the pattern of recommendation types, more or less in order of their importance.

1. Training projects need to be developed in considerable detail, with direct contact between participating agencies, to increase the chance of success. The actual needs and interests of the recipients should be established, and the ability of the recipient to fulfill commitments should be ensured during project development.
2. Centrally funded training opportunities should be continued, even on the ad-hoc basis at present, because they fulfill the Bangladesh decision-makers need for exposure to new ideas. Information concerning the opportunities should be more widely circulated, and the subjects covered should be expanded.
3. AID should definitely pursue its proposal to support and expand in-country training. This should take several forms:
  - a. institution building (or rebuilding) of agency-specific training institutions, particularly in training of trainers and supplementary teaching aids. Energy-related agencies with training institutions requiring support are Titus (training program defunct), BPC (training program thriving; a good basis for expansion) and Forest Department and PDB (both have large training programs operating, but have needs), BCSIR and BARC are research institutes which would benefit from more support.
  - b. support and expansion of multi-purpose training institutions to provide energy-related training, particularly energy awareness and energy management. This could be done through existing management training institutions (MDC, IBA, NIPA, Institute of Appropriate Technology) or through creation of new multi-purpose energy management courses located in a Petrobangla or BPC facility. These should be locally operated and a permanent local establishment, but US expertise may be required. Linking the local institute with a US, or third country institution is a possibility.
4. Support for third country training is needed and could be utilized by Petrobangla (Indonesia), BPC (India) and Forestry Department (Philippines). There are doubtless many other applications.

5. Manpower planning and an assessment of management problems are needed by most of the organizations reviewed. Such a study should be the first stage of any major training package for an energy organization. Donor coordination, which is recommended throughout, is particularly important here, where especially for the major energy producers a variety of donors are working in isolation on small parts of the overall training needs.
6. AID is in a particularly good position to sponsor high level orientation seminars to expose senior decision makers to new energy options. Recommended subjects are gas utilization and peat, including high technology for both. As interest of the Government is the most critical factor in project development, such seminars should be seen as the first step in an energy project package, with very high long term benefits. Study tours in selected subjects are also still recommended, for the same reasons.
7. Field trials combined with pilot training/extension work are recommended for both fuelwood and bio-gas.

Across the board, two subjects emerge as the most critically needed:

management, especially of materials  
maintenance and safety

Energy tends to be treated by the donors as a technical subject, but the primary step in making improvement will be improved management and maintenance. At all levels, from logistics of petroleum handling in BPC to deciding how to plant and prune homestead trees, management is a critical step. Management training can more easily be carried out in-country than more specialized technical training, so an emphasis on management, maintenance and conservation using in-country training would fulfill a number of well established needs.

Courses can be established in one of the four categories shown in the matrix below:

Energy Training Matrix

PURPOSE OF TRAINING	SOURCE OF TRAINERS
Special to a particular organization	Local
Multi-purpose (serves several organizations)	Local with external technical assistance support

## CONTEXT OF THE STUDY

### Introduction:

The terms of reference for this study outlined a process whereby manpower plans and training needs of various energy-related organizations would be analyzed in the light of their development plans and current staffing patterns. It was soon found however, that the organizations do not have the data base upon which such an analysis can be done quickly. Development plans are general, short-term and/or not accessible. Staffing patterns constantly fluctuate in terms of total numbers employed and internal deployment of staff.

It can be said that virtually none of the organizations involved in energy-related matters in Bangladesh currently do any long-range manpower planning. Some of the largest organizations, such as Petrobangla, do have short range training plans, but nowhere are long-term staffing requirements matched with a plan for staff recruitment and upgrading through training.

It can also be said that virtually all of the organizations involved in energy have training needs, many of them acute. As it was impossible, given the lack of base information, to undertake any thorough assessment of real training requirements of the sector within the short duration of this study, instead, a "shopping list" approach was taken. Each individual interviewed was asked what the highest priority training requirements are in the energy field, or in his/her particular organization. Many of these ideas are included in the review of energy-related organizations below. Those which did not readily fit in are listed in a final section called Training Ideas. Some of the proposals are no more than suggestions of what should be; others are more firmly grounded in existing institutional requirements. Wherever possible, details as to appropriate counterpart agency and institutional arrangements are given.

Given that the interest of the Bangladesh Government may be the overriding factor in what aid to the energy sector is developed, perhaps this review of the opinions of the decision makers in the field is as good a place to begin as any.

### Energy Sector Review

#### Background

This is not a technical review of the various components of the Energy Sector in Bangladesh. Rather it is an attempt to synthesize the parameters of the problem, as a context for an examination of the training needs of the sector. For a technical summary, see the Bibliography.

Even within the eastern zone, natural gas distribution is expensive. Distribution of electricity to rural areas is already receiving a high priority among BDG and donors. However, costs are high due to low demand and off balance because of attempts to subsidize high power costs in the west and hidden subsidies of electrification.

- c. The third main issue of the modern sector is the poor quality of service: sporadic supply of diesel, constant power outages, mismatch of refinery production with market demand. Only kerosene, and to a lesser extent, motor spirit circulate with any efficiency.
- d. A fourth issue concerns energy wastage due to poor management, poor maintenance, and lack of conservation techniques. Among energy producers, technical losses are high at the time of production transmission and distribution. User inefficiencies are also high. Costs are affected by these losses and by the substantial rate of non-billing and non-payment.

Although costs of modern production and distribution are high, level of service is low, and coverage of the country is very limited. Wastage of these scarce expensive resources is considerable. These problems are in part due to the poverty of the country but in large measure are created or exacerbated by "lack of proper management, planning and technical skills in the sector of energy" (K. Islam, 1983). Thus, in the opinion of many Bangladeshis in the energy field, training in management and technical skills is an appropriate intervention. It should be noted that donors have tended so far to concentrate on technical equipment and skill training; management has received much less attention.

#### Traditional Sector Energy Problems

The traditional sector has limited access to commercial energy sources, with the exception of kerosene, which is widely distributed in Bangladesh. Increases in rural electrification and the distribution of gasoline still do not reach many parts of the country. Even where physical access is not a problem, in urban areas, poverty prevents access to commercial energy.

Traditional energy sources are, in rank of importance, agricultural wastes, animal wastes, and wood and tree trimmings. These are not uniformly available (there is a severe shortage of trees in the center and northwest, and an uneven distribution of cattle throughout) and all of these resources are subject to competing demands from agriculture (fodder, fertilizer) and construction. Thus Bangladesh is consuming its renewable traditional resources at a more rapid rate than they are being renewed.

In simplistic terms, Bangladesh has two quite separate energy problems. One concerns energy resources and consumption in the modern, commercial sector of the economy. The other problem concerns energy resources and consumption in the traditional sector, which includes the rural and the urban poor, traditional agriculture and traditional industry. In both modern and traditional sectors, per capita consumption of energy is extremely low.

#### Modern Sector Energy Problems

In the modern sector, there are four basic problems: dependence on imports, lack of access, poor service and **wasteage**.

- a. There is currently a heavy dependency on imported petroleum, which is expensive and requires scarce foreign exchange. Petroleum products are used for power generation, transportation, industry, and modernized agricultural inputs. Therefore a major policy of the BDG is to seek substitutes for imported petroleum. Bangladesh's extensive natural gas resources provide an excellent energy source, but they need to be further explored and exploited and new applications developed (methanol, LPG, CNG, etc.) for domestic use.

A constraint to the further exploitation of natural gas reserves is the limited purchasing power of potential consumers, and the lack of identifiable export markets to justify development costs. There are indications of a flexible market (response to LPG for example) but little creative thinking in the Government or among donors.

Other options in the modern sector are to exploit Bangladesh's peat reserves (which is low cost and has a very low foreign exchange cost), to search for oil within Bangladesh, and to develop substitutes for commercial energy from renewal resources (charcoal, solar, etc.).

- b. Along with substitution of imported petroleum, the most important priority in the modern sector is to improve distribution of energy. The major constraint is the Jamuna/Meghna River, which separates the country into two zones, with no natural gas in the western zone. Attempts to send electricity and natural gas from east to west are extremely expensive relative to foreseeable payoff. Coal reserves are located in the west but so deep that technical constraints to extraction are considerable. Peat reserves in the west have recently received attention since peat combines locational advantage, labor intensive techniques leading to significant employment generation, and the potential for upgrading marginal land into productive agricultural land as a follow-up to peat extraction. In addition to modern sector applications (power generation, gasification, boiler use) peat can be used directly as a traditional domestic (chula) and industrial (gur, tobacco curing) fuel.

Leaders in government and elsewhere are somewhat aware of the problem of rural energy, but government has no policy concerning either rural or renewable energy at present. The nascent efforts to deal with this issue in the Planning Commission continue to receive extremely low priority, and are not addressed by the Ministry of Energy at all. Organizations which might be capable of dealing with technical solutions in the rural areas, notable the Extension and Forestry sections of the Ministry of Agriculture, have not been able to do anything and have other higher priorities of their own. Various government supported research operations (BCSIR, BUET, FRI) have done a bit of research but have no facility for dissemination of their findings, and in any case have not developed the technologies to the implementation level. Until rural and renewable energy attains some priority within the government, donor activities will of necessity be limited to support of research and pilot projects.

#### Donor Activities

Current donor activities in the modern sector are considerable, sponsoring about 40 projects with grants and loans from 21 donors. In the absence of any real energy planning on the part of the country (both the Ministry of Energy and the Planning Commission deal with issues and problems, not the sector as a whole) coordination among these efforts has to come from the donors themselves. Technical assistance in several aspects of energy planning is also being given, but progress is slow.

Donor activity in renewable energy is much lower, mainly due to BDG priorities. There are a number of forestry projects and a new energy planning project is meant to include renewable energy.

Most bi-lateral projects include some funds for training, and a few give support to local training institutions, but because projects are undertaken by many donors, training is not well coordinated.

### Training Review:

There are a number of constraints to the establishment of training programs and individual training plans, which must be kept in mind but should not be construed as insurmountable barriers to a successful training component.

### Institutional Background

Salary scales of the Bangladesh government and all its subsidiary agencies are amongst the lowest in the world and are not competitive with other potential employers within, and outside, the country. Especially for persons with marketable technical skills, the opportunities to work in the private sector or outside the country are considerable. It should be anticipated that any training program will produce trainees, some percentage of whom will not join or return to the government agency for whom their training was intended, or will stay only long enough to fulfill their service bond. However, some trainees do return and stay, and those who do not are still directly or indirectly an asset to their country. It should be noted that although government cash salaries are extremely low (the maximum salary paid is Taka 4,000 per month - \$160.- plus additional benefits such as housing and vehicle) there is considerable prestige attached to government service in Bangladesh. There is furthermore the attraction of job security. Finally, government service provides a useful base from which private consultant work can be operated. For all these reasons, substantial numbers of technically qualified people do remain in government service, in spite of the low cash remuneration.

Bureaucratic procedures are complex in Bangladesh and there is a consistent pattern of overstaffing, and yet senior and technical posts are vacant, due to undertrained manpower. In addition to bureaucratic delays, this system means that communication between parallel agencies, and from bottom to top within agencies, is hampered. Transfers within the system are frequent, and it should be anticipated that a certain percentage of trainees may soon after their training be re-assigned to duties which do not relate to the training they have received. This situation again argues for increasing the number of persons trained, to make up for losses due to transfers. The transferred trainees still remain a direct, or indirect, asset to the country.

Promotions within government are almost entirely on the basis of seniority. This may limit the future productivity of entry level trainees and acts as a cause for resignation from government service, alongwith lack of salary incentives.

### Operational Constraints

Under-trained personnel is only one aspect of the difficulties facing Bangladesh's organizations. Lack of resources to carry out needed tasks will be expected to hamper the effectiveness of personnel who have received training. This difficulty argues for as much training as possible in-country, using local skills and the advice of overseas experts familiar with local conditions, whenever possible, so that training will be relevant to these constraints. It also argues for in-service training where the actual needs and constraints of the employer are built into the training program. But there is also a need for multi-purpose training to promote exchange of ideas and broadening of horizons.

### Procedural Constraints.

Once individuals have been identified to be trained, the procedures for arranging that that person be released from working duties and to provide the necessary papers, documents, and money to take advantage of the training, can be time consuming, and these procedures should be allowed for. US AID centrally funded training courses require that the BDG provide an air ticket from Dhaka to London, for example, and BDG clearance can take some time. These facts should be taken into consideration when overseas training proposals are carried out.

A similar, though much smaller scale, problem exists when arranging for in-country training. For longer term training, the individual must be given leave. Short courses must be scheduled at whatever time and place will effectively attract the desired participants. Individuals given leave for a preliminary course may then not be given time to take subsequent courses. Especially with technical personnel in the modern energy sector, operational schedules may interfere with planned training programs, and the two are rarely coordinated. Lead time to plan, organize and process the participation of individuals is rarely adequate, even when the training program has been planned, and the relevant administrators informed, months in advance. Thus it is often difficult to identify and produce the number of participants for which the training was designed. When all the participants of a course come from the same institution, or department, it is doubly difficult to arrange for adequate number of trainees.

Lack of coordination within the energy sector organizations, and among the donors, means that different training programs can be competing for the same potential trainees.

As training efforts have not always been based on adequate manpower and task analysis, training courses have been irrelevant to priority needs. This argues for careful background work before embarking on a training exercise.

Overall, being trained connotes status but being a trainer does not (except for University lecturers). Furthermore, trainers need special qualities and skills beyond their technical knowledge to be effective. "Train the trainers" is a key phrase cliché, but "With definite applicability to Bangladesh. They must be given status as well .

### Participator Constraints

There are many technically trained persons well able to take advantage of courses to upgrade their skills. However, these individuals tend to be needed in their jobs, and cannot be released for long periods, or for more than one short period. Other persons more easy to release may be lacking in some of the background skills necessary to take advantage of the training offered.

As promotion is based upon seniority (within government service) and as the personnel procedures do not allow for in-job salary increases following additional training, the incentive for an individual to undertake training comes only from his own motivation and this motivation may be lacking. However, any course which provides a certificate (or diploma) from a well regarded institution is sought after, especially for persons working in or desiring work in the private sector. An example of such an institution is BUET, where a diploma from a short course is highly desired, to the extent that the Institute of Appropriate Technology is now considering a final examination system for short courses, and the granting of two certificates: one for "particip-ant" and one for those who pass the exam.

For very high level participants, such as for an orientation seminar of one or two days, it may be difficult to assemble enough participants at a single time.

Scientists posted in field stations, junior scientists and employees of subsidiaries may be overlooked when course participants are selected.

These constraints argue for detailed and long term planning for any training undertaken, and for anticipating a lower participation rate than planned for. It also argues for working through the more prestigious local institutions when designing in-country courses.

Finally, it argues for a careful consideration of appropriate participants as well as appropriate courses.

Trainer/counterparts are also difficult to find because technically qualified people are needed in operation work and because of the lower status attached to teaching. Trained trainers are also subject to transfer.

On the job counterparts are also hard to identify, may be subjected to competing demands, and may be transferred out. This argues for identifying counterparts before a project begins, and anticipating counterpart difficulties.

#### Cultural Constraints:

Some experienced Bangladeshis cite the "false pride" of educated people who have a cultural bias against working with their hands and doing dirty tasks. More important, they cite the fundamental lack of familiarity with tools, machines and mechanics in the society. They feel that foreign experts underrate these cultural aspects in designing training courses here. This argues for involvement of professional Bangladeshis along with expatriate advisors in training course formulation and project development.

It should be noted that there is a tendency to solve a problem by creating a new institution in Bangladesh. The institution may flourish during development but then dwindle for lack of funds, lack of sustained support, irrelevance to local needs - or because newness alone is not likely to solve problems. At all costs, AID should avoid creating new institutions. But it should also avoid creating ad-hoc arrangements which will collapse at the end of the technical assistance (such as the Bechtel project). Counterpart organizations should be pressed to make existing facilities available for upgrading support. The frustrations of this approach tend to be outweighed by the benefits.

## ENERGY-RELATED ORGANIZATIONS

The organizations described below constitute most of the major energy-related activities in Bangladesh, and a number of other organizations which are either illustrative or which may play a greater future role in energy. Time and scheduling constraints prevented interviews with several organizations which might otherwise have been included in this study, and prevented revisits which would have been desirable.

For each organization, the purpose, history, current staffing and training needs have been recorded, along with training program details where available.

