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AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

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10. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = ____)

A. PROGRAM FINANCING	FIRST YEAR B. FX	C. L/C	D. TOTAL	ALL YEARS E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(350)	( )	(350)	(14,650)	( )	( )
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
TOTALS	350		350	14,650		

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION ALPHA CODE	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 80 D. GRANT	E. LOAN	FY 81 F. GRANT	G. LOAN	FY 82 H. GRANT	I. LOAN	ALL YEARS J. GRANT	K. LOAN
			350		3500		3500		14,650	
TOTALS										
12. ESTIMATED EXPENDITURES										

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID/PRP

To provide LDC participants with M.S. degree, in-service and industry fellowships in science and engineering fields related to conventional energy.

BEST AVAILABLE DOCUMENT

14. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.

[ ] YES [ ] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Alan B. Jacobs
Director, Office of Energy

DATE SIGNED MO. 06 DAY 26 YR. 80

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
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I. Recommendations

The Office of Energy, Development Support Bureau, recommends that A.I.D. approve a grant of $14.65 Million to fund a five year (FY80-84) Conventional Energy Training Project. The grant will be used to fund training for LDC personnel in science and engineering disciplines related to conventional energy. Three types of training will be provided: M.S. degree training; M.S. level non-degree academic training and industry fellowships. The training will be provided by U.S. instititions of higher education and by U.S. industry. The participants will come from any developing countries which qualify under the selection procedures. For short, the program is called the Energy Fellowship program.

DS/EY recommends that, subject to the availability of funds, monies to support the project be obligated as follows:

FY 80	$ 350,000
FY 81	3,500,000
FY 82	3,500,000
FY 83	3,500,000
FY 84	3,800,000

II. Background and Description of Project

A. Background

Compared to developed countries, developing countries do not use much fossil energy. However the fossil energy -oil, gas and coal - that they do use is vital to certain sectors of their economies, i.e. transportation, industry, electric power and, increasingly, agriculture.

Most of the fossil energy, principally petroleum, that non-OPEC developing countries (NODCs) use is imported. NODCs import over 60% of their oil. If NODC oil exporters are excluded, this percentage rises to 83%. Oil price increases since 1973, aggravated by the 1979-80 surge in price, have placed severe strains on LDCs. These strains have manifested themselves in balance of payments deficits, high external debt ratios, rising unemployment, increasing share of export earnings devoted to oil imports, idle capacity in industrial and manufacturing sectors and deferral of government expenditures on social programs. The severity of the oil import problem in non-OPEC LDCs has prompted international lending institutions, such as the IMF, Bank for International Settlements and major private banks to urge controlling overseas financial cash. Jamaica and Turkey are the visible examples of a major problem in oil-importing LDCs.

This serious situation is attenuated somewhat by reasonably good prospects for expanding oil, gas and coal production in some LDCs. The IBRD has concluded that, out of 70 countries it surveyed, 23 had prospects of finding 750-1500 million barrels of recoverable oil; another 15 had prospects of finding between 100-750 million barrels. The ultimately recoverable reserves (URR) of LDCs are uncertain, but one report to the UN Secretary General estimates that LDCs could account for 15% of the world's URR. In the coal sector, about 30 LDCs have known but only partially explored coal and lignite reserves.

Non-OPEC LDCs are believed to possess more than 40% of the world's oil-bearing sedimentary basins, yet only about 7% of all exploratory drilling to date has taken place in these areas. The World Bank estimates that unexplored regions of developing nations probably contain 75% of all Latin American oil resources, 80% of Africa's and 95% of Asia's and the Far East's.

There are several constraints to developing these potential fossil energy resources or political instability, lack of investment or venture capital, inadequate technical data and a shortage of trained LDC personnel all impede full development of the fossil energy resouces in developing countries. It is difficult and perhaps impossible for donor organizations to have a beneficial affect on political stability; the other constraints are more susceptible to outside assistance. The World Bank, through its petroleum and coal programs, is trying to stimulate capital investment. Other entities, such as OPIC and EX-IM Bank, are also working on this constraint. The IBRD is also funding the collection and analysis of technical data on oil, gas and coal resources. A.I.D. has developed a similar project on technical assistance in conventional energy.

This project paper deals with the fourth constraint, the shortage of LDC personnel trained in conventional energy technologies. This constraint has only recently been acknowledged as a serious problem worthy of donor attention. The IBRD, in reviewing impediments to LDC fossil energy production, concluded: "assistance is needed in many cases to create, or reorganize and strengthen, an energy planning authority and to train the necessary administrative and technical staff." (IBRD, A Program to Accelerate Petroleum Production in Developing Countries, January 1979, p. 23). In the coal sector, the IBRD states: "Only a few developing countries have made or are now initiating efforts to increase coal-related skills by emphasizing training, technical assistance and technology transfer in the coal mining sector." (IBRD, Coal Development Potential and Prospects in Developing Countries, October 1979, p. 22). The National Research Council, looking broadly at LDC needs in science and egnineering, argued there is a need for engineering technology programs to educate LDC engineering graduates in the application of technology rahter than the theoretical and scientific applications of engineering. (FN: National Research Council, BOSTID, The Role of U.S. Engineering Schools in Development Assistance, 1976).

The ability of U.S. academic institutions and industry to provide relevant training is unquestioned. In a speech before the National Association of State Universities and Land Grant Colleges on November 27, 1979, the Director of IDCA stated, "Recognizing that the U.S. higher education system is the most significant asset we have for transferring technical skills....we are preparing a new program to provide support for long-term training in science and engineering fields related to energy."

Legislative Mandate

Given the developing countries' current and projected oil supply problems and the impact of the oil crisis on development prospects, the U.S.

has a clear interest in assisting the developing world with fossil fuel exploration and development. The Congress recognized that interest in enacting Title I, Section 104 of the International Development Cooperation Act of 1979 (P.L. 96-53), which states:

> "...there is a compelling need for vigorous efforts to improve the available data on the location, scale and commercial exploitability of potential oil, natural gas and coal reserves in developing countries, especially those which are not members of the Organization of Petroleum Exporting Countries."

Further, the Congress found that:

> "Assistance for the production of energy from indigenous resources....would be of direct benefit to the poor in developing countries because of the overwhelming impact of imported energy costs upon the lives of the poor and their ability to participate in development.

The Act authorizes the President to:

> "furnish assistance....for energy programs involving research on and development of suitable energy sources....(including) the collection and analysis of information concerning the potential of a country for producing energy from indigenous resources. Such assistance may include data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production."

Specifically, Section 104 authorizes up to $7 million for FY 1980 to:

> "facilitate geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploratin for potential oil, natural gas, and coal reserves in developing countries....."

B. Description

(1) Goal and Purpose

The Goal of this project is to increase the technical competence in developing countries to explore for and exploit conventional energy resources.

The Purpose of the project is to provide M.S. level academic training and industry internships in science and engineering fields related to the conventional energy identification, exploration and production. The focus will be on fossil energy resources - oil, gas and coal. Other energy resources, such as geothermal or hydropower, will receive secondary attention. Although the emphasis will be on science and engineering, related

disciplines - economics, business and resource management, environment and law - will be covered.

(2) Activities

The main activity under this project is the identification, selection and placement of LDC personnel in academic institutions and industry in the U.S. There are two approaches to recruiting and placing Energy Fellows. One is essentially passive i.e., announce the program and let the candidates emerge, the other is a direct effort with a group actively resruiting Energy Fellows according to agreed upon criteria. The latter approach has been selected for this project to ensure quality of Energy Fellows and relevance of training to subsequent employment. A.I.D. will select a contractor to manage day-to-day activities, with DS/EY retaining overall responsibility for the project.

The Office of Energy has endeavored to draw up reasonable criteria for participation in this project. Eligible countries currently are limited to those receiving A.I.D. assistance. It is possible the A.I.D., IDCA or the State Department may determine that other countries should be allowed to participate. The project's implementation procedures are such that this would pose no problem. In addition, other Government agencies, such as the Department of Energy, and other organizations, such as the IBRD, ADB and IDB may wish to contribute funds to expand the list of eligible countries. Subject to formal discussions between AID/IDCA and other interested agencies, the Office of Energy sees no problem. A.I.D. expects to coordinate this project closely with.the conventional energy projects of the World Bank.

Upon approval of the project, AID/W will notify A.I.D. field missions of the project. Missions will be asked to discuss the project with the LDC governments and report back on the priority areas. This information will help A.I.D., the contractor and the Advisory Council to prepare the final list of criteria. Critieria are important as it is expected that interest in the project will exceed the number of Energy Fellowship available.

Among the criteria to be used in selecting the participanting countries are:

(a) Country potential for oil, gas or coal development, as estimated from available data;

(b) The degree of energy import dependence of the country, and the resulting severity of financial and developmental strains;

(c) Constaints to conventional energy identification and exploration, created by the lack of trained manpower, which could be alleviated by this project;

(d) The relationship between proposed training and other conventional energy activities, particularly the Technical Assistance in Conventional Energy project and related projects of the multilateral development banks and other donor organizations;

(e) The outlook for the country to acquire technology, capital and other services necessary to complement training received under this project;

(f) The willingness of the country to use the talent trained under this project; and

(g) The degree of political and economic stability in the country, with particular attention to the climate for public or private investment in fossil fuel development.

A 1975 study commissioned by the World Bank concluded that out of 70 countries surveyed, 23 (including 9 current producers) have prospects of finding "high" or "very high" quantities of oil (7500 to over 1500 million barrels), and another 15 countries (including two current producers) have prospects of finding "fair" quantities of oil (100-750 million barrels). The World Bank study grouped the countries into four categories:

(a) Current oil and gas producers (both net explorters and net importers);

(b) Countries with proven oil and gas reserves and announced commercial discoveries, but no production as yet;

(c) Countries with no production and no commercial discoveries to date, but with favorable geological prospects for oil and gas deposits;

(d) countries with unfavorable prospects (based on current knowledge) for oil and gas discoveries.

Those countries studied in the IBRD survey that are also A.I.D. assistance receipients in FY 1980 or FY 1981 are shown, by category, in Table 1.

A separate compilation, using Department of Energy data; ranked 75 nations according to three categories: "High", "Some", and "Little" potential for oil. (Table 2). These categories are not defined rigorously; the data base is weak and the criteria ambiguous. Therefore caution is advised in setting policy from these charts. A comparison of the two tables indicates that DOE has taken a more conservative stance than IBRD regarding the prospects of most countries. It cannot be said at this time that A.I.D. oil-related assistance will be given only to those nations with the most promising potential as indicated by these two surveys. More information and analysis are needed before country-specific decisions can be made.

The Office of Energy has had extensive discusions on this project with the Energy Department of the IBRD. There is a genuine desire to collaborate on training, particularly training which would complement large capital assistance that the IBRD is providing for conventional energy. DS/EY

TABLE 1
WORLD BANK ESTIMATES OF
OIL AND GAS PROSPECTS IN LDCs
(* = AID Country in 1979)

	Group A	Group B	Group C	Group D
AFRICA	Gabon Nigeria Angola *Zaire Congo	*Burundi *Chad *Rwanda *Tanzania Ivory Coast Cameroon	*Benin *Ethiopia *Gambia *Ghana *Guinea *Mali *Niger *Senegal *Sierra Leone *Togo Madagascar Central African Rep.	*Botswana *Kenya *Lesotho *Upper Volta *Mauritius *Malawi Uganda *Zambia
LATIN AMERICA AND CARIBBEAN	Argentina Brazil Barbados Colombia Chile Peru *Boliva *Ecuador	*Guatamala	*Jamaica *Guyana *Paraguay *Dominican Republic *Nicaragua *Costa Rica *Panama *El Salvador *Hondura *Haiti Surinam Uruguay	
ASIA	*Bangladesh Burma *India *Pakistan *Indonesia Brunei	Papua New Guinea *Philippines *Thailand	*Sri Lanka Korea	*Nepal
NEAR EAST	*Afghanistan *Syria *Tunisia *Egypt *Morocco		*Jordan *Yemen AR Yemen PDR	

A - Current oil/gas producers, including net oil importers.

B - Current non-producers of oil/gas but with proven reserves and announced commercial discoveries to be exploited as of November 1977.

C - Non-OPEC LDCs with favorable geological prospects for potential oi/gas discoveries.

D - Non-OPEC LDCs whose geological prospects for oil/gas at present rate of technical knowledge are not very favorable.

Source: Petroleum & Gas in Non-OPEC Developing Countries: 1976-1985, World Bank Staff Working Paper # 289, April 1978

TABLE 2

IDCA ESTIMATES OF OIL AND GAS

POTENTIAL IN NON-OPEC LDCs

	High Potential	Some Potential	Little Potential
AFRICA	*Zaire Angola Congo	*Cameroon *Chad *Ghana *Niger *Senegal *Sudan Madagascar	*Benin *Gambia *Guinea *Guinea-Bissau *Kenya *Lesotho *Liberia *Mali *Mauritania *Mozambique *Somalia *Tanzania *Togo Ethiopia Ivory Coast Namibia Equatorial Guinea
LATIN AMERICA AND CARIBBEAN	*Bolivia *Peru Argentina Mexico Trinidad-Tobago	*Guatemala Brazil Chile Columbia	*Dominican Republic *Guyana *Haiti *Honduras *Paraguay *Panama *Costa Rica *Jamaica *Barbados Belize French Guyana Nicaragua Surinam Uruguay
ASIA	*Thailand Malaysia/Brunei Vietnam	*Bangladesh *Burma *India *Philippines *Thailand Afghanistan Korea Pakistan	*Sri Lanka Papua New Guinea Taiwan
NEAR EAST	*Egypt *Syria *Tunisia	Turkey	*Morocco *Jordan *Lebanon Oman Yemen (PDR)

*AID Assistance countries.

Source: Prepared by IDCA for Fried Report from DOE and IBRD reports (March 1980)

has agreed to work closely with the IBRD in identifying candidate countries. Table 3 lists the countries the IBRD feels need training in FY 81.

Yemen Arab Republic	Ecuador
*Turkey	Tanzania
*Portugal	Peru
Tunisia	Mali
Bangladesh	Gambia
Pakistan	Mauritania
Burma	
Nepal	
Philippines	
*Malaysia	
*Thailand	
Papua New Guinea	

(*Countries that look most promising right now.)

Project Sequence

Many countries are likely to be involved in this project. projected sequence of events for a particular country would be:

(a) A.I.D. Mission/Embassy discusses project with Government.

(b) Government, with Technical Assistance from A.I.D. if necessary, develops preliminary plan for conventional energy identification, exploration and production program.

(c) Government uses plan to identify areas it wishes to concentrate on. Manpower needs in these areas are identified.

(d) Government nominates candidates for U.S. academic training or industry fellowships in priority areas.

(e) USAID forwards nominations to AID/W.

(f) Contractor and DS/EY review nominations, bearing in mind selection criteria accepted by Advisory Council.

(g) Accepted candidates are reviewed to determine whether M.S. degree, academic training or industry fellowship would be most appropriate.

(h) Mission notifies Government of successful candidates.

(i) Contractor manages relevant training and monitoring for Energy Fellow.

(j) At end of training, Fellow returns home.

(k) Contractor and A.I.D. monitor returned Energy Fellow to evaluate training program.

As this project will be coordinated closely with the IBRD, the above sequence may well be modified to accommodate training needs identified by the IBRD.

C. A.I.D. Strategy and Relationship to other AID/MDB Programs

A.I.D. has always placed a great deal of emphasis on energy activities in its development portfolio. U.S. programs have evolved from a concentration in past years on power generation and distribution to an increasing concern for the current and projected imbalance of supply and demand in both conventional and renewable resources. Bilateral efforts have concentrated on technical assistance, with a focus on renewable energy for rural applications. The U.S. has relied on the multilateral development banks to assume the major share of capital financing of large energy systems.

A.I.D.'s legislative mandate, while highlighting renewable energy projects consistent with the basic human needs strategy, has recognized that conventional energy resources play an important role in promoting and sustaining national economic growth. The House Committee on Foreign Affairs, in its report on the FY 81 foreign aid bill, states "more than ever, the committee is persuaded that increased effort and funding must be devoted to energy programming for fossil fuels (as well as renewable and nonconventional energy) since non-OPEC developing countries are diverting a growing share of their foreign exchange to pay for imported oil and development plans are being stifled as a result." [International Security and Development Cooperation Act of 1980, Report of the Committee on Foreign Affairs on H.R. 6942, August 16, 1980, page 41.] The Foreign Assistance Act 1961, as amended, states "Unless the energy deficit of the developing countries can be narrowed by more fully exploting indigenous sources of energy such as oil, natural gas and coal, scarce foreign exchange will increasingly have to be diverted to oil imports, primarily to the detriment of long-term development and economic growth." (Section 104).

This training project, while stressing conventional energy, is not a new area for A.I.D. For many years, A.I.D. has supported general academic and professional training for LDC personnel. Projects in this area include:

- Latin America Scholarship Program in American Universities (LASPAU)

- African Manpower Development Project (AMDP)

- African Scholarship Program of American Universities (ASPAU)

- African Graduate Fellowship Program (AFGRAD)

- Inter-American Universities Scholarship Program (INTERAF)

- Egypt Peace Fellowship Program (EPFP)

- Energy Management Training Program (EMTP)

A.I.D. has several small training projects related to conventional energy.

