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U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

JAN 12 1993

ACTION MEMORANDUM FOR THE ASSISTANT ADMINISTRATOR FOR RESEARCH AND DEVELOPMENT

FROM: R&D/EI, James B. Sullivan James B. Sullivan

SUBJECT: Authorization of Amendment for the Private Sector Energy Development Project (PSED) (936-5738)

PROBLEM: Your authorization is requested for Amendment 2 to the Private Sector Energy Development Project (936-5738). The centrally-funded PSED project was authorized on May 15, 1989 and amended on April 26, 1991. Your authorization is requested further to:

(a) extend the final fiscal year of obligation from FY 1996 to FY 1998;

(b) extend the PACD from August 24, 1996 to August 24, 1999; and

(c) increase Life of Project Costs from $21,772,000 to $42,312,000.

Your approval is also requested to add other participatory financing arrangements for buy-ins other than R&D. Such funding may also be provided from the Economic Support Fund (ESF), the Development Fund for Africa (DFA), or the Newly Independent States Fund (NIX), as well as from the accounts authorized under this project.

DISCUSSION: On May 15, 1989, the Private Sector Energy Development (PSED) project received authorization for six-years of funding in an amount of $9,760,000. The project authorization was amended on April 26, 1991 to increase the life of project costs to $21,772,000 and extend the PACD from September 30, 1994 to August 24, 1996.

Due to the growing interest and demand for private sector energy development assistance by developing countries, the level of activities of the PSED Project have grown significantly beyond the expectations of the original project plan. Currently, interest in private sector energy development assistance is expected to continue to increase dramatically over the next decade. Therefore, it is necessary to extend the life of the project out to the maximum 10 years, and to increase the project life costs, incorporating greater involvement from the A.I.D. missions (buy -ins) and greater cost-sharing activities by the private sector.

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A revised Life of Project budget for $42,312,000 is attached for consideration and review.

The original goal and purpose of the scope of work remains unchanged, however. The attached project paper supplement and budget reflect increased activities and level of effort in support of the increased demand for assistance.

The proposed PACD does not exceed ten years from the initial obligation of the project.

SOURCE AND ORIGIN OF COMMODITIES, NATIONALITY OF SERVICES:
All commodities, services, and suppliers financed by A.I.D. under this project shall have their source, origin, and nationality in the United States, except for the commodities, services, and suppliers that can only be locally procured in the "cooperating country". (Each country in which research, training, or technical or other assistance takes place under the project shall be considered a "cooperating country".) All such local procurements under this project fall under the exceptions listed in A.I.D. Handbook 1, Supplement B [Chapter 18, sections 1.c.(4) and 1.c.(6)], and therefore, no source/nationality waivers will be required. These local goods and services include such items as professional services contracts estimated not to exceed $250,000 as well as commodities and services which are only available locally: communications services, rental costs for housing and office space, hotel accommodations, meeting facilities, etc. All local procurement practices under the project will follow the guidelines set forth in A.I.D. Handbook 1, Supplement B [Chapter 18, sections 2 and 3].

Based on historical data, the PSED project has spent an estimated 5 percent of its core funds on locally procured goods and services, with the remaining 95 percent spent on United States commodities and services. Thus, core fund spending on locally procured goods and services under the project is not expected to exceed $2.2 million over the ten-year lifetime.

In addition to the above conditions, the Feasibility Study Fund operated under the project disburses funds only to a restricted class of applicants. Study funds will only be disbursed to applicants who will share 50 percent of the cost and who are (1) a U.S. company or (2) a public agency from an A.I.D.-assisted country that is working with a U.S. company.

WAIVERS, SPECIAL CLEARANCE, PROVISIONS AND DETERMINATION: No waivers or other special conditions are requested at this time.

CONGRESSIONAL JUSTIFICATION: Substantive Notification required since the LOP exceeds the previously notified amount by $5,000,000.

PROCUREMENT PLAN AND BUDGET: The FY 1993 planned budget is $4,448,000.

RECOMMENDATION: That you approve the attached PAF Amendment No. 2, extending the Final FY of Obligation to FY 1998, and changing the PACD from August 24, 1996 to August 24, 1999; and that you approve the increase of Life of Project Costs from $21,772,000 to $42,312,000.

In addition, your approval is requested to fund FY 1993 of the project in the amount of $4,448,000.

Clearances:

R&D/EI:S. Schweitzer	SS-/fp	Date 12-8-92
R&D/EI:S. Toth	SS-/fp	Date 12-8-92
R&D/PO:J. Bierke	[illegible]	Date 12/8/92
GC/R&D:G. Winter	(phone)	Date 12/7/92

Attachments:
PSED Budget
Project Data Sheet
Project Authorization
Project Paper

Drafter:R&D/EI:G.Weynand/GWW/235-4958/12-7-92

ATTACHMENT

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

	BUDGET ($000)
FY 1989	1,655
FY 1990	2,857
FY 1991	3,609
FY 1992	2,842
FY 1993	5,906
FY 1994	5,964
FY 1995	5,903
FY 1996	5,336
FY 1997	4,792
FY 1998	3,448
TOTAL	42,312

PROJECT AUTHORIZATION AMENDMENT NO. 2

Country/Entity: Worldwide

Name of Project: Private Sector Energy Development

Number of Project: 936-5738

1. Pursuant to Sections 103 and 106 of the Foreign Assistance Act of 1961, as amended, the Private Sector Energy Development Project, which is centrally funded, was authorized on May 15, 1989 and subsequently amended on April 26, 1991. That authorization is hereby further amended as follows:

a. To extend the final FY of obligation to FY 1998. The PACD will be extended from August 24, 1996 to August 24, 1999.

b. To increase the Life of Project Costs from $21,772,000 to $42,312,000.

c. Funds authorized under Section 103 and Section 106 may be used, subject to the availability of funds and in accordance with the A.I.D. OYB/Allotment process, without regard to previously authorized dollar limits for each appropriation so long as the total authorization of $42,312,000 for the project is not exceeded.

d. The use of funds from the Economic Support Fund (ESF) account, from the Development Fund for Africa (DFA), and from the Newly Independent States Fund (NIX) for this project is hereby approved.

2. SOURCE AND ORIGIN OF COMMODITIES, NATIONALITY OF SERVICES: All commodities, services, and suppliers financed by A.I.D. under this project shall have their source, origin, and nationality in the United States, except for the commodities, services, and suppliers that can only be locally procured in the "cooperating country". (Each country in which research, training, or technical or other assistance takes place under the project shall be considered a "cooperating country".) All such local procurements under this project fall under the exceptions listed in A.I.D. Handbook 1, Supplement B [Chap. 18, sections 1.c.(4) and 1.c.(6)], and therefore, no source/nationality waivers will be required. These local goods and services include such items as professional services contracts estimated not to exceed $250,000 as well as commodities and services which are only available locally: communications services, rental costs for housing and office space, hotel accommodations, meeting facilities, etc. All local procure-ment practices under the project will follow the guidelines set forth in A.I.D. Handbook 1, Supplement B [Chap. 18, sections 2 and 3].

Based on historical data, the PSED project has spent an estimated 5 percent of its core funds on locally procured goods and services, with the remaining 95 percent spent on United States commodities and services. Thus, core fund spending on locally procured goods and services under the project is not expected to exceed $2.2 million over the ten-year lifetime.

In addition to the above conditions, the Feasibility Study Fund operated under the project disburses funds only to a restricted class of applicants. Study funds will only be disbursed to applicants who will share 50 percent of the cost and who are (1) a U.S. company or (2) a public agency from an A.I.D.-assisted country that is working with a U.S. company.

3. The authorization cited above remains in force except as hereby amended.

Signature: _____
Richard E. Bissell
Assistant Administrator for
Research and Technology

Date: 1/12/93

Clearances:

R&D/EI,	S. Schweitzer	_____	Date 12-8-92
R&D/EI,	S. Toth	_____	Date 12-8-92
R&D/PO,	J. Bierke	_____	Date 1/8/93
GC/R&D,	G. Winter	(phone)	Date 12/7/92
DAA/R&D,	C. Johnson	_____	Date 1/11/93

Drafter:R&D/EI:G.Weynand/235-4958/12-7-92.

AGENCY FOR INTERNATIONAL DEVELOPMENT

PROJECT DATA SHEET

1. TRANSACTION CODE: C (A = Add, C = Change, D = Delete) — Amendment Number 02

DOCUMENT CODE 3

2. COUNTRY/ENTITY: Worldwide

3. PROJECT NUMBER: 936-5738

4. BUREAU/OFFICE: R&D/Office of Energy

5. PROJECT TITLE (maximum 40 characters): Private Sector Energy Development

6. PROJECT ASSISTANCE COMPLETION DATE (PACD): MM 08 DD 24 YY 99

7. ESTIMATED DATE OF OBLIGATION (Under 'B.' below, enter 1, 2, 3, or 4)
A. Initial FY 89 B. Quarter 3 C. Final FY 99

8. COSTS ($000 OR EQUIVALENT $1 =)

A. FUNDING SOURCE	FIRST FY 89 B. FX	C. L/C	D. Total	LIFE OF PROJECT E. FX	F. L/C	G. Total
AID Appropriated Total						
(Grant)	(1,655)	( )	(1,655)	(42,312)	( )	(42,312
(Loan)	( )	( )	( )	( )	( )	(
Other U.S. 1. Mission Buy-In				6,612		6,612
Other U.S. 2. Cost-Sharing				13,735		13,735
Host Country						
Other Donor(s)						
TOTALS	1,655		1,655	62,659		62,659

9. SCHEDULE OF AID FUNDING ($000)

A. APPROPRIATION	B. PRIMARY PURPOSE CODE	C. PRIMARY TECH. CODE 1. Grant	2. Loan	D. OBLIGATIONS TO DATE 1. Grant	2. Loan	E. AMOUNT APPROVED THIS ACTION 1. Grant	2. Loan	F. LIFE OF PROJECT 1. Grant	2. Loan
(1) ARDN	744	878		6,910			23,900	30,810	
(2) PSEE	744	878		2,540			8,962	11,502	
(3)									
(4)									
TOTALS				9,450			32,862	42,312	

10. SECONDARY TECHNICAL CODES (maximum 6 codes of 3 positions each)

11. SECONDARY PURPOSE

12. SPECIAL CONCERNS CODES (maximum 7 codes of 4 positions each)
A. Code
B. Amount

13. PROJECT PURPOSE (maximum 480 characters)

The purpose of the PSED Project is to assist in creating a favorable environment to encourage the private ownership, financing, and operation of energy facilities in selected developing countries, concentrating on the electric power sector.

14. SCHEDULED EVALUATIONS
Interim MM 09 YY 93 MM YY Final MM 08 YY 98

15. SOURCE/ORIGIN OF GOODS AND SERVICES
☐ 000 ☐ 941 ☐ Local ☐ Other (Specify)

16. AMENDMENTS/NATURE OF CHANGE PROPOSED (This is page 1 of a ____ page PP Amendment.)

To increase Life of Project Costs from $21,772,000 to $42,312,000. To reschedule the Final FY obligations to FY 1998 and to change the PACD to 8/24/99.

BEST AVAILABLE COPY

17. APPROVED BY
Signature: James B. Sullivan
Title: Director, Office of Energy and Infrastructure
Date Signed: MM 12 DD 08 YY 92

18. DATE DOCUMENT REC IN AID/W, OR FOR AID/W MENTS, DATE OF DISTRI
MM DD YY 17

PPN
EPPN1 01

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (PSED)

PROJECT NUMBER 936-5738

OFFICE OF ENERGY AND INFRASTRUCTURE

BUREAU FOR SCIENCE AND TECHNOLOGY

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

MAY 1989

REVISED NOVEMBER 1992

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LIST OF ABBREVIATIONS

A.I.D.	-	Agency for International Development
ABD	-	Asian Development Bank
ARDN	-	Agriculture and Rural Development and Nutrition
CORECT	-	Committee on Renewable Energy Commerce and Trade
DOC	-	Department of Commerce
DOE	-	Department of Energy
EXIMBANK	-	Export-Import Bank of the United States
FERC	-	Federal Energy Regulatory Commission
FOIA	-	Freedom of Information Act
GW	-	Gigawatt
GDP	-	Gross Domestic Product
IDB	-	Interamerican Development Bank
LDC	-	Lesser Developed Country
MW	-	Megawatt
OECD	-	Organization of Economic Cooperation and Development
OJT	-	On-the-Job Training
OPIC	-	Overseas Private Investment Corporation
PASA	-	Participating Agency Service Agreement
PID	-	Project Identification Document
PSED	-	Private Sector Energy Development (Project)
PSEE	-	Private Sector Energy and Environment
PUC	-	Public Utility Commission
PURPA	-	Public Utility Regulatory Policy Act
RSSA	-	Resource Support Service Agreement
TA	-	Technical Assistance
TAG	-	Technical Advisory Group
TDP	-	Trade and Development Program
WB	-	The World Bank

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I. PROJECT SUMMARY AND RECOMMENDATIONS

A. Recommendations

1. Funding

The Office of Energy and Infrastructure, Bureau for Research and Development recommends that the authorization for the Private Sector Energy Development Project be raised from $27,352,000 to $62,660,000, an increase of $35,308,000 for the amended project for an additional three years and change the Project Assistance Completion Date from August 24, 1996 to August 24, 1999.