The energy producing organizations are presented below, along with short descriptions of several important energy resources, both renewable and alternative, for which no single organization is yet responsible. Then follow the organizations involved in energy planning, research, and energy-related training. The scope of work did not include an examination of training institutions as such. An analysis of the facilities and capabilities of NIPA, MDC, COTA, IBA, Rapport B, etc., would be a useful adjunct to this report.

The information is uneven in that some aspects were studied in much more detail. Time constraints prevented collection of further information which is available and could be obtained on selected topics at a later date.

### Energy Producers

Following are descriptions of the major government organizations which supervise and carry out the production of commercial energy in Bangladesh. Not visited due to time constraints were BMEDC, Geological Survey, and the various subsidiaries of Bangladesh Petroleum Corporation.

**Mineral Resources Division**  
Ministry of Energy and Mineral Resources

Mr. Naruddin Kamal, Section Chief, Petroleum and Natural Gas

Purpose

The Ministry oversees and coordinates the production and distribution of energy. The Division is in charge of exploration, field development and transmission, and distribution of petroleum and natural gas (as well as exploration of other mineral resources and geological survey work.

Background

The Ministry of Energy was established in 1980, for the first time linking under one Ministry petroleum and natural gas with electricity.

The Mineral Resources Division has four sections: Petrobangla, Bangladesh Petroleum Corporation, Bangladesh Mineral Exploration and Development Corporation, and Geological Survey of Bangladesh. Under Petrobangla and BPC are the dozen subsidiaries concerned with resource exploration, acquisition, processing, distribution and marketing. (See also Petrobangla, B.G.F.C.L., Titus Gas, Bakhrabad Gas and BPC). The Energy Division (which is actually the power division) includes all electricity functions plus atomic energy. (See also Energy Division of the Ministry of Energy, BPDB, and REB).

The Ministry is a line department, staffed by technical and management staff but managed like a government bureaucracy. Many of the organizations it supervises were formerly private companies, and are still managed on the principles of private enterprise. This causes some conflict of outlook, especially in combination with the Government control on salaries and profits and the complex bureaucratic procedures prevailing in Bangladesh.

There is a planning cell in the division but, according to Mr. Kamal, creative planning is done by Petrobangla, etc., and the planning cell reviews project proposals. When asked who plans for those functions for which there is no existing agency, Mr. Kamal replied that there is then an ad-hoc search for aid.

The Ministry has three main functions in the Division: exploration, field development/transmission and distribution. The current priority is on exploration. Appraisal of total reserves is needed before any

adequate planning for the future can be done. Therefore there is a particular need for seismic work, and drilling of core samples for laboratory testing.

In addition to training constraints and training needs, see below, Mr. Kamal discussed a number of other issues facing the Ministry. This is not meant to be a comprehensive coverage of the Ministry, and emphasis is placed on Petrobangla, rather than the other sections.

1. Petrobangla already has a set of programs which cannot be expanded because of (internal) funding limitations. Therefore any new program suggestions must fit in with the established constraints for the next five or ten years.
2. When asked, Mr. Kamal agreed that there are management as well as technical needs; he added that Petrobangla is soon to be reorganized into two major companies, one for field development and one for gas transmission. Each of these companies will have several subsidiaries, perhaps on a geographical basis. Much can be done if the will exists to improve, but technical assistance on the management side will also be needed.
3. Maintenance cannot be done because demand is so close to supply that no operation can be shut down for maintenance. The Titus fields will be in a better position vis a vis maintenance when the three new wells are finished. The gas system is very vulnerable at present.
4. Mr. Kamal's own opinion is that BPI should include a data center, physical facilities including laboratories, processing and interpretation facilities, and training. There is some IDA funding for physical facilities and processing and interpretation but more will be needed; if no further UN funds are available then NORAD will be approached to help with training. One problem with BPI is that Government still sees it as a project, not an ongoing function. It needs a full-time director, a counterpart, but there is a shortage of persons senior enough to set aside for this task, as well as uncertainty about future funding. It may be too soon for an autonomous institute. Mr. Kamal himself had recommended that BPI become part of Petrobangla, but the Minister had wanted it to be a more independent, service oriented operation.

#### Staffing

Overall staffing of the Ministry was not discussed but Mr. Kamal commented on the brain drain, especially among staff who have received formal academic training, and among critical skilled workers such as welders. He also said that, while training is needed, it is very

difficult to spare personnel. The best approach is to train junior staff, who should be groomed for senior positions five years hence. The situation may change from time to time. For example, last year there were no execution projects, but now they can't think of sending production staff off for training, and no lull is in sight unless funding collapses. Shortages of all types of technical staff are well documented elsewhere.

### Training

#### Training Needs:

Only training for Petrobangla was discussed. Staff in all aspects of exploration need training, in particular reservoir engineering, use of digital seismic equipment, and "the drilling side".

Training at academic institutions to degree level exacerbates the brain drain, therefore emphasis should be on short term, practical, operational training, with academic training only for laboratory and policy level personnel.

Although Petrobangla has done a detailed training plan (see Petrobangla) not all aspects were taken into consideration. Furthermore, it is necessary to identify the persons who will be trained, as much as a year in advance, which Petrobangla has not done. Even if some individuals are changed, there will be benefit from the planning exercise. And even if as many as half of the people trained are subsequently lost, you still have the other half. But training courses must be carefully selected for relevance. Field people need field, not academic, training. Petrobangla may have mixed the two categories, and have gone for too many MScs. In any case, classroom and theoretical training is not enough.

#### Training Facilities:

These were not discussed; see Petrobangla, BPC, etc. Mr. Kamal discussed only the Bechtel project, about which he made several comments. He feels that the good aspects of the project are the data analysis and establishment of a data center; the training, including the seminars, which benefit other organizations as well as Petrobangla; and the review of existing operations. His criticisms are that the scope of work is not clearly written, and was not reviewed in sufficient details with Petrobangla beforehand. In contrast he mentioned the World Bank's second hydrocarbon project, which was based on a year of detailed discussions between donor and recipients. The agencies therefore know what they will have to do. He also criticised that some aspects of the Bechtel project duplicates work covered by the Bank project and by BPI.

In terms of funds for training, the production sharing contracts all include short course and on-the-job training. The Bank's second Hydrocarbon Project contains \$500,000 for training, usually in the donor's country. All other projects have training components as well.

#### Recommendations

1. Project development needs to be done in considerable detail, and if possible include discussion with those agencies who will actually participate in the project.

On the basis of existing training plans and discussions with only a few senior officers, it is impossible to accurately assess the real training needs of the Ministry. Their own capacity to identify and communicate long term needs in a practical manner also appears to be limited. Finally, their process of review of external aid proposals does not appear to be sufficiently detailed. For all these reasons, I recommend that AID offer to finance a manpower study or similar analysis of staffing and management needs, of the whole Ministry or of selected divisions, sections and subsidiaries. From this analysis, a broad based project or some special-purpose training projects could be developed.

Petrobangla, Ministry of Energy

Mr. Afsarrudin, Director of Training

### Purpose

Exploration and production of natural gas and oil resources of Bangladesh; supervision of the operation of its subsidiary companies.

### Background

Petrobangla was formed in 1977 and came under the newly formed Ministry of Energy in 1980.

In addition to its own activities in exploration and management, Petrobangla oversees and coordinates the activities of a number of subsidiaries, most of which were formerly private companies. These are:

Toila Shaudam - on-shore exploration.

Bangladesh Gas Field Company Ltd. - on-shore production of Titus and Habiganj.

Bangladesh Petroleum Ltd. - on-shore production of Sylhet and Chhatak.

Bakhrabad Gas System Ltd. - production and distribution of Bakhrabad.

Titus Gas Transmission & Distribution Company - distribution of Titus and Habiganj.

Jalalabad Gas Transmission & Distribution Company - distribution of Jalalabad.

Although the subsidiaries have fairly autonomous staff and management, the Board of Petrobangla must approve all major undertakings and, through them, all contacts with the Ministry of Energy and the External Resources Division must be channeled. Petrobangla is heavily represented on the subsidiaries' boards.

### Staffing

The total establishment of Petrobangla and its subsidiaries includes 900 officers, of whom 50% to 60% are technical, and 3,000 staff, of whom 50% are technical.

Within Petrobangla itself there are currently 484 officers and 1,347 staff, for a total of 1,831. There is a not-yet approved proposal to expand this staff to 666 officers and 1,485 staff; that is a 27%

increase in officers and a 9% increase in staff. The relationship between this expansion proposal and the proposal to train 215 officers in the next three years is not explicit, except that the 215 officers will presumably return to the various subsidiaries as well as Petrobangla itself (see below).

At present Petrobangla recruits ten to twenty new technical officers each year. There is no shortage of applicants, but they all require specialized training. Some new recruits, and some existing staff, do leave Petrobangla for more profitable employment elsewhere, but this is not a major problem, says the Director of Training. However, there are staff shortages throughout the organization. Areas of particularly acute shortages are:

- Petroleum geologists and geophysicists
- Drilling engineers
- Production engineers
- Well testing engineers
- Log analysts; mud and well
- Bio/Lithe analysts
- Well repairing and maintenance
- Pipeline transmission engineers
- Gas utilization planners
- Off-shore technology (but this is not a major emphasis)

### Training

#### Overall Situation:

Petrobangla suffers from many of the manpower problems commonly sited in Bangladesh which may be summarized as the inability to retain, motivate and efficiently utilize staff. As outlined in their recent comprehensive training program the basic problems are:

- poor emoluments (government pay scale).
- promotion based on seniority with no consideration for performance.
- no job satisfaction.

These factors lead to a "reluctant attitude toward work" (source: Comprehensive Training Programme, Revised) as well as outright loss of staff.

In addition, there is the need to train their technical staff in a wide range of specialties. This need has been identified in four categories:

- long term overseas academic training.

mid-term (6 months to 12 months) overseas on-the-job training.

short term senior staff orientation courses, seminars and study tours,  
and

in-country administrative training.

A separate approach, in-country mid-term technical training through technical assistance (such as the AID funded Bechtel program) and the UNDP supported Bangladesh Petroleum Institute) has not been specifically identified in the most recent training program, but adjustments to the mid-term training list apparently reflected these ongoing projects.

At least since 1981 Petrobangla has undertaken a study of its training needs and desires. A Comprehensive Training Programme in 1981 was followed by revisions in 1982, and a third version is currently being completed. A comparison of these various documents may help to show how well Petrobangla is planning for future manpower requirements.

The 1981 Comprehensive Programme discussed at some length the problems of staff retention and utilization, and then listed very specific short, medium and long term training requirements. In 1982 a newly appointed Training Director prepared a revised comprehensive plan.

Items in the 1981 Comprehensive Training Programme apparently later dropped were:

Reservoir evaluation (recently put back in).

Geochemical methods of exploration.

Sedimentary Petrography and Preparation of Geologic Maps

Overall, the original program placed more emphasis on planning and was more specific. For example, "Financial Management in Gas Development Project including Stores Accounting" was later revised to "Financial Management in Oil/Industries". However, the most recent revision has reinserted reservoir evaluation and expanded the planning function somewhat.

The major distinction between the original 1981 program and subsequent versions, aside from its greater specificity, is that there were 91 mid-term training positions proposed (compared with the current 177) and that against each post a particular person was identified. Of these, six worked for BGFCL, two for Titus, two for BPL, one for BGSL, and all the rest (80) worked directly for Petrobangla. The Petrobangla employees

came from the various divisions and specialties as follows:

Geologist	..	25
Geophysicist	..	5
Chemist	..	5
Pet Engineers	..	5
Mech Engineers	..	2
Drilling Engineers	..	6
Electrical Engineer or Officer	..	5
Other Engineer	..	3
Planning Division	..	7
Finance/Accounting	..	4
Implementation Division	..	8
Stores Officer	..	1

Four Directors for a two week management course were included.

Two of the candidates, both geologists, proposed for study of Palynology were women.

In 1982, after the appointment of a new Training Director, a Comprehensive Training and Manpower Development Programme for 83-85 (Revised) was produced. This program summarized the difficulties of the existing seniority-based promotion system and stated that the previous plan had not assessed training needs and had ignored some fields. Therefore the plan was revised, names of candidates were removed and the plan was expanded to 225 persons (177 mid-term). Terminology used and organization of specialties differed so that it is very difficult to specify exactly which categories of training were added or expanded. Planning functions were reduced and training categories made more general. The program included a list of preferred locations for overseas training, including seven US institutions, five British and two European institutions, plus the Algerian and Indonesian national petroleum companies.

It mentioned that while short and long term training is relatively easy to arrange, for mid-term on-the-job training it is very difficult to match courses with needs, and proposed to hire a consultant to locate and arrange suitable training opportunities, preferably in the US.

The programme stated that the Algerian government, which has already trained 76 persons, was willing to train 75 more, but since a favourable meeting in 1981, no further meetings have been held. The Indonesian

government has offered three-six month training for 56 people, free except for transportation and living costs, which BGD has not so far approved. Twelve people were trained by the Turkish Petroleum Corporation and offered further training in drilling, seismic survey, well cementation, petrography, paynology, well site geology and well log interpretation. This proposal is now with the Ministry awaiting approval; costs can be met by existing training funds. Three persons have been sent to Belgium, US AID sponsored four persons in 1981 and there are fifteen candidates awaiting approval.

The program mentions the utmost necessity to establish a good coordination and contact between ERD, the then Petroleum Ministry, and Petrobangla which may overcome lapses of these opportunities. Of BPI, it stated "efforts should be made to set it up in a full fledged way" and that unless a positive move was taken from the Bangladesh side, the Institute might come to an end.

Local training institutions were noted, all of which provide general administrative and management courses. The program states that 370 persons would be trained locally, mainly by BPI and the Bechtel program.

Funding sources for training were to come from Shell (\$500,000), ADB (\$640,000), IDA (negotiable) and ADB/IDA project training funds for BGSL, BGFCL and TGTDC and offers from "friendly countries". All local training costs could be covered by Petrobangla's annual budget for its own staff, but all subsidiary company staff costs would not be covered by Petrobangla.

A list of proposals to redress the difficulties caused by poor staff salaries, lack of job satisfaction and lack of upward mobility can be summarized as follows:

- increase of pay scales and benefits with or without promotion.
- tests, probation and other measures to identify good staff.
- over recruit to spare people for personal reading and for training.
- release people for training willingly.
- give Petrobangla autonomy to arrange training directly with government approval once it has been fixed up.

In February 1983 another Comprehensive Training Programme was prepared (and submitted to USAID). It was a much shorter document. Long term training was not included nor were there discussions of manpower difficulties, training history, or any policy recommendations. The total number of persons for mid-term training was set at 177.

Since that date, a revised version of this program has been made. The number of trainees proposed remains at 177 (plus 10 persons for long term training) but the following changes have been made:

a. Additions:

- Modern gravity prospecting
- Magnetic prospecting
- Plastic pipe use for gas transmission
- Gas use, gas based industry, methanol, petrochemicals
- Job equipment instrumentation, deviation drilling, side tracking

b. Expansion:

- Project planning and evaluation
- Oil field material management, procurement and supply

c. Reductions:

- Palymology
- Well repairing and servicing and production engineering
- Seismic data interpretation
- Instrumentation and TDC maintenance
- Radio communication engineering
- Pipe grading and inspection contract negotiation with multinationals
- Gas liquification and use (LPG, CNG)

d. Eliminations:

- Seismic data processing
- Drilling
- Drilling equipment engineering

The taka cost is the same (₳442,500), and the foreign currency cost increased very marginally (by ₳2,000).

In summary, the latest version shows greater specification of needs: there is an increase in planning and evaluation, management, deviation drilling, prospecting and a number of new technologies and gas uses. It shows a decrease in seismic data processing and interpretation, several types of maintenance, generalized drilling, gas liquification and palymology.

Short-term training needs have been substantially rearranged as follows:

a. Additions:

Reservoir engineering and evaluation  
 Gas well servicing and production  
 Gas distribution network  
 Gas well completion and production control  
 Oil field equipment, procurement and supply

b. Reductions:

Gas pricing and financial management for gas industries

c. Eliminations, gas transmission, gas production logistics and procurement

These changes appear to reflect a desire to be more specific and a greater emphasis on reserve assessment.