- Management training for the Petroleum General Administration of the Sudan

- Training of Indonesian engineers in coal exploration and production techniques

- Remote Sensing for Resource Assessment. The project has supported remote sensing centers in LDCs, trained technicians in remote sensing and provided Landsat data.

Existing Programs Relating to CETP

Several organizations have training and professional development programs which complement the objectives of this project. With the possible exception of the French Government petroleum program, none are as broad as the CETP.

a. World Bank

The World Bank fossil energy development program is described in two Bank documents: "Coal Development Potential and Prospects in the Developing Countries" (October 1979) and "A Program to Accelerate Petroleum Production in the Developing Countries" (January 1979). The Bank reports acknowledge that energy development is hampered in many LDCs by the shortage of trained energy specialists and administrators. However, to date, it has no formal program to alleviate the shortage. The training the Bank is doing is project specific. In discussion with the Office of Energy, the Bank has stated its desire to work on general program to upgrade professional skills of LDC conventional energy specialists.

b. United Nations

Various organizations within the UN family are active in the conventional energy field e.g. UNITAR, UNIDO, UNDP, the Regional Commissions and the ILO. Most training is short-term and project specific. Among the U.N. efforts reported to date are:

1) A study of the hydrocarbon potential of the ocean;

2) A pair of reports on new concepts, approaches and technologies for oil and gas exploration;

3) A UNEP study and meeting of experts on the environmental impacts of oil and gas development and producation;

4) ILO studies on labor-related issues, including the safety, health and working conditions of petroleum industry workers, and the availability of training for technicians and workers in national oil industries;

5) UNDP technical cooperation projects and short-term advisory missions relating to oil and gas in five countries;

6) U.N. Division of Natural Resources and Energy (UNDNRE) activities in oil and gas exploration, including individual country-level assessments now underway or planned in some 20-30 countries, providing one-month reviews of existing data by two experts;

7) Two UNDNRE conferences for LDC petroleum personnel in 1980, including one on petroleum geology in Beijing in March and one on exploration strategies in Oslo in August.

c. Inter-American Development Bank

The IDB is currently considering the establishment of a political risk insurance fund of approximately $1.1 billion to encourage private investment in energy and mineral development in Latin America. No Training is envisioned.

d. France

The French Government, through the Institut Francais du Petrole (IFP) and the Ecole Nationale Superieure du Petrole at des Moteurs (ENSPM) provides LDCs with training in petroleum technology, R&D and feasibility studies (both in France and in LDC institutions). Training ranges from specialized post-graduate studies to general petroleum courses. Roughly $4 million annually is allocated to this effort. In addition to the IFP programs, French oil companies (Compagnie Francaise des Petroles and Elf-Aquitaine) have technical assistance programs with LDCs, particularly in the training areas.

e. Private Oil Companies

Several oil companies have limied programs to train LDC employees.

III. A. Technical Analysis

As discussed in he project description, this project will provide LDC personnel with M.S. level training in the science and engineering

disciplines relating to conventional energy exploration and production. The training will be academic and on-the-job, with individual requirements determing which is most appropriate. While the focus will be on science and engineering disciplines, applications will be considered from persons wishing to study in related areas, e.g. economics, law, business and resource management, architecture and the environment. Hydropower and geothermal will be considered where appropriate.

1. The Disciplines

The development of conventional energy resources and technology in LDCs partly will be a function of the available technical manpower. The application of technologies in the energy field will require people educated in science, engineering and related disciplines at a level most appropriate for their position and country. This may be accomplished through degree programs, in-service academic programs (non-degree) or industry internships. The following is a list of disciplines and the rationale for offering education in them as part of this program.

Physics

From physics come the foundations for all the other sciences. Energy physics is focused on basic research areas such as electromagnetics, lasers and plasmas.

Chemistry

Chemistry is the science dealing with the properties of substances. Professionals in the field study the chemistry of energy bearing fuel such as coal and petroleum. Chemists also provide basic scientific knowledge to enable the design of energy-related equipment such as fuel cells and industrial process equipment.

Biology

Biology is the science of living matter. The study of biological processes leads to a better understanding of the environmental impacts of conventional energy technologies.

Geology

Geology is the science dealing with the earth's strata. Petroleum, gas, coal and geothermal exploration as well as hydropower development depend on a firm understanding of geology. Fossil fuel resource exploration in general requires the services of a geologist.

In the engineering fields, the links between disciplines and energy technology are more direct:

Mechanical Engineering

Mechanical engineering, an applied science discipline, deals with physical state changes of energy. It is foremost in advancing the state of the art of energy technology through the application of basic scientific principles from such fields as thermodynamics and heat transfer. Both renewable and conventional energy systems are designed by the mechanical engineer.

Electrical Engineering

Electrical engineering is the applied science discipline dealing with the phenomena and laws of electricity. Electrical engineers are engaged in generation, distribution and utilization of electrical energy as well as the further development of solar, fuel cell and other more sophisticated technologies.

Chemical Engineering

Chemical engineering is the applied science which is concerned with the development of energy systems through application of the principles of chemistry where one form of energy is chemically converted to another. Chemical engineers design process hardware for petrochemical and fertilizer industries.

Civil Engineering

Civil engineering has traditionally been a discipline of construction technology. Civil engineers are engaged in energy work through construction of hydroelectric facilities, fossil fuel power plants, oil wells and petrochemical plants. Sanitary engineers, a sub-speciality of civil engineers are engaged in biomass energy conversion systems design.

Mining Engineering

Mining engineering is the application of scientific principles in the extraction of minerals and solid fossil fuels. It is a specialized field offered at a few universities.

Petroleum Engineering

Petroleum engineering is the application of scientific principles to the extraction of oil. Offered at relatively few institutions, people trained in this discipline are vital for oil exploration, production and reservoir analysis.

Industrial Engineering

Industrial engineering has traditionally been concerned with the manufacture of goods. Industrial engineers, from an energy perspective, are involved in conservation and efficient use of energy in various industrial operations.

Information Systems Engineering

Information systems engineering or simply EDP is the management of large quantities of data through application of digital computers. All energy program formulation will require extensive data availability on an organized basis.

Environmental Engineering

Environmental engineering deals with the impact of man on the environment and vice versa. The use and misuse of energy is a major threat to the environment. The generation and use of power can affect seriously the environment and, consequently, people through gaseous emissions, despoiling through mining, the release of heat, oil spills, etc. Environmental engineers have an important role in the safe development and utilization of conventional energy resources.

Architecture

Architecture, the science and design of appropriate physical structures for habitation, is an important discipline having an energy component. Passive and active solar design of buildings can improve the efficiency with which conventional energy is used in buildings.

Business Management

Business management, although not strictly germane to a science discipline, is a skill necessary for rational exploitation of any energy resources. Financing requirements, personnel management and general corporation planning are essential ingredients for any resource exploitation activity.

Law

Law underlies most agreements to identify, explore and produce oil, gas and coal. These agreements tend to be extremely complex documents, negotiated by skilled legal specialists. Resource exploitation is becoming a specialized sector within the legal disciplines.

Economics

Economics deals with the production, consumption and utilization of resources and commodities. Economic principles are evident in every stage of conventional energy exploration and production. Economists are employed throughout the energy industry, from cost analysts to board chairmen.

2. Types of Education

Three types of education will be offered under this project:

- M.S. degree training
- In-service academic training
- Industry and government internships

Generally, the M.S. degree training will be most appropriate for recent B.S. graduates who will form the junior staff of the Energy Ministry or public sector energy companies. These people will benefit the most from a rigorous academic program and could be released by their Governments for two years. An age ceiling of 35 years is recommended for applicants for the M.S. degree.

The inservice academic and industry fellowhsips will be most appropriate for middle level managers who need to upgrade their technical and managerial skills but can not leave their positions for more than 12 months.

M.S. Degree Training

The decision to emphasize M.S. degree training rather than B.S. or Ph.D. is deliberate. An M.S. level program offers the quickest turn-around and lowest cost per student. Four years are required for a B.S. For an M.S., one additional year is necessary if the graduate work is done at the same school and in the same discipline; if not, two years are required. A Ph.D. takes two to three years beyond the M.S. Subject content consists of fundamentals at the B.S. level, new appliation of research at the M.S. and new research at the Ph.D. level.

Most LDCs have engineering schools at the B.S. level. Indeed, in the 1950's and 1960's, the U.S. and other donors invested heavily in building strong undergraduate engineering institutions abroad. Thus a large pool of college graduates trained in basic engineering principlies exists. Some of the people selected for training under this project may require English improvement courses. Arrangements for this will be done on an individual basis.

An M.S. program is generally oriented to a specialty area within a discpline making it an ideal vehicle for training in energy. Some typical examples are given below.

Specialty Area	Discipline
Electromagnetics	Physics
Fuels	Chemistry
Environmental Impact	Biology
Seismic Exploration	Geology
Thermo Dynamics	Mechanical Engineering
Power Transmission	Electrical Engineering
Combustion	Chemical Engineering
Hydropower	Civil Engineering
Extraction Techniques	Mining Engineering
Reservoir Analysis	Petroleum Engineering
Energy Conservation	Industrial Engineering/ Architecture

Specialty Areas	Discipline
Data Management	Information Systems
Organization Management	Business Management
Polluation Control Technology	Environmental Engineering
Resource Contracts	Law
Project Feasibility	Economics

This list is not exhaustive. Rather it is indicative of the specialization in the conventional energy field.

In-Service Academic Training

As a complement to degree programs, internships or fellowships in institutions such as national labs/universities will be offered. It is expected that mid-career individuals will be interested in upgrading their skills through a period of residence in organizations offering short- term professional opportunities up to 12 months. Such internships or fellowships would be provided to individuals who have responsible positions in ministries, the private sector or academia and are or will be in a position to influence energy policy in their countries.

At a workshop sponsored by the Office of Energy and organized by the National Academy of Sciences, a group of educators and engineers suggested that in-service academic training and on-the-job internship would be of great value to LDC personnel. There are roughly two dozen universities in the U.S. which offer non-degree M.S. level academic courses. This group includes the major universities with oil, gas and coal programs (ex. IGT, Colorado School of Mines, Universities of Texas, Oklahoma, Houston, MIT, etc.). Courses can be taken in all of the specialty areas listed above. Courses are also offered at several of the national laboratories of the Department of Energy. Several private companies offer non-degree academic courses relevant to this project. E.g. Sylvania Training Operations (part of GTE); Arthur D. Little Management Education Institute (which also offers an M.S. in Management).

Industry and Government Internships

The third category of education opportunities will be internships of up to 12 months in government and industry. Internships which provide on-the-job training may be the most useful training for those persons who have the requisite academic qualifications but lack practical experience of working in conventional energy industries. In addition to those coming solely for an internship, the project will enable students taking an M.S. degree or in-service academic training to spend up to 12 months interning in an industry as part of their academic training. This will enable the student to gain practical experience as well as the necessary academic background.

Internships will be sought with non-profit government contractors, national laboratories, federal agencies, academic institutions and the private sector. Organizations will be chosen on the basis of a strong capability in an energy technology. Examples of indstitutions are:

Federal Government

Department of Energy
US Geological Survey
Department of the Interior - Bureau of Mines
Bureau of Land Management
National Oceanic and Atomospheric Administration

National Laboratories

Brookhaven National Laboratory
Oak Ridge National Laboratory
Argonne National Laboratory
Solar Energy Research Institute (SERI)
Lawrence Berkeley Laboratory
Lawrence Livermore Laboratory

Non-Profit Private Sector

Battelle
MITRE
SRI
Electric Power Reseach Institute (EPRI)
Institute for Gas Technology (IGT)

Private Sector

A. D. Little
Booze-Allen
Bechtel
Chevron Research Company
Dow Chemical Company
Exxon
General Electric Company
IBM
3M
Mobil
Standard Oil
Stone and Webster Engineering

Placing interns in the private sector will not be easy. The profit-making private sector makes personnel decisions on the basis of the company's business interests. These are few companies in the energy sector which have a training subsidiary open to outsiders (A.D. Little and Sylvania do). Nevertheless, discussions with academic leaders and certain energy companies indicate that LDC personnel can be placed in internships in the U.S. private sector.

Since 1968, the American Society for Engineering Education (ASEE) has sponsored a Resident Follow Program which places American engineering professors in industry for up to 15 months. The program was begun in the

early 1960's by the Ford Foundation to provide engineering professors with 'hands-on' experience. To date, over 90 companies have participated. In addition, ASEE has summer fellowship programs with NASA, DOE and the Navy Department. Educational institutions have placed students in industry internships for several years. The IGT is one school with a long-standing program.

There are benefits and costs to industry in accepting LDC interns. There are long-term benefits with the company establishing contact with energy policymakers and implementors in LDCs. The company also gains a greater appreciation of LDC energy problems by having the intern work with the company.

The costs are not insignificant. To have a productive internship, the company must select a company official to work closely with the intern. There is proprietary information which the company may wish to keep from non-company employees. The company is providing training to a person it knows will leave after 12 months.

From the intern's and this project's perspective, industry internship will be very valuable. Thus, a prime criterion for selecting the contractor will be good links to industry and experience in placing students in industry.

B. Economic Analysis

Numerous studies over the past two decades have attempted to measure the economic impact of education and training. Benefits of investing in human capital are generally measured in terms of anticipated impact on future income and productivity. This type of analysis is beset with statistical problems and exogenous factors. For example, there is a high correlation between persons receiving advanced training and persons with other advantages i.e., high social and/or economic status, educated parents, high intelligence, etc. Thus it is difficult to distinguish benefits attributable directly to advanced education and training.

Measuring economic returns from data on salary tends to undervalue he returns to investment in graduate-level training acquired in the U.S. Two factors account for this: (a) the cost of higher education in the U.S. relative to salaries in LDCs, particularly those AID deals with, is extremely high, and (b) salary levels of government and public sector employees, the main beneficiaries of this project, do not reflect the full value of their marginal productivitiy.

While *ex post* quantification of economic benefits education and training is difficult, *ex ante* quantification is even more so. For this project, which covers a broad range of degree and non-degree academic training and internships, a realistic quantification of economic benefits cannot be carried out.

1. Types of Economic Benefits

Nevertheless, one can be reasonably confident that the benefits will justify the investment. Few development professionals, whether

economists or not, doubt that investment in human capital generates a high level of real economic benefits.

The economic benefits to society are more evident than those to the individual. In the energy sector, several organizations have noted the lack of trained personnel to conceptualize, design, present and implement projects. This lack has resulted in fewer investment opportunities being presented to external donors and investors. Inefficiency in government also exacts a high cost in terms of utilizing scarce human and financial resources. The limited ability of government and public sector employees to manage energy resources effectively not only hinders private sector investment but also limits energy alternatives. By improving the capability to develop indigenous energy resources, the project should have a large beneficial impact on LDC economies. As energy planning, decision-making and production is increasingly under national control, the audience for this project is likely to be quite influential.

This project places high value on in-service training, an area of human resource development where returns are generally the highest. By emphasizing training related to post-training employment and by selecting mature, work-oriented individuals, benefits should be even higher. Officials on a career track will be more likely to return home and contribute their enhanced skills to national development. A potential brain-drain is thus minimized. (A 1977 survey of LAC's LASPAU program showed that 98% of the participants returned to Latin America.)

Were the project to be justified solely in terms of economic return to the individual, it would be difficult to establish the value. Returns to individuals, particuarly those employed in the government or public sector, are constrained by salary levels. USAID/Cairo estimates that if the entire cost of a 21-month Peace Fellowship (approximately $41,000) were to be borne by the direct beneficiary, the return "would be small, distant and would probably not match the added value to be derived from almost any other investment." (USAID/Egypt, Peace Fellowship Project Paper, Project No. 263-0110, February 1980, p. 16). Salary levels vary greatly by country, but it is not unusual for an individual to double his/her salary with an advanced degree. Thus, to the individual, the economic gain is substantial. However, even a 100% increase from e.g., $1000 per annum to $2000 per annum would not justify the cost, if the individual had to pay the full investment.

2. Cost Effectiveness of Activities

This project takes advantage of existing educational and training programs, rather than creating new programs. The latter is extremely expensive, and can increase per participant costs three to four times. By using existing courses, costs, although high, will be kept reasonable for the service being provided. The project will explore the feasibility of utilizing relevant third country training facilities, thus lowering costs in the future.

C. Social Soundness Analysis

The social soundness of this project should be viewed from two perspectives: (1) the selection of participants and course of study and (2) how they apply their training upon their return home.