Private power and related infrastructure development evolve through time with awareness building, information dissemination, and other educational activities prior to project development and development work. This was true in the U.S. during the early 1970's and now with the wave of privatization in A.I.D.-assisted countries it seems to repeat itself. The early years of PSED focused more heavily on the up-front activities. As the effort has become more successful and the economic/political situation more receptive, requirements are shifting increasingly to active forms of technical assistance, project development activities, Mission assistance, and U.S. industry support to penetrate new markets. Thus, there seems to be the need to engage in more of the costly activities, at least in those markets in which opportunities are very real (Pacific Rim, Central America, etc.).

This evolutionary trend towards the more costly activities is compounded by the fact that the U.S. market for private power, related infrastructure, and engineering services is close to saturation. Thus, we observe an increased interest and activities of U.S. companies in the A.I.D.-assisted countries. This in turn requires increased Mission support through PSED. Consequently, modifying the Project Paper to allow for additional funding is in the interest of A.I.D., U.S. industry, and the U.S. Government.

The Private Sector Energy Development Project was originally amended on April 26, 1991 to increase the authorized level of funding from the original $15,340,000 to $27,352,000 with no change in the Project Paper. This amendment reflects that increase and further recommends an increase in the authorized level of funding to $62,660,000 and changes to the Project Paper as shown in bold print.

The Office of Energy and Infrastructure will contribute $42.3 million in core funding for the PSED Project. An additional $20.34 million in matching funds and joint funding will be sought from relevant A.I.D. Bureaus, Missions, other U.S. Government Agencies, other bilateral and multilateral donors, and from the Private Sector. The Office of Energy and Infrastructure funding is planned to be incrementally obligated as shown on the following page.

It is expected that over the lifetime of the PSED Project buy-ins from A.I.D. Regional Bureaus and Missions will be increased by $3.31 million from $3.3 million to $6.61 million. The PSED Project anticipates an increase by 11.44 million from $2.3 million to $13.73 million worth of costsharing from the private sector and other sources in the form of matching funds for feasibility and prefeasibility studies and other subproject development assistance. Monies expended by the Feasibility Study Fund on successful subprojects would be reimbursed to the U.S. Treasury, unless other arrangements are approved. (As used in the Project Paper, the term "subproject" refers to the energy facilities supported by the Feasibility Study/Subproject Development Assistance Fund, e.g., a new power generating plant).

FY	PSEE/ARDN Funding (OOO)
89	1,655
90	2,857
91	3,609
92	2,842
93	5,906
94	5,964
95	5,903
96	5,336
97	4,792
98	3,448
TOTAL	42,312

2. Waiver Requests and Determinations

None.

B. Project Summary

The goal of the ten-year PSED Project is to accelerate the sustainable economic and social development of A.I.D.-assisted countries by increasing the supply of reliable, affordable energy, particularly electric power, for productive purposes. The purpose of the PSED Project is to assist in creating a favorable environment to encourage the private ownership, financing and operation of energy facilities in selected developing countries, concentrating on the electric power sector. Note that the PSED Project will provide funding only for technical assistance, training, and feasibility studies, and will not provide financing for the actual construction of facilities.

The PSED Project has resulted from several years of policy dialogue with host countries on the need to increase the role of private enterprise in the development, maintenance and operation of their energy/power sector and its direct supporting infrastructure, particularly with regard to electric power. The PSED Project continues to follow the proposed "Private Sector Electric Power Strategy" outlined in the A.I.D. report to Congress, Power Shortages in Developing Countries: Magnitude, Impact, Solutions, and the Role of the Private Sector. The report found that the current shortages of energy, especially electric power, are curtailing economic growth in most A.I.D.-assisted countries because prospects for growth are closely related to the provision of adequate and reliable supplies of modern forms of energy. A similar lack of adequately maintained and operated infrastructure directly supporting energy/power facilities, including road and transportation systems, water delivery and sewage treatment plants, telecommunication networks, and pollution control equipment, is impeding social and economic development. Activities as diverse as industrial expansion, commercial enterprise, agricultural development, health services improvement, and educational development are closely linked to the availability and reliability of electric power and other forms of

modern energy and the presence of adequate supporting infrastructure facilities.

The energy/power sector requires infrastructure support to provide a reliable and affordable supply of electric power. Electric power production facilities, for example, require water delivery systems for cooling purposes, and facilities for treating effluent discharges to safeguard public health. Adequate road/transportation facilities are essential for transporting heavy machinery such as electric power generators, boilers, pumps, and tubing, in addition to heavy machinery used in the construction of those facilities. In addition, roads are essential to the delivery of fuel for electric power plants. Communication service is required for dispatching power and for managing fuel supplies.

The shortage of infrastructure facilities supporting the energy/power sector can be traced to a lack of investment capital necessary to develop and maintain infrastructure in developing countries, and a dearth of skilled management and entrepreneurial spirit in the state-owned infrastructure sector. The private sector, with its access to additional investment capital and its innovative management techniques, can improve infrastructure development and service delivery in developing countries. The PSED Project furthers this effort by harnessing the capabilities and resources of the private sector, as a means of creating a stronger base for economic and social development in these countries.

The PSED Project will consider a number of strategy options through which the private sector could increase its role in energy/power and infrastructure development, such as the following:

- Private sector participation in the development, generation and distribution of energy/power resources and direct supporting infrastructure facilities;
- Industrial and commercial cogeneration of power;
- Long-term contracts for private companies to perform certain energy/power and related infrastructure development and maintenance functions including operation and maintenance of energy generation and distribution plant networks and supporting infrastructure facilities as necessary;
- Investment of private capital in energy/power facilities and direct supporting infrastructure as necessary;
- Privatization and divestiture of existing public utilities and other energy-related infrastructure operations;
- Participation of private companies in the decentralization of rural electric power and related infrastructure systems and service delivery.

The PSED Project will make funds directly available to U.S. private enterprises for feasibility studies supporting private sector involvement in energy/power and related infrastructure development in A.I.D.-assisted countries. The PSED Project will also provide direct technical assistance (TA) to developing countries to implement policies and enable host country institutions to encourage the development of private energy/power and supporting infrastructure facilities. TA will include targeted training, workshops, legal assistance and regulatory advice. The PSED Project will undertake a number of special studies on subjects pertinent to advancing private sector participation in selected developing countries. Finally, the PSED Project will endeavor to establish collaborative relationships with other U.S. agencies, multilateral development banks and other bilateral donors to encourage private participation in the development, ownership and operation of private and public energy/power and supporting infrastructure facilities.

The major expected outputs include assistance in the reform or design of laws, policies, and institutions to allow and encourage private participation in energy/power and direct supporting infrastructure sectors, and assistance to private companies in the preparation of the prefeasibility and feasibility studies through a Feasibility Study and Subproject Development Assistance Fund (referred to as the Feasibility Study Fund).

As a result of participation in the prefeasibility and feasibility phases and related activities, this project should act as a catalyst for investment of $500 million of private capital for environmental' ound new generating capacity or major rehabilitation in five or more power plants ranging from 20 to 200 megawatts with a total capacity of 500 megawatts. The Project will also assist small scale power facilities and operations, as well as non-electric power, private energy activities.

To facilitate the efforts of new construction it will be necessary to improve or increase infrastructure capabilities/capacity as described above, thus increasing opportunities for the United States to improve U.S. foreign trade by promoting U.S. technology cooperation with developing countries and by increasing investment overseas. The U.S. energy/power industry has unparalleled experience in the development of private infrastructure supporting energy/power facilities. The U.S. water and sewage treatment and delivery industry has a long history of private development and operation. With regard to roads and other transportation projects, several states have initiated privately owned and operated toll road and bridge projects to avoid local government financing of these very expensive projects. The deregulation of the U.S. telecommunication industry has resulted in the development of increased competition among companies and the development of new technologies, with the result that U.S. telecommunication companies are among the most competitive and cost efficient in the world. The U.S. federal, state and local regulatory bodies are preeminent in integrating public and private power systems. Finally, with regard to environmental protection, U.S. companies are unchallenged in the development of pollution mitigation control systems and control technology.

In addressing related infrastructure requirements, the PSED Program also furthers A.I.D's new Business and Development Partnership program by increasing U.S. business knowledge of, and participation in, selected developing country markets. To speed up the transfer of and use of more energy efficient and environmental practices throughout the developing world, new linkages to U.S. industry are being fostered through export promotion projects, feasibility study and venture funds, market and technology assessments, and selected policy reform efforts.

The PSED Project supports the Office of Energy and Infrastructure's Program Plan objective to foster private enterprise energy development and management by promoting policy reform to improve the functioning of energy markets, building local private sector capabilities, and increasing the flow of technical and financial resources from the U.S. private sector. (Office of Energy and Infrastructure, "Program Plan - Fiscal Years 1988 and 1989").

C. Summary Findings

The PSED Project continues to be socially, financially, economically, administratively, and technically feasible. The scope of the PSED Project is amended to clarify its ongoing assistance in developing privately owned, constructed, and operated infrastructure facilities that directly support energy/power installations.

II. PROJECT DETAILS

A. Project Rationale

A.I.D.'s main concern is sustainable economic development and social growth. Within each country there needs to be a fundamental evolution of social and economic life that will make it possible for each country to meet the needs of its own people, on a sustained basis, ultimately out of its own material and human resources. To this end, there must be an expansion of productivity, income and employment.

Shortages of energy/power resources and energy-supporting infrastructure in developing countries, however, are preventing such an expansion. A.I.D. has outlined four approaches to development assistance that will help developing countries overcome obstacles to sustainable economic development: policy dialogue; institutional development; technology research, development and transfer; and utilization of the private sector.

The PSED Project will use each of these approaches in helping to alleviate power shortages in developing countries. The Project will facilitate policy reform by providing technical assistance to countries in drafting laws, regulations and guidelines that will allow the participation of the private sector in the energy/power and related infrastructure sectors. Institutional development will be addressed through the provision of technical advisors, workshops and conferences on private energy/power and related infrastructure development, internships with U.S. utilities, utility commissions and private companies engaged in the development and operation of private energy/power and infrastructure facilities, and study tours of U.S. private energy/power and other supporting infrastructure facilities that will be available to developing country government, utility, and private sector officials. The project will promote the transfer of cogeneration and other private power technologies from the U.S. to A.I.D.-assisted countries, and investment in, environmentally proven technology to assist in the development and maintenance of the energy/power and related infrastructure sectors in developing countries.

In addition to these approaches, the PSED Project will stress better management of the energy/power and related infrastructure sectors, development of the capital markets vital to private participation in the energy/power and infrastructure sectors, and improved economic and technology cooperation between U.S. industry and A.I.D.-assisted countries.

Electric Power Infrastructure

A.I.D.-assisted countries need more electrical energy than they are currently able to produce in order to support sustained economic growth. Many of these countries are presently spending 25 to 40 percent of their total development budgets on energy, primarily in the electric power sector. However, as discussed below, current spending will not fulfill the investment requirements necessary for sustaining the needed electricity generation capacity. Furthermore, any additional increases in power sector spending by these countries will correspondingly decrease the funds available for other development programs, thus constraining the overall development of these countries in crucial areas such as education, health care, housing, and agriculture.