Conclusions:

What can usefully be concluded from this perhaps labored analysis? I believe it shows four things:

1. that some serious attempt at identifying training needs has been made in the past and is still going on.
2. that changes in priority are the inevitable result of change of staff (i.e. new training Director, new Minister) and of new training opportunities which evolve (i.e. BPI, the Bechtel project).
3. that it cannot be concluded what degree of analysis went into the preparation of these programs, which in themselves are only lists. They were prepared by the Training Division, under the direction of the Board, with recommendations received from the various divisions and subsidiary companies. No comprehensive analysis of manpower requirements and matched training needs, as far as I know, has been undertaken, and
4. it would appear that the needs of the subsidiary companies have not been fully met, given that 46% of the technical officers work for the subsidiaries, but only 12% of the training opportunities were intended for them in 1981 and no recent contacts concerning training have been made with those subsidiaries interviewed. Of course, one reason for removing individual names from the list may have been to free-up positions for other subsidiary employees.

### Results of Past Training:

Altogether 183 persons have so far received training. Of these 29, or 16%, have been lost from the service (either failed to return or have since resigned). The majority of these have been trained in Algeria, Japan and UK. The US has trained overseas 17 persons on the list of training opportunities since 1980. None are listed as lost, but one has died.

The agency where those trained overseas now work is as follows:

Petrobangla, Geology Division	..	46
" other divisions	..	80
Titus Gas	..	16
BGSL	..	5
BPL	..	2
MDP	..	2
Jalalabad	..	2
Not known	..	7

Of those not in Petrobangla itself, only five were sent to Europe (four from Titus, one from MDP). The other 22 were sent to Algeria and one to Singapore.

Of the persons trained, but no longer working, the largest number were from Titus Gas.

### Current Training Opportunities & Preferences:

At the time of writing, Petrobangla has two geologists training in Germany, one gas transmitter in Algeria, one geologist in Norway, one geophysicist and three financial managers in USA (funded by Petrobangla), plus one geophysicist and one drilling engineer in the USA (AID funded). There are also 12 engineers who will be trained by Dresser France shortly.

Petrobangla has sufficient funds to pay for participants to local training institutes. For overseas training, they have a budget of \$1 million per year, from the production sharing fund. This pays for three, four or six months courses. In addition, training courses are paid for by "some friendly countries like Algeria, USA, FRG, UK, Indonesia, Belgium, Norway, USSR, etc". At present, all initiation for these training courses comes from the sponsoring countries or institutions. An array of offers is made to Petrobangla, through ERD. Processing of these

offers is supposed to take one month but in fact is a lengthy and arduous process, often causing a late start to courses. The normal duration of courses offered is five to eight months. This is the preferable length; sufficiently long to learn something, not so long as to be difficult to cover the officer's duties while he is away.

In addition to this overseas training, and local management training already available, Petrobangla would welcome short orientation seminar/courses, especially in gas utilization, for senior decision making staff. Such short courses are useful, but it is difficult to assemble all the desired people; such courses of one or two days can be done two or three times in a year.

The Training Director pointed out several difficulties in meeting training needs. For the staff, who do not have the educational background and language ability, overseas training is not possible. For the officers, aside from arranging for foreign exchange funds, there is the problem that overseas courses may not be exactly suited to individual's needs. Most are short courses pre-supposing a good background, whereas Petrobangla staff need fundamental training as well. Sometimes the officers selected do not stick to the course, especially if it is not very relevant. Finally, because Petrobangla is restricted to an unattractive government salary scale, and because promotions are based only on seniority, there is a lack of incentive for officers. These problems notwithstanding, there is a high priority need for further training of existing and future Petrobangla staff.

### Recommendations

There would appear to be six strategies AID could pursue in assisting Petrobangla in its training needs:

1. put together a major training package contracted through a major oil company such as Aramco or Kuwait Oil.
2. continue with ad-hoc funding of trainees using centrally funded training opportunities, augmented with Technical Resource funds.
3. support and expand existing in-country training:
  - a. BPI
  - b. Contractors, as with Bechtel project
  - c. Local management institutions
4. provide supplementary funds to permit third country training offers (such as from Indonesia) to be taken up.

5. offer Petrobangla technical assistance in manpower planning, personnel management and identification of training needs.
6. provide a series of short-term consultants to Petrobangla to address particular shortages and needs. These could be at several levels:

orientation and briefing for service level staff

on the job training for mid-level technicians

basic courses in such subjects as maintenance, repair, and safety for lower level technicians.

There are strengths and weakness with all of these approaches. Petrobangla and BGD interest and willingness will be the controlling factor. For that reason, perhaps the best approach would be to adopt both (1) and (5), with the terms of reference for (1) to include those of Petrobangla priority requests which are also observed to be needs, and those for which support exists in the Ministry and ERD. A firm such as Bechtel could undertake the manpower planning. However, AID's own interests might best be met by (3), in which building up local institutions could benefit several organizations.

An ancillary activity which AID could easily undertake would be to circulate more broadly a list of training opportunities as they arise; specifically, to copy all the subsidiary companies as well as Petrobangla itself. Special attention should be given to all management training courses: finance, materials, stores management courses are constantly cited needs among Petrobangla's subsidiaries.

Titus Gas Transmission & Distribution Co. Ltd.  
Petrobangla Subsidiary

M.A.H. Nizami Secretary

### Purpose

To transmit and distribute natural gas in mid-eastern Bangladesh; also authorized to deal with transportation and use of natural gas.

### Background

Titus Gas was incorporated in 1964 and began transmitting gas in 1968. The company was subsequently taken over by the government (1975) and since 1977 has operated as a subsidiary of Petrobangla. Current company priorities appear to be expansion of distribution.

### Staffing

Total number of staff is currently 1,118 officers and staff of which approximately one-third are technical. Altogether there are 220 officers half of whom are technical. Of 336 established technical posts, 325 were filled as of May 1983. Shortages appeared in pipeline construction and in several aspects of maintenance (transmission and distribution maintenance, metering and control technicians, cathodic protection technicians and equipment, and vehicle maintenance). Also very short were service connection technicians, but there were four times more service connection supervisors than establishment, and a shortage of sales engineers was balanced by an extra number of regional engineers. Similarly, a shortage of transmission and distribution engineers was balanced by an extra number of transmission and distribution technicians.

Of the 325 technical staff currently employed, 27 or 8% are engineering or science graduates and 35 or 11% have diplomas in engineering. At least one of the engineer graduates has had further overseas training to diploma level (in Holland). Among the senior staff listed in the Company prospectus, educational background was as follows:

BUET	..	14
Dhaka University	..	1
Rajshahi University	..	3
Chittagong University	..	2
East Pakistan Board of Technical Education	..	3
Calcutta University	..	3
West Pakistan University	..	2
Total		<u>28</u>

As with all similar organizations, Titus is suffering from a "brain drain". Some of this is due to experienced Titus people moving to other positions in Petrobangla (such as the General Manager Bakrabad Gas System Ltd) and some due to loss to the Middle East but more than half of the senior level staff have been there since the beginning. There is some gap at the middle level, however.

According to the Secretary, they keenly feel the constraints of changing from a private company to a government controlled operation. Aside from the government salary scale, the major constraint is that Petrobangla controls Titus, but is staffed with functionaries, not businessmen. The Titus Board is appointed by Petrobangla and Titus has no representation on the Board except the General Manager. There have been 11 Boards since the government took over with 11 different Chairmen. The Board is often indecisive. Contacts between Titus and ERD, and donors such as ADB, must all be channeled through Petrobangla.

### Training

#### Training Facilities:

Titus has a Training-Within-Institution program and a training facility at City Gate, but there is no staff at present. The training director has gone to Algeria and was never replaced. The facility consists of a building with space for 30 to 40 people, some equipment such as overhead projector, slide projector, etc., and open ground where special training can take place. When the TWI operated there was reportedly an attempt to assess training needs, evaluate, and then provide the course. A knowledgeable person to assist in this needs assessment would be useful.

Since their own training officer departed, current training in the country consists of some on-the-job training, and training in administration, accounting, etc., from short courses at BMDC, NIPA, IVA, Rapport Bangladesh, etc. But these courses are not gas oriented. BPI is seen by Titus as a potential to develop user-oriented technical courses locally. Titus's budget for local training is sufficient.

ADB has provided counterpart training and the recently approved Second Natural Gas Project includes technical assistance, in particular training of counterpart engineers.

#### Training Needs:

Overseas training opportunities are received from time to time. The program is circulated to managers who are asked for nominations. These are then screened and the number needed are provided. Titus has adequate funds to provide air tickets, etc., but no budget to cover overseas training costs. The ADB loan has helped in this.

It should be noted that ADB feels that one of the greatest needs of Titus is for improved management and administration, especially as they pertain to accounting. The covenant that no account will be allowed to be in arrears more than three months on the first loan has not been honoured. This is clearly an area in which training as well as management assistance is needed.

One particular need is to develop Gas Safety Rules and related training. The Secretary mentioned that the BPI safety course had been helpful, but they were all hampered by budget constraints from rigging a platform for proper training (which could be accommodated at the City Gate training facility).

Another is to expand maintenance activities, which are constrained by lack of manpower and lack of spare parts. The ADB loan assists with procedures for procurement of spare parts. The validity of this request is supported by the staff shortages currently evident in equipment and vehicle maintenance.

In addition to these specific requests, the Secretary suggested that any proposal to support overseas training of Titus staff should so specify; training "in the gas sector" would probably not come to Titus. He also recommended that any training opportunities be shared among the Petro-bangla subsidiaries in proportion to their manpower.

#### Recommendations

1. Copy Titus Gas when any relevant centrally funded training opportunities arise.
2. Investigate the potential for safety and maintenance courses in-country.
3. Consider ways in which USAID could assist Titus in reactivating its training facility, possibly also to train members of other subsidiary companies with similar needs. Possibly a series of courses at the technical rather than professional level could be conducted for all subsidiaries from Titus City Gate facility.
4. Provide technical assistance to analyze Titus's overall training needs.

Bangladesh Gas Field Co. Ltd.  
Petrobangla Subsidiary

### Purpose

Production and processing of natural gas from Titus and Habiganj fields.

### Background

Formerly this was the Bangladesh Shell Oil Company doing exploration and production of natural gas in five proven gas fields. It sold processed gas to Titus Gas, in which it owned 10% share. The 1975 Petroleum Act nationalized all petroleum resources in Bangladesh and the government bought out Shell. The exploration function was taken over by Petrobangla, which has subsequently created Bhakrabad to produce and distribute gas from the Bhakrabad field. BGFCL has retained the production and processing functions at Titus and Habiganj.

The Board is made up of Petrobangla people with the General Manager, BGFCL, as voting member. There have been very frequent Board changes. All decisions of the company must be channeled through Petrobangla. No definite development plans were identified, but there is a long term potential for two more wells at Titus and two at Habiganj. Currently under development are wells 6, 7 and 8 at Titus, financed by ADB, and two wells at Habiganj under French government aid.

Price changes in gas during 1982 may have a long-term impact. The profit had previously been Taka 1.53 but was reduced to 50 paisa (they receive Taka 18 from Titus but must pay Taka 17.50 in excise tax). This drop was simultaneous with a substantial increase in consumer charges. The ADB loan is intended to be repaid by BGFCL, but at the current pricing structure the firm may soon be bankrupt.

### Staffing

The present staff is 183 of whom 6 including the General Manager are graduate engineers. Headquarters is in Chittagong with a two man liaison office in Dhaka, and the field stations. When Shell was bought out it arranged that the government would take over the staff on existing terms and conditions. They are hired on a contract basis, and are not restricted to government salary scales. However, salaries were frozen at the 1975 level so the advantage is steadily reducing. Losses to the Middle East, especially of mid-level staff, are considerable.

## Training

### Training Needs:

Senior staff have remained and most of them have had adequate training. However, all new recruits have only background education and have been trained on the job. This is true of the financial and management staff as well as the technical, and both would benefit from upgrading training.

The training priorities are for graduate engineers in production, petroleum and gas reserve engineering, and for diploma engineers in maintenance and operations. Also important is the need for upgrading training in finance and in management, in particular materials administration (procurement, warehouse management, shipping, stock registration and accounting).

### Training Arrangements:

No staff have recently received any formal training. BGFCL might benefit from in-country training in materials management but for petroleum engineering they feel practical experience is required. (There has been no contact between BPI and BGFCL). Maintenance training would be useful, but a one or two day seminar to upgrade foremen/workmen skills is not sufficient.

Any training opportunity which is meant to benefit BGFCL should be so specified, as they say they are not currently included in training opportunities. One graduate engineer or management staff, and one or two diploma engineers could be released at a time for upgrading training.

## Recommendations

1. BGFCL be copied when any relevant training opportunities arise.
2. The possibility of materials management training be pursued in consultation with ADE and the French government.
3. BGFCL be included in any in-country training in maintenance which may be developed.

Bakhrabad Gas Systems Limited  
Petrobangla Subsidiary

Chowdhury Md. Mohsin, Director & General Manager

### Purpose

To develop natural gas and distribute it throughout southeastern Bangladesh. A multi-purpose company covering both production and distribution/transmission.

### Background

This is a wholly Government owned company, a subsidiary of Petrobangla, begun in 1979 to provide natural gas for southeastern Bangladesh, with financial assistance from OPEC and IDA. Headquarters are in Comilla, with a large office in Chittagong and a small office in Dhaka. It is fairly autonomous, with Petrobangla providing a review function. Two Bakhrabad Board members are from Petrobangla.

The five wells have been established and the pipeline to Chittagong all but completed. Work is now to begin on the distribution system in Chittagong and other parts of southeastern Bangladesh. ADB will provide further aid in this phase.

### Staffing

At present there are 350 persons on the payroll including 45 engineers. Ultimate establishment will be 1,150 employees.

According to the General Manager, recruitment of staff has not been a problem. Except for one or two people such as himself who came from Titus Gas, most staff are recent engineering graduates, all young, mainly from BUET. The General Manager says he has deliberately not filled a number of senior posts so as to leave room for advancement within the company. This is especially important since government salary structure is not attractive. At present three divisions (technical, distribution and finance/administration) report to the General Manager, who has no deputy. There are a total of 10 senior officer positions. It is proposed to develop three General Manager positions, with two or three Managers each, and a total of 26 senior officer positions.

As the company is new, loss of engineers to the Middle East has not yet been significant. Hundreds of welders trained by the Chittagong pipeline contractor have been lost, however.

### Training

There is no training facility or program existing or proposed; all training is carried out on the job, so as to keep the focus practical. The General Manager feels that after on the job training and experience, further formal training overseas may be beneficial, but not overseas training first.

#### Training Needs:

There is a \$2 million budget for outside training of technical personnel in both operation and maintenance from the IDA and ADB assistance. One employee has recently gone to USA. However management training, especially training focused on gas management, is also much needed and has not adequately been catered for. The General Manager expressed great interest in possible participation in overseas energy management courses. Of particular importance is training on the financial side, managing materials, stores, purchases, etc.

The General Manager saw no difficulty in participating in centrally funded training; he can pay the London fare.

### Recommendation

Given the apparent enlightened management of the company, and the tremendous growth of staff expected, Bakhrahad Gas Company should be informed of any relevant training opportunities, especially in the field of energy management. The General Manager can then make his needs known through Petrobangla and ERD in the normal way. Any attempt to aid Petrobangla's training program should take particular note of this company's needs.

Bangladesh Petroleum Corporation  
Ministry of Energy

M.H. Choudury, Director of Planning  
Ashar-ul Islam, Training Coordinator  
Wali-ul Islam, Special Assistant to Chairman

### Purpose

To acquire, refine and distribute all petroleum products; to carry out and expand petroleum marketing.

### Background

In December 1976 Petrobangla was divided into two organizations, Petrobangla to undertake exploration for oil and gas and distribution of gas, and BPC to handle all refining and marketing of petroleum products, directly and through its subsidiaries. Unfortunately none of these were visited. They are:

Eastern Refinery, and its sub-units

Asphaltic Bitumen Plant

LPG Plant

Burmah Eastern Limited

Jamunah Oil Company Limited (formerly BNOL) )  
 ) petrol marketing

Meghna Petroleum Limited (formerly ESSO and PPL))

Eastern Lubricants Blenders Limited )  
 ) lube blending

Standard Asiatic Oil Company Limited )

Foreign Equity in the above companies is Eastern Refinery: 30% BOC London; Eastern Lubricants: 49% BOC London; 16% Sadhaion Bima, 7% private; SAOCL 50% private.

All other ownership is with BPC. Products at present are motor spirit, including high octane, kerosene; high speed and light diesel; jute batching oil, high and low sulphur; furnace oil; turpentine; LPG and bitumen.

BPC's current emphasis is on upgrading the refinery and improving the balance of products to meet market demand. Currently an excess of naptha and furnace oil is produced, but middle distillates need to be imported. A World Bank project is assisting with refinery improvements.