(1) Selection of Participants:

The selection criteria will almost certainly exclude most of those AID's refers to as the "poor majority." By requiring a Bachelor's Degree and preferably relevant energy work experience in government or the private sector, the primary beneficiaries of this project will either come from, or become a member of, the elite of a country. This is a fact and not a value judgement. In this respect, the Conventional Energy Training Project is similar to other general AID training programs, i.e. Latin American Scholarship Program in American Universities (LASPAU), Energy Management Training Program (EMTP), African Manpower Development Project (AMDP), African Scholarship Program of American Universities (ASPAU), African Graduate Fellowship Program (AFGRAD), Inter-African Universities Scholarship Program (INTERAF), and the Egypt Peace Fellowship Program. It is expected that those selected to participate in the program will be the best qualified or in a position to contribute the most to the energy development of their country. The latter determination is inherently subjective. Among candidates, every effort will be made to select them on a just and equitable basis. There are three steps in this process:

(a) Identification

AID Missions and/or American Embassy officers and the Contractor will discuss the program with host government officials. The Government may wish to establish a separate candidate identification and review committee or use existing procedures.

Prior to nominating any candidates, either from the government, public or private sector, the Government will determine the priority areas for its conventional energy development and the training needs in each area.

Candidates will be identified based on the priority areas, e.g. if coal development is the priority area for conventional energy development, and there is a manpower shortage because of a lack of trained personnel, it is expected that the Government will nominate candidates for coal-related training.

The candidates will submit an application to the Government. Included in the application should be a statement describing how the candidates feels he/she, with additional training in the U.S., could contribute to the conventional energy development of his/her country.

(b) Review

The Government will appoint one Ministry or Agency to accept and review applications. It is expected that either the Energy, Economic Development or Planning Ministry will be selected to manage the Government's role in identifying and reviewing candidates. The Government will submit to the AID Mission/Embassy its ranked list of candidates for training, according to its priority sector(s).

Each candidate's application will be endorsed by the Government and include a statement describing why the Government feels the individual should receive training, the particular field and type of training proposed and Government plans for utilizing the candidate, upon return, in the conventional energy program.

(c) Selection

The AID Mission/Embassy will forward all applications to DS/EY. Where the Mission/Embassy has relevant information on the candidate, it will attach a statement to the application. It may endorse or suggest rejection of any application.

The applications will be reviewed by the Contractor's Selection Committee, according to criteria approved by AID and the Advisory Committee. The Selection Committee will determine whether degree-academic, in-service academic or industry internship is most appropriate for each candidate selected for training. For those candidates not selected for training, the Selection Committee will identify those it considers deserving of consideration in future years. The Governments will be notified promptly, via the AID Mission/Embassy, of candidates selected, those rejected and those who will be considered in future years.

AID Missions and Governments and the Contractor will actively recruit qualified women candidates. The Selection Committee, similarly, will give special consideration to applications of women candidates. While no quota for women will be set, the Advisory Committee, Contractor and AID may decide on formal measures to recruit women if natural selection proves that significant barriers exist to women applying.

(2) AID and the Governments of the Energy Fellows have a clear interest in seeing the Energy Fellows participate productively in their country's energy development programs. It is difficult, and subjective, to evaluate the impact of a particular training course on an individual's career.

The Contractor will establish a system to keep track of the Energy Fellows' careers. As the Fellows are likely to be scattered among many LDCs, the Missions will have a key role to play. A newsletter may be appropriate. If conventional energy exploration, production and utilization can be increased partly as a result of the training available under this project, it is likely that social and economic development can increase. This will benefit all segments of society as everyone, with the possible exception of extremely isolated groups, uses conventional energy, directly or indirectly.

D. Administrative Feasibility

The Office of Energy, DSB, will have overall responsibility for the project.

The DS/EY project manager will ensure that all aspects of project implementation, including negotiation of contracts and the flow of AID monies, are in accordance with AID procedures. The project manager will ensure that other relevant AID offices, particularly the field missions, DS/IT and the Regional Bureau energy offices, are consulted about the project and informed of its progress.

It is estimated that during the first twelve months of the project, 70 percent of the project manager's time will be taken up with matters related to the management of the project, including negotiation of a contract and selecting the first group of Energy Fellows. During months 12-48, it is estimated that 40 to 50 percent of the project manager's time will be devoted to this project. Once procedures have been established for identifying and selecting Energy Fellows, the project manager will spend time on follow-up activities and evaluation. The project manager will assist the contractor develop a system to collect information on returned Energy Fellows and feed this information into an evaluation system.

(1) Contractor

There are two ways to implement this project. Either AID can implement it, using direct hire employees, or most of the work can be contracted for with AID retaining general management responsibilities.

DS/EY has chosen the latter course. AID does not have, either in DS/EY or DS/IT, sufficient people to manage directly (i.e. identify, select, place and monitor) 100-150 new Energy Fellows each year. A program of this size probably would require 10 persons to manage directly.

A contractor must be chosen with care. The qualifications that are necessary include:

- in-depth knowledge of science and engineering disciplines as they relate to conventional energy,
- ties with U.S. academic establishment offering relevant courses, degree and non-degree
- wide contacts with U.S. industries for placing interns
- track record in selecting, placing, and managing students, particularly LDC students
- commitment to monitor and follow-up students
- low management cost

It is possible that no single institution has all the requisite qualifications. A joint venture among two organizations may be appropriate. After careful review, the Office of Energy has identified the following short-list of potential contractors:

- American Society of Engineering Education (ASEE)
- Institute for International Education (IIE)
- Institute for Gas Technology (IGT)

American Society for Engineering Education (ASEE)

The ASEE, founded in 1893, is a professional society dedicated to the improvement of the process and content of engineering and engineering technology education. It has both individual and institutional members. There are 340 university members, 89 industrial and 12,000 individual. The ASEE Board of Directors represents both engineering schools and industries.

In addition to promoting improved teaching and research in engineering faculties, the Society works to place professors and students in industry to increase "hands-on" experience. Relevant ASEE programs in this area are:

- ASEE Resident Fellow Program (begun by the Ford Foundation and managed by ASEE since 1968)
- Summer Faculty Fellowship Program with NASA
- Summer Faculty Program with DOE
- Summer Faculty Research Program with Department of Navy.

The ASEE is affiliated with many of the other professional engineering societies and is a member of the American Association of Engineering Societies (successor to the Engineers Joint Council). The ASEE is a not-for-profit organization.

Institute for International Education (IIE)

The IIE was founded in 1919 to build international understanding through the exchange of students and scholars, knowledge and skills. It is a not-for-profit organization. Most recently, much of its work has been with developing countries. In 1978-79, IIE programs assisted 6250 men and women through 244 projects sponsored by 120 governments, universities, foundations, corporations and interntional organizations. The IIE provides a range of services for LDC students in the U.S., from helping identify candidates to placing and managing the student.

Programs relevant to this project which the IIE manages include:

- Hubert H. Humphrey North-South Fellowship program. This program, funded by USICA, permits mid-career professionals from developing countries to spend one year in non-degree study and research at U.S. universities.

- Libyan Oil Company Scholarship Program. For five years, the IIE managed training programs for over 400 Libyans under oil company sponsorship. IIE arranged English language training, then placed them in academic institutions offering the required programs, supervised them while in the U.S. and handled student payments. IIE's role in the program ended in 1979.

- Gran Mariscal de Ayacucho Scholarship Program (GMA). The GMA program, started in 1974 by Venezuela, uses State oil revenues to provide technical training needed for Venezuelan development. The focus is on scholarships for rural and low-income youths. From 1974-1978 the IIE provided administrative services to GMA students selected to study in the U.S. Over 3500 students were handled by IIE; 82 percent were undergraduates. Fifty-eight (58) percent were placed in engineering fields, viz oil/gas/coal, electrical, chemical, metallurgical.

Institute for Gas Technology (IGT)

Founded in 1941 by leaders in the U.S. gas industry, IGT is a not-for-profit organization which conducts programs in energy education and research, particularly in oil, gas and coal. Its activities are supported in part by 200 member-organizations in the U.S. and Canada and more than 40 international associates. Members are principally natural gas transmission and distribution utilities and a growing number of chemical, oil and metals companies plus others in heavy industry. IGT has its own degree and non-degree programs and places students in industry internships. Programs IGT has or is conducting relevant to this project include:

- Ten month programs in gas technology for engineers from Venezuela and Malaysia.

- From 1971-79, IGT founded and operated two schools in Algeria, one to train LNG and other plant engineers; the second to train technicians.

- IGT is discussing with Malaysia a proposal to train technicans and engineers for oil and gas operations. The goal is to train 200 persons in three years.

- IGT is also discussing training Nigerian gas industry employees.

In addition to the above, there are other consortia who might be interested in managing this project. These include Argonne National Laboratory, the Consortium for International Cooperation in Higher Education (CICHE), Southeast Consortium for International Development (SECID) etc. While these groups might be able to place or train a few students, they do not have the general technical and LDC experience considered essential to manage this project.

(2) Advisory Council

To provide advice and counsel to the contractor and AID, DS/EY will establish an Advisory Council. This group will also provide advice and counsel to the contractor(s) of a related DE/EY project, Technical Assistance in Conventional Energy. The Council will meet at least twice a year. Its role will be advisory, not management. Its membership will be small (not more than 10) to promote active discussion and interest in the projects. Council members have not yet been identified. They will represent the following groups:

- oil, gas and coal industry
- academic (science and engineering faculties)
- professional societies involved in conventional energy
- developing countries.
- appropriate USG and MDB agencies

Within each category, preference will be given to representatives with LDC experience and commitment to educating LDC personnel.

It is anticipated that the Council will review both projects at its semi-annual meetings. Funds will be provided in each project, the Training and Technical Assistance project, so that each contractor can alternate in hosting the Council meetings.

IV. Implementation Arrangements

A. Financial Plan

The Office of Energy has made an effort to develop a financial plan that is reasonable and realistic. Several factors can change the budget projections.

(a) inflation increases at greater than 10% annually over the next four fiscal years (current inflation rates have not been extrapolated over four years for two reasons: the inflation rate, because of the U.S. recession, is projected to drop substantially from the

current annual rate of 18%; the CPI is influenced greatly by home construction and energy costs, costs which are not major ones in a student's budget),

(b) contractor costs cannot be held to 10% or less;

(c) the mix of participants (two year M.A., one year academic and one year industry fellowship) changes significantly,

(d) cost estimates for industry fellowships prove inaccurate.

A.I.D. will have a much clearer idea of apportionment of training once field missions and host governments have submitted their training requests. Should requests for two year M.S. programs be less than estimated, more one year academic and industry fellows could be accommodated. Should the reverse be true, and project funds are not increased, fewer participants can be accommodated.

Cost

In preparing the budget estimate, DS/EY chose to work with projected budget totals rather than total costs of individual participants. $3.5 million was used as the target for each fiscal year. Table I estimates what A.I.D. can get for that amount in each fiscal year.

The figures assume that each country will provide international travel (estimated at $2000/participant) and the person's salary while he/she is in the U.S. Obviously it is impossible to estimate the total host country contribution, as this will depend on each participant's salary and international travel costs. For those countries whose budget and foreign exchange problems are so severe as to preclude paying international travel, A.I.D. will consider paying travel, either from Mission funds or out of this project. Such instances are expected to be rare.

Academic costs were calculated using DS/IT's estimates for FY 81 for long-term academic training. The monthly costs of $1850 includes maintenance, tuition, books, supplies, insurance, administration and a contingency factor. Thus for FY 81, a 21 month MA degree program costs $38,850 (not including international travel) and a 12 month non-degree academic program costs $22,200. See Tables II and III.

A 12 month internship in industry is estimated to cost $11,000 in 1981. This figure assumes that companies do not charge A.I.D. to place an intern. This is reasonable as the intern is expected to contribute as well as learn from the company. See Table IV.

These one and two year academic and one year industry costs have been estimated for FY 82-84 using a 10% inflation factor. The academic costs may be reduced if no special services (i.e. English courses, orientation, special meetings) are needed and students attend State universities. The Institute of International Education (IIE) estimates that a 21 month M.A. program will cost $23,000 in 1980-81. This figure does not include English language training,

orientation or special services. The IIE estimate for international air travel is about 50% below A.I.D.'s.

In using DS/IT's figures, the Office of Energy has chosen to err, if necessary, on the conservative side. If costs are lower, more students can be accommodated.

Summary

The total cost to A.I.D. of the project is estimated at $14.650 million. This amount will be a grant. Host countries will provide international travel plus continue salary payments for Energy Fellows.

TABLE I

Estimated Budget
A.I.D.

FY 80	Start-up				$ 350,000
FY 81					
	25	Industry Fellow-ships	@ 11,000	275,000	
	35	2 Year Academic	@38,850	1,359,750	
	70	1 Year Academic	@22,200	1,554,000	3,188,750
	130				
		Contingency		311,250	3,500,000
FY 82					
	40	Industry Fellow-ships	@12,100	484,000	
	30	2 Year Academic	@42,735	1,282,050	
	60	1 Year Academic	@24,420	1,465,200	3,231,250
	130				
		Evaluation		50,000	
		Contingency		218,750	3,500,000
FY 83					
	50	Industry Fellow-ships	@13,210	665,500	
	25	2 Year Academic	@47,009	1,175,225	
	50	1 Year Academic	@26,862	1,343,100	3,183,825
	125				
		Contingency		316,175	3,500,000
FY 84					
	50	Industry Fellow-ships	@14,641	732,050	
	25	2 Year Academic	@51,710	1,292,750	
	50	1 Year Academic	@29,548	1,477,400	3,502,200
	125				
		Evaluation		75,000	
		Contingency		222,800	3,800,000
				TOTAL	$14,650,000

TABLE II

M.S. DEGREE PROGRAM
(21 months)

	A.I.D.	Host Country
Tuition, Maintenance, Books, Supplies, Insurance, Contingency Administration - $1850/month*	38,850	
International Travel		2,000
Salary		Variable
	38,850	2,000 +

*This estimate has been prepared by DS/IT for 1981.

TABLE III

M.S. Level (non-dgree) Program
(12 months)

	A.I.D.	Host Country
Maintenance, Supplies, Instrance, Contingency, Administration - $1850/month*	22,200	
Travel		2,000
Salary		Variable
	22,200	2,000 +

*This estimate has been prepared by DS/IT for 1981.

TABLE IV

Industry Followships
(12 months)

	A.I.D.	Host Country
Maintenance $775/month	9,300	
Insurance	400	
Contingency	300	
International Travel		2,000
Regular Salary		Variable
Administrative Cost (10% of AID Cost)	1,000	
	11,000	2,000 +

B. Implementation Highlights

The accompanying table lists target dates for performing the key implementation steps. Certain dates are relatively fixed, i.e. most academic programs (degree and non-degree) begin in September. For planning purposes, it is assumed that all Energy Fellows will arrive in August of each year, with programs beginning in early September.

The first year will be a testing period, for the Contractor and A.I.D. Assuming a contract is signed by September 1980 at the latest, it may be possible to place a small number of LDC officials in non-degree academic programs and industry internships in early calender 1981. The main group of Energy Fellows, funded with FY 81 money, will arrive in August 1981.

To explain the program and assess LDC conventional energy training needs, the contractor will visit selected LDCs in early FY 81. The LDCs to be visited will be determined jointly by the contractor and A.I.D., in accord with the selection criteria approved by the Advisory Council. Prior to visiting each country, the contractor will review relevant reports on the country's energy situation and manpower needs. In-country, the contractor will meet with A.I.D. and Embassy and the appropriate energy officials of the Government. Each country will prepare a conventional energy manpower training plan which will describe the priority areas for energy training and the rationale for each. These plans will form the basis for nominating the first group of Energy Fellows.

The A.I.D. project officer (a staff member of DS/EY) will be responsible for monitoring the achievement of project targets. The project officer will work closely with the energy officers in the Regional Bureaus and Missions. A prime forum for coordination will be the AID/W Energy Coordinating Group, a monthly meeting of the Bureau energy representatives. The project officer, or the Director, Office of Energy, will be the A.I.D. contact with the contractor.

The A.I.D. Missions will have an important role in disseminating information on the program, establishing contact with appropriate LDC energy officials and keeping up with the Energy Fellows on their return home. In certain cases, A.I.D. Missions will fund international travel. In the U.S., all logistical support will be provided by the contractor.

Action	Responsibility*	Completion Date
Prior Action		
PP Approved	A.I.D.	6/80
AID Missions notified of project	A.I.D.	7/80
Contractor Negotiation	A.I.D.	7/80 - 9/80

Action	Responsibility	Completion Date
Implementation		
Advisory Council Meets	A.I.D./Contractor	9/80
Selection Criteria finalized	A.I.D./Advisory Council/ Contractor	9/80
Field visits to selected countries/program packets prepared and sent to Missions	Contractor/A.I.D.	10/80 - 11/80
Spring 1981 academic fellows selected and placed	Contractor/A.I.D.	12/80
Fall 1981 Energy Fellows selected and placed	Contractor/A.I.D.	3/81 - 5/81
Advisory Council meets	A.I.D./Contractor	4/81
Fall 1981 Energy Fellows Arrive	Contractor	8/81
Advisory Council meets	A.I.D./Contractor	10/81
Fall 1982 Recruitment	Contractor/A.I.D.	11/81 - 2/82
Fall 1982 Energy Fellows selected and placed	Contractor/A.I.D.	3/82 - 5/82
Advisory Council meets	A.I.D./Contractor	4/82
Evaluation	A.I.D.	7/82 - 8/82
Fall 1982 Energy Fellows arrive	Contractor	8/82
Advisory Council meets	A.I.D./Contractor	10/82
Fall 1983 Recruitment	Contractor/A.I.D.	11/82 - 2/83
Fall 1983 Energy Fellows selected and placed	Contractor/A.I.D.	3/83 - 5/83
Advisory Council meets	A.I.D./Contractor	4/83
Fall 1983 Energy Fellows arrive	Contractor	8/83
Advisory Council meets	A.I.D./Contractor	10/83

Action	Responsibility	Completion Date
Fall 1984 Recruitment	Contractor/A.I.D.	11/83 - 2/84
Fall 1984 Energy Fellows selected & placed	Contractor/A.I.D.	3/84 - 5/84
Advisory Council meets	A.I.D./Contractor	4/84
Evaluation	A.I.D.	7/84 - 8/84
Fall 1984 Energy Fellows arrive	Contractor	8/84
Advisory Council meets	A.I.D./Contractor	10/84
Fall 1984 Industry and one year academic Fellows depart	Contractor	8/85
Fall 1984 two year academic Fellows depart	Contractor	5/86

*Where two entities are named, the first one has prime responsibility.