Economic development is tied strongly to the consumption of energy, specifically, high level energy. Long-term economic development trends illustrate that one percent increases in per capita income correspond to 1 - 1.3 percent increases in the use of energy services per capita and as much as two percent increases in per capital modern energy use (i.e., electricity, and liquid and gas fuels). (A.I.D., Power Shortages in Developing Countries, March 1988). Large increases in demand, however, cannot be satisfied with the capacity and reliability of the current power supply. In fact, in many developing countries, increases in demand for electric power have resulted in power shortages and load shedding which further impede the growth of the economy.

Currently, developing countries, which represent over 75 percent of the world's population, consume only 18 percent of the electricity used in the world. Such disparities of supply and demand of electric power in developing countries combined with the poor quality and reliability of existing electric power systems have significantly constrained developments in agriculture, health services, and industry, and the resulting standards of living. Growing demand for electric power in developing countries must be countered by adequate supplies of power to satisfy citizens' demands, to strengthen the economy and social infrastructure, and to ensure political stability.

To study the power sector requirements of the developing countries, scenarios were modeled and analyzed for the years 1988 through 2008. (A.I.D., Power Shortages in Developing Countries, March 1988). Each scenario reflects a particular trend in power production and consumption at a specified economic growth rate. The analysis of current trends in production and utilization of electric power (the Current Trend Scenario) suggests that the developing countries would require an estimated 1,500 gigawatts of additional generation capacity by the year 2008 to support moderate economic growth of 4.5 percent per year. This increase in capacity would cost over $2.6 trillion, or an average of $125 billion per year. Developing countries cannot bear this financial and economic burden alone.

Under the Conservation Scenario, financial and capacity requirements are reduced. This scenario assumes that efficiency gains in both production and utilization of power are realized. Generation capacity requirements are reduced to 1,200 GW and corresponding financial investments are reduced to $74 - $110 billion per year. By comparison, only $50 - $60 billion is currently spent on the power sector each year. Considering that this figure represents approximately 25 to 40 percent of many countries' development budget, other sources of capital -- specifically, private investment -- are necessary to support the required power development.

To reduce this financial burden many countries are exploring prospects for private sector participation in power generation. Pakistan, the Philippines, Thailand, India, and Indonesia all have legislation permitting the generation of electric power by the private sector. In addition, legislation permitting private sector participation in the energy sector is currently pending in both the Dominican Republic and Costa Rica. The Office of Energy and Infrastructure is aware of over eighty proposals for private power projects that have resulted from these legislative initiatives.

A.I.D.'s field missions and its ability to develop innovative projects are valuable assets that make A.I.D. unique among donors in its ability to address developing country energy/power sector problems. A.I.D. has been a leader in promoting private sector participation in the energy/power sector of developing countries. This leadership has catalyzed interest in private power among multilateral developments banks and other bilateral donors. In Pakistan, A.I.D. has joined a consortium of donors and the World Bank to establish a loan pool for private energy/power projects as well as funding technical assistance for capacity building within the state-owned utility and local financial intermediate financial institutions. In Jamaica, the PSED Program assisted the World Bank in developing a similar fund for a private power project. The PSED Project will seek to expand these models of leadership and resource leveraging with other donors in other A.I.D.-assisted countries.

A major priority in the United States is to improve U.S. foreign trade. By promoting private power investment in A.I.D.-assisted countries, the PSED Project addresses this crucial issue through use of indigenous expertise. The U.S. utility industry and regulatory bodies are preeminent in integrating public and private power systems, and furthermore, U.S. industry has competitive advantage in a number of power technologies. Thus, in addition to the major rationale discussed above, trade and investment interests of U.S. industry are likely to benefit from the PSED Project.

A.I.D.'s strong interest in private sector and advanced industrial development support its role in the

Private Sector Energy Development Project. A.I.D. has promoted programs to improve health care, agricultural productivity, industrial expansion, and overall living conditions. A.I.D.'s promotion of private investment in the power sector through the PSED Project can increase funds available for these other government priorities, thus helping to improve socioeconomic conditions through an improved energy supply.

The majority of developing country governments, however, have not been able to develop and maintain the infrastructure resources and service delivery systems necessary to support the reliable provision of economical energy services and to promote economic and social development. Like the energy/power sector, the infrastructure sector is capital intensive. The inability of developing country governments to self-finance infrastructure development has led to increased multilateral and bilateral debt. Mounting national fiscal problems have resulted in cutbacks to maintenance of existing facilities, further exacerbating the deficit in quality infrastructure. It is clear that developing country governments alone will not be able to adequately develop and maintain the infrastructure resources necessary to support the energy/power sector, thereby contributing to attracting investment and promoting economic and social development.

The growing interest in private energy/power development in developing countries, as reflected by the success of the PSED Project, reinforces the need for A.I.D. to continue its support for those infrastructure facilities that directly support the energy/power sector. Moreover, certain commonalities between private energy/power development and private infrastructure development sustain the need for A.I.D. to promote the concept of private energy-related infrastructure development, and to work more efficiently in establishing the commercial, financial, regulatory, and institutional mechanisms for private infrastructure development. For example, financing principles, contracts and regulations for the development and operation of privately owned and operated telecommunication and water delivery systems directly supporting energy/power facilities are similar to those for privately developed energy/power projects.

The PSED Project has adopted a multi-faceted approach to technical assistance for private energy/power projects, including the use of conferences, study tours, expert assistance, and the Private Sector Energy Development Feasibility Study Fund. PSED will continue this approach and provide assistance to those infrastructure sectors supporting public and private energy/power facilities. The PSED Project is currently working in several countries, including El Salvador, Jamaica, Dominican Republic, Guatemala, Costa Rica, Kenya, India, Indonesia, Tunisia, and the Philippines, where a base of interest in private energy/power development has been developed and could be expanded to include attracting private infrastructure development in support of energy/power facilities.

B. Goal, Purpose, and Objectives of Project

1. Goal

The goal of the ten-year PSED Project is to accelerate the sustainable economic and social development of A.I.D.-assisted countries by increasing the supply of reliable, affordable energy, particularly electric power, and through the improvement of related infrastructural systems for productive purposes.

2. Purpose

The purpose of the PSED Project is to assist in creating a favorable environment to encourage the private ownership, financing, and operation of energy and infrastructural facilities in selected developing countries.

3. Objectives

To achieve the goal and purpose, the PSED Project has three objectives:

a. Induce policy reform and institutional development supportive of private participation in the energy/power and related infrastructure sectors of developing countries. The PSED Project will utilize Country Assessments, Special Studies, Conferences and Workshops, Technical Assistance Teams, Training Courses, Internships, Regional Energy Consultants, and Study Tours to achieve this end.

b. Assist in private energy/power and related infrastructure project development, especially in the electric power sector. While employing Technical Assistance Teams and Special Studies to reach this end, the Project will rely primarily on the Feasibility Study Fund to promote greater private sector involvement in site specific, energy and related infrastructure subprojects.

c. Improve coordination and use of U.S. government resources by the private firms seeking involvement with the energy/power and related infrastructure systems of developing countries. The operation of the Technical Advisory Group -- with representation from across A.I.D., other U.S. government agencies and the private energy sector -- coupled with Conferences, Workshops, and Special Studies are intended to help achieve this end.

C. Project Elements

A.I.D.-assisted countries are at various levels regarding their willingness and ability to accept private sector participation in their energy/power and related infrastructure sectors.

Many countries have public policies, regulations, and practices that prohibit or discourage such private sector involvement. Therefore, the PSED Project inputs and activities listed below will be packaged and targeted according to three different levels: low, medium, and high levels of ability and willingness to accept and implement private participation in their energy sectors. The PSED Project will initially categorize these countries into levels based on assessments of their legal and regulatory systems, financial markets, health of their economies, technical state of existing energy and power facilities and their utilities, and the level of host government interest in private sector participation in power generation (See Annex J).

In those countries where there is low acceptability of private sector participation, such as in some African nations, Country Assessments, Conferences, and General Workshops might be the primary activities. In countries where there are moderate levels of acceptance, Workshops, Study Tours, Technical Assistance Team visits and prefeasibility studies will be used to increase the level of readiness for private participation. In those countries where there exists a high level of interest, acceptability, and readiness for private sector participation in the energy and power sector, the PSED Project will offer Feasibility Study funds for specific subprojects and targeted Technical Assistance along with the other activities outlined above.

It is not anticipated that the PSED Project will involve activities affecting the physical environment, because the Project will finance only technical assistance, training and feasibility studies. Of course, the actual construction of energy/power development, generation, transmission, and energy-related infrastructure facilities, which themselves are outside the scope of this project, may have significant impacts on the environment. However, due to A.I.D.'s commitment to sound environmental practices, appropriate training and technical assistance activities will address environmental concerns. In addition, to the extent the Project would also support feasibility studies possibly leading, at some future time, to the construction of facilities, such studies would incorporate attention to environmental aspects of the proposed energy activities as appropriate.

The number and magnitude of project outputs are based on the Office of Energy and Infrastructure's past experience in the field of private power through the Energy Conservation and Services Project and through discussions with the Missions. For example, the Regional Energy Consultant to be funded at $250,000 per year for four years, is based on conversations with the Missions in Indonesia, Thailand, and the Philippines. These Missions have expressed an interest in having Mission energy officers, but do not have the funding available to support them.

Over the last five years R&D/EI has done country assessments in Pakistan, Indonesia, Thailand, Costa Rica, India, the Dominican Republic, and the Philippines, Jamaica, El Salvador, Kenya, and Mexico. Regional assessments have also been done for countries in South America, Central America, and the Caribbean. The cost of these assessments ranged from $25,000 - $250,000.

Technical assistance teams have been dispatched to the Philippines, Costa Rica, the Dominican Republic, Pakistan, India, El Salvador, Jamaica, Indonesia, Guatemala, and Bolivia, over the last five years. The cost for these technical assistance teams has and is expected to range from $15,000 - $250,000.

In the past, R&D/EI has employed a technical assistance group to advise the ECSP project. This group is no longer functioning.

R&D/EI has held private power workshops/conferences in the Dominican Republic, Indonesia, Costa Rica, the Philippines, Jamaica, El Salvador, Colombia, Guatemala, India, and Malaysia (for regional A.I.D.-assisted countries), over the past four years. The cost of these conferences have ranged from $50,000 - $200,000.

R&D/EI has conducted study tours from Pakistan, India, Indonesia, Morocco, Egypt, Jamaica, and El Salvador.

In the past the Office has completed special studies on potential impediments to private power, computer models analyzing private power projects and the Power Shortages in Developing Countries report. The cost of these studies has ranged between $50,000 and $200,000.

The budget for the core staff is based on the existing Office of Energy and Infrastructure contract with the 8(a) firm of K&M Engineering and Consulting Corporation, which employs seven professionals and three support staff.

The Private Enterprise (PRE) bureau has experience in studies advancing the role of the private sector in developing countries and in direct funding of private sector projects through their loan guarantee program. The PRE bureau is also funding the Center for Privatization, which will be approached by R&D/EI where privatization presents a viable option.

The Trade and Development Program has a feasibility study loan program in effect. The Office of Energy and Infrastructure has worked closely with TDP, and, in the past has cofunded a number of studies with that agency. TDP has been consulted on the design, structure, and operation of the PSED Feasibility Study Fund. To date, the PSED Feasibility Study Fund has funded nine companies to conduct feasibility studies in seven countries. The total combined capacity that may result from these studies is over 1000 MWs. R&D/EI also cooperates with TDP and the Department of Energy in the Federal International Energy Trade Development Opportunities Program, which allows the three agencies to jointly fund feasibility studies for private energy/power projects.

As mentioned, A.I.D. has been involved with the World Bank in Pakistan, Jamaica, India, and

Tunisia and has been in discussion with the International Finance Corporation (IFC), Asian Development Bank (ADB), and InterAmerican Development Bank (IDB) on coordinating their assistance to private sector projects.

It is the intention of the project to focus on medium scale projects. Small scale projects will be considered, however, if they contribute to improving the energy situation of A.I.D.-assisted countries or if they significantly advance the role of the private sector in energy and related infrastructural development. The purpose of the project is to "increase the supply of reliable and affordable energy." The activities of the project by no means diverge from the purpose of the project.

1. Description of Nature and Scope of Inputs and Actions to be Taken During Project

a. Country Assessments

An initial component of the PSED Project will be the preparation of Country Assessments of the potential for, and barriers to, private sector participation in the energy/power and related infrastructure sectors in developing countries. These assessments will (1) identify the market and economic potential for private sector energy/power production, distribution, and other energy development sources; (2) identify opportunities for private participation in the development, ownership, operation and maintenance of those infrastructure facilities directly supporting energy/power installations; (3) identify the policy/regulatory/institutional and other impediments to private sector power and related infrastructure participation; and (4) develop recommendations and an action plan for addressing impediments.