The management is also expanding and improving storage and distribution, and converting to the metric system, a major exercise given the large fleet of transport vehicles and containers involved. They are installing a computer-based system, using the BUET computer but are seeking funding for five computers of their own.

Recently completed development projects are the LPG bottling plant (now to be expanded with French aid) a bitumen plant, an aircraft refuelling plant and several storage tanks, jetties and petroleum depots.

### Staffing

BPC has 58 officers and 151 staff. The officers serve in the Divisions as follows:

Secretarial	..	15
Operations	..	11
Planning	..	5
Finance	..	26

Manpower of the subsidiaries is:

	<u>Total</u>	<u>Management</u>	<u>Non-Management</u>
BEL	833	145	688
JOL	620	160	460
MPL	527	119	408
ERL	495	100	395
LPG plant	50	10	40
SAOL	20	3	17
(BPC)	<u>209</u>	<u>58</u>	<u>151</u>
Total:	<u>2,754</u>	<u>595</u>	<u>2,159</u>

BEL and ERL having foreign equity are not subject to the government pay scale, but some sort of uniformity of salary is attempted. BPC and all other subsidiaries are restricted to government pay scale. BPC suffers from the loss of technical and management staff like other similar organizations. A recent World Bank report noted a 27% shortage of staff and the lack in number and quality of technical and management skills. New recruits receive no formal training, only on-the-job.

### Training

Training Needs:

BPC has a small Training Directorate, although for some years the senior post was vacant. The Bank study mentioned above identified production planning, maintenance and training of junior staff as the most pressing

needs. The Bank proposed to provide a Training Director Advisor for three years. A five-year training plan has been prepared by BPC, and parts of this plan have been submitted to various donors, including AID, for funding. The request sent to AID in December 1982 is very similar to one submitted to UNIDO at the same time. The differences are that AID was asked to supply in Technical Assistance two men of 15 years experience each, one as a trainer and one a management trainer, whereas UNIDO was asked to find a Business Administration Trainer, and short-term Accountant/Data Processing and Computer experts. In terms of overseas training, UNIDO was asked to finance 12 man months of training in systems engineering and 12 man months of energy efficiency engineering, as well as the 120 man months of training in refinery engineering, maintenance engineering, petroleum economics and management training requested of AID. UNIDO was also asked for 10 extra man months of management training.

A recent letter (25/5/83) to the Secretary, Ministry of Energy, copied to AID, outlined the need for training in Energy Conservation, Industrial Plant Engineering and Power Systems Operation/Management.

A discussion with various BPC officers revealed a pressing need for follow-up training in Metric Conversion. One officer who recently went to A.D. Little for petroleum management course is now organizing a Management Information System and implementing a computerized metric conversion program. There is a great need during this transition period for BPC staff to visit a country which has recently been through this process. They have suggested India, but the Energy Ministry refused. However, they felt that if donor funding were secured, the Ministry might agree. There would then be a need to follow up with training in metric application for all levels of staff plus consumers.

The officers present made a persuasive argument for the utility of third country training and on-the-job experience. Their priorities are for the Directorate of Operations staff to go to Singapore or Bangkok or Indonesia for technical training. Shell and Esso at Singapore have a crude processing orientation which is relevant. Shell has a hydrocracker, where BPC would like to attach engineers for three months. There is also need to visit a country where computerization exists and, preferably, where the conversion has recently taken place.

#### Training Facilities : Overseas:

In the past seven years three present BPC staff members have studied in the USA. Of the A.D. Little course, the participant (Wali-ul Islam) said that as an exposure it was very stimulating but applications to Bangladesh almost nil. The emphasis there is on downstream applications whereas BPC has upstream needs. He thought that bringing a Little team to Bangladesh, where they were first given time to adjust their curriculum to local conditions, would be very useful.

### Training Facilities : Local:

BPC operates a Training Center in Chittagong at Burmah Oil headquarters. They have room for 20 to 30 participants and some audio visual equipment. Teaching is done by BPC staff who are called in to give a lecture. Courses normally last one week, and are held once a month. Such subjects are taught as Marketing, Management, Safety and Fire Fighting. The courses are primarily held for field officers and attendance is good as officers enjoy being away from the office, being in Chittagong, meeting colleagues and making contact with higher officers (the teachers). Training for senior level staff is more difficult; the Training Director said you would need a seminar on the Rocket to attract them.

The facility is also used by outsiders: for the regular management, etc. courses, customers are interested and send a few participants. They are charged Taka 600 per head which includes lunch (staff attend for free). Special courses have also been arranged, such as for National Cash Register. IBM gave a two day course last year which BPC organized and "all of Chittagong was mobilized to attend". BPC is currently organizing a similar course in Dhaka, and would be ready and willing to organize other special interest seminars and short courses.

### Recommendations

1. Determine the progress of IDA negotiations to provide a Training Director Advisor, and what is the intended assistance of UNIDO. Coordinate with other donors as needed. If no manpower study is proposed one should be done.
2. Pursue the possibility of a metric conversion assistance grant, including third country study tours, preferably to India, for a few senior officers, and an in-country staff training program on metric conversion. This latter could be done in conjunction with the Metric Standard Institute, but would need considerable technical input, possibly from third country expertise. With 187 tankers and massive logistical and storage problems, the need is established, and the transition period is an ideal one to institute other needed administrative reforms. This effort might be relevant to other energy producers too.
3. Give serious consideration to the training package as requested.
4. Investigate the possibility of bringing an A.D. Little training team to Dhaka, preferably for a multi-purpose management course covering BPC, Petrobangla, etc. Former Little participants could contribute to curriculum design. A series of field trips and orientation meetings should also be undertaken before the course began. Very careful scope of work and guidance of the consultants would be required to make the course relevant, perhaps using a local professional counterpart consultant.
5. Continue with centrally funded training opportunities.

Bangladesh Power Development Board, Ministry of Energy  
Directorate of Training & Career Planning

Mr. Safi Khan, Director, Director of Training and Career Planning  
Mr. M. Alum, Director, Chittagong Regional Training Center

### Purpose

To generate, transmit and distribute electric power in Bangladesh (except that REB distributes in some rural areas); to plan, develop and operate the power system (except that schemes over Taka 5 million must be evaluated and approved by the Planning Commission). The Directorate makes training plans and supervises all in-service training.

### Background

Power was formerly generated by private companies. The government began to nationalize power generation and distribution after partition. In 1972 the government formed the present BPDB.

Present electricity consumption is very low and many areas of the country are unserved. Within the serviced area there are low connection rates (20% in Dhaka) and bulk of consumption (70%) is by industry.

There are weaknesses throughout the system, especially low generation capacity, overlong transmission lines, and an overloaded distribution system, causing constant outages and voltage fluctuations. Also weak are maintenance, billing and collection procedures. Due to these and technical losses, currently about 40% of power generated remains unpaid for. Government consumption is considerable and frequently unpaid for.

The technical causes for these problems are being addressed by expansion of generating and distribution facilities, with significant donor assistance (IDA, ADB, ODA, FRG, CIDA).

Rural electricity is being expanded by the recently created Rural Electricity Board (USAID funded). Generation capacity is being expanded with donor assistance from IDA and ADB. Transmission and distribution facilities are being upgraded and expanded in four cities with bilateral donor assistance. But rapid expansion of distribution continues to stress the system. And overall lie the problems rooted in poor administration, lack of trained personnel, and loss of staff to the Middle East.

### Staffing

BPDB currently has 24,000 staff of whom more than half are technical, 13% are officers, 54% are skilled or semi-skilled workers and 33% are unskilled. Of the officers, 800 (26%) are graduate engineers, 1,875 (60%) are diploma engineers and 435 (14%) are non-technical.

Staff are recruited from the engineering colleges and trained on-the-job. As power is a growing sector in the Middle East, loss of trained manpower is considerable.

### Training

#### Training Facilities:

The Directorate is in charge of long-term planning for training of BPDB staff and to that end has prepared a ten-year plan (in September 1981). It has not yet been approved by government and, for the present, in-country training is provided by the six functioning training institutes of BPDB, plus supplementary training in outside Bangladeshi institutions such as NIPA, COTA, etc. Overseas training offers are received from donors and suitable candidates sought from the line departments to take advantage of these offers. Two standing committees, one for personnel earning less than Taka 2,000 per month, and the other for personnel earning more than Taka 2,000 per month, review the candidates and award the courses. This is done on a short-term basis as offers are normally given with very little notice.

The BPDB has six training institutions currently in operation and a new institution at Ashuganj is planned. These institutions offer the following training at present:

1. Kaptai Academy (jointly with Water Development Board)  
Management training for senior level officers.
2. Regional Training Centres at Khulna, Chittagong and Rajshahi  
Training of technicians in Distribution of Power.
3. Ghorasal Training Institute for lower level technicians.
4. Tongi Training Centre (and centralized repair workshops)  
Courses in specialized equipment, in conjunction with the maintenance/repair shop.

The capacity of these institutions is as follows:

BPDB Training Facilities : Existing Capacity

<u>Facility</u>	<u>Existing Staff</u>	<u>Hostel* Places</u>	<u>Classroom</u>	<u>Workshop</u>	<u>Vehicle</u>	<u>Staff Qtrs. Officers/Staff</u>	
Kaptai (BPDB only)	88	75		adequate	3	30	2
Regional Training (Rajshahi Chittagong Khulna)	?	none rented <b>rented</b>		none (all rented)	1 each		none
Ghorasal	45	50	2800 sq.ft.	2400 sq.ft.	1		none
Tongi	53	80	13400 sq.ft.	none	2	8	8
Ashuganj	0	0	0	0	0	0	0

\* Note: There is also a total of 196 hostel places in five apprentice hostels located at the power stations at Ashuganj, Bheramara, Shahjibazar, Siddirganj and Khulna.

Some of the above centres have typewriters, photocopy machine, film projector, etc., but equipment is very insufficient.

BPDB proposes to reinforce the Khulna Regional Training Centre to train higher level staff, engineers in distribution so that Khulna will become a central facility for all distribution training. The new training centre at Ashuganj will train engineers in power generation.

One regional training centre, at Chittagong, was inspected. It operates from a rented four-storey residential building in Chittagong. The building has an office, two small classrooms, a store, a demonstration space in the garage, sleeping space for 16 persons and residential accommodation for two staff members.

The purpose of the centre is to train linemen, linemen helpers, foremen and electrical staff involved in power distribution in the region. There are currently 370 linemen in the Chittagong region and 807 linemen helpers.

Courses normally last two to four weeks. They are refresher courses for experienced linemen (who are often unenthusiastic to be taught what they feel they already know). They also do proficiency courses for secretarial and clerical staff. The courses for linemen are in four parts; you must pass one course to move on to the next.

The Centre was established in 1976 as part of a training project with assistance from CIDA. Ten people were sent to Canada for one year of teacher training and a consultant came to Bangladesh to assist with development of courses and curriculum. The Chittagong centre's Director was one of the Canadian-trained staff. He has a teaching staff of five, including one subdivisional engineer, one sub-assistant engineer and three foremen.

The Centre handles two groups doing two separate courses at a time - normally 30 to 40 students. There is an established syllabus and regular examinations. The linemen's course includes Basic Mathematics, Basic Electricity, Tools and Equipment, First Aid, Energy Metering, Connections, Safety Practice, Tree Trimming and Customer Relations. Most trainees are older linemen - new recruits are not trained in the Centre.

There are no teaching aids at the Centre and tools and line hardware have to be begged for. The facility is small and there is no room for practical linework. They have the use of a field five miles away, but it is too small. They have a mini-bus but need a pickup truck to transport equipment.

The Director of the Centre said his particular needs were:

teaching aids, specifically projector and films.

compression tools and join tools

a pickup truck

a refresher course to upgrade the training skills of his teachers (in-country or out of country) none of whom have had any teacher training.

The Centre was found to be clean, orderly, and what little equipment was available looked properly cared for. It appears that the Centre functions well, within the limits of its facilities, and could be expanded and built upon.

### Training Needs:

In all of BPDB's training institutions there are three priority needs:

1. Training of trainers: upgrading of technical skills and training in teaching methodology.
2. Visual Aid equipment.
3. Training Software: Films, cassettes, training manuals, etc., some needing to be translated into Bangla.

In connection with these needs, technical assistance would be useful in providing the training of trainers (who may also need overseas courses) and teaching the use of training software.

The BPDB is aware of the need for longer term and more comprehensive training planning. A ten-year program has been developed by the Directorate of Training and Career Planning which identifies the materials and training required to establish these training institutions as envisaged. Key elements of the plan, which have not yet received government approval, are as follows:

1. Increase of training staff from 214 to 409.
2. Training of the above staff, both locally and overseas.
3. Capital expenditures for teaching materials, etc.
4. Capital expenditure for physical plant.

These requirements have been worked out in some detail, for each institution's particular needs.

Total costs are estimated at Taka 4,000 lakh, of which 30% is in foreign exchange. Taka 100 lakh is approved in the current Five Year Plan. It appears that the Planning Commission agrees in principle to the training requirements, but has asked the BPDB to cut overall costs, which the BPDB does not wish to do.

The UN recently completed a study of BPDB identifying five urgent needs, which fit in with the expressed needs of the Directorate. These five are:

1. to reinforce the material base of the Training Centres.
2. to reinforce the staffing of the Centres.
3. to provide on-the-job training, through technical assistance.

4. to link training curricula with jobs.
5. to design an integrated manpower plan.

Donor assistance in overseas training is also needed.

Following from this study, UNDP has proposed assistance to long term manpower planning and upgrading of Kaptai Academy. Negotiations are at an advanced stage but not yet approved. Other on-going donor assistance would contribute some of these above needs, in particular ODA.

The ten year plan and other activities indicate that BPDB has the capacity to identify its own training needs and to absorb assistance in this sector. However, an inside source has observed that training is not a high priority with BPDB (allegedly because it does not give direct results) and the Directorate of Training does not hold a position of strength within the overall management.

#### Recommendations

1. AID initiate or participate fully in a meeting of all donors to coordinate training assistance to the power sector.
2. AID continue and, if possible, expand its offer of overseas training opportunities to the power sector.
3. AID look into the possibility of a project to upgrade the existing training facilities (in particular the regional training facilities).

The project would consist of:

- a. overseas or in-country (preferably) upgrading of teaching skills.
- b. provision of basic teaching equipment, including software and tools.
- c. analyse current curricula for any needed revisions.
- d. investigate ways to coordinate and share training facilities with REB (see also REB).

Directorate of Training  
Rural Electricity Board  
Ministry of Energy

Jim Lemming, Training Advisor

### Purpose

To transmit and distribute electricity in rural areas by providing power and assisting in the establishment and operation of rural electrification societies, Palli Bidiut Samities (PBS).

The purpose of the Training Directorate is to develop and conduct a comprehensive program of training in all facets of rural electrification for all levels of REB and PBS employees, consultants and contractors.

### Background

REB was started in 1977 as an entirely new institution, on the US rural electrification model. Although a few staff members may have previously worked with BPDB, there is no formal relationship between the two organizations. The REB uses a single phase electrical system which is compatible with but quite different from the three phase system used by BPDB. However, BPDB has agreed that all rural electrification will use REB standards and systems, including systems built outside REB.

Because the institutional framework is new and follows new technical and management procedures, training has been a major component of the project since its inception.

### Staffing

The REB has a large staff of its own. The PBS each have their own Boards of Directors, General Managers and employees, and private contractors are used for all the actual electrical work down to the level of village electricians to do house wiring. All of these people are included in the Directorate's training scheme. Most staff are brought in new from the outside.

There is staff turnover. For example, in less than four years, of ten PBS General Managers, eight have gone to the Middle East or to other jobs in Bangladesh (one was sacked). The General Managers tend to stay about one year. Linemen trained by the program have used their skills to go to the Middle East. Although REB is a brand new organization, and technical assistance has instituted new management techniques

(such as the firing of incompetent staff) the system of promotion by seniority is still followed. In one instance when a person was promoted on the basis of merit out of seniority sequence, his former job was held vacant for two years pending the promotion of the four other men senior to him on the list. Thus, one can conclude that the system of seniority promotion is entrenched in the society, not simply an inheritance from outmoded institutions.