C. Evaluation Plan

Evaluation will be the responsibility of A.I.D., the contractor, the Advisory Council and Host Country Governments.

Routine evaluations will look at selection procedures, fields of study and utilization of returned Energy Fellows. The Advisory council, meeting at least semi-annually, will review the progress of the Countractor in all phases of the project and make recommendations where appropriate. In addition, the project budgets $125,000 for two external evaluations, one in FY 82 and one in FY 84.

Under selection procedures, the primary concern will be whether the selection criteria (countries, disciplines) are reasonable and whether the best candidates within a country are encouraged to apply.

The fields of study will be reviewed to see whether they meet the education/training needs of the Energy Fellows. The U.S. institutions will be examined to see whether they are providing the services, academic and personal (such as counselling) needed by the LDC officials. The Energy Fellows will be asked for their views on the relevance of the training and its quality.

The goal of this project is to increase the pool of LDC manpower skilled in conventional energy technology. The premise is that this will stimulate LDC exploration and production of conventional energy resources. The success of the project will be limited unless the Energy Fellows return to

their countries and apply their new skills productively. The contractor and A.I.D. will develop procedures to determine whether the Energy Fellows indeed are placed in positions where they can further the conventional energy programs of their countries.

In addition to the above, A.I.D. and the contractor shall review, at regular intervals, the progress of the project. This may be a formal meeting between the Director, DS/EY and the Executive Director of the Contractor. More likely it will involve weekly discussions between project officers of the Contractor and A.I.D. The principal concern will be whether the system for identifying, selecting, placing and supporting the Energy Fellows work efficiently.

There will be two independent assessments of the implementation and impact of the project. The first will take place at the end of FY 82 when the first group of Energy Fellows will have completed the U.S. stay. The second outside evaluation is scheduled for FY 84 when most of the Fellows will have finished their training. Some will have been back in their country for two years, thus allowing sufficient time to draw conclusions on their early development. $185,000 is budgeted for these two evaluations.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Conventional Energy Training Program 936-0997

Life of Project: From FY 80 to FY 84
Total U.S. Funding 14.4 Million
Date Prepared: 13 June 1980

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: To increase LDC technical competence to identify, explore for and exploit conventional energy resources.	Measures of Goal Achievement: Recipients return home to conventional energy jobs.	AID Records LDC Government Records	Assumptions for achieving goal targets: (a) There is a technical manpower constraint in LDCs hindering conventional energy development. (b) There will be minimal 'brain drain' as a result of the project.
Project Purpose: To provide M.S. level academic training and industry internships in science and engineering fields related to conventional energy identification, exploration and production.	Conditions that will indicate purpose has been achieved: End of project status. Candidates complete U.S. training and return to jobs in conventional energy field.	Contractor and AID Reocrds LDC Government Records	Assumptions for achieving purpose: Recipients complete academic and professional programs and will obtain relevant jobs on return home.
Outputs: (a) M.S. degree training (b) M.S. level academic in-service training (c) industry fellowships	Magnitude of Outputs: Up to 500 LDC officials trained.	(a) AID Records (b) Contractor Records	Assumptions for achieving outputs: (a) Sufficient number of candidates with adequate academic, work and English skills.
Inputs: AID Academic and professional training LDCs Salaries and travel	Implementation Target (Type and Quantity) AID Up to manyears $14.1 Million LDCs To be determined	Contractor Vouchers LDC Government Records	Assumptions for providing inputs: AID Congressional budget authority LDCs Foreign exchange for international travel and salaries.

V. B. PID Approval Message

Excerpts from the minutes of PID Reveiw, 22 April 1980.

Mr. Levin directed DS/EY to move on to project paper design under these conditions:

1. Emphasis and Focus of Project Paper

Predominant emphasis in the project is to be on the conventional energy field and the choice of disciplines to be included should reflect this fact. Within the conventional field, the concentration should be on identification, exploration and production of fossil fuels.

There should, however, be a mechanism permitting optional responses to selected LDC requests outside the conventional energy area. The presentation in the project paper should establish that the production/utilization/marketing activities, while not excluded, will, in most instances, come into consideration some years down stream. The early emphasis of this training project must be very clearly on discovery, development, and production. The supply side of the problem is to be attacked as first priority; the utilization (e.g., refining) training is to follow in much less priority.

2. Administrative Management Mechanisms

In order accurately to match developing country training requirements with precise educational supports provided by this project, mechanisms need to be explicitly established in the project paper including, at the outset, a built-in contractor capability to assist Missions and host governments to analyze and define their particular training needs. This need not require visitation in every instance.

Mechanisms must also be stated for coordination and, where feasible, linkages between A.I.D. energy training and other donor assistance (investment) plans. Technical review committees established under this project should include representation from DOE, USGS and other appropriate agencies. These agencies need not be represented on a candidate selection committee but should be consulted on substantive, technical education questions as well as on matters of general project management and planning.

An essential element of this project paper will establish procedures for identification, recruitment and comparative review of training requirements.

3. Evaluation Criteria

The section of the project paper concerned with evaluation must set up criteria to measure progress against A.I.D.'s true purposes. It would not be sufficient to measure effectiveness in terms of the number trained. It would be essential to set up objective ways to measure the effective participation of trainees within the energy infrastructure of host

governments. It would be germane to demonstrate that energy production and management structures have been strenghtened through this project. We are not concerned solely with numbers, but, rather in improvements of LDC energy capabilities and capacities. The project paper must specify not merely what is to be evaluated but how progress is to be determined.

4. Project Paper Content

Mr. Levin expressed a strong preference that the project should focus A.I.D. resources on A.I.D. country training needs. Not to be tautological, however, he is willing to have the project paper address this question and attempt to establish the case for a broader focus. The matter is deferred for consideration in the project paper.

Mr. Levin suggested that the possibility of transferring some training to third country institutions should be considered and, at a minimum, the contractor should be encouraged to look at the training possibilities of LDC institutions.

5. Contractor Selection

A contractor selection subcommittee will be named by the AA/DS to look at various means of contracting this effort without going out for competitive bids. Some more limited competitive selection may be possible in which four or five potential contractors' capabilities could be examined. Mr. Levin said the project paper would include a full examination of alternate contracting institutions and modalities.

Mr. Levin then polled the Bureau representatives for their approval of the PID. The results were:

Blumgart, Africa Bureau, said some of Africa's views had been accommodated and he could now agree to move forward to project paper design.

Ichord, Asia Bureau, said he approved moving forward with a project paper. Asia Bureau is now trying to prepare a paper defining Asia's energy training requirements as they were presented at the Manila conference and this might be useful to project designers.

Maushammer, LAC Bureau, approved the PID subject to the analytic requirements and conditions expressed by the AA/DS. He cautioned DS/EY to look carefully at the direct-hire staffing implications.

Klein, PPC, deferred on casting a vote. Following receipt of the minutes, he will consult with Alex Shakow. Klein is uncertain whether the purpose should be so fixed on conventional energy production and questioned what energy support would be provided LDCs with little conventional energy potentials. He favored a more balanced program with some possibility of support to all A.I.D. countries. There are other equally significant training gaps. He did not feel he had authority to give PPC Bureau approval.

Mr. Pike, Near East Bureau, approved the PID for development into a project paper. Near East Bureau was convinced the proper starting point is as assessment of the training needs of the A.I.D. countries.

Mr. Levin directed DS/EY to proceed with design of the project paper, subject to the conditions stated.

C. Initial Environmental Examination

Project Location	:	Worldwide
Project Title	:	Training in Conventional Energy
Project Number	:	936-9997
Funding	:	FY 80, $100,000 Grant FY 81-84 - $14,300,000
Life of Project	:	Five Years - FY 80-83
IIE Prepared by	:	Eric D. K. Melby Office of Energy
Environmental Action Recommended	:	Negative Determination (See page 2)

Eric D. K. Melby

Date

Concurrence:

Alan B. Jacobs
Director
Office of Energy

Date

I. Examination of Nature, Scope and Magnitude of Environmental Impacts

The project will increase the number of developing country personnel trained in science and engineering disciplines relating to conventional energy exploration, production and utilization. The training activities will have minor, if any, impact on the environment. Some of the training, e.g. petroleum engineering, may require hands-on drilling experience which would involve surface or off-shore drilling. In general, instruction will be classroom or part of larger activities already covered by an environmental assessment. Training activities will all take place in the U.S.

Application of the training received under this project may well lead to projects with significant environmental implications. It is presumed that these will be evaluated when specific projects are reviewed.

II. Recommendation for Environmental Action

The project will have no adverse impact on the human or natural environment of the country(ies) in which it takes place. It is recommended that the Assistant Administrator for Development Support approve a Negative Determination for this project.

PD-AAH-710-E1

936-9997

(2)

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (IX APPROPRIATE BOX)
[X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PP

DOCUMENT CODE 3

2. COUNTRY/REGIONAL ENTITY/GRANTEE
Worldwide

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER
936-9997

5. BUREAU
A. SYMBOL DS/EY
B. CODE

6. ESTIMATED FY OF PROJECT COMPLETION
FY 85

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)
Conventional Energy Training Project

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION
A. INITIAL MO. 08 YR. 80 B. FINAL FY 84

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

10. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = ____)

A. PROGRAM FINANCING	FIRST YEAR B. FX	C. L/C	D. TOTAL	ALL YEARS E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(350)	( )	(350)	(14,650)	( )	( )
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
TOTALS	350		350	14,650		

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION ALPHA CODE	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 80 D. GRANT	FY 80 E. LOAN	FY 81 F. GRANT	FY 81 G. LOAN	FY 82 H. GRANT	FY 82 I. LOAN	ALL YEARS J. GRANT	ALL YEARS K. LOAN
			350		3500		3500		14,650	
TOTALS										
12. ESTIMATED EXPENDITURES										

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID/PRP

To provide LDC participants with M.S. degree, in-service and industry fellowships in science and engineering fields related to conventional energy.

BEST AVAILABLE DOCUMENT

14. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.

[ ] YES [ ] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Alan B. Jacobs
Director, Office of Energy

DATE SIGNED MO. 06 DAY 26 YR. 80

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MO. DAY YR.

AID 1330-4 (5-75)

Project Authorization and Request for Allotment of Funds

Part II

ENTITY: Worldwide

PROJECT: Conventional Energy Training

PROJECT NUMBER: 936-9997

APPROPRIATION ACCOUNT: Selected Development Problems

AID grant financing is approved in the amount of up to $7,000,000. FY 1981 grant financing of $3,500,000 and FY 1982 grant financing of $3,500,000 are authorized for the initial two years of project implementation. A management review will take place prior to obligation of FY 1982 funds.

Authorization of funding for the subsequent two years of the project is subject to thorough AID review of project performance.

Sander Levin
Assistant Administrator
Bureau for Development Support

Clearances:

AFR/DR, L.Heilman LCHeilman Date 10/3/80
ASIA/TECH, T.Arndt TArndt Date 10/6/80
LAC/DR, M. Brown MB Date 10/6/80
NE/TECH, L. Reade LR Date 10/2/80
PPC/EY, S. Klein SK Date 2 Oct 80
DS/PO, B. Chapnick BC Date 10/9/80

Discussion: Like its companion project ("Technical Assistance in Conventional Energy Resource Identification"), the Conventional Energy Training (CET) project has been developed in response to the increasingly obvious need of developing countries, particularly non-OPEC low-income countries, to enhance their domestic energy supplies in order to foster economic development and reduce dependence on expensive imported sources of supply. A shortage of trained manpower in the technical fields related to fossil fuels has been identified as a major barrier to exploration and development of such fuels in developing countries. The United States can provide significant help in overcoming that constraint by marshalling its considerable educational resources in behalf of LDC personnel whose governments wish to strengthen their technical competence in the conventional energy area.

The main activity under the CET project will be the selection and placement of personnel from AID-assisted LDCs in U.S. training institutions (and in third-country institutions in instances where that seems most advantageous). Training participants will be selected carefully to ensure that they will return to productive activities in the energy development programs of their countries. Care will be taken to match realistic training needs with appropriate participants, and to match those participants with appropriate training institutions.

As you no doubt recall, considerable discussion of possible contracting mechanisms for the project occurred at the review meeting. Reflecting that discussion, we have explored a number of alternative contractual arrangements and have concluded that the project can proceed most effectively and expeditiously under a contract with the American Society for Engineering Education and the Institute for International Education. We believe, after examining a number of other possible contractor candidates, that these two organizations working together do, in fact, possess a predominant capability in the fields of expertise required for the CET project. A document describing those capabilities and providing justification for non-competitive procurement is attached for your review and approval.

We are also implementing the directive you issued at the PP review to communicate with all AID missions by cable about this and the companion project. The draft cable is also attached.

Recommendation: That you signify your approval of the project paper at the appropriate point on this action memo, and that you approve the PAF (attached) authorizing grant financing of $3,500,000 in FY 1981 and $3,500,000 in FY 1982.

In addition, we request that you signify your agreement to transmit the attached Request and Justification for Non-Competitive Procurement of Contractor to the Contracts Office and the Non-Competitive Review Board. DS/EY will prepare the appropriate PIO/T and work statement to accompany the justification.

Approved _____

Disapproved _____

Date OCT 29

Attachments:

1. Project Authorization and Request for Allotment of Funds
2. Request and Justification for Non-Competitive Procurement of Contractor
3. Draft Cable to AID Missions
4. Project Paper, "Training in Conventional Energy"

Clearances:

AFR/DR:LCHeilman LCH Date 10/3/80
ASIA/TR:TMArndt _____ Date 10/6/80
LAC/DR:MDBrown _____ Date 10/6/80
NE/TECH:LReade _____ Date 10/2/80
PPC/EY:SKlein _____ Date 10/2/80
DS/PO:BChapnick BC Date 10/9/80

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, DSB

DATE: September 29, 1980

THRU: DS/DAA/DT, Franklin Tugwell

FROM: DS/EY, Alan B. Jacobs

Problem: Your formal approval of the attached project paper, "Training in Conventional Energy", is required. The project was informally approved at the PP review meeting on July 29, 1980, with all the Regional Bureaus concurring.

The goal of the project is to increase the technical competence of developing countries to explore for and exploit conventional energy resources. The project will provide graduate-level academic and in-service training, predominantly in science and engineering fields, related to exploration, development, production and utilization of conventional energy resources (especially oil, natural gas and coal). Approximately 200 trainees will be enrolled in the program at any given time during the project's life, and individual trainees will generally participate for periods of one or two years.

At this time, the following specific actions are requested:

1) Authorization to proceed with the project as described in the project paper;

2) Approval of AID grant financing of $3,500,000 in FY 1981 and $3,500,000 in FY 1982 for the first two years of the project life. A management review will take place at the end of the first year's activities and prior to obligation of FY 1982 funds, and a full-scale evaluation will be conducted prior to approval of the third and fourth years of funding; and

3) Approval to proceed with procurement of the combined services of the American Society for Engineering Education and the Institute for International Education as project contractors, subject to the approval of the Non-Competitive Review Board and the normal contracting procedures and regulations of AID.

rec'd 10/9/80 1009-02

PD-AAH-700-A1

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43p.

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (IX APPROPRIATE BOX)
[X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PP

DOCUMENT CODE 3

2. COUNTRY/REGIONAL ENTITY/GRANTEE
Worldwide

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER
936-9997

5. BUREAU
A. SYMBOL: DS/EY
B. CODE:

6. ESTIMATED FY OF PROJECT COMPLETION
FY 85

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)
Conventional Energy Training Project

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(LOAN)	( )	( )	( )	( )	( )	( )
OTHER U.S. 1.						
OTHER U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
TOTALS	350		350	14,650		

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A. APPROPRIATION ALPHA CODE	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 80 D. GRANT	E. LOAN	FY 81 F. GRANT	G. LOAN	FY 82 H. GRANT	I. LOAN	ALL YEARS J. GRANT	K. LOAN
			350		3500		3500		14,650	
TOTALS										
L. ESTIMATED EXPENDITURES										

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID/PRP

To provide LDC participants with M.S. degree, in-service and industry fellowships in science and engineering fields related to conventional energy

BEST AVAILABLE DOCUMENT

WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.