The PSED Project plans to complete twenty-one (21) Country Assessments.

b. Feasibility Study/Subproject Development Assistance Fund

The PSED Project will establish the Feasibility Study/Subproject Development Assistance Fund to share with private developers the cost of prefeasibility, feasibility, and other subproject assistance activities for private power and related infrastructure activities in A.I.D.-assisted countries. Feasibility study funding for public sector energy and infrastructure-related subprojects with a substantial opportunity for private sector investment will also be available, e.g., funding for a state-owned utility to study the feasibility of privatizing its operations. Both private and public sector studies would include an analysis of the technical, legal, financial, and environmental aspects of subprojects. Monies expended by the Feasibility Study fund on successful subprojects would be reimbursed to the U.S. Treasury, unless other arrangements are approved.

Often there is no clear distinction between where a prefeasibility activity ends and a feasibility study begins. Generally, however, prefeasibility activities lead to general project definition and identification of multiple proposed subproject sites and technologies, while a feasibility study is usually specific to a given site and technology.

Prefeasibility activities generally involve research on the regulatory, financial, and technological aspects of private power to help identify a suitable location and the parameters of a subproject. Feasibility activities, however, could include investigating in detail electricity pricing, legal requirements and environmental impacts and mitigation measures, subproject design, engineering and cost estimates and financial planning. Some of the other eligible project assistance activities would include detailed engineering, operation and maintenance plans, contract preparation, technology assessments, and testing programs.

Some illustrative criteria for selecting eligible subprojects include the likelihood of project implementation, the level of private sector costsharing contribution (the PSED would seek, where appropriate,

50/50 public to private costsharing) and the importance of the subproject in advancing the private sector participation in the energy sector. The Feasibility Study Fund would be available to firms from the U.S. and developing countries.

With the proposed resources, the PSED Project would cost share approximately 37 studies.

c. Conduct Special Studies

To promote further private participation in the energy/power and related infrastructure sectors, additional research and analysis is necessary on a variety of issues. As the PSED Project proceeds, the Office of Energy and Infrastructure in coordination with the Core Staff/Expertise Sourcing Contractor will determine what Special Studies are undertaken. The possible special study topics listed below are illustrative, but not inclusive of all of the possible topics.

- Model policies and guidelines for private participation in the energy/power and infrastructure sectors.

This study would develop policies and guidelines for implementing private power and infrastructure. Many developing countries have public policies, regulations, and practices that actually prohibit or discourage private sector involvement. In most A.I.D.-assisted countries, the State owns and controls the electric power and related infrastructural support sectors. Additional barriers to investment by foreign and domestic private sources, such as restrictive tax policies, high import duties, restrictions on repatriation of profits, prohibitions on foreign ownership of companies, lack of guarantees of payment on contracts and inadequate mechanisms for dispute resolution exist in most of the developing countries. Before private sector participation in the energy and infrastructure sectors can occur, a high level policy dialogue must be initiated and basic policy issues must be resolved.

The study would prepare guidelines for implementing appropriate policies which are necessary for private sector involvement in energy development. Guidelines will also be prepared to assist host governments in soliciting and evaluating proposals. negotiating contracts, settling contract disputes and monitoring contract compliance.

- Analysis of alternative private enterprise participation strategies

The involvement of the private sector can take many approaches, depending on the interests of the national government, its utility authorities, and local and foreign private interests. The approaches for private involvement could include:

- private ownership and operation of discrete components of the system, such as generating plants or transmission and distribution systems;
- contracting to private businesses to perform certain functions, such as revenue collection or plant operation and maintenance;
- temporary private ownership where the utility authority sells certain assets for later lease-back or buy-back; and
- investment of private funds into publicly held utility systems through debt instruments, loans, and bonds.

- Capital markets

Depending upon host country needs, important studies for the PSED Project could be the analysis of characteristics of indigenous capital markets and the extend to which these capital markets can provide financing for subprojects and the extent to which they can support private power generation activities over the long-term. The Office of Energy and Infrastructure foresees working closely with the Bureau for Private Enterprise in this area.

- Macro-economic impacts of private power generation

Studies could be conducted, as needed, to assess the impact of private power on the macro-economic situation of developing countries. This could include the effects on Gross National and Domestic Product, balance of payments and trade flows, agricultural and industrial output and employment opportunities in selected developing countries.

- Subproject financing

As needed, finance experts would be retained to analyze possible financing assistance programs, contract guarantees, and possible alternative loan security instruments. Export credit agencies and public and private bank lending programs, such as sovereign guarantees, escrows, and bank letters of credit would also be investigated.

- A.I.D. direct loan or loan guarantee program

A.I.D. recently designed a direct loan program that would be relevant to the PSED Project. The Pakistan Private Sector Energy Development fund is administered by the National Development Finance Corporation. The Fund finances private sector subprojects which meet the eligibility criteria and qualify for financing. The terms of the loan include a five year grace period and repayment over twenty years. The on lending interest rate from the Fund to the eligible private sector entities is currently 14% p.a. The repayment terms for on lending are up to twenty-three years including up to eight years grace period. The Government of Pakistan bears the foreign exchange and interest rate risks.

This type of direct lending and a possible loan guarantee program for the PSED Project would be analyzed.

The PSED Project will complete 14 special studies.

d. Conferences and Training Workshop in Host Countries

The PSED Project will conduct twenty-eight (28) in-country Conferences and Workshops with government officials, state utility officials and private sector representatives to develop acceptable approaches to private sector participation in the energy/power sector, including information about the experience in the United States with the Public Utility Regulatory Policies Act.

The Conferences, aimed at high level government officials and private sector executives, will address key policy and institutional and corporate financial issues based on findings of the country specific assessments. The Conferences are intended to improve the overall policy and institutional framework for private sector participation in the energy sector.

The Workshops will target middle management and technical personnel in government ministries, state utilities, and the private sector. For example, the Workshops will provide guidance in soliciting, evaluating and pricing proposals to produce and sell private power. They will also provide assistance in arranging equitable contracts, securing subproject loans from foreign lenders and integrating private facilities into public power systems.

Examples of successful workshops and seminars of this nature in which A.I.D. has recently participated appear in Annex K.

e. Expertise Sourcing Assistance

The PSED Project will support twenty-seven (27) Technical Assistance Teams of private power experts to be dispatched to A.I.D.-assisted countries requesting assistance for participation in their energy/power sectors. This assistance could help increase their level of confidence in dealing with private sector power firms, thereby reducing the amount of time spend on the expensive development phase. The short term assignments would be from one week to three months. Long-term energy consultants to host countries could also be provided, if necessary and if resources permit. The PSED Project will develop and maintain as part of the Private Power Data Base a "roster" of technical experts. The consultants would have special expertise and experience in energy utility law and regulation, utility power purchase agreements, international law, negotiating with private power providers, international financing and subproject financing, political and commercial risk insurance, utility engineering, design and construction, and market analysis.

Since experts in the field of private power are generally in high demands and are highly compensated, in preparing the PSED Project Paper, a limited telephone survey was undertaken to determine the available of these experts at the A.I.D. maximum daily rates. The survey contacted executives from American Electric Power, Inc., Pacific Gas & Electric, Inc., Morgan Stanley, Shearson Lehmen, California Public Utility Commission, Massachusetts Public Utility Commission, utility economics professors, and utility lawyers.

The survey asked these questions: (1) Would the person be willing to be a technical expert and travel overseas to a developing country to provide training and/or technical assistance for one to two weeks or more? (2) Would they be willing to do so if they were compensated at A.I.D.'s maximum daily rate?

In general, most respondents were willing to consider providing their technical expertise, but could not commit without knowing the exact specifics of the travel and technical assistance required. Public utility commission members expressed the most interest with some lesser degree of interest expressed by utility executives and the utility economics professor and lawyers. Needless to say, follow-on business is always desirable, subject to the standard FAR requirements, which will be included in all such technical assistance contracts and will be followed in the consultant selection procedures to insure that there are no organizational conflicts, as defined in the FAR.

Regarding the compensation question, as expected, few of the persons surveyed would provide a definitive answer concerning their willingness to accept A.I.D. daily rates. The utility commissioners and a utility company executive were the most willing to accept the rates. The acceptance of the A.I.D. rate apparently depends on the nature of the assignment, its relationship to other business opportunities, individual availability and the length of the assignment.

It was generally concluded that a sufficient number of technical experts would be available for the PSED Project Technical Assistance Teams and that the A.I.D. compensation rate would not be a significant obstacle for short term (1-2 week assignments). For longer term assignments and for special individuals, however, it

was clear that a waiver from A.I.D.'s compensation rate would be necessary.

f. Regional Energy Representatives

A.I.D. Missions are commonly unable to devote a person full-time to energy matters, let along private power issues. Therefore, the PSED Project proposes to seek funding for at least one energy consultant, to be located in an A.I.D. regional office, to encourage and assist private participation in the energy/power sectors of the countries of that region. Funding will have to be derived from the Bureau, Regional Offices, and Missions since the PSED Project lacks sufficient resources.

The PSED Project will fund two regional energy representatives per year.

g. Study Tours

During the PID review, a number of participants urged the inclusion of Study Tours in the PSED Project. Bringing officials from developing countries to the United States has proven very effective in a number of A.I.D. programs.

Given the dramatic expansion of interest by U.S. companies and utilities in private power and the potential to market U.S. goods and services, the Project now intends to conduct eighteen Study Tours of the facilities and operations of U.S. utilities, private power producers and U.S. public utility commissions for representatives from A.I.D.-assisted countries. **The PSED Project will conduct 30 study tours over the course of the project.**

h. The Technical Advisory Group

In order to assist the Core Staff/Expertise Sourcing Contractor, a Technical Advisory Group (TAG) would be established to provide guidance and counsel to the PSED Project. The TAG will be comprised of representatives of government and industry chosen by the contractor with input from the Office of Energy and Infrastructure. Examples of possible members include A.I.D. Bureaus and Missions, TDP, Eximbank, OPIC, DOC, DOE, and U.S. energy companies.

The TAG will provide a forum for the discussion of the progress of the PSED Project and a review of project policy and direction. The TAG would provide a mechanism for detached review of ideas in a knowledgeable forum to ensure that the project pursues viable options and is abreast of the latest developments of the industry. Also, the TAG will help ensure coordination within A.I.D., and with other U.S. agencies and with the energy industry. **The PSED Program will organize two meetings per year of the Technical Advisory Group.**

i. Supervision of the Private Power Data Base

In order to help coordinate the activities of the PSED Project on a worldwide basis, the Office of Energy and Infrastructure proposes to assist in maintaining the Private Power Data Base, established under Energy Conservation Services Program (936-5728). The Data Base contains information concerning country policies, key contracts, subproject opportunities, U.S. suppliers of power equipment and services. The Data Base will be valuable in providing support to the public and private sectors.

Building upon its extensive network in A.I.D.-assisted countries, such activity would be coordinated with the DOC Major Project Tracking System and its Foreign Commercial Service, as well as interagency activities carried out under DOE's Committee on Renewable Energy Commerce and Trade (CORECT).

The Data Base will provide an updated inventory of the following:

- Subproject opportunities by country;
- U.S. and foreign suppliers of power equipment and services;
- Key contact persons, firms, agencies, and associations in the public and private sectors of developing countries;
- Current information about laws and regulations on private power; and
- Information about the economic and trade impacts of specific subprojects, including jobs created, value of exports of goods and services utilized, and estimates of annual income generated.

The PSED Project will maintain the database with seven countries actively updated in the database. Thirty-two (32) issues of the Private Power Reporter, a quarterly newsletter with information from the Private Power Database, during the life of the project.

2. Project Sites

At this time, sites for PSED Project activities have not been determined. It is believed, however, that the activities, especially feasibility and special studies, will be carried out in the Philippines, Costa Rica, the Dominican Republic, Jamaica, Indonesia and/or Pakistan, El Salvador, Honduras, Colombia, Brazil, Venezuela, Kenya, Egypt, Nigeria, the Commonwealth of Independent States. This is due to the high level of interest and cooperation in private sector energy development by these host country governments to date.