Under the Director of Training there are three Deputies for Management Training, Technical Training and Planning and Records. Management has two Assistant Directors, Planning and Records has one. The Planning and Records section has no teaching function but the Deputy Director teaches management courses. The Director also has an Assistant Director of Training Logistics. The Deputies and the present Director have had working experience, but the Assistants were all recruited straight out of University. None have had teacher training except for the two expatriate advisers. These advisers have helped with program planning, developed a series of course curricula and training manuals (which the students are given) and teaching guides. They are gradually introducing visual aids (transparencies and film). The advisers are expected to continue for several more years.

All REB staff are expected to be available for teaching specialized courses for which they are given an honorarium. The advisers would like to expand the teaching role of REB staff.

### Training

#### Training Facilities:

The Directorate has a current staff of 14 officers, all of whom take some part in teaching, plus two expatriate advisers, who also teach.

Since the inception of the program in 1978 a total of 50 courses have been developed.

Courses range from three days for a Director level administrative course to six weeks for linemen training.

The courses are taught in Dhaka at one of the two facilities of the Training Directorate - one at the Engineers Institute, where they have two classrooms and offices, and the other in a building in Dhanmondi where in addition to classrooms they have limited outdoor training facilities for linemen. There are two separate hostel facilities, one for Directors and Managers and one for Linemen.

REB has designed a Central Training Facility to conduct all training functions under one roof, and to provide adequate outdoor training space.

The facility would also include accommodation for trainees. A central facility would make coordination of the program much simpler and eliminate the extensive travelling between facilities which is currently required. No funding for this facility has yet been identified. The need for regional training facilities has been discussed but there are no active proposals.

#### Trainees:

So far the courses have been attended by over 5,000 persons (some overlap for people who have taken more than one course). A training schedule is circulated three months in advance, with the job titles of those who should attend specified. There is also a record kept of each REB staff member, and he is called by name if he has not attended the appropriate courses. Training was accorded a high priority from the very beginning. The present Director of Management was formerly the Training Director and, therefore, training continues to be a high priority. Nevertheless, there is some resistance to training at the Deputy Director level, and it is almost impossible to train the Directors. They would be receptive only to a seminar at Cox's Bazar or some similar approach. Course attendance is otherwise quite good. Occasionally a person has trouble getting released to attend a course. Course dropouts are rare, and offenders are severely dealt with.

#### Overseas Training:

There are currently four trainees from the PBS studying in the States and a few REB staff go to NRECA for six weeks of management and operational training. Funds for that sort of activity appear to be adequate.

#### Training Planning:

The Training Advisors have prepared a curriculum plan for Palli Bidyut Samities which includes job descriptions and training plans for both formal courses and on-the-job skill training for all levels of PBS staff. For example, for General Managers and Department Heads, there is a series of 17 three-day courses. On-the-job training has not yet been started, since in the new organization field staff are still solving basic problems.

#### Training Needs:

Funding for future training needs is not a major problem. However, funding for a Central Training Facility is sought as well as continual AID pressure on REB to maintain the high priority of training, and to expand particular training courses. For example, there is a need for plant accounting and work order procedures.

Recommendations

1. Further enquiry should be made into the need for and feasibility and desirability of building a central training facility.
2. AID should continue to support the importance of training in REB's overall program.
3. Other training projects should be referred to REB for advice and assistance.

### Renewable Energy Sources

A major concern of Government, Bangladeshi leaders and donors alike, is to solve the impending crisis in renewable energy, which can be summarized as follows:

1. reduction in bio-mass supply due to competing demands for fodder, fertilizer and fuelwood in the face of restricted sources.
2. Imbalance of fuelwood distribution in the country (excess supply in Northeast and Southeast, severe shortage in Northwest and Central areas).
3. Inefficient use of bio-mass due to inefficient burning devices (from homestead chulas to modern boilers).

These problems have caused severe overcutting of village/homestead forests, so that fuelwood resources could be destroyed within a decade in some parts of the country.

The perceived solutions are to increase the supply of fuelwood through conventional forestry and social forestry; to improve the efficiency of burning devices; and to seek new sources of renewable energy. Among these, only fuelwood and bio-gas are discussed here. Solar energy may have some future application but does not appear very relevant or cost effective at the moment. ECSIR is working on solar cook stoves. Mini-hydro and wind power do not look at all promising. Improvement of domestic cook stoves (chulas) and bio-mass fuel for chulas is receiving considerable attention among NGOs, notably BACE, some donor projects, and BUET. None of these were studied due to time constraints and the minimal training element involved. However, there is ample information and the subject is worthy of further study.

## Fuelwood

### Background

As AID is currently investigating the potential for community forestry and forestry education in a separate mission, this report does not cover all aspects of the subject, nor go into any technical details. Instead a number of the constraints to which a forestry project will need to be adjusted are reviewed, and several training suggestions are offered which arise from discussions with the various forestry-related persons interviewed.

#### Constraints:

1. The fuelwood crisis is not yet perceived as such by farmers, except in the fringes of urban areas, where the very poor feel that fuelwood is a crisis, because they are forced to buy wood at very high prices (Taka 40 per maund).
2. Farmers priorities for tree growing include:
  - a. timber sale for furniture
  - b. fruit (or other human food)
  - c. cattle fodder
  - d. green manure

Fuelwood is a desirable secondary benefit but farmers are not yet interested in planting trees for fuelwood alone, and probably not for fuelwood and green manure alone. In other words:

3. A tree must be directly cash producing or food producing. Savings earned by tree growing is not a sufficient motivation on which to invest scarce resources, especially when an unknown or risky crop is involved.
4. Homesteads are already heavily treed in most parts of the country and farmers fear the shade effects of trees in the farm ridges. It may be that to effectively improve homestead fuelwood production a careful management scheme of selective replacement will be required. However, this will require very sensitive and technically sophisticated extension services.

5. Extension workers are inefficient, under paid, poorly motivated, have a very low level of technical expertise and inadequate support services. There is tremendous duplication of efforts and the farmers are not responsive to extension workers' word alone; demonstration is necessary.
6. Research into fast growing species is just beginning; further research and extensive farm trials will be needed before the sensitive replacement and management scheme in (4) above will be feasible.
7. There is unutilized land (Kas land, road and railroad embankments) which could be planted if there is a sponsoring agency (such as Roads and Highways) or some other means of organization. Land tenure is too touchy a subject for ad-hoc programs, because of two problems:
  - a. use of land by one party precludes use by another.
  - b. continuous use leads to claim of permanent land rights. This latter is a major concern to the Forest Department.
8. Seedlings need to be provided, watered, protected and cropped in an environment of competitive uses (cattle fodder, traffic); this takes close supervision and organizational support.
9. The very recent and still nascent interest of the Forest Department in community forestry has not yet yielded any substantial expertise.

Possibilities:

As with most subject areas, a critical factor in project development will be the interest and willingness of the Forest Department, and then the capability to absorb assistance and manage new projects. The relevant areas where some potential for useful intervention was found are research and forestry education. Research focuses heavily on the needs of industry. Extension personnel were not interviewed directly, and although frequent rotation of officers results in extension experience among present teachers and researchers, no formal regular coordination between the various branches exists. Research and extension field stations are physically widely separated. The Department continues to prefer a style of training which emphasizes discipline and physical fitness; this and their tree protection role project an authoritarian role to rural population which is not conducive to sensitive extension work.

Balanced against these negatives is the expressed interest of the Department in fast growing species and their nascent research and extension work in this field.

### Training

There are four established training institutions of the Forestry Department:

Institute of Forestry, Chittagong University, which grants a BSc honors after a four year course, entry level is HSC, i.e. 14 years of school. This is a fledgling institution with academic objectives. It has a severe shortage of qualified staff and facilities. A recent FAO document listed the following difficulties: "lack of lecturers with recent refresher courses or pedagogical training; lack of international contacts; low funding priority; jurisdictional disputes and lack of access to .....FRI;" To this, on the basis of our visit, I would add very minimal and poorly organized physical facilities; lack of equipment and books; a Director who carries the entire institution and has many other commitments; and an apparent preference by the Forest Department for the more rigorous 'para-military' style of education. On the positive side, Dr. Alim, the Director, is highly committed to community forestry with a proven record of innovative project implementation, and is a member of the Chittagong University Council. The curriculum includes three semesters of forestry extension and rural forestry, one of urban forestry. The institution is in need of major assistance; Canadian aid may be forthcoming, as well as some Australian assistance.

Forest Ranger College, Chittagong, which grants a BSc, pass, after a two year course; entry level is completion of a two year college degree in science (i.e. 16 years of school). Also affiliated with the University of Chittagong, this is a separate institution, located near FRI and run by the Forest Department on traditional lines with discipline a major curriculum component. Its curriculum has been broadened in recent years, upgraded from sub-professional to nearly professional training and students and staff expanded. The Director had been trained in the US; other staff were given a crash course MSC 78-80 at the Institute of Forestry. At present a Director and full-time staff of seven plus part-time teachers loaned by FRI train 45 students. A brand new classroom and office building, plus faculty housing are under construction about half a mile from the present Ranger College, which will function as student hostel. IDA will provide some facilities, but still needed are books and equipment, and further academic training in forestry economics, aerial photography and logging engineering.

Sylhet Forest School provides technical training in a one-year course for students with MSC. (Not visited).

The Forest Development Training Center at Kaptai has a three-month course for Forest Guards and trains workers and supervisors in a number of specific worker skills.

A new training institute in community forestry extension is proposed as part of ADB's community forestry project. Originally to be located in Rajshahi, it is now proposed that it be located in Bogra.

Overseas training includes professional training at Peshawar, Pakistan, plus a few sub-professionals, and a total of three persons to the Philippines. AID has sponsored students for one and two year courses in the past.

#### Program Suggestions:

There are a number of ways in which AID could assist in the expansion of the community forestry component of Forest Department training:

1. In order to increase the production of fuelwood, a research project, channeled through BARC, could simultaneously support fast growing species research at FRI and field trials of species as a part of cropping systems through contact with farmers at the demonstration sites (see also BARC). However, considerable input in terms of expatriate technical assistance, local counterpart finance, and logistical support (vehicles, operating budget) would have to be supplied by AID if any big project were undertaken, as BARC appears to be stretched thin already. BARC officers expressed great interest, however expanding research at FRI appears to be more simple, as they have a fairly orderly institute and could accommodate more research; have shown recent receptivity to foreign expert influence.

In such a project, the training component might include some overseas (third country) mid-term courses for senior staff of FRI and DAEM, but the focus should be on developing the information and techniques which extension workers need to take to the farmers and training the extension workers. This in turn requires, after basic research, training of field station staff, training of trainers, and development of materials. Possible coordination with UN/FAO support to extension training should be investigated. Close contact should be kept with ADB assistance to training of forest extension workers proposed for Rajshahi or Bogra.

2. A small scale model of how to implement such a research project could be undertaken.

One of the nine existing Forestry Department Seed Orchard centres could be selected for upgrading. The major components would be:

Physical Facilities: deep tubewell and pump, electricity supply, vehicle, basic laboratory, structure and equipment.

Technical Assistance: to demonstrate by example how the seed orchards could be upgraded; to introduce and strengthen an orientation towards agro-forestry and village fuelwood supply; to introduce and test new varieties of seedlings and to experiment with a variety of extension techniques.

Staff training on-the-job through Technical Assistance and selective short course training abroad, if needed.

The long term objective would be to expand the supply of fuelwood; the short range objective to provide a prototype research/training/extension facility to promote and disseminate the technologies and facts necessary to increase village fuelwood supply.

It is recommended that the Seed Orchard centre in Tangail district be selected for three reasons:

- a. to address the most severe demand/supply imbalance, which is in Dhaka and Rajshahi districts.
- b. to permit an examination of poor urban as well as rural fuelwood demand and supply potential.
- c. to be located centrally, and near Dhaka, to facilitate the broadest dissemination of research findings and training capacity.

It should be noted that this proposal was written with Salna Seed Orchard in mind. FRI Director Ali stated that Charalgani, Tangail, 65 miles from Dhaka, would be a better location because Salna is a physically constrained sub-center without sufficient professional staff. The location could easily be changed, but I still recommend that Salna be investigated, as staff build up should not be difficult if physical facilities are expandable. Salna has been proposed for upgrading to a main center.

3. With the objective of expanding the role of the Forest Department in homestead fuelwood production, a project to expand present training of forestry employees could be undertaken.
  - a. AID could provide substantial institutional assistance to the Institute of Forestry, Chittagong, or could in-fill with technical assistance in community forestry (visiting lecturers,

overseas training of Bangladeshi teaching staff) in conjunction with proposed Canadian and Australian aid. Coordination with other donors, including FAO is recommended. The IF is the most receptive institution to community forestry, but appears to have the lowest status within the Forestry Department.

- b. AID might assist the Forest College by providing overseas training for lecturers, as they have requested:

forest economics  
aerial photography  
logging engineering  
community forestry

This could be fortified with technical and material assistance to the College, or could be simply a training funding package. The FC enjoys favourable support within the Forest Department and recognizes the need for homestead forestry, but is not likely to play an innovative role in developing community-oriented extension foresters.

- c. AID can monitor the progress of the ADB project, which has been delayed due to lack of an acceptable project manager, and in particular the development of the new extension training facility; substantial assistance might be required in a year or two. BGD has already approached the World Bank.

#### Recommendations

1. AID undertake a field trial/demonstration project in fast growing multi-purpose fuelwood as outlined above, number (1) or (2).
2. AID support one of the two major forestry training institutions in Chittagong.
3. AID pursue the possibility for centrally funded training opportunities for all relevant Forest Department staff.
4. Needs of the Sylhet Forest School, which was not visited, should be ascertained.

## Bio-Gas Digesters

### Background

Bio-gas digesters convert human or animal dung or vegetative waste materials into bio-gas; the bio-gas can be used for cooking and lighting, and the remaining material is an excellent fertilizer. At the domestic scale, a bio-digester (costing from Taka 4,000/- to less than Taka 1,000/-) can operate on dung from two to four head of cattle, to meet all needs of a family of six.

Several organizations in Bangladesh have been experimenting in this area for some time. Notable are:

BSCIC, which has developed a model for about Taka 4,000, conducts two-week training courses in manufacture and operation of bio-gas digesters, and will advise on their application. A small number have already been put into operation.

Chemistry Department, BUET, which has conducted research and developed models. Through their institute of appropriate technology a program could be launched.

IRDP, Noakhali, a DANIDA supported integrated rural development project which has emphasized intergrated farming systems and has had bio-gas digesters in use for several years. They have done extensive research and have recently devised a very inexpensive (Taka 890) all-plastic model which is ready for widespread implementation and monitoring. It is intended to be used in conjunction with amonia-treated rice straw fodder for two head of cattle to produce fodder, fertilization and energy at the homestead level. It could be operated on human waste in the context of a village latrine system which would then also have health and sanitation benefits.

Many NGO's are currently experimenting with and/or operating bio-gas digesters; a rough sort of communication between them is maintained by ADAB.

### Constraints:

In brief, the arguments against bio-gas digesters are:

efforts and funds should be focused on the most urgent needs and simplest solutions to the rural energy crisis, i.e. the commercial sector (electricity, natural gas, kerosene, etc) and fuelwood.

bio-gas digestion of cowdung robs the poorest sector of the population of a source of fuel to scavenge while benefiting a class of small farmers (not rich) who have sufficient resources to own several cows (est. 15% of population).

application involving human waste will not be culturally acceptable.

applications involving other waste materials have not been sufficiently tested.

larger than homestead size units are much too difficult to organize and manage.

there are signs that even in China bio-gas digestion is not a panacea.

The constraints to actual implementation of proven methods are:

lack of interest of BGD.

lack of a single widespread implementation agency or even coordinative implementation agency or department.

Benefits:

The arguments in favour of further work on bio-gas digestors at the homestead level in Bangladesh are:

that they are already a proven, affordable and efficient way to manage farm resources, and need widespread application to establish their exact costs and benefits.

that bio-digestion of cowdung is far preferable to burning it because the sludge is used as fertilizer and the soil is not robbed of nutrient.

that costs can be brought down to a level which is affordable and management/maintenance are simple enough so that small farmers will be able to use them; farm trials are needed to determine the need for detailed modifications.

### Recommendation

Although there is some skepticism about bio-gas digestors, a review of the possibilities by AID is advisable. AID should investigate the possibility of funding and/or sponsoring an application throughout the country of 50 to 100 units for trial on farmers' homesteads. These could include the demonstration sites of the BARC umbrella of agencies, existing integrated rural development projects and well placed NGOs. The

project itself could consist of:

capital cost of the digesters; a small team of experts (foreign and local) to install, train in the use and provide back-up services for up to one year for the bio-digesters; plus one or two jeeps for this team.

a research program to monitor and evaluate their performance with special attention to level of inputs, operating characteristics, and impact on the household in terms of energy cost-savings and soil fertility.