[ ] YES [ ] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Alan B. Jacobs
Director, Office of Energy

DATE SIGNED MO. DAY YR. 06 26 80

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MO. DAY YR.

AID 1330-4 (5-75)

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I. Recommendations

The Office of Energy, Development Support Bureau, recommends that A.I.D. approve a grant of $14.65 Million to fund a five year (FY80-84) Conventional Energy Training Project. The grant will be used to fund training for LDC personnel in science and engineering disciplines related to conventional energy. Three types of training will be provided: M.S. degree training; M.S. level non-degree academic training and industry fellowships. The training will be provided by U.S. instititions of higher education and by U.S. industry. The participants will come from any developing countries which qualify under the selection procedures. For short, the program is called the Energy Fellowship program.

DS/EY recommends that, subject to the availability of funds, monies to support the project be obligated as follows:

FY 80	$ 350,000
FY 81	3,500,000
FY 82	3,500,000
FY 83	3,500,000
FY 84	3,800,000

II. Background and Description of Project

A. Background

Compared to developed countries, developing countries do not use much fossil energy. However the fossil energy -oil, gas and coal - that they do use is vital to certain sectors of their economies, i.e. transportation, industry, electric power and, increasingly, agriculture.

Most of the fossil energy, principally petroleum, that non-OPEC developing countries (NODCs) use is imported. NODCs import over 60% of their oil. If NODC oil exporters are excluded, this percentage rises to 83%. Oil price increases since 1973, aggravated by the 1979-80 surge in price, have placed severe strains on LDCs. These strains have manifested themselves in balance of payments deficits, high external debt ratios, rising unemployment, increasing share of export earnings devoted to oil imports, idle capacity in industrial and manufacturing sectors and deferral of government expenditures on social programs. The severity of the oil import problem in non-OPEC LDCs has prompted international lending institutions, such as the IMF, Bank for International Settlements and major private banks to urge controlling overseas financial cash. Jamaica and Turkey are the visible examples of a major problem in oil-importing LDCs.

This serious situation is attenuated somewhat by reasonably good prospects for expanding oil, gas and coal production in some LDCs. The IBRD has concluded that, out of 70 countries it surveyed, 23 had prospects of finding 750-1500 million barrels of recoverable oil; another 15 had prospects of finding between 100-750 million barrels. The ultimately recoverable reserves (URR) of LDCs are uncertain, but one report to the UN Secretary General estimates that LDCs could account for 15% of the world's URR. In the coal sector, about 30 LDCs have known but only partially explored coal and lignite reserves.

Non-OPEC LDCs are believed to possess more than 40% of the world's oil-bearing sedimentary basins, yet only about 7% of all exploratory drilling to date has taken place in these areas. The World Bank estimates that unexplored regions of developing nations probably contain 75% of all Latin American oil resources, 80% of Africa's and 95% of Asia's and the Far East's.

There are several constraints to developing these potential fossil energy resources or political instability, lack of investment or venture capital, inadequate technical data and a shortage of trained LDC personnel all impede full development of the fossil energy resouces in developing countries. It is difficult and perhaps impossible for donor organizations to have a beneficial affect on political stability; the other constraints are more susceptible to outside assistance. The World Bank, through its petroleum and coal programs, is trying to stimulate capital investment. Other entities, such as OPIC and EX-IM Bank, are also working on this constraint. The IBRD is also funding the collection and analysis of technical data on oil, gas and coal resources. A.I.D. has developed a similar project on technical assistance in conventional energy.

This project paper deals with the fourth constraint, the shortage of LDC personnel trained in conventional energy technologies. This constraint has only recently been acknowledged as a serious problem worthy of donor attention. The IBRD, in reviewing impediments to LDC fossil energy production, concluded: "assistance is needed in many cases to create, or reorganize and strengthen, an energy planning authority and to train the necessary administrative and technical staff." (IBRD, A Program to Accelerate Petroleum Production in Developing Countries, January 1979, p. 23). In the coal sector, the IBRD states: "Only a few developing countries have made or are now initiating efforts to increase coal-related skills by emphasizing training, technical assistance and technology transfer in the coal mining sector." (IBRD, Coal Development Potential and Prospects in Developing Countries, October 1979, p. 22). The National Research Council, looking broadly at LDC needs in science and egnineering, argued there is a need for engineering technology programs to educate LDC engineering graduates in the application of technology rahter than the theoretical and scientific applications of engineering. (FN: National Research Council, BOSTID, The Role of U.S. Engineering Schools in Development Assistance, 1976).

The ability of U.S. academic institutions and industry to provide relevant training is unquestioned. In a speech before the National Association of State Universities and Land Grant Colleges on November 27, 1979, the Director of IDCA stated, "Recognizing that the U.S. higher education system is the most significant asset we have for transferring technical skills....we are preparing a new program to provide support for long-term training in science and engineering fields related to energy."

Legislative Mandate

Given the developing countries' current and projected oil supply problems and the impact of the oil crisis on development prospects, the U.S.

has a clear interest in assisting the developing world with fossil fuel exploration and development. The Congress recognized that interest in enacting Title I, Section 104 of the International Development Cooperation Act of 1979 (P.L. 96-53), which states:

> "...there is a compelling need for vigorous efforts to improve the available data on the location, scale and commercial exploitability of potential oil, natural gas and coal reserves in developing countries, especially those which are not members of the Organization of Petroleum Exporting Countries."

Further, the Congress found that:

> "Assistance for the production of energy from indigenous resources....would be of direct benefit to the poor in developing countries because of the overwhelming impact of imported energy costs upon the lives of the poor and their ability to participate in development.

The Act authorizes the President to:

> "furnish assistance....for energy programs involving research on and development of suitable energy sources....(including) the collection and analysis of information concerning the potential of a country for producing energy from indigenous resources. Such assistance may include data collection and analysis, the training of skilled personnel, research on and development of suitable energy sources, and pilot projects to test new methods of energy production."

Specifically, Section 104 authorizes up to $7 million for FY 1980 to:

> "facilitate geological and geophysical survey work to locate potential oil, natural gas, and coal reserves and to encourage exploratin for potential oil, natural gas, and coal reserves in developing countries....."

B. Description

(1) Goal and Purpose

The Goal of this project is to increase the technical competence in developing countries to explore for and exploit conventional energy resources.

The Purpose of the project is to provide M.S. level academic training and industry internships in science and engineering fields related to the conventional energy identification, exploration and production. The focus will be on fossil energy resources - oil, gas and coal. Other energy resources, such as geothermal or hydropower, will receive secondary attention. Although the emphasis will be on science and engineering, related

disciplines - economics, business and resource management, environment and law - will be covered.

(2) Activities

The main activity under this project is the identification, selection and placement of LDC personnel in academic institutions and industry in the U.S. There are two approaches to recruiting and placing Energy Fellows. One is essentially passive i.e., announce the program and let the candidates emerge, the other is a direct effort with a group actively resruiting Energy Fellows according to agreed upon criteria. The latter approach has been selected for this project to ensure quality of Energy Fellows and relevance of training to subsequent employment. A.I.D. will select a contractor to manage day-to-day activities, with DS/EY retaining overall responsibility for the project.

The Office of Energy has endeavored to draw up reasonable criteria for participation in this project. Eligible countries currently are limited to those receiving A.I.D. assistance. It is possible the A.I.D., IDCA or the State Department may determine that other countries should be allowed to participate. The project's implementation procedures are such that this would pose no problem. In addition, other Government agencies, such as the Department of Energy, and other organizations, such as the IBRD, ADB and IDB may wish to contribute funds to expand the list of eligible countries. Subject to formal discussions between AID/IDCA and other interested agencies, the Office of Energy sees no problem. A.I.D. expects to coordinate this project closely with.the conventional energy projects of the World Bank.

Upon approval of the project, AID/W will notify A.I.D. field missions of the project. Missions will be asked to discuss the project with the LDC governments and report back on the priority areas. This information will help A.I.D., the contractor and the Advisory Council to prepare the final list of criteria. Critieria are important as it is expected that interest in the project will exceed the number of Energy Fellowship available.

Among the criteria to be used in selecting the participanting countries are:

(a) Country potential for oil, gas or coal development, as estimated from available data;

(b) The degree of energy import dependence of the country, and the resulting severity of financial and developmental strains;

(c) Constaints to conventional energy identification and exploration, created by the lack of trained manpower, which could be alleviated by this project;

(d) The relationship between proposed training and other conventional energy activities, particularly the Technical Assistance in Conventional Energy project and related projects of the multilateral development banks and other donor organizations;

(e) The outlook for the country to acquire technology, capital and other services necessary to complement training received under this project;

(f) The willingness of the country to use the talent trained under this project; and

(g) The degree of political and economic stability in the country, with particular attention to the climate for public or private investment in fossil fuel development.

A 1975 study commissioned by the World Bank concluded that out of 70 countries surveyed, 23 (including 9 current producers) have prospects of finding "high" or "very high" quantities of oil (7500 to over 1500 million barrels), and another 15 countries (including two current producers) have prospects of finding "fair" quantities of oil (100-750 million barrels). The World Bank study grouped the countries into four categories:

(a) Current oil and gas producers (both net explorters and net importers);

(b) Countries with proven oil and gas reserves and announced commercial discoveries, but no production as yet;

(c) Countries with no production and no commercial discoveries to date, but with favorable geological prospects for oil and gas deposits;

(d) countries with unfavorable prospects (based on current knowledge) for oil and gas discoveries.

Those countries studied in the IBRD survey that are also A.I.D. assistance receipients in FY 1980 or FY 1981 are shown, by category, in Table 1.

A separate compilation, using Department of Energy data; ranked 75 nations according to three categories: "High", "Some", and "Little" potential for oil. (Table 2). These categories are not defined rigorously; the data base is weak and the criteria ambiguous. Therefore caution is advised in setting policy from these charts. A comparison of the two tables indicates that DOE has taken a more conservative stance than IBRD regarding the prospects of most countries. It cannot be said at this time that A.I.D. oil-related assistance will be given only to those nations with the most promising potential as indicated by these two surveys. More information and analysis are needed before country-specific decisions can be made.

The Office of Energy has had extensive discusions on this project with the Energy Department of the IBRD. There is a genuine desire to collaborate on training, particularly training which would complement large capital assistance that the IBRD is providing for conventional energy. DS/EY

TABLE 1
WORLD BANK ESTIMATES OF
OIL AND GAS PROSPECTS IN LDCs
(* = AID Country in 1979)

	Group A	Group B	Group C	Group D
AFRICA	Gabon Nigeria Angola *Zaire Congo	*Burundi *Chad *Rwanda *Tanzania Ivory Coast Cameroon	*Benin *Ethiopia *Gambia *Ghana *Guinea *Mali *Niger *Senegal *Sierra Leone *Togo Madagascar Central African Rep.	*Botswana *Kenya *Lesotho *Upper Volta *Mauritius *Malawi Uganda *Zambia
LATIN AMERICA AND CARIBBEAN	Argentina Brazil Barbados Colombia Chile Peru *Boliva *Ecuador	*Guatamala	*Jamaica *Guyana *Paraguay *Dominican Republic *Nicaragua *Costa Rica *Panama *El Salvador *Hondura *Haiti Surinam Uruguay	
ASIA	*Bangladesh Burma *India *Pakistan *Indonesia Brunei	Papua New Guinea *Philippines *Thailand	*Sri Lanka Korea	*Nepal
NEAR EAST	*Afghanistan *Syria *Tunisia *Egypt *Morocco		*Jordan *Yemen AR Yemen PDR	

A - Current oil/gas producers, including net oil importers.

B - Current non-roducers of oil/gas but with proven reserves and announced commercial discoveries to be exploited as of November 1977.

C - Non-OPEC LDCs with favorable geological prospects for potential oi/gas discoveries.

D - Non-OPEC LDCs whose geological prospects for oil/gas at present rate of technical knowledge are not very favorable.

Source: Petroleum & Gas in Non-OPEC Developing Countries: 1976-1985, World Bank Staff Working Paper # 289, April 1978

TABLE 2

IDCA ESTIMATES OF OIL AND GAS

POTENTIAL IN NON-OPEC LDCs

	High Potential	Some Potential	Little Potential
AFRICA	*Zaire Angola Congo	*Cameroon *Chad *Ghana *Niger *Senegal *Sudan Madagascar	*Benin *Gambia *Guinea *Guinea-Bissau *Kenya *Lesotho *Liberia *Mali *Mauritania *Mozambique *Somalia *Tanzania *Togo Ethiopia Ivory Coast Namibia Equatorial Guinea
LATIN AMERICA AND CARIBBEAN	*Bolivia *Peru Argentina Mexico Trinidad-Tobago	*Guatemala Brazil Chile Columbia	*Dominican Republic *Guyana *Haiti *Honduras *Paraguay *Panama *Costa Rica *Jamaica *Barbados Belize French Guyana Nicaragua Surinam Uruguay
ASIA	*Thailand Malaysia/Brunei Vietnam	*Bangladesh *Burma *India *Philippines *Thailand Afghanistan Korea Pakistan	*Sri Lanka Papua New Guinea Taiwan
NEAR EAST	*Egypt *Syria *Tunisia	Turkey	*Morocco *Jordan *Lebanon Oman Yemen (PDR)

*AID Assistance countries.

Source: Prepared by IDCA for Fried Report from DOE and IBRD reports (March 1980)

has agreed to work closely with the IBRD in identifying candidate countries. Table 3 lists the countries the IBRD feels need training in FY 81.

Yemen Arab Republic	Ecuador
*Turkey	Tanzania
*Portugal	Peru
Tunisia	Mali
Bangladesh	Gambia
Pakistan	Mauritania
Burma	
Nepal	
Philippines	
*Malaysia	
*Thailand	
Papua New Guinea	

(*Countries that look most promising right now.)

Project Sequence

Many countries are likely to be involved in this project. A projected sequence of events for a particular country would be:

(a) A.I.D. Mission/Embassy discusses project with Government.

(b) Government, with Technical Assistance from A.I.D. if necessary, develops preliminary plan for conventional energy identification, exploration and production program.

(c) Government uses plan to identify areas it wishes to concentrate on. Manpower needs in these areas are identified.

(d) Government nominates candidates for U.S. academic training or industry fellowships in priority areas.

(e) USAID forwards nominations to AID/W.

(f) Contractor and DS/EY review nominations, bearing in mind selection criteria accepted by Advisory Council.

(g) Accepted candidates are reviewed to determine whether M.S. degree, academic training or industry fellowship would be most appropriate.

(h) Mission notifies Government of successful candidates.

(i) Contractor manages relevant training and monitoring for Energy Fellow.

(j) At end of training, Fellow returns home.

(k) Contractor and A.I.D. monitor returned Energy Fellow to evaluate training program.

As this project will be coordinated closely with the IBRD, the above sequence may well be modified to accommodate training needs identified by the IBRD.

C. A.I.D. Strategy and Relationship to other AID/MDB Programs

A.I.D. has always placed a great deal of emphasis on energy activities in its development portfolio. U.S. programs have evolved from a concentration in past years on power generation and distribution to an increasing concern for the current and projected imbalance of supply and demand in both conventional and renewable resources. Bilateral efforts have concentrated on technical assistance, with a focus on renewable energy for rural applications. The U.S. has relied on the multilateral development banks to assume the major share of capital financing of large energy systems.

A.I.D.'s legislative mandate, while highlighting renewable energy projects consistent with the basic human needs strategy, has recognized that conventional energy resources play an important role in promoting and sustaining national economic growth. The House Committee on Foreign Affairs, in its report on the FY 81 foreign aid bill, states "more than ever, the committee is persuaded that increased effort and funding must be devoted to energy programming for fossil fuels (as well as renewable and nonconventional energy) since non-OPEC developing countries are diverting a growing share of their foreign exchange to pay for imported oil and development plans are being stifled as a result." [International Security and Development Cooperation Act of 1980, Report of the Committee on Foreign Affairs on H.R. 6942, August 16, 1980, page 41.] The Foreign Assistance Act 1961, as amended, states "Unless the energy deficit of the developing countries can be narrowed by more fully exploting indigenous sources of energy such as oil, natural gas and coal, scarce foreign exchange will increasingly have to be diverted to oil imports, primarily to the detriment of long-term development and economic growth." (Section 104).

This training project, while stressing conventional energy, is not a new area for A.I.D. For many years, A.I.D. has supported general academic and professional training for LDC personnel. Projects in this area include:

- Latin America Scholarship Program in American Universities (LASPAU)

- African Manpower Development Project (AMDP)

- African Scholarship Program of American Universities (ASPAU)

- African Graduate Fellowship Program (AFGRAD)

- Inter-American Universities Scholarship Program (INTERAF)

- Egypt Peace Fellowship Program (EPFP)

- Energy Management Training Program (EMTP)

A.I.D. has several small training projects related to conventional energy.

- Management training for the Petroleum General Administration of the Sudan

- Training of Indonesian engineers in coal exploration and production techniques

- Remote Sensing for Resource Assessment. The project has supported remote sensing centers in LDCs, trained technicians in remote sensing and provided Landsat data.