3. Project Participants and Responsibilities

a. Office of Energy and Infrastructure

The Office of Energy and Infrastructure will assign a Project Officer who will be responsible for overseeing and providing guidance for the PSED Project. The Office of Energy and Infrastructure will provide centralized project supervision and a mechanism for dissemination of project results as needed in the broader A.I.D. policy and programming process. The Office of Energy and Infrastructure will coordinate the efforts of the other A.I.D. Bureaus, Missions, the multilateral banks, other government agencies and representatives from private industry, in order to achieve the project objectives in an efficient manner. The Project Officer in the Office of Energy and Infrastructure will be responsible for managing the project and ensuring that A.I.D. objectives are met.

b. Other A.I.D. Bureaus and Missions

The expertise and knowledge of the A.I.D. Bureaus and Missions of the current conditions in host countries will important to the efficient implementation of energy subprojects.

The A.I.D. Bureaus and Missions would provide information germane to the specific subprojects, such

as economic, environmental, cultural, and political considerations existing in the host country. They will be invited to assist the PSED Project in activities such as the following:

- Advise on feasibility studies;
- Recommend countries needing technical experts;
- Co-sponsor Country Assessments, Conferences, Workshops, Training and Internships, and Study Tours; and
- Collaborate on Special Studies and Regional Energy Consultants.

c. Core Staff and Expertise Sourcing Contractor

The Core Staff/Expertise Sourcing Contractor has overall responsibility for PSED Project management and coordination. The contractor oversees all activities with direct responsibility for the Technical Advisory Group, Technical Assistance teams, workshops and conferences, study tours, and the private power database, and the regional energy consultants.

d. Feasibility Study Fund Administration

This contractor serves as Feasibility Study Fund administrator on a worldwide basis. The contractor is responsible for several key functions, including the following:

- Promote the PSED Project and the use of the Feasibility Study Fund throughout the energy industry and A.I.D. worldwide so that qualified parties are aware of the existence of the Fund, its purpose and procedures required to access it;
- Solicit applications for assistance from the Feasibility Study Fund;
- Help the Office of Energy and Infrastructure review proposals for feasibility studies;
- As needed, conduct special studies, such as economic, financial, institutional/regulatory and technical analysis to ascertain likelihood of success of subprojects proposed in applications to the Feasibility Study Fund;
- Assist subproject sponsors and A.I.D. with application to the Feasibility Study Fund, throughout the contracting phase, and later, assist subproject sponsors with A.I.D. administrative problems related to their subprojects; and
- Provide project monitoring support to help ensure that A.I.D.'s objectives are met by subproject sponsors.

For the initial sixteen months of the PSED Project the Feasibility Study Fund was administered by Bechtel. The current Feasibility Study Fund Administrator is Price Waterhouse. The standard subcontract agreement developed by Price Waterhouse has been reviewed and approved by the A.I.D. Procurement Offices. The Price Waterhouse contract with the Office of Energy and Infrastructure extends to September, 1994.

e. Subproject Sponsors

For the purposes of the PSED Project, a "subproject" is a proposed private energy facility, such as a power generation plant. The subproject sponsor will be a U.S. or host country private sector company responsible for project development, financing or implementation. The subproject sponsor would be responsible for prefeasibility and feasibility studies for individual private energy subprojects. The subproject sponsor will be responsible for determining the economic, financial, social, and environmental feasibility of a particular power subproject.

Willingness of private firms to buy into the project is based on offers from over twenty-five (Cogentrix, United Engineers, Stone and Webster, United Engineers, Florida Power and Light, Intrag,

Bechtel, AES Transpower, Synergics, Southern Electric International, ICF Kaiser, Mission Energy,) and from the research conducted for the Power Shortages in Developing Countries Report. **To date the PSED Project has funded seven subprojects.**

f. Other appropriate U.S. agencies, bilateral donors & multilateral development banks

Other appropriate U.S. agencies, such as OPIC, the Department of Commerce and the Department of Energy, will be invited to participate in this project, either on a subproject by subproject basis or as members c the Technical Advisory Group.

The Department of Commerce sponsors trade missions which promote U.S. exports and posts Foreign Commercial Service Officers in A.I.D.-assisted countries. They would be a useful instrument for promoting th Private Sector Energy Development Program and would be a forum for attracting U.S. firms to invest in developing countries.

The Department of Energy has a fund ($750,000) available for use on energy development in the advanced coal technologies area. The DOE also has an experienced technical staff who could assist in the evaluation of subproject proposals.

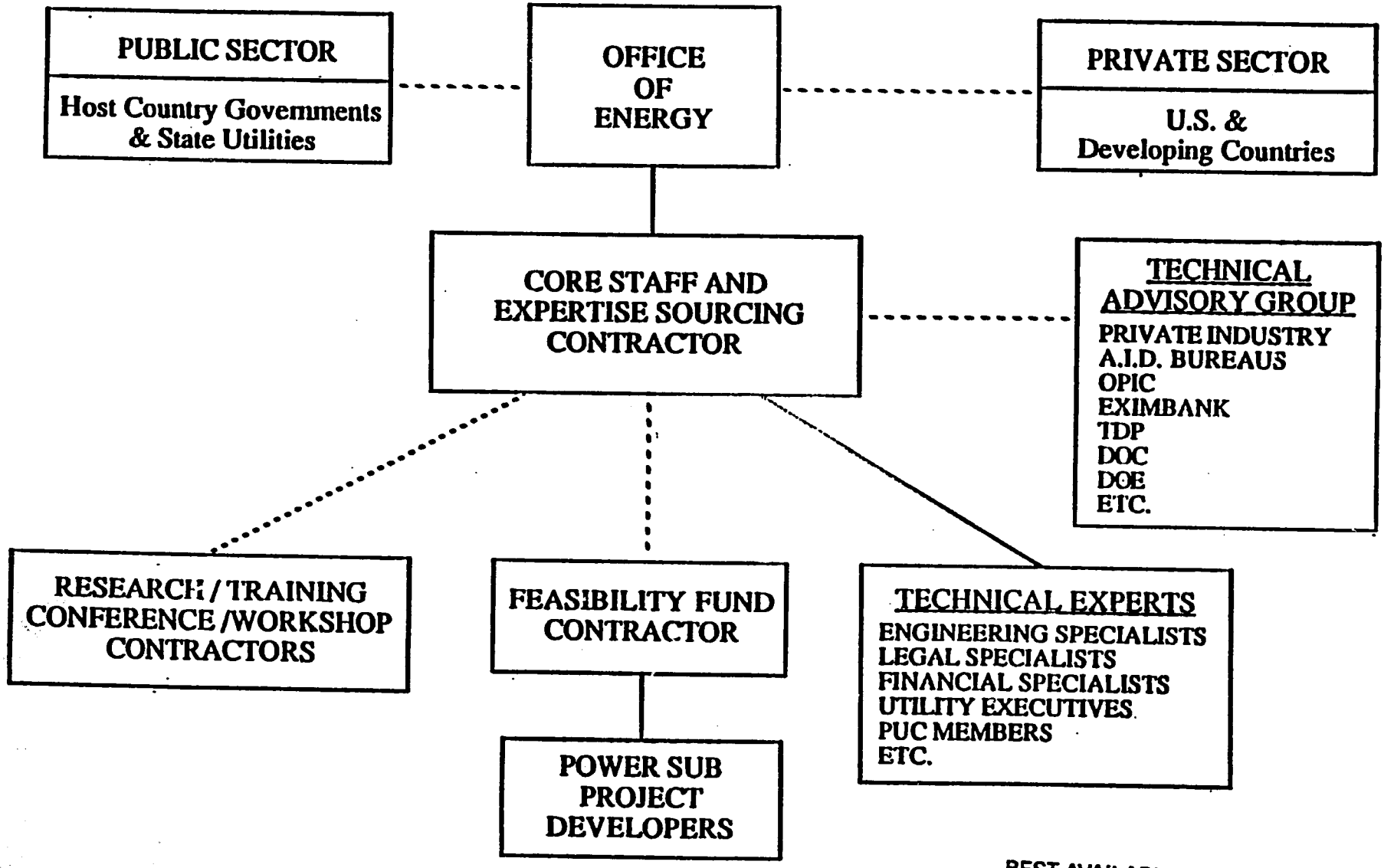
Since EXIMBANK and OPIC are potential sources of direct loan guarantees or risk insurance for private energy subprojects, they could play major roles in increasing private participation in the energy sector.

The World Bank, Asian Development Bank, Interamerican Development Bank, the African Development Bank, and International Finance Corporation are multilateral financial institutions that could assist in the financing of energy generating projects. Their precise involvement in the project will depend upon specific subprojects that are proposed.

Government and State utilities in A.I.D.-assisted countries would be the direct beneficiaries of A.I.D. technical assistance, training, and special studies. Their participation would be sought in all project activities throughout the life of the project.

The PSED Project will benefit private industry and energy trade associations through it information dissemination activities and opportunities to provide technical assistance, as well as through its ability to create new subproject opportunities for energy/power equipment supply and service companies. While the PSED Project will not be a funding source for subproject development beyond the feasibility study stage, an objective of the PSED Project is to leverage private capital for investment in the energy/power sector of A.I.D.-assisted

PSED PROJECT ORGANIZATIONAL CHART



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countries. To the extent that it is able to do so, the PSED Project will also benefit international and host country capital market groups including securities markets, private banks, and private investors.

III. COST ESTIMATES AND FINANCIAL PLANS

The PSED Project will be funded at $62.6 million over the life of the project -- $42.3 million of Office of Energy and Infrastructure funds and an estimated $20.34 million in matching funds from Missions, other A.I.D. Bureaus, other donor agencies, multilateral funding agencies and the private sector. The project will be conducted over a period of ten years beginning in 1989, with funding commitments to be completed in the tenth year, 1998. The following outputs are expected:

- Twenty-One (21) Country Assessments/Strategic Plans of the p r Private Sector participation
- Thirty-seven (37) Feasibility Studies
- Fourteen (14) Special Studies (e.g., Macro-economic impact studies, local capital market requirement studies, and studies on the alternative forms of private sector participation in the energy sector).
- Twenty-Eight (28) conferences and workshops
- Twenty-Seven (27) Short-term Technical Assistance Team Missions to Host Countries
- Two (2) Regional Energy Consultants in the field
- Thirty (30) Study Tours
- Twelve (12) Technical Advisory Group Meetings
- Private Power Data Base supervised.

The PSED Project Budget appears in Exhibit 2. The activities of PSED Project in a specific country will depend on the particular in-country conditions and how evolve over time. Since the type of private power activities that the PSED Project will undertake in a particular country cannot be known, a certain degree of flexibility between funding levels for different activities is required.