If possible, some of these should be installed as part of a farming system program including ammonia treatment of straw. One intriguing proposal is to install bio-digesters free of charge and advise on their operation for one year. Then the farmer would be given the option to buy it or have it removed. This decision itself would be a test of success.

Suitable implementation agencies would be BARC, with particular involvement of all farming system research sites and Livestock Research Centre. Co-sponsor might be DANIDA. NGOs could also be involved.

## Conservation

### Background

No systematic investigation of the potential for aid in energy conservation was undertaken during this study. However, as many important persons in the energy sector in Bangladesh (notably Dr. Iqbal Mahmood, BUET, Dr. Shamsul Huq, BCCIR, Dr. Nurul Islam, Institute of Appropriate Technology, Dr. Kursheed Islam, Consultant) feel that simple conservation measures, based in the first instance on improved maintenance of equipment, would significantly save on energy consumption, this aspect should be given further consideration.

The Australian Government, through a Commonwealth energy program, is hoping to assist the Ministry of Industry to establish a Conservation Cell, with technical assistance from Australia, in the near future. This cell may generate areas for additional donor support. The Chemical Engineering Department of BUET has also been given conservation technologies.

Contributions to conservation can also be made by direct technical assistance to the major commercial energy companies, or by technical assistance to teaching staff of the polytechnics and engineering colleges from among whose graduates most personnel responsible for maintenance are recruited. Maintenance is invariably an area for which energy-related organizations request training assistance, both at the senior engineering level and at the foreman technical level. Courses in maintenance are included in the curriculums of BPDB, REB.

Constraints to good maintenance are lack of tools and spare parts, procurement regulations which favor the purchase of new equipment over parts, lack of technical tradition, and lack of orientation to good maintenance. Both of the latter are subject to correction through training, and especially among the energy-producing companies who are still somewhat cost conscious, demonstrated savings through maintenance could result in management emphasis on maintenance and conservation.

### Recommendations

1. Maintenance should be a major topic included in any AID sponsored training effort in Bangladesh.
2. AID can investigate the potential for a single-purpose or multi-purpose training course in maintenance or maintenance and safety (see also Training Ideas). This kind of course could also be relevant to private industry. Engineering Colleges and Polytechnics could be used as base, possibly incorporating stronger industry/college links.

3. AID can investigate the interest among the major energy producers in an outside consultant investigation of their operations and the potential for energy conservation. This could be done by foreign and/or local consultants. Such analyses are currently proposed for the steel mill and the paper mill in Chittagong.
4. If a project in this area is contemplated, a study of several ongoing ILO projects would be useful, viz. diesel pump maintenance and training, and vocational training, including machine shop maintenance and training of trainers.
5. An AID funded contribution of equipment for secondary school technical training at the sub-divisional level was completed some years ago. The equipped workshops are said to be locked up; their status should be ascertained.

It should be noted that while conservation measures bring savings to the individual, modern energy consumption needs to be expanded in Bangladesh to support further development, not reduced.

### New and Alternative Energy Sources

The emphasis in this report has been placed on conventional, commercial, and traditional renewable energy sources, reflecting the current priorities of the Bangladesh Government. However, the government has given recent attention to the potential of LPG, methanol and other products of natural gas. The UN has just completed a feasibility study of peat, which shows considerable promise. These energy resources are briefly reviewed below.

#### Other Uses of Natural Gas

##### Liquid Propane Gas:

No proper investigation of this method of processing natural gas has been undertaken in this study. However, LPG is an important and useful fuel for domestic cooking, with a good potential for domestic lighting; motor vehicles, and industrial applications in areas not served by natural gas.

BPC has one LPG plant using naphtha from the refinery. LPG is priced on a par with kerosene. There has not only been a market response from industry, but also many automobile conversions to take advantage of the big differential in LPG and motor spirit costs. Reportedly the factory production is much less than demand, and the real market price is nearly double the fixed price. This indicates that there is considerable potential for expansion of the market.

It should be noted that conversion of automobiles to LPG further exacerbates the low demand for motor spirit, however. BPC with French aid is currently doubling LPG production.

CIDA has recently completed a desk study on extraction of LPG from natural gas for Petrobangla. CIDA is prepared to finance a full scale feasibility study and probably two LPG plants if the feasibility is proven. They would hope to include Petrobangla staff in the analysis. There has also apparently been an offer of German assistance to this potential sector. US AID has decided not to become involved in this technology for the moment.

#### Recommendation

AID should keep up to date on other donor activities in this area.

### Methanol:

A quick review of the local literature shows that methanol has been analyzed only in terms of its export potential, by the Government and the donors. Given the distance to the major market (Japan) and the competitive advantages of the other major producers, this capital-intensive investment does not look promising. However, the technology for using neat methanol as a motor fuel exists. The potential for development of methanol for domestic consumption in transport, irrigation and agricultural equipment needs to be analyzed with an eye to long term self-sufficiency in these sectors. Given natural gas reserves, and the current very low number of combustion engines in the country, it is feasible to think of a long term conversion to methanol powered engines. Use as a domestic fuel needs further research as well.

### Recommendation

AID investigate government receptivity to a pre-feasibility study on the potential domestic market for methanol. Ford Motor Company has some expertise and one of its Vice-Presidents recently visited Bangladesh on a UN mission.

### Other Products

Gas utilization is a particularly critical area for Bangladesh, because although natural gas resources are very large, they cannot be exploited until users are identified. The variety of products emanating from a particular gas field requires that a variety of viable end users exist, to consume that well's production before further fields are exploited. So, for example, using gas as a feedstock for chemical industries will increase, not decrease, the natural gas supply available for domestic energy requirements. The World Bank has reportedly recently commissioned a consultant study on the potential for gas utilization, and it is a BDG priority.

Peat

Peat deposits in Bangladesh were identified and some preliminary studies made in the early 1960s. However, attention was soon focused exclusively on the development of natural gas, and no development work or further analyses have been undertaken. Last year the UN initiated a pre-feasibility study of peat resources and the findings are, in brief:

1. There are peat reserves in southwestern Bangladesh of between 509 and 678 million metric tons (at 20% moisture). At 6,400 BTUs per lb. they have an energy potential 60% to 80% of natural gas reserves of 12 trillion cubic feet. There are unmeasured reserves elsewhere.
2. The main peat fields are in Faridpur and Khulna districts, which have no natural gas and are cut off from transmission by the Jamuna River.
3. The peat is in areas of poor soil and marginal land and could be extracted in combination with an embankment program which would result in increased agricultural production.
4. Extraction by manual methods would create considerable employment, perhaps as many as 30,000 man years of unskilled employment labor.
5. Peat can be used directly as a domestic cooking fuel, an industrial fuel for gur making, tobacco curing, brick making, etc., as a substitute for scarce fuelwood resources.

Modern applications, such as for electricity generation, well established in such countries as Ireland, Finland and USSR, are relevant to Bangladesh. High technology methods to upgrade the calorific value could be employed as well as simple burning techniques. Peat can be bricketed, gasified, or turned into methanol and other liquid fuels.

These promising findings suggest that further, more technical analyses of the potential for peat development in Bangladesh should be undertaken. The US has considerable expertise in this field, and short term consultancies (International Gas Institute, University of South Carolina, AID, Burundi) could be commissioned to:

1. review the quality and extraction characteristics of peat in Bangladesh (preferably by a tropical peat expert).
2. conduct a seminar to familiarize senior decision makers (and donors) with the potential for peat development (Pumwani, International Gas Institute)

3. sponsor a familiarization study tour for senior decision makers on the high technology applications of peat, as a follow-up of the seminar. Appropriate to send from Bangladesh would be staff from the Ministry of Energy, the Planning Commission and Dhaka University, Chemical Engineers Department.
4. investigate the possibility of a study tour to Burundi where tropical peat is being developed in a third world setting.

Note: At the moment no single government agency handles peat. BMEDC is responsible for peat and coal, in theory. Also interested would be: BPDB, BMDE, Ministry of Agriculture, Geological Survey, Soil Survey, other branches of the Ministry of Energy, and the Planning Commission. All of these could participate in a seminar in Dhaka. NGOs working in peat areas, government agencies such as Bangladesh Rural Development Board, and the World Food Programme should also be included, for the employment, agricultural and rural development applications.

#### Recommendation

In coordination with UNDP, which has already indicated that it would like to finance further studies, AID should develop one or more of the above consultancies. Correspondence with the AID funded peat development in Burundi would be useful.

Energy Planning, Research and Training

Energy planning is carried out in the planning cells in various energy organizations above, plus an energy cell in the Planning Commission. It is fair to say that energy planning is not as rigorous and comprehensive, nor as centralized, as may be desirable.

Research organizations involved in energy are BCSIR, BARC and also the Forestry Department (see Fuelwood) discussed in the preceding chapter.

Energy training takes place within the relevant production organizations and in several institutes, as well as in educational institutions. Referral should also be made to the training facilities of BPDB, REB, and the Forestry Department (see Fuelwood) described above.

A number of these organizations were interviewed. As some are involved in both training and research, they have been grouped together.

Energy Division, Planning Commission

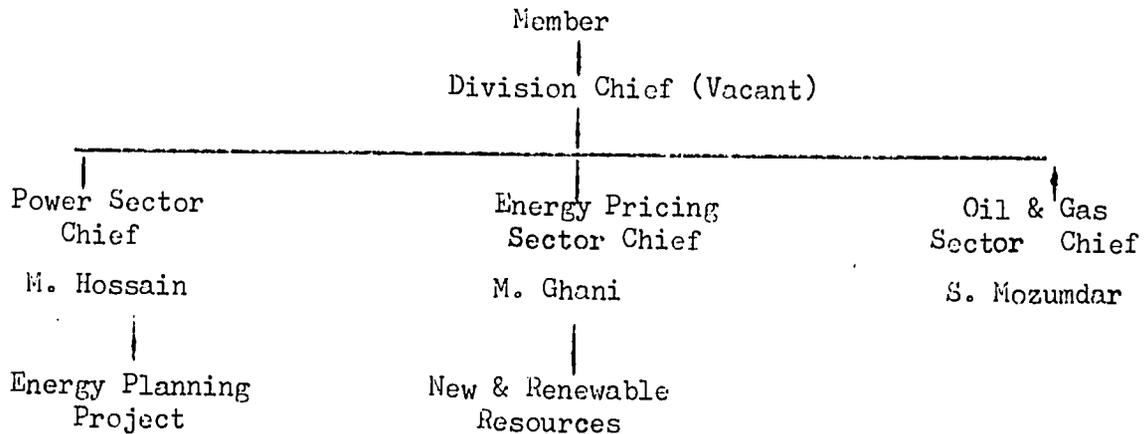
S.N. Mozumdar, Oil and Gas Sector Chief  
 Moqbul Hossein, Power Sector Chief  
 M. Ghani, Energy Pricing Sector Chief

### Purpose

The role of the Energy Division of the Planning Commission is to review all energy related government projects and proposals in the context of the economy as a whole. (The Planning Cell of the Ministry of Energy has the responsibility to develop and review proposals within the agencies which compose the Ministry. There is no systematic coordination between the two).

### Background

At the date of writing, the Energy Division of the Planning Commission had the following staff and organization:



New and Renewable Resources was switched from the Oil and Gas Sector to its present position late in April 1983. The Energy Planning Project, funded by UNDP and the Asia Development Bank, is expected to begin in May 1983.

At present the Energy Division does not take any active role in Manpower Planning for energy related agencies in Bangladesh. All three sector chiefs are conversant with the problem and their detailed suggestions are appended below.

The Oil and Gas Sector Chief, Mr. Mozumdar, stated that his sector could prepare a paper on manpower requirements in the area under his purview. The Pricing Sector Chief, now also concerned with New and Renewable Energy, offered to consult with the relevant agencies and prepare a list of training requirements. The Power Sector Chief, who will be the counterpart for the Energy Planning Project, said that the project will produce manpower and training requirements as part of its analysis of required institutional reorganization to adequately coordinate and manage the various elements of energy in Bangladesh.

Particular priorities expressed by the three Sector Chiefs were as follows:

In the Oil and Natural Gas Sector, the two priorities of government are for pricing of energy, and for expanded development of natural gas. Throughout the relevant agencies there is a need for a long term perspective on training requirements, for the identification and further training of staff with leadership potential, and for management training to overcome what Mr. Mozumdar termed "the inertia of the system". The development of gas-based industries is desirable but controversial because of pricing issues which must be resolved first.

In power, Mr. Hossain stated that although BPDB has already received and is still receiving extensive training assistance, and that a UNDP proposal to provide more training is in an advanced stage of negotiation, this does not mean that all BPDB needs are being met. For one thing, the pressure of manpower evacuation to the Middle East is particularly high in the power sector, because power is an expanding field in the middle-eastern countries. The REB is under less pressure, because it is a new organization and training is still in the initial stages. Particular needs are for training staff of power stations, both operation and maintenance, middle and lower level personnel. The operation of automatic controls also creates a requirement for upgrading training.

For all commercial energy sources maintenance and conservation are major ways to increase energy supply. The precise needs will be determined by the forthcoming Energy Planning Project, as mentioned above.

In new energy resources, Mr. Mozumdar and Mr. Hossain personally feel that peat looks promising. Mr. Hossain said that the Energy Planning Project will look into it. Methanol also should be considered but such questions as its export potential, the desirability of exporting a non-renewable resource, and technical problems in using methanol as a substitute for middle distillates (especially kerosene) need examination.

In terms of renewable energy, all three Sector Chiefs expressed the strongest preference for expanded forestry resources, especially non-forest or village based forestation efforts. Mr. Hossain feels that other renewable energy sources such as biogas, solar, etc., will take a very long time to implement, and are still in the experimental stages. Research should continue but government efforts should go for community forestry which will also take time to implement. Appropriate organizations to handle this are Forestry Department, Ministry of Agriculture and BADC, both in the Ministry of Agriculture.

Mr. Hossain pointed out that more than two-thirds of energy consumed is traditional (i.e. renewable) and that for a long time to come this traditional energy cannot be replaced by commercial sources. This is why an expansion of traditional fuel supply is so important. Mr. Ghani mentioned that as the Planning Commission (and his sector) is the only government body coordinating efforts in New and Renewable Resources, offers for training in this area should be channeled from ERD to him for appropriate dissemination.

#### Training

A number of staff members have already been sent to the US on centrally funded courses, which were broadening if not directly applicable.

#### Recommendations

1. Continue centrally funded training opportunities.
2. Closely monitor the Energy Planning Project, with an eye to future further assistance.
3. Review any AID training proposal with Energy Division for their comments early in project development.

Planning Cell, Energy Division  
Ministry of Energy and Mineral Resources

Jacob Rosing, Chief Technical Advisor to Planning Cell  
M.A. Almeda, Power Engineer

Purpose

To develop proposals, to monitor ongoing projects and to prepare position papers, make policy suggestions for the Ministry. Note that long range power plans are done by BPDB itself, and that the overall energy planning function has been given to the Planning Commission. There is also a small planning cell in the Petroleum Division of the Ministry.

Background

The UN Project of the Planning Cell was established when power and water development were still in the same Ministry. Since the Ministry of Energy was formed in 1980, the advisors have dealt with both Ministries.

There is a Director of Training for the division, but it was not possible to interview him. This should be done for complete coverage of this division. (See also BPDB).

The problems of the division were reviewed with the main point being that the overriding weakness is managerial, not technical. Managerial problems stem from:

1. the personal style of administration in which officers seek to minimize their area of responsibility, are overly involved in details, and cause inconsistency when they are transferred out.
2. a leadership vacuum, lack of decision making.
3. lack of delegation of authority.
4. weak information base, because there is no system of information collection, no capacity for summary reporting.
5. complete lack of personnel planning, manpower planning.

Managerial problems create technical problems, such as capital idle equipment and lack of maintenance..

### Staffing

Staffing was not discussed except to say that with 24,000 employees, BPDB greatly needs to decentralize its decision making process. (See also BPDB and REB).

### Training

The training program of the REB is felt to be successful because it is coordinated and because all courses are carefully documented.