Existing Programs Relating to CETP

Several organizations have training and professional development programs which complement the objectives of this project. With the possible exception of the French Government petroleum program, none are as broad as the CETP.

a. World Bank

The World Bank fossil energy development program is described in two Bank documents: "Coal Development Potential and Prospects in the Developing Countries" (October 1979) and "A Program to Accelerate Petroleum Production in the Developing Countries" (January 1979). The Bank reports acknowledge that energy development is hampered in many LDCs by the shortage of trained energy specialists and administrators. However, to date, it has no formal program to alleviate the shortage. The training the Bank is doing is project specific. In discussion with the Office of Energy, the Bank has stated its desire to work on general program to upgrade professional skills of LDC conventional energy specialists.

b. United Nations

Various organizations within the UN family are active in the conventional energy field e.g. UNITAR, UNIDO, UNDP, the Regional Commissions and the ILO. Most training is short-term and project specific. Among the U.N. efforts reported to date are:

1) A study of the hydrocarbon potential of the ocean;

2) A pair of reports on new concepts, approaches and technologies for oil and gas exploration;

3) A UNEP study and meeting of experts on the environmental impacts of oil and gas development and producation;

4) ILO studies on labor-related issues, including the safety, health and working conditions of petroleum industry workers, and the availability of training for technicians and workers in national oil industries;

5) UNDP technical cooperation projects and short-term advisory missions relating to oil and gas in five countries;

6) U.N. Division of Natural Resources and Energy (UNDNRE) activities in oil and gas exploration, including individual country-level assessments now underway or planned in some 20-30 countries, providing one-month reviews of existing data by two experts;

7) Two UNDNRE conferences for LDC petroleum personnel in 1980, including one on petroleum geology in Beijing in March and one on exploration strategies in Oslo in August.

c. Inter-American Development Bank

The IDB is currently considering the establishment of a political risk insurance fund of approximately $1.1 billion to encourage private investment in energy and mineral development in Latin America. No Training is envisioned.

d. France

The French Government, through the Institut Francais du Petrole (IFP) and the Ecole Nationale Superieure du Petrole at des Moteurs (ENSPM) provides LDCs with training in petroleum technology, R&D and feasibility studies (both in France and in LDC institutions). Training ranges from specialized post-graduate studies to general petroleum courses. Roughly $4 million annually is allocated to this effort. In addition to the IFP programs, French oil companies (Compagnie Francaise des Petroles and Elf-Aquitaine) have technical assistance programs with LDCs, particularly in the training areas.

e. Private Oil Companies

Several oil companies have limied programs to train LDC employees.

III. A. Technical Analysis

As discussed in he project description, this project will provide LDC personnel with M.S. level training in the science and engineering

disciplines relating to conventional energy exploration and production. The training will be academic and on-the-job, with individual requirements determing which is most appropriate. While the focus will be on science and engineering disciplines, applications will be considered from persons wishing to study in related areas, e.g. economics, law, business and resource management, architecture and the environment. Hydropower and geothermal will be considered where appropriate.

1. The Disciplines

The development of conventional energy resources and technology in LDCs partly will be a function of the available technical manpower. The application of technologies in the energy field will require people educated in science, engineering and related disciplines at a level most appropriate for their position and country. This may be accomplished through degree programs, in-service academic programs (non-degree) or industry internships. The following is a list of disciplines and the rationale for offering education in them as part of this program.

Physics

From physics come the foundations for all the other sciences. Energy physics is focused on basic research areas such as electromagnetics, lasers and plasmas.

Chemistry

Chemistry is the science dealing with the properties of substances. Professionals in the field study the chemistry of energy bearing fuel such as coal and petroleum. Chemists also provide basic scientific knowledge to enable the design of energy-related equipment such as fuel cells and industrial process equipment.

Biology

Biology is the science of living matter. The study of biological processes leads to a better understanding of the environmental impacts of conventional energy technologies.

Geology

Geology is the science dealing with the earth's strata. Petroleum, gas, coal and geothermal exploration as well as hydropower development depend on a firm understanding of geology. Fossil fuel resource exploration in general requires the services of a geologist.

In the engineering fields, the links between disciplines and energy technology are more direct:

Mechanical Engineering

Mechanical engineering, an applied science discipline, deals with physical state changes of energy. It is foremost in advancing the state of the art of energy technology through the application of basic scientific principles from such fields as thermodynamics and heat transfer. Both renewable and conventional energy systems are designed by the mechanical engineer.

Electrical Engineering

Electrical engineering is the applied science discipline dealing with the phenomena and laws of electricity. Electrical engineers are engaged in generation, distribution and utilization of electrical energy as well as the further development of solar, fuel cell and other more sophisticated technologies.

Chemical Engineering

Chemical engineering is the applied science which is concerned with the development of energy systems through application of the principles of chemistry where one form of energy is chemically converted to another. Chemical engineers design process hardware for petrochemical and fertilizer industries.

Civil Engineering

Civil engineering has traditionally been a discipline of construction technology. Civil engineers are engaged in energy work through construction of hydroelectric facilities, fossil fuel power plants, oil wells and petrochemical plants. Sanitary engineers, a sub-speciality of civil engineers are engaged in biomass energy conversion systems design.

Mining Engineering

Mining engineering is the application of scientific principles in the extraction of minerals and solid fossil fuels. It is a specialized field offered at a few universities.

Petroleum Engineering

Petroleum engineering is the application of scientific principles to the extraction of oil. Offered at relatively few institutions, people trained in this discipline are vital for oil exploration, production and reservoir analysis.

Industrial Engineering

Industrial engineering has traditionally been concerned with the manufacture of goods. Industrial engineers, from an energy perspective, are involved in conservation and efficient use of energy in various industrial operations.

Information Systems Engineering

Information systems engineering or simply EDP is the management of large quantities of data through application of digital computers. All energy program formulation will require extensive data availability on an organized basis.

Environmental Engineering

Environmental engineering deals with the impact of man on the environment and vice versa. The use and misuse of energy is a major threat to the environment. The generation and use of power can affect seriously the environment and, consequently, people through gaseous emissions, despoiling through mining, the release of heat, oil spills, etc. Environmental engineers have an important role in the safe development and utilization of conventional energy resources.

Architecture

Architecture, the science and design of appropriate physical structures for habitation, is an important discipline having an energy component. Passive and active solar design of buildings can improve the efficiency with which conventional energy is used in buildings.

Business Management

Business management, although not strictly germane to a science discipline, is a skill necessary for rational exploitation of any energy resources. Financing requirements, personnel management and general corporation planning are essential ingredients for any resource exploitation activity.

Law

Law underlies most agreements to identify, explore and produce oil, gas and coal. These agreements tend to be extremely complex documents, negotiated by skilled legal specialists. Resource exploitation is becoming a specialized sector within the legal disciplines.

Economics

Economics deals with the production, consumption and utilization of resources and commodities. Economic principles are evident in every stage of conventional energy exploration and production. Economists are employed throughout the energy industry, from cost analysts to board chairmen.

2. Types of Education

Three types of education will be offered under this project:

- M.S. degree training
- In-service academic training
- Industry and government internships

Generally, the M.S. degree training will be most appropriate for recent B.S. graduates who will form the junior staff of the Energy Ministry or public sector energy companies. These people will benefit the most from a rigorous academic program and could be released by their Governments for two years. An age ceiling of 35 years is recommended for applicants for the M.S. degree.

The inservice academic and industry fellowhsips will be most appropriate for middle level managers who need to upgrade their technical and managerial skills but can not leave their positions for more than 12 months.

M.S. Degree Training

The decision to emphasize M.S. degree training rather than B.S. or Ph.D. is deliberate. An M.S. level program offers the quickest turn-around and lowest cost per student. Four years are required for a B.S. For an M.S., one additional year is necessary if the graduate work is done at the same school and in the same discipline; if not, two years are required. A Ph.D. takes two to three years beyond the M.S. Subject content consists of fundamentals at the B.S. level, new appliation of research at the M.S. and new research at the Ph.D. level.

Most LDCs have engineering schools at the B.S. level. Indeed, in the 1950's and 1960's, the U.S. and other donors invested heavily in building strong undergraduate engineering institutions abroad. Thus a large pool of college graduates trained in basic engineering principlies exists. Some of the people selected for training under this project may require English improvement courses. Arrangements for this will be done on an individual basis.

An M.S. program is generally oriented to a specialty area within a discpline making it an ideal vehicle for training in energy. Some typical examples are given below.

Specialty Area	Discipline
Electromagnetics	Physics
Fuels	Chemistry
Environmental Impact	Biology
Seismic Exploration	Geology
Thermo Dynamics	Mechanical Engineering
Power Transmission	Electrical Engineering
Combustion	Chemical Engineering
Hydropower	Civil Engineering
Extraction Techniques	Mining Engineering
Reservoir Analysis	Petroleum Engineering
Energy Conservation	Industrial Engineering/ Architecture

Specialty Areas	Discipline
Data Management	Information Systems
Organization Management	Business Management
Polluation Control Technology	Environmental Engineering
Resource Contracts	Law
Project Feasibility	Economics

This list is not exhaustive. Rather it is indicative of the specialization in the conventional energy field.

In-Service Academic Training

As a complement to degree programs, internships or fellowships in institutions such as national labs/universities will be offered. It is expected that mid-career individuals will be interested in upgrading their skills through a period of residence in organizations offering short- term professional opportunities up to 12 months. Such internships or fellowships would be provided to individuals who have responsible positions in ministries, the private sector or academia and are or will be in a position to influence energy policy in their countries.

At a workshop sponsored by the Office of Energy and organized by the National Academy of Sciences, a group of educators and engineers suggested that in-service academic training and on-the-job internship would be of great value to LDC personnel. There are roughly two dozen universities in the U.S. which offer non-degree M.S. level academic courses. This group includes the major universities with oil, gas and coal programs (ex. IGT, Colorado School of Mines, Universities of Texas, Oklahoma, Houston, MIT, etc.). Courses can be taken in all of the specialty areas listed above. Courses are also offered at several of the national laboratories of the Department of Energy. Several private companies offer non-degree academic courses relevant to this project. E.g. Sylvania Training Operations (part of GTE); Arthur D. Little Management Education Institute (which also offers an M.S. in Management).

Industry and Government Internships

The third category of education opportunities will be internships of up to 12 months in government and industry. Internships which provide on-the-job training may be the most useful training for those persons who have the requisite academic qualifications but lack practical experience of working in conventional energy industries. In addition to those coming solely for an internship, the project will enable students taking an M.S. degree or in-service academic training to spend up to 12 months interning in an industry as part of their academic training. This will enable the student to gain practical experience as well as the necessary academic background.

Internships will be sought with non-profit government contractors, national laboratories, federal agencies, academic institutions and the private sector. Organizations will be chosen on the basis of a strong capability in an energy technology. Examples of indstitutions are:

Federal Government

Department of Energy
US Geological Survey
Department of the Interior - Bureau of Mines
Bureau of Land Management
National Oceanic and Atomospheric Administration

National Laboratories

Brookhaven National Laboratory
Oak Ridge National Laboratory
Argonne National Laboratory
Solar Energy Research Institute (SERI)
Lawrence Berkeley Laboratory
Lawrence Livermore Laboratory

Non-Profit Private Sector

Battelle
MITRE
SRI
Electric Power Reseach Institute (EPRI)
Institute for Gas Technology (IGT)

Private Sector

A. D. Little
Booze-Allen
Bechtel
Chevron Research Company
Dow Chemical Company
Exxon
General Electric Company
IBM
3M
Mobil
Standard Oil
Stone and Webster Engineering

Placing interns in the private sector will not be easy. The profit-making private sector makes personnel decisions on the basis of the company's business interests. These are few companies in the energy sector which have a training subsidiary open to outsiders (A.D. Little and Sylvania do). Nevertheless, discussions with academic leaders and certain energy companies indicate that LDC personnel can be placed in internships in the U.S. private sector.

Since 1968, the American Society for Engineering Education (ASEE) has sponsored a Resident Follow Program which places American engineering professors in industry for up to 15 months. The program was begun in the

early 1960's by the Ford Foundation to provide engineering professors with 'hands-on' experience. To date, over 90 companies have participated. In addition, ASEE has summer fellowship programs with NASA, DOE and the Navy Department. Educational institutions have placed students in industry internships for several years. The IGT is one school with a long-standing program.

There are benefits and costs to industry in accepting LDC interns. There are long-term benefits with the company establishing contact with energy policymakers and implementors in LDCs. The company also gains a greater appreciation of LDC energy problems by having the intern work with the company.

The costs are not insignificant. To have a productive internship, the company must select a company official to work closely with the intern. There is proprietary information which the company may wish to keep from non-company employees. The company is providing training to a person it knows will leave after 12 months.

From the intern's and this project's perspective, industry internship will be very valuable. Thus, a prime criterion for selecting the contractor will be good links to industry and experience in placing students in industry.

B. Economic Analysis

Numerous studies over the past two decades have attempted to measure the economic impact of education and training. Benefits of investing in human capital are generally measured in terms of anticipated impact on future income and productivity. This type of analysis is beset with statistical problems and exogenous factors. For example, there is a high correlation between persons receiving advanced training and persons with other advantages i.e., high social and/or economic status, educated parents, high intelligence, etc. Thus it is difficult to distinguish benefits attributable directly to advanced education and training.

Measuring economic returns from data on salary tends to undervalue he returns to investment in graduate-level training acquired in the U.S. Two factors account for this: (a) the cost of higher education in the U.S. relative to salaries in LDCs, particularly those AID deals with, is extremely high, and (b) salary levels of government and public sector employees, the main beneficiaries of this project, do not reflect the full value of their marginal productivitiy.

While ex post quantification of economic benefits education and training is difficult, ex ante quantification is even more so. For this project, which covers a broad range of degree and non-degree academic training and internships, a realistic quantification of economic benefits cannot be carried out.

1. Types of Economic Benefits

Nevertheless, one can be reasonably confident that the benefits will justify the investment. Few development professionals, whether

economists or not, doubt that investment in human capital generates a high level of real economic benefits.

The economic benefits to society are more evident than those to the individual. In the energy sector, several organizations have noted the lack of trained personnel to conceptualize, design, present and implement projects. This lack has resulted in fewer investment opportunities being presented to external donors and investors. Inefficiency in government also exacts a high cost in terms of utilizing scarce human and financial resources. The limited ability of government and public sector employees to manage energy resources effectively not only hinders private sector investment but also limits energy alternatives. By improving the capability to develop indigenous energy resources, the project should have a large beneficial impact on LDC economies. As energy planning, decision-making and production is increasingly under national control, the audience for this project is likely to be quite influential.

This project places high value on in-service training, an area of human resource development where returns are generally the highest. By emphasizing training related to post-training employment and by selecting mature, work-oriented individuals, benefits should be even higher. Officials on a career track will be more likely to return home and contribute their enhanced skills to national development. A potential brain-drain is thus minimized. (A 1977 survey of LAC's LASPAU program showed that 98% of the participants returned to Latin America.)

Were the project to be justified solely in terms of economic return to the individual, it would be difficult to establish the value. Returns to individuals, particuarly those employed in the government or public sector, are constrained by salary levels. USAID/Cairo estimates that if the entire cost of a 21-month Peace Fellowship (approximately $41,000) were to be borne by the direct beneficiary, the return "would be small, distant and would probably not match the added value to be derived from almost any other investment." (USAID/Egypt, Peace Fellowship Project Paper, Project No. 263-0110, February 1980, p. 16). Salary levels vary greatly by country, but it is not unusual for an individual to double his/her salary with an advanced degree. Thus, to the individual, the economic gain is substantial. However, even a 100% increase from e.g., $1000 per annum to $2000 per annum would not justify the cost, if the individual had to pay the full investment.

2. Cost Effectiveness of Activities

This project takes advantage of existing educational and training programs, rather than creating new programs. The latter is extremely expensive, and can increase per participant costs three to four times. By using existing courses, costs, although high, will be kept reasonable for the service being provided. The project will explore the feasibility of utilizing relevant third country training facilities, thus lowering costs in the future.

C. Social Soundness Analysis

The social soundness of this project should be viewed from two perspectives: (1) the selection of participants and course of study and (2) how they apply their training upon their return home.

(1) Selection of Participants:

The selection criteria will almost certainly exclude most of those AID's refers to as the "poor majority." By requiring a Bachelor's Degree and preferably relevant energy work experience in government or the private sector, the primary beneficiaries of this project will either come from, or become a member of, the elite of a country. This is a fact and not a value judgement. In this respect, the Conventional Energy Training Project is similar to other general AID training programs, i.e. Latin American Scholarship Program in American Universities (LASPAU), Energy Management Training Program (EMTP), African Manpower Development Project (AMDP), African Scholarship Program of American Universities (ASPAU), African Graduate Fellowship Program (AFGRAD), Inter-African Universities Scholarship Program (INTERAF), and the Egypt Peace Fellowship Program. It is expected that those selected to participate in the program will be the best qualified or in a position to contribute the most to the energy development of their country. The latter determination is inherently subjective. Among candidates, every effort will be made to select them on a just and equitable basis. There are three steps in this process:

(a) Identification

AID Missions and/or American Embassy officers and the Contractor will discuss the program with host government officials. The Government may wish to establish a separate candidate identification and review committee or use existing procedures.