EXHIBIT 2-i

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (936-5738)
TOTAL BUDGET FOR OBLIGATION OF FUNDS FY 1992-1998

	TOTAL 1992-1998			
EXPENDITURES(3)	PSED	BUY INS	PRIV S C/S (1)	TOTAL
A. PROJ CORE STAFF(2)				
Director	1,663,980	0	0	1,663,980
Deputy Director	1,663,980	0	0	1,663,980
Legal/Fin Spec	1,663,980	0	0	1,663,980
Res Proj Mgr	801,916	0	0	801,916
Res Assist (2)	1,202,875	0	0	1,202,875
Office Mgr	601,438	0	0	601,438
Secretary (2)	1,002,395	0	0	1,002,395
B. TECH ADVGROUP(4)	550,943	0	67,200	618,143
C. TECH ASSIST TMS(5)	3,860,497	350,000	0	4,210,497
D. CONF/WKSHOPS(6)	4,811,494	0	0	4,811,494
E. STUDY TOURS(7)	1,122,684	210,000	35,000	1,367,684
F. COUNTRY ASSESS(8)	2,405,747	475,000	0	2,880,747
G. SPEC STUDIES(9)	833,996	300,000	0	1,133,996
H. REG EY CNSLT(10)	1,603,923	1,331,175	0	2,935,098
I. FEAS STUDIES(11)	8,019,149	3,287,853	13,632,561	24,939,563
J. FEAS FUND ADM(12)	1,603,829	657,571	0	2,261,400
K. PRIV PWR DBSE(13)	561,342	0	0	561,342
L. EVALS/AUDITS(14)	225,000	0	0	225,000
TOTAL EXPENDITURES	34,199,168	6,611,599	13,734,760	54,545,528

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Exhibit 2-ii

8a CONTRACT

TECHNICAL ADVISORY GROUP

Category	Year 1	Year 2
2 Meetings in D.C.* $22,500@	45,000	45,000
2 Committee meetings in D.C.** $6,075	12,150	12,150
Misc. Expenses: mailings, copying, telephones	3,000	4,000
Subtotals	60,150	61,150

* Assumptions: 20 members: 5 from D.C. area, 5 from East Coast, 5 from West Coast, and 5 from Midwest
Per diem = 3 days per meeting = 3 X $125/day = $375 @ 20 X $375 = $7,500
Travel = (10 X $600) + (5 X $1,000) = $11,000
Misc. expenses = $4,000

** Assumptions: 5 members: 1 from D.C. area, 1 from East Coast, 2 from West Coast and 1 from Midwest
Per diem = 3 days per meeting = 3 X $125 - $375 @ 5 X$375 = $1,375
Travel = (2 X $600) + (2 X $1,000) = $3,200
Misc. expenses = $1,000

Exhibit 2-iii

8a CONTRACT

EXPERTISE SOURCING
SHORT-TERM TECHNICAL ASSISTANCE TRIPS

Category	Year 1	Year 2
4 Expert Teams/yr.* $22,500@	90,400	90,400
Subtotal	$90,400	$90,400

* Assumptions: Expenses for 1 trip with 2 experts per team
Air fare = $4,000 x 2 = $8,000
Per diem = 14 days/trip x 2 x $100/day = $2,800
Salary = $350/day x 14 days x 2 = $9,800
Expenses = $2,000/trip
Total = $22,600/trip

Exhibit 2-iv

8a CONTRACT

WORKSHOPS

Category	Year 1	Year 2
2 One Day Workshops for Utils. & PP Devels. - 1 East Coast & 1 West Coast*	11,600	11,600
1 Two Day Wkshp. in Devel. Count**	78,500	78,500
Subtotal	$90,100	90,100

* Assumptions: Costs for one workshops
1 outside speaker: fee = $500; airfare = $600; per diem for 2 days = $100 x 2 = $200
Subtotal = $1,300
Room rental, A-V equipment rental for day = $500
Brochure & mailing = $500
Misc. expenses = $1,000
Subcontractor support = $2,500
Subtotal = $5,800

** Assumptions: Costs for one 2 day workshop
5 outside speakers: fee $1,000@ x 5 = $5,000; airfare = $3,000@ x 5 = $15,000; per diem = $100/day x 5 = $3,500
Subcontractor support = $35,000
Brochure preparation & mailing = $10,000
In-country logistics = $10,000
Subtotal = $43,500

Exhibit 2-v

8a CONTRACT

STUDY TOURS

Category	Year 1	Year 2
1 tour per year*	33,750	33,750
Subtotal	33,750	33,750

* Assumptions: Costs per study tour with 5 persons per tour
Air fare = $4,000 x 5 = $20,000
Per diem = $125/day x 5 x 14 days = $8,750
In-country transportation = $3,000
Misc. expenses = $2,000
Subcontractor support = $33,750
Subtotal = $5,800

Exhibit 2-vi

8a CONTRACT

SPECIAL STUDIES

Category	Year 1	Year 2
Security Issues for Private Power	$40,000	
Other studies	$20,000	30,000
Subtotal	$60,000	30,000

EXHIBIT 3-i

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (936-5738)
DETAILED BUDGET FOR OBLIGATION OF FUNDS FY 1992-1998

	FY 1992				FY 1993				FY 1994			
EXPENDITURES(3)	PSED	BUY INS	PRIVS C/S (1)	TOTAL	PSED	BUY INS	PRIVS C/S (1)	TOTAL	PSED	BUY INS	PRIVS C/S (1)	TOTAL
A. PROJ CORE STAFF(2)												
Director	207,500	0	0	207,500	216,838	0	0	216,838	226,596	0	0	226,596
Deputy Director	207,500	0	0	207,500	216,838	0	0	216,838	226,596	0	0	226,596
Legal/Fin Spec	207,500	0	0	207,500	216,838	0	0	216,838	226,596	0	0	226,596
Res Proj Mgr	100,000	0	0	100,000	104,500	0	0	104,500	109,203	0	0	109,203
Res Assist (2)	150,000	0	0	150,000	156,750	0	0	156,750	163,804	0	0	163,804
Office Mgr	75,000	0	0	75,000	78,375	0	0	78,375	81,902	0	0	81,902
Secretary (2)	125,000	0	0	125,000	130,625	0	0	130,625	136,503	0	0	136,503
B. TECH ADVGROUP(4)	60,300	0	9,600	69,900	73,046	0	9,600	82,646	76,333	0	9,600	85,933
C. TECH ASSIST TMS(5)	402,000	50,000	0	452,000	472,340	50,000	0	522,340	545,845	50,000	0	595,845
D. CONF/WKSHOPS(6)	600,000	0	0	600,000	627,000	0	0	627,000	655,215	0	0	655,215
E. STUDY TOURS(7)	140,000	30,000	5,000	175,000	146,300	30,000	5,000	181,300	152,884	30,000	5,000	187,884
F. COUNTRY ASSESS(8)	300,000	50,000	0	350,000	313,500	50,000	0	363,500	327,608	75,000	0	402,608
G. SPEC STUDIES(9)	104,000	0	0	104,000	108,680	50,000	0	158,680	113,571	50,000	0	163,571
H. REG EY CNSLT(10)	200,000	166,000	0	366,000	209,000	173,470	0	382,470	218,405	181,276	0	399,681
I. FEAS STUDIES(11)	1,000,000	410,000	1,700,000	3,110,000	1,045,000	428,450	1,776,500	3,249,950	1,092,025	447,730	1,856,443	3,396,198
J. FEAS FUND ADM(12)	200,000	82,000	0	282,000	209,000	85,690	0	294,690	218,405	89,546	0	307,951
K. PRIV PWR DBSE(13)	70,000	0	0	70,000	73,150	0	0	73,150	76,442	0	0	76,442
L. EVALS/AUDITS(14)	0	0	0	0	50,000	0	0	50,000	0	0	0	0
TOTAL EXPENDITURES	4,148,800	788,000	1,714,600	6,651,400	4,447,780	867,610	1,791,100	7,106,490	4,647,933	923,552	1,871,042	7,442,528

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EXHIBIT 3-ii

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (936-5738)
DETAILED BUDGET FOR OBLIGATION OF FUNDS FY 1992-1998

	FY 1995				FY 1996				FY 1997			
EXPENDITURES(3)	PSED	BUY INS	PRIVS C/S (1)	TOTAL	PSED	BUY INS	PRIVS C/S (1)	TOTAL	PSED	BUY INS	PRIVS C/S (1)	TOTAL
A. PROJ CORE STAFF(2)												
Director	236,793	0	0	236,793	247,449	0	0	247,449	258,584	0	0	258,584
Deputy Director	236,793	0	0	236,793	247,449	0	0	247,449	258,584	0	0	258,584
Legal/Fin Spec	236,793	0	0	236,793	247,449	0	0	247,449	258,584	0	0	258,584
Res Proj Mgr	114,117	0	0	114,117	119,252	0	0	119,252	124,618	0	0	124,618
Res Assist (2)	171,175	0	0	171,175	178,878	0	0	178,878	186,928	0	0	186,928
Office Mgr	85,588	0	0	85,588	89,439	0	0	89,439	93,464	0	0	93,464
Secretary (2)	142,646	0	0	142,646	149,065	0	0	149,065	155,773	0	0	155,773
B. TECH ADVGROUP(4)	79,768	0	9,600	89,368	83,358	0	9,600	92,958	87,109	0	9,600	96,709
C. TECH ASSIST TMS(5)	570,408	50,000	0	620,408	596,076	50,000	0	646,076	622,899	50,000	0	672,899
D. CONF/WKSHOPS(6)	684,700	0	0	684,700	715,512	0	0	715,512	747,710	0	0	747,710
E. STUDY TOURS(7)	159,764	30,000	5,000	194,764	166,953	30,000	5,000	201,953	174,466	30,000	5,000	209,466
F. COUNTRY ASSESS(8)	342,350	75,000	0	417,350	357,756	75,000	0	432,756	373,855	75,000	0	448,855
G. SPEC STUDIES(9)	118,682	50,000	0	168,682	124,023	50,000	0	174,023	129,604	50,000	0	179,604
H. REG EY CNSLT(10)	228,233	189,433	0	417,666	238,503	197,957	0	436,460	249,236	206,865	0	456,101
I. FEAS STUDIES(11)	1,141,166	467,878	1,939,983	3,549,027	1,192,518	488,933	2,027,282	3,708,733	1,246,181	510,935	2,118,510	3,875,626
J. FEAS FUND ADM(12)	228,233	93,576	0	321,809	238,503	97,787	0	336,290	249,236	102,187	0	351,423
K. PRIV PWR DBSE(13)	79,882	0	0	79,882	83,477	0	0	83,477	87,233	0	0	87,233
L. EVALS/AUDITS(14)	75,000	0	0	75,000	0	0	0	0	0	0	0	0
TOTAL EXPENDITURES	4,932,091	955,887	1,954,582	7,842,561	5,075,660	989,677	2,041,881	8,107,219	5,304,064	1,024,987	2,133,109	8,462,161

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EXHIBIT 3-iii

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (936-5738)
DETAILED BUDGET FOR OBLIGATION OF FUNDS FY 1992-1998

	FY 1998			
EXPENDITURES(3)	PSED	BUY INS	PRIV S C/S (1)	TOTAL
A. PROJ CORE STAFF(2)				
Director	270,220	0	0	270,220
Deputy Director	270,220	0	0	270,220
Legal/Fin Spec	270,220	0	0	270,220
Res Proj Mgr	130,226	0	0	130,226
Res Assist (2)	195,340	0	0	195,340
Office Mgr	97,670	0	0	97,670
Secretary (2)	162,783	0	0	162,783
B. TECH ADVGROUP(4)	91,029	0	9,600	100,629
C. TECH ASSIST TMS(5)	650,929	50,000	0	700,929
D. CONF/WKSHOPS(6)	781,357	0	0	781,357
E. STUDY TOURS(7)	182,317	30,000	5,000	217,317
F. COUNTRY ASSESS(8)	390,678	75,000	0	465,678
G. SPEC STUDIES(9)	135,436	50,000	0	185,436
H. REG EY CNSLT(10)	260,546	216,174	0	476,720
I. FEAS STUDIES(11)	1,302,259	533,927	2,213,843	4,050,029
J. FEAS FUND ADM(12)	260,452	106,785	0	367,237
K. PRIV PWR DBSE(13)	91,158	0	0	91,158
L. EVALS/AUDITS(14)	100,000	0	0	100,000
TOTAL EXPENDITURES	5,642,840	1,061,886	2,228,442	8,933,169

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EXHIBIT 3-iv

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT (936-5738)

SUMMARY OF BUDGET FOR FY 1992-1998

FISCAL YEARS	PSED	BUY INS	PRIV S C/S (1)	TOTAL
FY 92	4,148,800	788,000	1,714,600	6,651,400
FY 93	4,447,780	867,610	1,791,100	7,106,490
FY 94	4,647,933	923,552	1,871,043	7,442,528
FY 95	4,932,091	955,887	1,954,583	7,842,561
FY 96	5,075,660	989,677	2,041,882	8,107,219
FY 97	5,304,064	1,024,987	2,133,110	8,462,161
FY 98	5,642,840	1,061,886	2,228,443	8,933,169
TOTAL	34,199,168	6,611,599	13,734,760	54,545,528

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EXHIBIT 3-v

OFFICE OF ENERGY AND INFRASTRUCTURE
BUREAU FOR RESEARCH AND DEVELOPMENT
PRIVATE SECTOR ENERGY DEVELOPMENT (936-5738)

FOOTNOTES AND ASSUMPTIONS TO BUDGET FOR FY 1992-1998

(1) Private Sector Cost Sharing.

(2) Salaries are based on current experience of program core staff and include a multiplier of 2.50. Secretary salaries include a multiplier of 1.4.

(3) Esitmates for FY 1992 are based on current experience of the program. Estimates for FY 1993 - 1998 are escalated by 1.045 per year, excluding estimates for buy-ins and cost sharing.