A recent UN review of training needs in the power sector (the Stancescu report) found that although organization charts and job descriptions indicate an "integrated and coherent" management system, in fact performance is much lower than it should be. In addition to the administrative difficulties described above, serious overstaffing was found (one employee for every 24 electricity customers) yet a shortage of trained personnel, aggravated by the loss of staff to the Middle East. There is a ten year training plan which has received approval in principle from the Planning Commission. However, a comprehensive manpower plan, including recommendations for improved personnel management techniques, is required. The report recommends funding several urgent needs immediately (preferably in conjunction with other donors) and a second phase which would improve and assist in implementing the long term manpower and training program. The urgent needs identified are to reinforce the material and staffing base of the existing training centers, to increase on-the-job training through technical assistance with a mobile team of experts; to better link curriculum with actual work situations, and to design an integrated manpower plan. UNDP funds are proposed to fund technical assistance and training of trainers overseas, as well as direct assistance to the Kaptai Academy.

### Recommendations

1. AID to continue and expand the offer of centrally funded training opportunities to both BPDB and REB.
2. To consider contribution to one or more of the urgent needs identified by the UN, following further consultation with both UN and the power agencies. (See also BPDB and REB).

Bangladesh Council for Scientific and Industrial Research  
Ministry of Industry

Dr. Shamshul Huq, Chairman  
Dr. Yusuf, Institute of Fuel Research

### Purpose

The BCSIR was established in the 1960's to undertake research in scientific and industrial areas of concern to Bangladesh.

### Background

In the beginning BCSIR had a very scientific orientation, attempting to carry out research within Bangladesh, using local inputs under local conditions, to test existing and develop new techniques. More recently the emphasis has changed to industrial research, and with this has come the need to develop application systems so that industrialists can actually implement their findings. They have, therefore, begun a Pilot Plant and Process Development Center, as part of the Council, to develop the engineering applications of their scientific work. This is in the nascent stage.

Of relevance to energy is the Institute of Fuel Research which has been particularly concerned with domestic cooking (solar cookers and improved chulas), domestic lighting (kerosene efficient traditional lamps) and bio-gas digestors for domestic use. In all these three areas technical problems have been solved but extension of these technologies is just beginning. Bio-gas digester cost has now been reduced to Taka 3,000 for a family sized unit (3-5 cows) and work is going on to develop a mini bio-gas unit for domestic lighting only, based on dung from one to two cows.

Bangladesh Krishi Bank has expressed willingness to finance at least part of bio-gas implementation. BCSIR has also prepared a manual for construction and operation of bio-gas digestors, will provide models, and will assist with any special problems users have. They expressed great concern about the extension side of the problem. They said that NGOs are best suited to provide the correct kind of extension work needed. Rural people, they said, are pragmatic and need to be shown how something will work. To that end, Dr. Huq suggested that funds be utilized for local films showing bio-digestors at work, plus further work on manuals and brochures. They have proposed to the Ministry of Education that basic information on the fuel problem in Bangladesh be included in primary and secondary school text books. Implementation barriers can eventually be broken down, they feel, but the problems are not technological, rather they are economic and social.

It should be noted that Dr. Huq in a private capacity is Chairman of BACE, a prominent NGO.

### Staffing

BCSIR is run by a Board of three members plus the Chairman, and consists of three establishments, the Central laboratories in Dhaka and the laboratories in Chittagong and Rajshahi. Rajshahi tends to specialize in food, especially fruits, while the bulk of work in Chittagong is in the field of medicine and drugs. Of the several laboratories in Dhaka, the two most relevant to energy are the Institute of Fuel Research and the Pilot Plant and Processing Development Center. Altogether there are 1,300 staff of whom about 300 are scientists. All scientists are MA or PhD holders, but BCSIR encourages post-doctoral studies. The particular current staff need is to expand the establishment for engineers to work out implementation of scientific research results (see above). In this area of implementation their needs are for more staff, more equipment, and especially more operating funds as the costs of application development can be twenty times as high as scientific development.

### Training

#### Training Offered:

Two week training courses of 25 participants each are being given at BCSIR on the application of family-sized bio digestors. The first class was completed April 18, 1983 with 25 district level staff of BSIC. The second batch will begin mid-May 1983 with 20 participants from upgraded thanas: thana administrators, other social officers and several union chairmen. The courses will continue, with participants from government, NGOs, and the private sector participating.

### Recommendations

1. Pursue the possibility of a connection between BCSIR and Denver Research Institute (Professor Black) to aid in building up the Pilot Plant and Process Development Center. This seems necessary as BCSIR is accused of having produced very little practical applicable work.
2. Investigate the ability of the Fuel Research Institute to undertake research in commercial energy sector innovations related to natural gas utilization. This is a logical subject for them and a much needed sector, not currently part of their priorities. Their past record of achievement is not encouraging, however.
3. The status of the World Bank consultancy on gas utilization should be investigated.

Institute of Appropriate Technology  
Bangladesh University of Engineering and Technology

Dr. Nurul Islam, Director

### Purpose

To undertake broad-based research in appropriate technology, including energy technology, and to bring the technology to potential users and policy makers. An apparent preference for practicality and applicability is shown. The Director himself is particularly interested in the rural sector. The focus will be different from BCSIR, which deals with industrial applications.

### Background

BUET Chemical Engineering Department has been involved in a variety of hardware research for a long time. By now most subject areas have been touched on, but the research has been for its own sake, not directed towards influencing policy. Teaching faculty does not have time for application of their findings.

Last year, therefore, Dr. Islam was relieved of his teaching duties to establish and run the Institute for Appropriate Technology. He submitted a detailed proposal for staffing, etc., on 10 April 1983. The Institute is to report to the BUET Syndicate, but is funded by the Ministry of Agriculture.

### Staffing

At present, the Institute has only Dr. Islam and support staff. The proposal is for Director and Deputy, 18 research fellows, 24 technical staff, and 41 administrative and support staff. The approach will be multi-disciplinary and field-research oriented. The proposal is not yet approved, but the Institution is functioning with its small current staff and draws on the talents of Chemical Engineering Department (who have been doing research for years and get along well together) and others.

### Training

#### Training Capacity:

It is intended that the Institute provide training, to be generated out of research findings. Emphasis will be on application, dissemination of information, and training of users.

The Institute has given a number of short courses, using both local and expatriate teachers. They charge Taka 1,000 for a typical course which covers course costs, teachers' honorarium, tea and lunch, etc., provided there are about 30 students. It is therefore highly preferable to have a client group of 30 already committed, to avoid loss.

Most course participants are government sponsored, although a few pay their own way. Some students come to learn, others are attracted by the prestige of a certificate from BUET. To this end, course evaluation and some form of grading will be instituted in future, to distinguish between successful completion of a course and mere attendance.

The Institute also has some institutional constraints, such as lack of typists.

The Institute has also participated by invitation in the short courses of other organizations. For example, BCOTA requested five energy lectures be given to its civil servant students. It has the capacity for curriculum development and would be interested in offering its services for any group with a nucleus of people needing training.

Until the Institute is officially approved and given permission to recruit staff, detailed institutional arrangements may best be channeled through the Vice Chancellor, BUET, to the Chemical Engineering Department or to Dr. Islam as an individual.

### Recommendations

1. Dr. Islam emerges as one of the most promising resources in the energy sector. In terms of helping build up the Institute, there appears to be little AID can do at the moment. In terms of utilizing Dr. Islam's talents, he as an individual or as Director could be requested to develop curriculums or develop and run courses in the energy field. The best approach is personal discussion with Dr. Islam, when details can be worked out.
2. AID should keep up to date on the status of the Institute, possibly through the Agriculture staff as well as RDE, and to consider more substantial institutional assistance when it becomes relevant.

Note: The status of a certificate from a short course at BUET is considerable and might be used as a tool for attracting participants.

Bangladesh Agricultural Research Council (BARC)  
Ministry of Agriculture

Ekramul Ashan, Member, Economics and Social Science  
M.M. Rahman, Member, Cropping Systems and Forestry  
Ahmed Husain, Training Director  
Dorsey Davy, Training Advisor  
Uko Manzano, Cropping Systems Advisor

#### Purpose

BARC is an umbrella organization to coordinate agricultural research in Bangladesh.

#### Background

BARC was established in 1973. At the present time, in addition to the headquarters in Dhaka, there are eight associated institutions:

Bangladesh Agricultural Research Institute - (BARI) in Joydepur and its four regional institutes in Jamalpur, Jessore, Ishurdi and Hathazan.

Bangladesh Rice Research Institute (BRRI) at Joydepur.

Forest Research Institute (FRI) at Chittagong.

Bangladesh Jute Research Institute

Livestock Research Center at Savar.

Institute of Nuclear Agriculture

Fisheries Research Institute

Bangladesh Agricultural University (BAU) at Mymensingh. (BARC provides BAU with research funds).

BARC has member directors to cover the program areas of Economics and Social Science, Technical Support, Cropping Systems and Forestry, Soil and Irrigation Agricultural Engineering and Livestock and Fisheries. Two member directorship posts are currently vacant, so that Economics and Social Science and Technical Support are both directed by Ekermol Ashan and Cropping Systems and Livestock and Fisheries are both directed by M.M. Rahman.

Among the many research programs being sponsored by BARC is the USAID funded research in farming systems. At present tree cropping is not a major emphasis, but since tree planting is an important part of home-stead management, BARC has expressed very strong interest in expanding into this aspect of their research.

Forestry is already an identified priority area with the Government:

1. to establish fast growing trees
2. to improve seeds and seedling
3. to improve mangrove forestry, including

establishment of fast growing species  
 reforestation of embankments and deltas  
 promotion of village or homestead forestry

The BARC five-year research plan which will receive support from IDA (Phase IV) identifies twelve aspects of forestry. All of these relate to fuelwood supply but of particular interest to both BARC and AID is the possibility of expanding the village/homestead forestry component of farming system research. Both Mr. Ashan and Mr. Rahman expressed very strong interest in considering trees, not only as a fuel resource but also for their role in soil nutrients, income generation and utility of bi-products.

#### Training

Senior staff of BARC, local and foreign, would benefit from a seminar on the household energy crisis, along with decision makers in other relevant organizations. More intensive training would be required by the scientific officers and their field assistants if tree crops are to be included in demonstration site research. There should be considerable involvement with the Forest Research Institute, in particular the areas of extension, silviculture, cash crops and field research. The emphasis should be on forest/tree production and management, not forest products, Mr. Rahman feels.

The Training Director stated that the details of the training should be based on a careful assessment of training needs. This in turn requires a task analysis in the first instance. The curriculum which is used should be detailed and precise. Emphasis should be placed on training of field staff, and those having direct contact with farmers, according to both the Training Director and the Member, Cropping Systems.

Management of training needs and training courses is a key viable: trainers must be adequately trained (this takes time), must be kept available as trainers for two years or longer, and trained staff must be utilized in the work for which they were trained. This would pre-suppose an emphasis on the training component in the design of a demonstration project to introduce tree crops into the cropping system research.

There are already adequate funds within BARC. Long term overseas training opportunities have all been allocated, however. Short term opportunities (three to six months) are still available. Additional funds would be needed for a major tree crop project.

BARC has no facilities for training except for a 300-seat conference room. The constituent institutions have facilities and the Forest Research Institute is discussed separately.

#### Recommendations

1. Pursue the possibility of field trial/demonstration of trees crop as part of farming. See discussion on fuelwood.
2. It should be noted that the heavy involvement of AID in BARC is a major argument in favour of channeling fuelwood trials through this organization.
3. BARC appears to have a strong capability in training program design which could be mobilized for this project. The Training Director set up a well respected program at BIRRI and was previously with DAEM.

Bangladesh Petroleum Institute  
Ministry of Energy

Mr. I. Jarre, UNDP Advisor

### Purpose

To serve as a research and training institute for all aspects of the petroleum sector. The three primary functions are:

1. petroleum training institute
2. service division, and
3. data and information collection

### Background

This institute was first discussed in 1979, originally to be funded by OPE. Although there have been many ideas as to appropriate activities for this institute, its precise role and functions have not been clarified by the BDG. UNDP funding was initiated in 1980 and Oildeco, a consortium of Norwegian firms was contracted to undertake the technical assistance. The current contract will be completed in June 1983 and it has not yet been decided whether the project will be continued (see 'Constraints' below).

### Staffing

The Board of Directors of the institute consists of a Chairman and six members. The Chairman is the Secretary, Mineral and Petroleum Division, Ministry of Energy. Other Board members represent Petrobangla, BPC, the Geological Society of Bangladesh, UNDP and Oildeco.

The BGD has not appointed a Director of the institute, or any counterpart staff to the technical assistance program. No single person in the government has responsibility for the institute.

Teaching staff consists of one resident UN expert, Oildeco experts brought in for specific courses, and several Petrobangla employees who are counterpart trainers.

### Training

The institute operates from a large two storey building in Dhanmondi. Facilities include two classrooms, a laboratory, a Blow-Out Simulator, and specialized equipment for Safety Training. The classrooms are well furnished, have overhead projectors, film projectors, etc.

So far, after an initial course to train counterpart instructors, the following courses have been given: Drilling Technology (5), Drilling Course I and II, Safety Course (3). Courses in Geology and Geophysics; Reservoir Engineering; and Petroleum Production were previously planned for June and July 1983, but have now been deleted from the plan. The Drilling Course II, which was to have started in late April, may be delayed or cancelled as the intended participants will be engaged in Sitakunda.

If BPI had developed as intended, it would gradually have been able to train more persons in a wider range of subjects. Although initial UNDP funding was limited, and acted as a constraint, had the institute developed, further funding could have been sought from a number of donors. The Norwegian government expressed interest in undertaking a five-year program of support, but not until the constraints outlined below have been resolved.

#### Constraints:

1. Lack of clear definition by the BDG of functions of the institute.
2. Failure to appoint a Director, or counterpart to the UNDP Advisor. (In view of this, in November 1982 the BPI Board proposed that the General Manager, Training Division, Petrobangla, become the counterpart and, in effect, for the Institute to become the training wing of Petrobangla. The Minister for Energy felt that the institute should remain independent to better serve a larger number of organizations, so this decision was not implemented). No subsequent action has been taken.
3. Failure to appoint sufficient counterpart instructors. Failure to process two counterparts in time to start training in Norway at beginning of the course.
4. Failure to release students who have completed the preliminary course to take subsequent course. Failure to coordinate training schedule with work schedule (of drillers, especially).
5. Failure of individual students to complete the course.
6. Failure to inform the institute of other training programs with potential for cooperation/overlap.

The Ministry of Energy pays the rent on the present structure. The equipment belongs to UNDP and may be turned over to the BGD. Further UNDP funding is doubtful.

#### Recommendations

No action at present.

## AID Conventional Energy Project: Bechtel Engineering

F. Powlan, Team Leader

It was originally intended that this study would review the progress of the Bechtel Project. However, due to the late start of the project it is not sufficiently far along for any useful analysis. Instead, a few personal observations are offered:

1. There was some initial difficulty in establishing the exact role of the project, establishing the local contacts (neither problem unexpected in Bangladesh). This points to the need for very detailed discussions and flexible local control over such projects during the development stage, which in turn would necessitate extensive AID staff time to ensure that BGD review is thorough and reaches the participants involved. It also points to the need for a flexible attitude on the part of the consultant (as appears here to be the case).
2. There were competing demands of other donor projects (which in this case appear to have been resolved in favor of Bechtel). In the absence of extremely detailed coordination among donors - much more coordination than is likely to occur - this will be an anticipated problem in all projects. Management of local institutions tends to respond to the demands of the moment, and fails to plan far ahead or anticipate conflicts. The frequent result can be an agreed-upon project, but a failure to provide adequate counterparts and students.
3. External consultants can expect to have a long set-up time, with a high energy cost, even when the project is technical, and even as in this case where existing facilities were taken over from another project.
4. It will be very useful to evaluate the results of the Bechtel project, with special attention to the following:
  - a. the quality and quantity of students put forward by the BDG for training.
  - b. an assessment of the usefulness of the courses from a technical point of view.
  - c. an assessment of the difficulties caused by lack of equipment and of logistics (as opposed to the difficulties of working with BDG personnel).
  - d. follow-up on placement of the trained students, and their transfers over the next year or so.
  - e. cost per student receiving training.

This evaluation can be used in designing future projects. Of course, the other outputs of the project should also be evaluated.

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### Purpose

To plan for technical education, initiate new programs, liaise with the Technical Education Board, and administer the Engineering College, Polytechnics and Vocational Training institutes. Note that BUET is not under the Directorate.