Prior to nominating any candidates, either from the government, public or private sector, the Government will determine the priority areas for its conventional energy development and the training needs in each area.

Candidates will be identified based on the priority areas, e.g. if coal development is the priority area for conventional energy development, and there is a manpower shortage because of a lack of trained personnel, it is expected that the Government will nominate candidates for coal-related training.

The candidates will submit an application to the Government. Included in the application should be a statement describing how the candidates feels he/she, with additional training in the U.S., could contribute to the conventional energy development of his/her country.

(b) Review

The Government will appoint one Ministry or Agency to accept and review applications. It is expected that either the Energy, Economic Development or Planning Ministry will be selected to manage the Government's role in identifying and reviewing candidates. The Government will submit to the AID Mission/Embassy its ranked list of candidates for training, according to its priority sector(s).

Each candidate's application will be endorsed by the Government and include a statement describing why the Government feels the individual should receive training, the particular field and type of training proposed and Government plans for utilizing the candidate, upon return, in the conventional energy program.

(c) Selection

The AID Mission/Embassy will forward all applications to DS/EY. Where the Mission/Embassy has relevant information on the candidate, it will attach a statement to the application. It may endorse or suggest rejection of any application.

The applications will be reviewed by the Contractor's Selection Committee. according to criteria approved by AID and the Advisory Committee. The Selection Committee will determine whether degree-academic, in-service academic or industry internship is most appropriate for each candidate selected for training. For those candidates not selected for training, the Selection Committee will identify those it considers deserving of consideration in future years. The Governments will be notified promptly, via the AID Mission/Embassy, of candidates selected, those rejected and those who will be considered in future years.

AID Missions and Governments and the Contractor will actively recruit qualified women candidates. The Selection Committee, similarly, will give special consideration to applications of women candidates. While no quota for women will be set, the Advisory Committee, Contractor and AID may decide on formal measures to recruit women if natural selection proves that significant barriers exist to women applying.

(2) AID and the Governments of the Energy Fellows have a clear interest in seeing the Energy Fellows participate productively in their country's energy development programs. It is difficult, and subjective, to evaluate the impact of a particular training course on an individual's career.

The Contractor will establish a system to keep track of the Energy Fellows' careers. As the Fellows are likely to be scattered among many LDCs, the Missions will have a key role to play. A newsletter may be appropriate. If conventional energy exploration, production and utilization can be increased partly as a result of the training available under this project, it is likely that social and economic development can increase. This will benefit all segments of society as everyone, with the possible exception of extremely isolated groups, uses conventional energy, directly or indirectly.

D. Administrative Feasibility

The Office of Energy, DSB, will have overall responsibility for the project.

The DS/EY project manager will ensure that all aspects of project implementation, including negotiation of contracts and the flow of AID monies, are in accordance with AID procedures. The project manager will ensure that other relevant AID offices, particularly the field missions, DS/IT and the Regional Bureau energy offices, are consulted about the project and informed of its progress.

It is estimated that during the first twelve months of the project, 70 percent of the project manager's time will be taken up with matters related to the management of the project, including negotiation of a contract and selecting the first group of Energy Fellows. During months 12-48, it is estimated that 40 to 50 percent of the project manager's time will be devoted to this project. Once procedures have been established for identifying and selecting Energy Fellows, the project manager will spend time on follow-up activities and evaluation. The project manager will assist the contractor develop a system to collect information on returned Energy Fellows and feed this information into an evaluation system.

(1) Contractor

There are two ways to implement this project. Either AID can implement it, using direct hire employees, or most of the work can be contracted for with AID retaining general management responsibilities.

DS/EY has chosen the latter course. AID does not have, either in DS/EY or DS/IT, sufficient people to manage directly (i.e. identify, select, place and monitor) 100-150 new Energy Fellows each year. A program of this size probably would require 10 persons to manage directly.

A contractor must be chosen with care. The qualifications that are necessary include:

- in-depth knowledge of science and engineering disciplines as they relate to conventional energy,
- ties with U.S. academic establishment offering relevant courses, degree and non-degree
- wide contacts with U.S. industries for placing interns
- track record in selecting, placing, and managing students, particularly LDC students
- commitment to monitor and follow-up students
- low management cost

It is possible that no single institution has all the requisite qualifications. A joint venture among two organizations may be appropriate. After careful review, the Office of Energy has identified the following short-list of potential contractors:

- American Society of Engineering Education (ASEE)
- Institute for International Education (IIE)
- Institute for Gas Technology (IGT)

American Society for Engineering Education (ASEE)

The ASEE, founded in 1893, is a professional society dedicated to the improvement of the process and content of engineering and engineering technology education. It has both individual and institutional members. There are 340 university members, 89 industrial and 12,000 individual. The ASEE Board of Directors represents both engineering schools and industries.

In addition to promoting improved teaching and research in engineering faculties, the Society works to place professors and students in industry to increase "hands-on" experience. Relevant ASEE programs in this area are:

- ASEE Resident Fellow Program (begun by the Ford Foundation and managed by ASEE since 1968)
- Summer Faculty Fellowship Program with NASA
- Summer Faculty Program with DOE
- Summer Faculty Research Program with Department of Navy.

The ASEE is affiliated with many of the other professional engineering societies and is a member of the American Association of Engineering Societies (successor to the Engineers Joint Council). The ASEE is a not-for-profit organization.

Institute for International Education (IIE)

The IIE was founded in 1919 to build international understanding through the exchange of students and scholars, knowledge and skills. It is a not-for-profit organization. Most recently, much of its work has been with developing countries. In 1978-79, IIE programs assisted 6250 men and women through 244 projects sponsored by 120 governments, universities, foundations, corporations and interntional organizations. The IIE provides a range of services for LDC students in the U.S., from helping identify candidates to placing and managing the student.

Programs relevant to this project which the IIE manages include:

- Hubert H. Humphrey North-South Fellowship program. This program, funded by USICA, permits mid-career professionals from developing countries to spend one year in non-degree study and research at U.S. universities.

- Libyan Oil Company Scholarship Program. For five years, the IIE managed training programs for over 400 Libyans under oil company sponsorship. IIE arranged English language training, then placed them in academic institutions offering the required programs, supervised them while in the U.S. and handled student payments. IIE's role in the program ended in 1979.

- Gran Mariscal de Ayacucho Scholarship Program (GMA). The GMA program, started in 1974 by Venezuela, uses State oil revenues to provide technical training needed for Venezuelan development. The focus is on scholarships for rural and low-income youths. From 1974-1978 the IIE provided administrative services to GMA students selected to study in the U.S. Over 3500 students were handled by IIE; 82 percent were undergraduates. Fifty-eight (58) percent were placed in engineering fields, viz oil/gas/coal, electrical, chemical, metallurgical.

Institute for Gas Technology (IGT)

Founded in 1941 by leaders in the U.S. gas industry, IGT is a not-for-profit organization which conducts programs in energy education and research, particularly in oil, gas and coal. Its activities are supported in part by 200 member-organizations in the U.S. and Canada and more than 40 international associates. Members are principally natural gas transmission and distribution utilities and a growing number of chemical, oil and metals companies plus others in heavy industry. IGT has its own degree and non-degree programs and places students in industry internships. Programs IGT has or is conducting relevant to this project include:

- Ten month programs in gas technology for engineers from Venezuela and Malaysia.

- From 1971-79, IGT founded and operated two schools in Algeria, one to train LNG and other plant engineers; the second to train technicians.

- IGT is discussing with Malaysia a proposal to train technicans and engineers for oil and gas operations. The goal is to train 200 persons in three years.

- IGT is also discussing training Nigerian gas industry employees.

In addition to the above, there are other consortia who might be interested in managing this project. These include Argonne National Laboratory, the Consortium for International Cooperation in Higher Education (CICHE), Southeast Consortium for International Development (SECID) etc. While these groups might be able to place or train a few students, they do not have the general technical and LDC experience considered essential to manage this project.

(2) Advisory Council

To provide advice and counsel to the contractor and AID, DS/EY will establish an Advisory Council. This group will also provide advice and counsel to the contractor(s) of a related DE/EY project, Technical Assistance in Conventional Energy. The Council will meet at least twice a year. Its role will be advisory, not management. Its membership will be small (not more than 10) to promote active discussion and interest in the projects. Council members have not yet been identified. They will represent the following groups:

- oil, gas and coal industry
- academic (science and engineering faculties)
- professional societies involved in conventional energy
- developing countries.
- appropriate USG and MDB agencies

Within each category, preference will be given to representatives with LDC experience and commitment to educating LDC personnel.

It is anticipated that the Council will review both projects at its semi-annual meetings. Funds will be provided in each project, the Training and Technical Assistance project, so that each contractor can alternate in hosting the Council meetings.

IV. Implementation Arrangements

A. Financial Plan

The Office of Energy has made an effort to develop a financial plan that is reasonable and realistic. Several factors can change the budget projections.

(a) inflation increases at greater than 10% annually over the next four fiscal years (current inflation rates have not been extrapolated over four years for two reasons: the inflation rate, because of the U.S. recession, is projected to drop substantially from the

current annual rate of 18%; the CPI is influenced greatly by home construction and energy costs, costs which are not major ones in a student's budget),

(b) contractor costs cannot be held to 10% or less;

(c) the mix of participants (two year M.A., one year academic and one year industry fellowship) changes significantly,

(d) cost estimates for industry fellowships prove inaccurate.

A.I.D. will have a much clearer idea of apportionment of training once field missions and host governments have submitted their training requests. Should requests for two year M.S. programs be less than estimated, more one year academic and industry fellows could be accommodated. Should the reverse be true, and project funds are not increased, fewer participants can be accommodated.

Cost

In preparing the budget estimate, DS/EY chose to work with projected budget totals rather than total costs of individual participants. $3.5 million was used as the target for each fiscal year. Table I estimates what A.I.D. can get for that amount in each fiscal year.

The figures assume that each country will provide international travel (estimated at $2000/participant) and the person's salary while he/she is in the U.S. Obviously it is impossible to estimate the total host country contribution, as this will depend on each participant's salary and international travel costs. For those countries whose budget and foreign exchange problems are so severe as to preclude paying international travel, A.I.D. will consider paying travel, either from Mission funds or out of this project. Such instances are expected to be rare.

Academic costs were calculated using DS/IT's estimates for FY 81 for long-term academic training. The monthly costs of $1850 includes maintenance, tuition, books, supplies, insurance, administration and a contingency factor. Thus for FY 81, a 21 month MA degree program costs $38,850 (not including international travel) and a 12 month non-degree academic program costs $22,200. See Tables II and III.

A 12 month internship in industry is estimated to cost $11,000 in 1981. This figure assumes that companies do not charge A.I.D. to place an intern. This is reasonable as the intern is expected to contribute as well as learn from the company. See Table IV.

These one and two year academic and one year industry costs have been estimated for FY 82-84 using a 10% inflation factor. The academic costs may be reduced if no special services (i.e. English courses, orientation, special meetings) are needed and students attend State universities. The Institute of International Education (IIE) estimates that a 21 month M.A. program will cost $23,000 in 1980-81. This figure does not include English language training,

orientation or special services. The IIE estimate for international air travel is about 50% below A.I.D.'s.

In using DS/IT's figures, the Office of Energy has chosen to err, if necessary, on the conservative side. If costs are lower, more students can be accommodated.

Summary

The total cost to A.I.D. of the project is estimated at $14.650 million. This amount will be a grant. Host countries will provide international travel plus continue salary payments for Energy Fellows.

TABLE I

Estimated Budget
A.I.D.

FY 80	Start-up				$ 350,000
FY 81					
	25	Industry Fellow-ships	@ 11,000	275,000	
	35	2 Year Academic	@38,850	1,359,750	
	70	1 Year Academic	@22,200	1,554,000	3,188,750
	130				
		Contingency		311,250	3,500,000
FY 82					
	40	Industry Fellow-ships	@12,100	484,000	
	30	2 Year Academic	@42,735	1,282,050	
	60	1 Year Academic	@24,420	1,465,200	3,231,250
	130				
		Evaluation		50,000	
		Contingency		218,750	3,500,000
FY 83					
	50	Industry Fellow-ships	@13,210	665,500	
	25	2 Year Academic	@47,009	1,175,225	
	50	1 Year Academic	@26,862	1,343,100	3,183,825
	125				
		Contingency		316,175	3,500,000
FY 84					
	50	Industry Fellow-ships	@14,641	732,050	
	25	2 Year Academic	@51,710	1,292,750	
	50	1 Year Academic	@29,548	1,477,400	3,502,200
	125				
		Evaluation		75,000	
		Contingency		222,800	3,800,000
				TOTAL	$14,650,000

TABLE II

M.S. DEGREE PROGRAM
(21 months)

	A.I.D.	Host Country
Tuition, Maintenance, Books, Supplies, Insurance, Contingency Administration - $1850/month*	38,850	
International Travel		2,000
Salary		Variable
	38,850	2,000 +

*This estimate has been prepared by DS/IT for 1981.

TABLE III

M.S. Level (non-degree) Program
(12 months)

	A.I.D.	Host Country
Maintenance, Supplies, Instrance, Contingency, Administration - $1850/month*	22,200	
Travel		2,000
Salary		Variable
	22,200	2,000 +

*This estimate has been prepared by DS/IT for 1981.

TABLE IV

Industry Followships
(12 months)

	A.I.D.	Host Country
Maintenance $775/month	9,300	
Insurance	400	
Contingency	300	
International Travel		2,000
Regular Salary		Variable
Administrative Cost (10% of AID Cost)	1,000	
	11,000	2,000 +

B. Implementation Highlights

The accompanying table lists target dates for performing the key implementation steps. Certain dates are relatively fixed, i.e. most academic programs (degree and non-degree) begin in September. For planning purposes, it is assumed that all Energy Fellows will arrive in August of each year, with programs beginning in early September.

The first year will be a testing period, for the Contractor and A.I.D. Assuming a contract is signed by September 1980 at the latest, it may be possible to place a small number of LDC officials in non-degree academic programs and industry internships in early calender 1981. The main group of Energy Fellows, funded with FY 81 money, will arrive in August 1981.

To explain the program and assess LDC conventional energy training needs, the contractor will visit selected LDCs in early FY 81. The LDCs to be visited will be determined jointly by the contractor and A.I.D., in accord with the selection criteria approved by the Advisory Council. Prior to visiting each country, the contractor will review relevant reports on the country's energy situation and manpower needs. In-country, the contractor will meet with A.I.D. and Embassy and the appropriate energy officials of the Government. Each country will prepare a conventional energy manpower training plan which will describe the priority areas for energy training and the rationale for each. These plans will form the basis for nominating the first group of Energy Fellows.

The A.I.D. project officer (a staff member of DS/EY) will be responsible for monitoring the achievement of project targets. The project officer will work closely with the energy officers in the Regional Bureaus and Missions. A prime forum for coordination will be the AID/W Energy Coordinating Group, a monthly meeting of the Bureau energy representatives. The project officer, or the Director, Office of Energy, will be the A.I.D. contact with the contractor.

The A.I.D. Missions will have an important role in disseminating information on the program, establishing contact with appropriate LDC energy officials and keeping up with the Energy Fellows on their return home. In certain cases, A.I.D. Missions will fund international travel. In the U.S., all logistical support will be provided by the contractor.

Action	Responsibility*	Completion Date
Prior Action		
PP Approved	A.I.D.	6/80
AID Missions notified of project	A.I.D.	7/80
Contractor Negotiation	A.I.D.	7/80 - 9/80

Action	Responsibility	Completion Date
Implementation		
Advisory Council Meets	A.I.D./Contractor	9/80
Selection Criteria finalized	A.I.D./Advisory Council/ Contractor	9/80
Field visits to selected countries/program packets prepared and sent to Missions	Contractor/A.I.D.	10/80 - 11/80
Spring 1981 academic fellows selected and placed	Contractor/A.I.D.	12/80
Fall 1981 Energy Fellows selected and placed	Contractor/A.I.D.	3/81 - 5/81
Advisory Council meets	A.I.D./Contractor	4/81
Fall 1981 Energy Fellows Arrive	Contractor	8/81
Advisory Council meets	A.I.D./Contractor	10/81
Fall 1982 Recruitment	Contractor/A.I.D.	11/81 - 2/82
Fall 1982 Energy Fellows selected and placed	Contractor/A.I.D.	3/82 - 5/82
Advisory Council meets	A.I.D./Contractor	4/82
Evaluation	A.I.D.	7/82 - 8/82
Fall 1982 Energy Fellows arrive	Contractor	8/82
Advisory Council meets	A.I.D./Contractor	10/82
Fall 1983 Recruitment	Contractor/A.I.D.	11/82 - 2/83
Fall 1983 Energy Fellows selected and placed	Contractor/A.I.D.	3/83 - 5/83
Advisory Council meets	A.I.D./Contractor	4/83
Fall 1983 Energy Fellows arrive	Contractor	8/83
Advisory Council meets	A.I.D./Contractor	10/83

Action	Responsibility	Completion Date
Fall 1984 Recruitment	Contractor/A.I.D.	11/83 - 2/84
Fall 1984 Energy Fellows selected & placed	Contractor/A.I.D.	3/84 - 5/84
Advisory Council meets	A.I.D./Contractor	4/84
Evaluation	A.I.D.	7/84 - 8/84
Fall 1984 Energy Fellows arrive	Contractor	8/84
Advisory Council meets	A.I.D./Contractor	10/84
Fall 1984 Industry and one year academic Fellows depart	Contractor	8/85
Fall 1984 two year academic Fellows depart	Contractor	5/86

*Where two entities are named, the first one has prime responsibility.