(4) **Technical Advisory Group.** Assumes all staffing expenses provided under Project Core Staff. Assumes $9,600/yr in cost sharing (30 people x $320/day = $9,600). Assumes domestic travel for 30 technical experts:

Travel:	30 people x $600/rdtp air	$18,000
Perdiem:	30 people x $135/day x 3 days	$12,150
Subtotal		$30,150

$30,150/mtg x 2 mtgs/yr = **$ 60,300**

(5) **Techical Assistance Teams.** Assumes all staff costs provided under Project Core Staff. Assumes 3 people per Technical Assistance Team, consulting fees, international travel, perdiem and miscellaneous expenses:

Labor:	$320/day x 2.5 multiplier x 3 people x 5 days x 4 trips =	$ 48,000
Travel:	3 people x $3,500/rdtp air x 4 trips =	$ 42,000
Perdiem:	3 people x $125/day x 5 days x 4 trips	$ 7,500
Misc:		$ 3,000
Subtotal		$100,500

$100,500 per team x 4 teams per year = **$402,000**

(6) **Conferences/Workshops.** Assumes 4 workshops per year at $150,000 per workshop:

Travel:	30 speakers x $2,370/rdtp	$ 71,100
Perdiem:	30 speakers x $125/day x 3 days	$ 11,250
Staff Travel:		
	3 people x $2,370/rdtp x 2 trips	$ 14,220
	3 people x $125/day x 35 days	$ 13,125

EXHIBIT 3-v

Other Costs:

Printing - 30 speakers x 25 pages x 250 copies x .10/page	$ 18,625
Conference Space	$ 6,000
Translation	$ 2,500
Video Recordings	$ 1,000
Materials/Supplies (includes binders)	$ 3,000
Logistics Support (local contractor)	$ 10,000
Total	$150,820

$150,000/workshop x 4 per year = **$600,000**

(7) **Study Tours.** Assumes 4 per year at $35,000 per tour:

Travel: 6 people x $2,370/rdtp	$ 14,220
Perdiem: 6 people x $135/day x 14 days	$ 11,340
Domestic Travel: 6 people x $900/rdtp	$ 5,400
Logistics Support	$ 4,040
Total	$ 35,000

$35,000/tour x 4 per year = **$140,000**

(8) **Country Assessments.** Assumes 3 per year at $100,000 per assessment:

Labor: $800/day ($320/day + 2.5 multiplier) x 3 people x 15 days	$ 36,000
Travel: 3 people x $2,370/rdtp	$ 7,110
Perdiem: 3 people x $125/day x 15 days	$ 5,625
Reports: $800/day x 3 people x 15 days	$ 36,000
Mat/Supplies: (copy reports, binders)	$ 5,265
Logistics Support: (local subcontractor)	$ 10,000
Total	$100,000

$100,000/assessment x 3 per year = **$300,000**

(9) **Special Studies.** Assumes 2 studies per year at $52,000 per study:

Labor: 1 person x $800/day x 60 days	$ 48,000
Travel: 1 person x $2,370/rdtp	$ 2,370
Perdiem: 1 Person x $125/day x 15 days	$ 1,875
	$ 52,000

$52,000/study x 2 per year = **$104,000**

(10) **Regional Energy Consultant (REG EY CONSULT).** Assumes 2 consultants per year at $100,000 per consultant. Includes salaries, reports, travel and perdiem expenses for 2 consultants:

$100,000/consultant x 2 per year = **$200,000**

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EXHIBIT 3-v

(11) **Feasibility Studies.** Assumes 5 per year at $200,000 per study.

$200,000/study x 5 per year = **$1,000,000**

(12) **Feasibility Administration.** Assumes 20% of Feasibility Study budget per year:

$1,000,000/yr x .20 = **$200,000**

(13) **Private Power Database.** Includes publishing of the Private Power Reporter. Assumes $10,000 per country per year x 7 countries:

$10,000/yr. x 7 countries = **$70,000**

(14) **Audits and Evaluations.** Assumes $50,000 in 1992, $75,000 in 1995 and $100,000 in 1998:

FY 1992	=	**$ 50,000**
FY 1995	=	**$ 75,000**
FY 1998	=	**$100,000**

IV. IMPLEMENTATION PLAN

A. Description of Responsibilities of Participants

The PSED Project will be administered by a Project Officer in the Office of Energy and Infrastructure who will be directly accountable to the Director of the Office of Energy and Infrastructure.

Core Contractor

The PSED Project will continue to operate primarily through two contractors; the Core Contractor and the Feasibility Study Fund Administrator.

The Core Contractor will be responsible for overall coordination and marketing of the PSED Project and will assist the Office of Energy and Infrastructure in its project management responsibilities and in obtaining A.I.D. buy-ins and matching funds from private sources. This contractor will retain a core project staff; supervise the Private Power Data Base and the "Private Power Reporter"; organize and lead the Study Tours for energy officials from developing countries; organize and supervise the workshops for representatives of U.S. energy industry and developing countries; organize and staff the Technical Advisory Group; organize and as appropriate, lead the Technical Assistance Team trips to developing countries; organize and supervise training (which will continue to be funded through the Energy Training Project); assist the Office of Energy and Infrastructure and the Feasibility Study Fund Contractor with designing, marketing and implementing the Feasibility Study Fund; assist the Office of Energy and Infrastructure, as needed, with other feasibility studies funded through other projects in the Office of Energy; assist the Office of Energy and Infrastructure in designing and implementing the Conferences; assist the Office of Energy and Infrastructure in supervising the Country Assessments. The Core Contractor will also be responsible for coordinating PSED Project activities, under the direction of the A.I.D. Project Officer, with other activities within the Office of Energy and Infrastructure and other A.I.D. Bureaus and Missions.

To advise the Core Staff/Expertise Sourcing Contractor on matters relevant to private sector energy development, the contractor will form a Technical Advisory Group (TAG). The TAG may be comprised of the Project Officer, Project Director of each of the two contractors, A.I.D. Bureau and Mission representatives as appropriate, a representative from DOE, DOC, TDP, OPIC, EXIMBANK, and representatives from the private sector energy industry, particularly the power industry.

The full TAG will meet twice a year to review the overall progress and direction of the PSED Project, and provide a forum to discuss trends and developments in the field as they relate to the PSED Project. The TAG will also have an opportunity to review the most recent proposals for use of the Feasibility Study Fund and provide input on the viability of proposals. The TAG will guard against the PSED Project becoming insular or non-responsive to external forces.

Feasibility Study Fund Administrator

It will be the responsibility of the Feasibility Study Fund Contractor to coordinate the activities associated with the Feasibility Study Fund worldwide. The Feasibility Study Fund contractor will capitalize the Feasibility Study Fund; conduct an annual solicitation for subproject sponsors ("assistance recipients"); prepare a "Standard Form Agreement," which will be developed in consultation with the Office of Procurement and the Office of the General Counsel, for execution by the recipient. (This Standard Form Agreement will include appropriate clauses to reserve rights to the U.S. Government similar to conditions for direct A.I.D. grants, such as rights of access to examine recipient records); advise A.I.D. on which should be approved; and distribute and account for funds for the recipients and administer the repayment of funds from successful subprojects. Monies

expended would be repaid to the U.S. Treasury unless other arrangements are approved.

The Feasibility Study Fund Administrator contract is currently held by Price Waterhouse. Price Waterhouse has developed a standard form agreement for subcontracts with project sponsors of subprojects, which has been reviewed and approved by the Offices of Procurement and General Counsel. The Price Waterhouse contract is effective through September, 1994.

For the follow on operation of the Feasibility Study Fund both a cooperative agreement, with its known limitations, and a straight contract are being considered. The Office of Energy and Infrastructure, in consultation with the Office of Procurement, will make the decision of what procurement method is appropriate.

A cooperative agreement might be an appropriate procurement vehicle where A.I.D. could support an eligible organization doing work in this subject area. It is envisioned that upon termination of A.I.D. assistance this activity would be sustained by contributions from private and other non-A.I.D. sources of funding. Concurrence on the future administration arrangements for the Feasibility Study Fund will be obtained from both the Office of General Counsel and the Agency's Office of Procurement.

The Feasibility Study Fund Contractor will work closely with the Core Staff/Expertise Sourcing Contractor to evaluate proposals submitted to the Feasibility Study Fund, assist in expediting administrative details related to use of the Feasibility Study Fund, and disseminate information with respect to the use of the Feasibility Study Fund and progress and findings of the PSED Project. The Feasibility Study Fund Contractor must demonstrate organizational, managerial, and administrative support ability to manage a project of this magnitude.

The Feasibility Study Fund will. continue to operate on a first-come, first-served basis using the evaluation criteria modeled after the criteria used by the U.S. Trade and Development Program's Feasibility Study Fund. Funds will be made available to subproject sponsors through application to the Feasibility Study Fund Contractor under this project. Funds will be disbursed to conduct prefeasibility, feasibility and other project assistance activities to determine the technical, commercial, and financial feasibility of the subproject described in the applicant's study proposal.

The Feasibility Study Fund Contractor will make an annual announcement in the Commerce Business Daily and other appropriate journals of the availability of funds and a request for applications. The announcement will contain the following:

- Description of the Feasibility Study Fund and its purpose.
- Priority areas of interest for funding subprojects.
- Proposal selection criteria.
- Proposal evaluation and review procedures.
- Schedule for submitting applications.

The selection of assistance recipients will made by judging them against the criteria, similar to the traditional A.I.D. grant selection approach, (not against one another) on a first-come, first-served basis until the funds are totally committed each year.

A full list of selection criteria will be drawn up by the Feasibility Study Fund Administrator for the

approval of the Office of Energy and Infrastructure. At a minimum, applicants must possess sufficient financial resources and/or the business experience necessary to attract the financing and management that implementation of the subproject would require.

Other Contractors

As needed, the PSED Project will buy into existing Office of Energy and Infrastructure contractors and IDC's to undertake the Country Assessments, Special Studies, Conferences, Workshops, Study Tours, Training, and some Technical Assistance Team Activities.

B. Procurement Plan

1. Number of Procurements

The Office of Energy and Infrastructure currently does not require the services of contractor outside of the core staff contractor and the feasibility study fund administrator contract. The PSED will, however, require the following procurements mechanisms:

a. The PSED Project will require a new core staff contractor in FY 1994.

b. A new Feasibility Study Fund Administrator contractor will be required in FY 1994.

2. Options on contracting arrangements & procedures

All commodities, services, and suppliers financed by A.I.D. under this project shall have their source, origin, and nationality in the United States, except for the commodities, services, and suppliers that can only be locally procured in the "cooperating country". (Each country in which research, training, or technical or other assistance takes place under the project shall be considered a "cooperating country".) All such local procurements under this project fall under the exceptions listed in A.I.D. Handbook 1, Supplement B [Chapter 18, sections 1.c.(4) and 1.c.(6)], and therefore, no source/nationality waivers will be required. These local goods and services include such items as professional services contracts estimated not to exceed $250,000 as well as commodities and services which are only available locally: communications services, rental costs for housing and office space, hotel accommodations, meeting facilities, etc. All local procurement practices under the project will follow the guidelines set forth in A.I.D. Handbook 1, Supplement B [Chapter 18, sections 2 and 3].

Based on historical data, the PSED project has spent an estimated 5 percent of its core funds on locally procured goods and services, with the remaining 95 percent spent on United States commodities and services. Thus, core fund spending on locally procured goods and services under the project is not expected to exceed $2.2 million over the ten-year lifetime.

In addition to the above conditions, the Feasibility Study Fund operated under the project disburses funds only to a restricted class of applicants. Study funds will only be disbursed to applicants who will share 50 percent of the cost and who are (1) a U.S. company or (2) a public agency from an A.I.D.-assisted country that is working with a U.S. company.

During the PSED Project design process, the Office of Energy and Infrastructure has determined that a need for flexibility in accessing contracted services existed in order to conduct the diverse types of Project

activities envisioned under PSED. Thus, several contracting mechanisms, such as individually bid contracts, PASAs or RSSAs, cooperative agreements with leading U.S. research centers, and competitive procurements, Section 8 (a) contracts, noncompetitive cooperative agreements, and existing contracts and IQCs were considered.