### Background

Technical Education in Bangladesh:

At present there is the Bangladesh University of Engineering and Technology (BUET) under the University Grants Commission and then, under more direct control of the Ministry of Education, Directorate of Technical Education, are three Engineering Colleges at Chittagong, Khulna and Rajshahi. A College of Engineering was recently established in Dhaka (Joydepur) to further educate diploma engineers from the Polytechnics to degree status. This college will also have a technical teachers training course. These four colleges are attached to their respective Universities for the purposes of academic standards and awarding of degrees.

There is an attempt to focus each of the colleges in one specialty, as follows: Civil in Rajshahi, Mechanical in Chittagong and Electrical in Khulna. There is also a proposal to develop a course in Rural Energy at Khulna.

There are 17 Polytechnics offering a post-secondary three year course, and a diploma in Engineering. (There are 54 Vocational Training Institutes at thana and sub-divisional level). All these institutions, including the colleges, have severe staff problems due to low salary, poor working environment, lack of equipment and facilities, the low status of teaching, and the many competing opportunities for degree-holding engineers. Staff turnover among new teachers is extremely high and only the older more established teachers stay on. As of last year only 1,200 of 1,538 teaching positions under the DTE were filled, with the biggest gap at the colleges (30% vacancy). Over 60 persons received overseas training since 1975, but 15% were lost upon return due to Government delays in placement. Considerable more overseas teacher training is recommended.

IDA, SIDA, DANIDA and other bilateral donors have actively assisted in technical education, and there are two UN projects on-going. The UN and World Bank are sponsoring a project already accepted in principle by the Government to augment teaching staff with technical personnel from Bangladesh industry and related organizations who would take up temporary teaching positions under contract at subsidized pay scales. This project has been accepted in principle by BGD.

Other identified needs are for closer contact between engineering colleges and industry, and more opportunities for research.

It is worth mentioning that no employers of engineers interviewed during this study expressed dis-satisfaction with the quality of basic engineering training; they made note only of the necessity for specialized training once new recruits were on the job. By external standards, the quality of training and graduates is low.

Employment opportunities for engineers are considerable; as there is great pressure on admission. But the targeted number of engineers specified by the SFYP has not been met (targetted annually 1,200 engineers and 6,000 technicians; provided annually are 1,000 engineers and 2,500 technicians). Only 20 chemical engineers are produced per year. A number of studies by the Planning Commission and the Bureau of Manpower Employment and Training have projected demand for engineers within Bangladesh and for Bangladeshi engineers in the Middle East and North Africa. The external demand nearly equals the total present output of engineers. Demand among the major energy sector users has been projected as 125 engineers in 1981 gradually increasing to 320 by 1985. This seems quite conservative.

Facilities at all the Colleges and Polytechnics are in need of improvement, including buildings, books and equipment.

### Recommendation

There appears to be much room for additional donor activity in the sector.

1. In relation to energy sector training a logical involvement for AID might be at the Khulna Engineering College where Electrical Engineering and Rural Energy are areas of focus. It was not possible to visit this College or pursue this option in any great detail. Coordination with IDA and UNDP would be a first step in project development.
2. Another area where considerable potential exists for program development is in the need for maintenance training. Although maintenance practices are partly controlled by administrative priorities and procurement habits, good maintenance even with inadequate resources and support is possible provided the technicians have the correct orientation and adequate training. The need for an overall emphasis on maintenance is stressed by the World Bank, and a separate maintenance unit is proposed as part of their project. There may, however, be a potential for a users-oriented maintenance course in which staff from such companies as Titus Gas, Bakhrabad Gas and BPDB are trained along with polytechnic students in particular types of maintenance. This would require the careful selection of technical assistance; persons with hands on experience but also flexibility to communicate. Again, coordination with World Bank and the Directorate of Technical Education would be required.

### Local Consultants

The Bangladesh Government requires, in most circumstances, that an expatriate consulting firm work with a local consulting firm. However, frequently the local firm is relegated to the role of providing personal logistics and liaison with government, while the expatriates do most of the consulting work.

There are, however, a number of local firms and individuals with the capacity for professional contribution in technical and management fields. This study made no attempt to cover such consultants, but several individuals were interviewed, each of whom have highly qualified skills to offer.

One is Professor of Chemical Engineering, BUET, and formerly Minister of Agriculture. The combination of technical training, government experience and natural abilities make him uniquely able to contribute to project development. He has recently contributed to an ILO report on technical manpower requirements.

Another person is Dr. Kursheed Islam, with a German Phd (Chem.Eng.) and three years of postgraduate work experience there. He has undertaken a number of consultancies since returning to Bangladesh, including a Marketing Survey for Meghna, and a comprehensive review of energy sector issues for UNCHS. He is currently associated with the oldest Bangladeshi consulting firm, Ganibangla, which is undertaking a gas utilization industry study for the World Bank.

A third, Shelley Rahman, a Chemist at Dhaka University, has studied and lectured at Sussex University, and participated several years ago in a television program here on natural gas.

These are illustrative, and are mentioned here to verify that there are experienced, motivated and trustworthy Bangladeshis capable of professional contribution. It will be worth AID's effort to seek out and, after careful screening, use such individuals and firms, to increase the relevance and practicality of aid projects. See also Institute of Appropriate Technology.

OTHER TRAINING IDEAS

The persons interviewed were asked what the highest priority training requirements are in the energy field, or in their own particular organization. Many of the suggestions are included in the preceding review of energy related organizations. Those which did not readily fit in there are listed below. They are organized by subject area, and the person who proposed it is identified. Some are no more than suggestions of what should be; others are more firmly grounded in existing institutional requirements.

Subject: Administrative Management

Source: Rosing, Ministry of Energy

Idea: It is the expressed view of Rosing and Almeda and many foreign experts working here that the major energy problems are not technical but rather are administrative. Organizations are not organized; government funds are not released in a timely manner, information is not transferred, either vertically within organizations or horizontally between related organizations. The inability to write summary reports exacerbates this problem. There is an inadequate data base, because there is no systematic information gathering. Current donor efforts in the energy field tend to focus on technical problems and technical training; there is no significant input into management problems.

The management weakness of most Bangladesh organizations is also caused by the personal style of administration: everything depends upon the man at the top, who is inevitably overburdened with details, cannot delegate authority, cannot decentralize decision-making, and who therefore tends to minimize his area of responsibility, rather than to expand his operations. The system of frequent transfers makes this situation worse.

Taking the most pessimistic view, one would have to retrain the entire government in order to solve these problems. However, if individuals are given management training, they will have the tools with which to deal with the system (ref: Mozamdar at the Planning Commission who says the same thing; people need management training so they are able to fight the inertia of the system).

All of this argues for an expansion, in any and all ways possible, of AID funded opportunities for management training, and in particular to expand management training locally, where the particular constraints of working in Bangladesh can be dealt with directly. AID has already identified local management training institutions suitable for assistance. This report identifies training needs and training facilities whose requirements could be met with AID funded joint management training efforts.

Subject: Petroleum Management

Source: Muench

Idea: Identify one or several particular management problems of Petrobangla, BPC, or both. Contract with A.D. Little or a similar consultant with training skills to come to Bangladesh, analyze the local situation and conduct a course here. This would require thorough preparation of scope of work and close supervision of the project to ensure useful results, but could have a high pay-off. Bangladeshi former USA course participants could assist in orientation and curriculum adjustment to local conditions. A local training facility could act as co-sponsor or as a secondary or simultaneous recipient of benefit. While some highly technical subjects may need to be taught outside Bangladesh, management courses can easily be conducted here. Feedback from past recipients of US training opportunities indicate that the courses were broadening and stimulating, but not very relevant to Bangladesh.

Another approach would be to hire a local technical/professional consulting firm to act as organizer/liaison/counterpart. This would avoid involvement of AID/Dhaka staff in project detail. The training program could be conducted in an existing BPC or Petrobangla facility, or in one of the local management training institutes.

Subject: Petrobangla Management

Source: Powlan, Bechtel

Idea: Placement of expatriate managers throughout Petrobangla for on-the-job training. This could be carried out by Aramco or Kuwaiti Oil. This would overcome the difficulty that current workload is too heavy for many to participate in formal training. Note: Such a scheme might best be preceded by a manpower study, which a firm like Bechtel could undertake.

This concept could clearly be applied to other energy-related organizations.

Subject: Petroleum background training for new recruits

Source: Dr. Kursheed

Idea: Petrobangla, BPC and other government organizations involved in energy obtain new staff by recruiting recent graduates from BUET and the Engineering Colleges. These graduates have received a basic engineering education, with no background or special training in petroleum engineering. They learn on-the-job, often from overworked senior people,

and can never develop the background for their work which would be desirable.

Dr. Islam feels that a course could be developed which would cover such basic subjects as petroleum geology, petroleum engineering, and geophysics. More specialized subjects could then be addressed as needed, possibly with some Technical Assistance input. Field visits should also be included. The purpose would be to give a proper grounding in the area for which on-the-job training is being acquired.

It would be preferable if the courses were conducted over a period of at least six weeks, part-time at regular intervals such as two afternoons a week leaving the recruits a majority of their time for learning their new job.

Available in Dhaka are three or four people who could cover the core courses: (Bangladeshis with overseas working experience and education, and recently retired civil servants from the relevant ministries). Special lecturers could also be called in, from here and abroad. The assistance of an expatriate expert could also be useful.

As this would specify that trainees be new recruits, the difficulties of trainee identification, willingness to participate, and interest in the course might be eliminated. As it would be a part-time course linked with on-the-job training, the exact needs of the employing agencies will not be lost.

The course would be designed for government employees, but could be open to fee-paying University people and private engineers. In this way the needs of private enterprise could also indirectly be met.

Subject: Gas Utilization

Source: Affsarudin, Training Division, Petrobangla and Muench

Idea: Utilization of natural gas, as an energy source and a feedstock for chemical industries, for local use and for export, is a rapidly developing high technology field, in which USA has considerable expertise. Both in-country orientation seminars and USA-based study tours would be extremely useful for senior officials in the energy sector in Bangladesh. There is also scope for longer term training of technical people, once any particular gas utilization is determined to be a feasible priority. Therefore, one could envision a two-stage training program, in which during the first phase relevant decision makers are exposed to the various options, and then a series of feasibility studies are undertaken. The second phase would be the actual training of the required manpower to implement the chosen utilization. Implementing agency could be Petrobangla, Ministry of Energy, or Planning Commission for the first phase. Coordination with World Bank is recommended.

Subject: Conservation : Management

Source: Mahmoud, BUET

Idea: To develop an awareness of energy issues and the potential for cost savings through conservation and improved energy use management, seminars could be held (scheduled so that decision makers can attend) for the various sector corporations and private businessmen. These short courses could be run by the Management Development Centre or, perhaps, the Polytechnics or Engineering Colleges could be involved in a joint college/industry program in energy conservation techniques.

Possible linkages: MDC; Directorate of Technical Education (see also Conservation, above), Institute of Appropriate Technology, BUET.

Subject: Conservation : Boiler Technology

Source: Dr. N. Islam, BUET, and Dr. L. Muench, UN.

Idea: Establish local training for boiler technology: both operation and maintenance. Possibly initiated by BUET (Muench's suggestion). Boiler maintenance courses could then be introduced to technical training institutions. Boiler operation is reportedly extremely inefficient at present, including fuelwood, and profit losses can be serious.

There is a Chief, Boiler Inspectorate, but this is a completely untechnical licensing bureaucracy.

Subject: Maintenance

Source: Muench

Idea: There would be receptivity among managers of the subsidiaries of Petrobangla and BPC for maintenance courses. These would have to be geared to the particular needs of each company as well as to the climatic, procurement, and budgetary conditions in Bangladesh. As there are so many donors involved in Petrobangla/BPC, detailed contact with all of them prior to project development is recommended. But as maintenance is a particular problem, and could be dealt with in-country, the possibility is worth pursuing. The City Gate Training Facility, Titus Gas, Dhaka, is one possible location for such courses. Another possible location is Khulna Engineering College (see also Technical Education, Titus Gas, Bakhrabad Gas, Conservation Safety Training). Consultation with ILO would be advisable.

Subject: Safety

Source: BPI

Idea: The BPI has successfully undertaken a number of safety courses directed at the modern energy sector. They have had good cooperation with the Fire Department and with Titus Gas. Titus Gas has provided a field and other equipment necessary to train gas fire fighting. BPI has equipment and training materials for related aspects such as resuscitation, panic, etc. Two counterpart instructors have been trained for this course. There seems potential to continue and expand training in this area.

BPC also includes safety in their training courses, as does BPDB and REB. But safety standards and practices are generally low in Bangladesh, and to expand short-course training in this area would be very useful, possibly with BPI or BPC or Titus Gas as a base. (See also Training Idea: Maintenance).

Subject: Communications/Mass Media

Source: Huq, BCSIR

Idea: Develop and introduce material on energy issues and energy conservation into primary school texts. He has already approached the Ministry of Education on the matter, but it would need funding support; possibly technical assistance would also be helpful.

Subject: Communication/Mass Media

Source: Donovan and Muench

- Idea:
1. Radio program on energy (or energy plus other) conservation, geared especially for teachers.
  2. a similar radio program for children.
  3. TV program on energy issues in Bangladesh, aimed at senior level decision makers.

Note: This has been a successful approach in other countries. A group of Dhaka University chemistry professors did a TV series on natural gas a few years ago, and could be organized to do a new one, and/or Nurul Islam, Institute of Appropriate Technology, could be involved.

Subject: Assessment of Technology

Source: Mahmoud, BUET

Idea: Background: Dr. Mahmoud feels that assessment of the appropriateness of technologies is completely absent in Bangladesh; indentors and company agents are the ones who decide which technologies are imported, as well as donors who dictate what will be funded.

Project Appraisal in the Planning Commission should be carried out by two parallel groups: the economists and technically qualified people who can assess the technical merits of the project. This requires a staff with the relevant orientation as well as technical ability.

AID could propose to fund the establishment of a technical review section in the Energy Division of the Planning Commission. There are already engineers on the staff (Hosseini, for example) so it would best be introduced as a focused part of the review process. Or AID could fund a series of local consultant technical reviews, to test out the desirability and feasibility of establishing a permanent in-house technical review function in the Energy Division. While not a training project in the first instance, training of the staff would be required to establish the unit.

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Milton Coke, Director, World Vision

SELECTED BIBLIOGRAPHY

Of the many publications on energy in Bangladesh, the following should provide an overview of the technical and policy aspects. Several of these contain more comprehensive bibliographies.

Agricultural Development Association of Bangladesh:

A'dab News

a bi-monthly magazine which covers activities of NGOs in rural development in Bangladesh, including energy sources and use.  
eg: January-February 1983, Vol. X No. 1 re bio-digestors.

Asian Development Bank/World Bank:

Bangladesh: Donor Support for Energy Sector Development, Dhaka, 1982

a review of all donor activities in energy, by sector and by country; being updated.

Directorate of Technical Education, Ministry of Education:

Proposal for Strengthening of Technical Education in Bangladesh Dhaka, May 1981

a review of current facilities and weaknesses in engineering and technical education.

Food and Agricultural Organization:

Supply and Demand of Forest Products and Future Development Strategies: Bangladesh, FAO, Rome, 1982

see also other FAO reports on Forestry.

Hossein, G. et al:

Human Resource Development and Employment Generation in Bangladesh ILO/UNDP (BDG/79/028) Dhaka, 1982

see especially Chapter 8, on appropriate technology, by Dr. Iqbal Mahmoud, BUET.

Islam, Kursheed ul

Energy Situation in Bangladesh, Recommended Planning Strategies UNCHS (BGD/72/104) Dhaka, 1982

a comprehensive review from a slightly different perspective; has more coverage on alternative energy sources like methanol and peat than other reviews.

Islam, M.N.

An Assesment of Energy Issues in Bangladesh, list of Appropriate Technology BUET, Dhaka, September 1982

a good review which emphasizes rural energy issues.

Montreal Engineering Co. Ltd., et al:

Bangladesh Energy Study, ADB/UNDP (BGD/73/038), Dhaka, Nov. 1976

the original study, currently being updated. Generally a competent report, but a few resources glossed over.

Stancescu, I.D.

Reports on the Mission to Bangladesh, Munich, 1983

a good review for UNDP of organizational constraints of the BPDB as well as of power generation/distribution.

World Bank:

Bangladesh : Issues and Options in the Energy Sector, Report No. 3873-BD, July 1982

a detailed and comprehensive review, though not to be treated as gospel truth. See also: Minutes of Meetings on Energy LCG, September 1982.

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a useful review but somewhat weak on institutional arrangements.