C. Evaluation Plan

Evaluation will be the responsibility of A.I.D., the contractor, the Advisory Council and Host Country Governments.

Routine evaluations will look at selection procedures, fields of study and utilization of returned Energy Fellows. The Advisory council, meeting at least semi-annually, will review the progress of the Countractor in all phases of the project and make recommendations where appropriate. In addition, the project budgets $125,000 for two external evaluations, one in FY 82 and one in FY 84.

Under selection procedures, the primary concern will be whether the selection criteria (countries, disciplines) are reasonable and whether the best candidates within a country are encouraged to apply.

The fields of study will be reviewed to see whether they meet the education/training needs of the Energy Fellows. The U.S. institutions will be examined to see whether they are providing the services, academic and personal (such as counselling) needed by the LDC officials. The Energy Fellows will be asked for their views on the relevance of the training and its quality.

The goal of this project is to increase the pool of LDC manpower skilled in conventional energy technology. The premise is that this will stimulate LDC exploration and production of conventional energy resources. The success of the project will be limited unless the Energy Fellows return to

their countries and apply their new skills productively. The contractor and A.I.D. will develop procedures to determine whether the Energy Fellows indeed are placed in positions where they can further the conventional energy programs of their countries.

In addition to the above, A.I.D. and the contractor shall review, at regular intervals, the progress of the project. This may be a formal meeting between the Director, DS/EY and the Executive Director of the Contractor. More likely it will involve weekly discussions between project officers of the Contractor and A.I.D. The principal concern will be whether the system for identifying, selecting, placing and supporting the Energy Fellows work efficiently.

There will be two independent assessments of the implementation and impact of the project. The first will take place at the end of FY 82 when the first group of Energy Fellows will have completed the U.S. stay. The second outside evaluation is scheduled for FY 84 when most of the Fellows will have finished their training. Some will have been back in their country for two years, thus allowing sufficient time to draw conclusions on their early development. $185,000 is budgeted for these two evaluations.

PROJECT DESIGN SUMMARY
LOGICAL FRAMEWORK

Project Title & Number: Conventional Energy Training Program 936-0997

Life of Project:
From FY 80 to FY 84
Total U.S. Funding 14.4 Million
Date Prepared: 13 June 1980

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Program or Sector Goal: The broader objective to which this project contributes: To increase LDC technical competence to identify, explore for and exploit conventional energy resources.	Measures of Goal Achievement: Recipients return home to conventional energy jobs.	AID Records LDC Government Records	Assumptions for achieving goal targets: (a) There is a technical manpower constraint in LDCs hindering conventional energy development. (b) There will be minimal 'brain drain' as a result of the project.
Project Purpose: To provide M.S. level academic training and industry internships in science and engineering fields related to conventional energy identification, exploration and production.	Conditions that will indicate purpose has been achieved: End of project status. Candidates complete U.S. training and return to jobs in conventional energy field.	Contractor and AID Reocrds LDC Government Records	Assumptions for achieving purpose: Recipients complete academic and professional programs and will obtain relevant jobs on return home.
Outputs: (a) M.S. degree training (b) M.S. level academic in-service training (c) industry fellowships	Magnitude of Outputs: Up to 500 LDC officials trained.	(a) AID Records (b) Contractor Records	Assumptions for achieving outputs: (a) Sufficient number of candidates with adequate academic, work and English skills.
Inputs: AID Academic and professional training LDCs Salaries and travel	Implementation Target (Type and Quantity) AID Up to manyears $14.1 Million LDCs To be determined	Contractor Vouchers LDC Government Records	Assumptions for providing inputs: AID Congressional budget authority LDCs Foreign exchange for international travel and salaries.

V. B. PID Approval Message

Excerpts from the minutes of PID Reveiw, 22 April 1980.

Mr. Levin directed DS/EY to move on to project paper design under these conditions:

1. Emphasis and Focus of Project Paper

Predominant emphasis in the project is to be on the conventional energy field and the choice of disciplines to be included should reflect this fact. Within the conventional field, the concentration should be on identification, exploration and production of fossil fuels.

There should, however, be a mechanism permitting optional responses to selected LDC requests outside the conventional energy area. The presentation in the project paper should establish that the production/utilization/marketing activities, while not excluded, will, in most instances, come into consideration some years down stream. The early emphasis of this training project must be very clearly on discovery, development, and production. The supply side of the problem is to be attacked as first priority; the utilization (e.g., refining) training is to follow in much less priority.

2. Administrative Management Mechanisms

In order accurately to match developing country training requirements with precise educational supports provided by this project, mechanisms need to be explicitly established in the project paper including, at the outset, a built-in contractor capability to assist Missions and host governments to analyze and define their particular training needs. This need not require visitation in every instance.

Mechanisms must also be stated for coordination and, where feasible, linkages between A.I.D. energy training and other donor assistance (investment) plans. Technical review committees established under this project should include representation from DOE, USGS and other appropriate agencies. These agencies need not be represented on a candidate selection committee but should be consulted on substantive, technical education questions as well as on matters of general project management and planning.

An essential element of this project paper will establish procedures for identification, recruitment and comparative review of training requirements.

3. Evaluation Criteria

The section of the project paper concerned with evaluation must set up criteria to measure progress against A.I.D.'s true purposes. It would not be sufficient to measure effectiveness in terms of the number trained. It would be essential to set up objective ways to measure the effective participation of trainees within the energy infrastructure of host

governments. It would be germane to demonstrate that energy production and management structures have been strenghtened through this project. We are not concerned solely with numbers, but, rather in improvements of LDC energy capabilities and capacities. The project paper must specify not merely what is to be evaluated but how progress is to be determined.

4. Project Paper Content

Mr. Levin expressed a strong preference that the project should focus A.I.D. resources on A.I.D. country training needs. Not to be tautological, however, he is willing to have the project paper address this question and attempt to establish the case for a broader focus. The matter is deferred for consideration in the project paper.

Mr. Levin suggested that the possibility of transferring some training to third country institutions should be considered and, at a minimum, the contractor should be encouraged to look at the training possibilities of LDC institutions.

5. Contractor Selection

A contractor selection subcommittee will be named by the AA/DS to look at various means of contracting this effort without going out for competitive bids. Some more limited competitive selection may be possible in which four or five potential contractors' capabilities could be examined. Mr. Levin said the project paper would include a full examination of alternate contracting institutions and modalities.

Mr. Levin then polled the Bureau representatives for their approval of the PID. The results were:

Blumgart, Africa Bureau, said some of Africa's views had been accommodated and he could now agree to move forward to project paper design.

Ichord, Asia Bureau, said he approved moving forward with a project paper. Asia Bureau is now trying to prepare a paper defining Asia's energy training requirements as they were presented at the Manila conference and this might be useful to project designers.

Maushammer, LAC Bureau, approved the PID subject to the analytic requirements and conditions expressed by the AA/DS. He cautioned DS/EY to look carefully at the direct-hire staffing implications.

Klein, PPC, deferred on casting a vote. Following receipt of the minutes, he will consult with Alex Shakow. Klein is uncertain whether the purpose should be so fixed on conventional energy production and questioned what energy support would be provided LDCs with little conventional energy potentials. He favored a more balanced program with some possibility of support to all A.I.D. countries. There are other equally significant training gaps. He did not feel he had authority to give PPC Bureau approval.

Mr. Pike, Near East Bureau, approved the PID for development into a project paper. Near East Bureau was convinced the proper starting point is as assessment of the training needs of the A.I.D. countries.

Mr. Levin directed DS/EY to proceed with design of the project paper, subject to the conditions stated.

C. Initial Environmental Examination

Project Location	:	Worldwide
Project Title	:	Training in Conventional Energy
Project Number	:	936-9997
Funding	:	FY 80, $100,000 Grant FY 81-84 - $14,300,000
Life of Project	:	Five Years - FY 80-83
IIE Prepared by	:	Eric D. K. Melby Office of Energy
Environmental Action Recommended	:	Negative Determination (See page 2)

Eric D. K. Melby

Date

Concurrence:

Alan B. Jacobs
Director
Office of Energy

Date

I. Examination of Nature, Scope and Magnitude of Environmental Impacts

The project will increase the number of developing country personnel trained in science and engineering disciplines relating to conventional energy exploration, production and utilization. The training activities will have minor, if any, impact on the environment. Some of the training, e.g. petroleum engineering, may require hands-on drilling experience which would involve surface or off-shore drilling. In general, instruction will be classroom or part of larger activities already covered by an environmental assessment. Training activities will all take place in the U.S.

Application of the training received under this project may well lead to projects with significant environmental implications. It is presumed that these will be evaluated when specific projects are reviewed.

II. Recommendation for Environmental Action

The project will have no adverse impact on the human or natural environment of the country(ies) in which it takes place. It is recommended that the Assistant Administrator for Development Support approve a Negative Determination for this project.

PD-AAH-710-E1

936-9997

(2)

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT PAPER FACESHEET

TO BE COMPLETED BY ORIGINATING OFFICE

1. TRANSACTION CODE (IX' APPROPRIATE BOX)
[X] ORIGINAL [ ] CHANGE [ ] ADD [ ] DELETE

PP

DOCUMENT CODE 3

2. COUNTRY/REGIONAL ENTITY/GRANTEE
Worldwide

3. DOCUMENT REVISION NUMBER

4. PROJECT NUMBER
936-9997

5. BUREAU
A. SYMBOL: DS/EY
B. CODE:

6. ESTIMATED FY OF PROJECT COMPLETION
FY 85

7. PROJECT TITLE - SHORT (STAY WITHIN BRACKETS)
Conventional Energy Training Project

8. ESTIMATED FY OF AUTHORIZATION/OBLIGATION
A. INITIAL MO. YR. 08 80 B. FINAL FY 84

9. SECONDARY TECHNICAL CODES (MAXIMUM SIX CODES OF THREE POSITIONS EACH)

10. ESTIMATED TOTAL COST ($000 OR EQUIVALENT, $1 = ____)

A. PROGRAM FINANCING	FIRST YEAR B. FX	C. L/C	D. TOTAL	ALL YEARS E. FX	F. L/C	G. TOTAL
AID APPROPRIATED TOTAL						
(GRANT)	(350)	( )	(350)	(14,650)	( )	( )
(LOAN)	( )	( )	( )	( )	( )	( )
OTHER 1.						
U.S. 2.						
HOST GOVERNMENT						
OTHER DONOR(S)						
TOTALS	350		350	14,650		

11. ESTIMATED COSTS/AID APPROPRIATED FUNDS ($000)

A. APPROPRIATION ALPHA CODE	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE	FY 80 D. GRANT	E. LOAN	FY 81 F. GRANT	G. LOAN	FY 82 H. GRANT	I. LOAN	ALL YEARS J. GRANT	K. LOAN
			350		3500		3500		14,650	
TOTALS										
12. ESTIMATED EXPENDITURES										

13. PROJECT PURPOSE(S) (STAY WITHIN BRACKETS) [ ] CHECK IF DIFFERENT FROM PID/PRP

To provide LDC participants with M.S. degree, in-service and industry fellowships in science and engineering fields related to conventional energy.

BEST AVAILABLE DOCUMENT

14. WERE CHANGES MADE IN THE PID/PRP FACESHEET DATA NOT INCLUDED ABOVE? IF YES, ATTACH CHANGED PID AND/OR PRP FACESHEET.

[ ] YES [ ] NO

15. ORIGINATING OFFICE CLEARANCE

SIGNATURE

TITLE Alan B. Jacobs
Director, Office of Energy

DATE SIGNED MO. 06 DAY 26 YR. 80

16. DATE RECEIVED IN AID/W, OR FOR AID/W DOCUMENTS, DATE OF DISTRIBUTION
MO. DAY YR.

AID 1330-4 (5-75)

Project Authorization and Request for Allotment of Funds

Part II

ENTITY: Worldwide

PROJECT: Conventional Energy Training

PROJECT NUMBER: 936-9997

APPROPRIATION ACCOUNT: Selected Development Problems

AID grant financing is approved in the amount of up to $7,000,000. FY 1981 grant financing of $3,500,000 and FY 1982 grant financing of $3,500,000 are authorized for the initial two years of project implementation. A management review will take place prior to obligation of FY 1982 funds.

Authorization of funding for the subsequent two years of the project is subject to thorough AID review of project performance.

Sander Levin
Assistant Administrator
Bureau for Development Support

Clearances:

AFR/DR, L.Heilman LCH Date 10/3/80
ASIA/TECH, T.Arndt Date 10/6/80
LAC/DR, M. Brown Date 10/6/80
NE/TECH, L. Reade Date 10/2/80
PPC/EY, S. Klein SK Date 2 Oct 80
DS/PO, B. Chapnick BC Date 10/9/80

Discussion: Like its companion project ("Technical Assistance in Conventional Energy Resource Identification"), the Conventional Energy Training (CET) project has been developed in response to the increasingly obvious need of developing countries, particularly non-OPEC low-income countries, to enhance their domestic energy supplies in order to foster economic development and reduce dependence on expensive imported sources of supply. A shortage of trained manpower in the technical fields related to fossil fuels has been identified as a major barrier to exploration and development of such fuels in developing countries. The United States can provide significant help in overcoming that constraint by marshalling its considerable educational resources in behalf of LDC personnel whose governments wish to strengthen their technical competence in the conventional energy area.

The main activity under the CET project will be the selection and placement of personnel from AID-assisted LDCs in U.S. training institutions (and in third-country institutions in instances where that seems most advantageous). Training participants will be selected carefully to ensure that they will return to productive activities in the energy development programs of their countries. Care will be taken to match realistic training needs with appropriate participants, and to match those participants with appropriate training institutions.

As you no doubt recall, considerable discussion of possible contracting mechanisms for the project occurred at the review meeting. Reflecting that discussion, we have explored a number of alternative contractual arrangements and have concluded that the project can proceed most effectively and expeditiously under a contract with the American Society for Engineering Education and the Institute for International Education. We believe, after examining a number of other possible contractor candidates, that these two organizations working together do, in fact, possess a predominant capability in the fields of expertise required for the CET project. A document describing those capabilities and providing justification for non-competitive procurement is attached for your review and approval.

We are also implementing the directive you issued at the PP review to communicate with all AID missions by cable about this and the companion project. The draft cable is also attached.

Recommendation: That you signify your approval of the project paper at the appropriate point on this action memo, and that you approve the PAF (attached) authorizing grant financing of $3,500,000 in FY 1981 and $3,500,000 in FY 1982.

In addition, we request that you signify your agreement to transmit the attached Request and Justification for Non-Competitive Procurement of Contractor to the Contracts Office and the Non-Competitive Review Board. DS/EY will prepare the appropriate PIO/T and work statement to accompany the justification.

Approved _____

Disapproved _____

Date OCT 29

Attachments:

1. Project Authorization and Request for Allotment of Funds
2. Request and Justification for Non-Competitive Procurement of Contractor
3. Draft Cable to AID Missions
4. Project Paper, "Training in Conventional Energy"

Clearances:

AFR/DR:LCHeilman LCH Date 10/3/80
ASIA/TR:TMArndt _____ Date 10/6/80
LAC/DR:MDBrown _____ Date 10/6/80
NE/TECH:LReade _____ Date 10/2/80
PPC/EY:SKlein _____ Date 10/7/80
DS/PO:BChapnick BC Date 10/9/80

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR, DSB

DATE: September 29, 1980

THRU: DS/DAA/DT, Franklin Tugwell

FROM: DS/EY, Alan B. Jacobs

Problem: Your formal approval of the attached project paper, "Training in Conventional Energy", is required. The project was informally approved at the PP review meeting on July 29, 1980, with all the Regional Bureaus concurring.

The goal of the project is to increase the technical competence of developing countries to explore for and exploit conventional energy resources. The project will provide graduate-level academic and in-service training, predominantly in science and engineering fields, related to exploration, development, production and utilization of conventional energy resources (especially oil, natural gas and coal). Approximately 200 trainees will be enrolled in the program at any given time during the project's life, and individual trainees will generally participate for periods of one or two years.

At this time, the following specific actions are requested:

1) Authorization to proceed with the project as described in the project paper;

2) Approval of AID grant financing of $3,500,000 in FY 1981 and $3,500,000 in FY 1982 for the first two years of the project life. A management review will take place at the end of the first year's activities and prior to obligation of FY 1982 funds, and a full-scale evaluation will be conducted prior to approval of the third and fourth years of funding; and

3) Approval to proceed with procurement of the combined services of the American Society for Engineering Education and the Institute for International Education as project contractors, subject to the approval of the Non-Competitive Review Board and the normal contracting procedures and regulations of AID.

rec'd 10/9/80 1009-02