After careful review of the contracting mechanisms available to the PSED Project, the Office of Energy and Infrastructure had decided on the following procurement and implementation strategy:

a. For the Core Staff/Expertise Sourcing Contractor, the Office of Energy and Infrastructure will contract with an 8 (a) firm specializing in project management, energy and/or financing. This contractor would provide core staff, project management, identification of technical expertise in energy generation and related fields; and coordinate with associations, private companies, and government agencies. This contractor will also have the responsibility for the Technical Advisory Group, (5) Technical Assistance Teams, Conferences and Workshops, Study Tours, Special Studies, Country assessments, the Regional Energy Consultant, and the Private Power Database and Private Power Reporter.

b. The Office of Energy and Infrastructure will continue to evaluate appropriate methods to administer the Feasibility Study Fund, in consultation with the Office of Procurement. Such organizations may include consulting firms, non-profit trade associations, energy technology research and development firms or consortium of the above.

c. Any PSED Project needs not met through the two procurements described above will be met through buy-ins into existing Office of Energy and Infrastructure contractors and IQC's.

d. The above arrangements will continue to be re-examined after the first year of the Project's operation.

3. Waivers

As part of the procurement process, it may be necessary to waive the A.I.D. maximum daily consultant rates since many of the special experts needed to ensure the Project's success must come from the private sector and cannot be obtained at current A.I.D. daily rates. These experts include U.S. utility executives, Public Utility Commissions members, private power and energy specialists, investment bankers, attorneys, and economists specializing in power generation and/or utilities.

For compensating specialists at a rate higher than the FS-1 cap rate during the PSED Project, a waiver will be requested for each individual consultant from the Assistant Administrator for the Bureau of Research and Development on a case by case basis.

4. General Logistics and Responsibilities

The Core Staff/Expertise Sourcing Contractor will provide the PSED Project's core staff and overall project management and will identify and field technical long- and short-term experts on an as-needed basis.

The contractor will also conduct workshops, study tours, and manage Regional Energy Consultants (to be funded by buy-ins). The contractor will also oversee Country Assessments, Special Studies, the coordination

of Feasibility Study Fund activities, Conferences, Workshops, Internships, and other PSED Project activities as directed by the Office of Energy and Infrastructure.

Please see Exhibit 1 for a chart showing the general organization of the PSED Project.

5. Feasibility Study Fund

The Feasibility Study Fund Contractor in coordination with the PSED Project Director, will be responsible for establishing, marketing, and administering the Feasibility Study Fund and assisting the Office of Energy and Infrastructure in obtaining buy-ins from A.I.D. Bureaus and Missions and matching funds from private sources.

6. Legal Considerations

With respect to the implementation of the PSED Project, two sets of legal considerations must be taken into account, those of the Host Countries and those of the United States. Legal considerations of host countries will be evaluated on a case by case basis. In the United States, the PSED Project must take into account the ownership and public accessibility of feasibility studies funded, at least partially, with federal monies.

a. Freedom of Information Act

Under the Freedom of Information Act and Amendments of 1974, all Federally funded information must be available for disclosure to the public. In several situations information can be exempt from the disclosure requirements. As FOIA pertains to the PSED program, the following exception would apply: Trade secrets and commercial or financial information obtained from a person and privileged or confidential information is exempt from disclosure.

Commercial or financial information is considered "confidential" if disclosure of such information is likely to cause substantial harm to the competitive position of the person/firm from whom the information was obtained. This rule also protects the government's ability to obtain necessary information in the future. In several cases of U.S. law, information provided by a private firm or person has been considered exempt from disclosure.

According to the General Counsel's office at A.I.D., all general information found in a prefeasibility study would be available for disclosure. However, specific financial or commercial information of the contractor who conducted the study would not be disclosed.

b. Rights & Data Issues

A major component of the PSED Project will be to fund prefeasibility and feasibility studies for energy sector development in A.I.D.-assisted countries. In cases where the U.S. government funds a study, the question as to who owns the information in the study's final report. Does the contracted firm own the information in the report because it performed the study? Or does the information belong to the Government because it funded the study? The answer is two-fold. The government does have access to the information in the study. However, the firm has proprietary right to the information in the study. (F.A.R. 52.227-14).

In general, the government honors the rights in data resulting from private developments, and limits its demands for such rights to those essential for government purposes. In cases where completion of the contract results in an invention, the contractor is normally granted a revocable, nonexclusive, royalty-free license to that invention throughout the world. In contracts that involve cosponsored, cost sharing, or joint venture research

and development, and the contractor, cosponsor or joint venturer is making a substantial contribution of funds, facilities, or equipment to the work performed under the contract, there can be a modification, waiver, or omission of rights of the government.

In order to carry out their missions and programs, it is necessary for the departments and agencies to acquire or obtain access to many kinds of data produced during or used in the performance of their contracts. Agencies require such data to obtain competition among suppliers; fulfill certain responsibilities for disseminating and publishing the result of their activities; ensure appropriate utilization of the results of research, development, and demonstration activities including the dissemination of technical information to foster subsequent technological developments; and meet other programmatic and statutory requirements.

At the same time, the government recognizes that its contractors may have a legitimate proprietary interest (e.g., a property right or other valid economic interest) in data resulting from private investment. Protection of such data from unauthorized use and disclosure is necessary in order to prevent the compromise of such property right or economic interest, avoid jeopardizing the contractor 's commercial position, and preclude impairment of the government's ability to obtain access to or use of such data. The protection of such data by the government is also to encourage qualified contractors to participate in government programs and apply innovative concepts to such programs. Under these conditions, subcontractors will be able to argue the propriety of prefeasibility and feasibility studies resulting from the PSED Project.

C. Audit and Evaluation Plan

1. FY 1993 Audit and Evaluation

The FY 1993 evaluation will examine the validity of PSED Project assumptions and make recommendations for PSED Project continuation. The following will be examined:

a. The extend and commitment of host countries' interest in pursuing private power in their national systems as evidenced by a willingness to examine objectively the state of their power facilities, a willingness to allow U.S. power firms to conduct prefeasibility or feasibility studies in their countries, and a receptiveness to policy dialogue.

b. The interest and capability of the U.S. and host country private sector to propose viable subprojects as evidenced by the number of proposals for use of the Feasibility Study Fund.

c. The performance of the Feasibility Study Fund and the effectiveness of the private sector in conducting prefeasibility and feasibility activities in the area of private power generation. This evaluation will come at an important juncture in the PSED Project since by this time the PSED Project institutions should be fully operational, five to seven study requests should have completed the process of general tender, proposal submissions, evaluations, and study start-up, and several feasibility studies should be underway, with at least two completed.

Also, a redesign of the monitoring plan for years (1993-1998) will be completed.

2. 1996 Mid Term Audit and Evaluation

In FY 1996, a mid-term evaluation will be completed. This audit and evaluation will examine the effectiveness of the project, as stated in paragraph 1 above.

3. Final PSED Project Evaluation (FY 1998)

This review will focus on the effectiveness of the Feasibility Study Fund as a catalyst for private power subcontract implementation and the integrity of the Feasibility Study Fund's study portfolio.

D. Monitoring Plan

A.I.D. must balance the need for progress with the A.I.D. required levels of reviews and approvals, assuring itself that the PSED Project is moving as planned while not requesting unnecessary information that could further slow what could easily become a cumbersome process. A key ingredient for success will be the speedy appraisal of private sector proposals by the Feasibility Study Fund Contractor to allow approval of disbursements from the Feasibility Study Fund. These reviews must be fair, thorough, and in the best interests of the PSED Project's goals and purposes.

Selection of fund recipients will be made based on selection criteria developed by the Feasibility Study Fund Contractor with the Office of Energy and Infrastructure. The Project Officer from the Office of Energy and Infrastructure will need to monitor these reviews to ensure that this is the case. This monitoring plan covers only the first two years of the PSED Project. Recommendations for a monitoring plan for subsequent years will be an output of the first formal PSED Project evaluation.

1. Monitoring Objectives

Ultimately, it will be possible to monitor the PSED Project by measuring contributions to the PSED Project goal, e.g., how much additional electricity has been generated. In the first two years, however, it will be more appropriate to measure achievement of the PSED Project purpose, e.g., the extent to which private sector technical and managerial resources have been mobilized to meet energy investment needs.

This early monitoring will be best accomplished by a planned review of progress towards the achievement of specific outputs as well as the timely and adequate supply of inputs.

a. Input Monitoring

The Office of Energy and Infrastructure will monitor: (1) timely provision of long and short-term technical assistance by the contractor; (2) timely establishment of the Technical Advisory Group; (3) timely procurement of appropriate commodities; (4) timely provision of inputs by other donors (if any, contributions to the Feasibility Study Fund and financing required technical assistance); and (5) the timely provision of A.I.D. Bureaus and Missions contributions to the PSED Project.

b. Output Monitoring

The Office of Energy and Infrastructure will monitor: (1) the number and quality of proposals received; (2) the number and quality of Feasibility Study Fund use reviews carried out by the contractor; (3) progress of on-going private sector power proposals; (4) drawdown of the Feasibility Study Fund by subproject sponsors; (5) the number and quality of policy and other studies being conducted or other tenders issued by host governments for private sector proposals.

2. Monitoring Methods

a. Persons Responsible

The Office of Energy and Infrastructure proposes to delegate much of the day-to-day implementation responsibilities to the Core Staff contractor and to the Feasibility Study Fund contractor. These contractors will provide information needed by the Office of Energy and Infrastructure to effectively monitor progress. They will report to the Project Officer who will be a member of the Office of Energy and Infrastructure staff. The Project Officer will be responsible for ensuring effective monitoring of the PSED Project. An illustrative monitoring schedule is presented in Section C below; this will undoubtedly be amended several times to take into account the exigencies of the PSED Project as it unfolds.

b. Data Gathering

The Project Officer will acquire data needed to monitor the PSED Project from a number of sources. Some of these sources would include:

- Daily/weekly meetings with the Core Staff Project Director
- Monthly/quarterly reports from the Core Staff Project Director
- Semi-annual meetings with the Technical Advisory Group
- As-needed visits to key host country officials, usually accompanied by the Project Director
- Site visits to potential plant sites
- Meetings with potential power investors, foreign, and domestic
- Meetings with other donor counterparts
- Field visits to evaluation the technical and financial claims of potential users of the PSED Project Assistance Feasibility Study Fund. This tool should be used only for spot checks, since monitoring of proposal claims will be the responsibility of the contractors.
- Semi-annual Project Implementation Reviews for participating U.S.A.I.D.s (for which the Missions' PROMIS and ISS computer assisted monitoring systems will be used).

c. Illustrative Monitoring Schedule

A possible schedule of activities for monitoring progress towards provision of inputs and achievement of outputs is provided below. It describes the activities to be undertaken by the Project Officer, reporting to the Director of the Office of Energy and Infrastructure.

Activity	Frequency	1. Inputs/2. Outputs Monitored
Meetings with Project Director	As needed, at least weekly	1. Provision of technical asst. & commodities; Assessment of quality of TA staffing. Early identification of constraints.

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		2. Overviews of progress on all outputs.
Meetings of Technical Advisory Group	Semi-annually	1. Overview of constraints to speedy input delivery; detailed discussion of solutions. 2. Analysis of quality and quantity of outputs by relevant institutions.
Visits to host country officials	As needed, irregularly	Personal confirmation of information; assessment of quality of TA
Visits to potential sites to be studied	As needed, infrequently	Spot checking of viability of fund use
Meetings with Private Sector	As needed, and/or requested by Private Sector	Assessment of level of comfort/confidence of potential and actual proposers. Identification of bottlenecks and potential problems.
Meetings of donor counterparts and use of these	As needed, at least semi-annually in first two years	Review of resources available to the Feasibility Study Fund and use of these resources; mutual assessment of progress towards outputs; identification of policy issues; and coordinated responses to policy issues.

3. Future Refinements

The purpose of a monitoring plan is to identify and quantify the actions and sites of Project activities required and to deploy available staff, in a rational and systematic manner. If successful, the result will be good management of the PSED Project leading to expedient implementation of PSED Project elements.

Currently, it is not possible to identify or quantify most actions and sites for subprojects, because investors have yet to be identified. Therefore, this monitoring plan is not complete. As subprojects are identified, the requirements for monitoring (frequency, scope, and personnel available) will also be identified.

E. Summary of Analyses

1. Technical Analysis

Electrical energy has traditionally played a key role in the agricultural, industrial, and social development of a country. In general, about 50 percent of the electricity production in developing countries is used by industry and the remainder is consumed in the agricultural, commercial, and residential sections.

During the 1980-1985 period, the demand for electricity in most developing countries out-paced the general growth in energy consumption and increased by 7% per year. This high growth rate was, in part, due to energy intensive industrial uses coupled with urban development which increased the residential power consumption.

Furthermore, many of these countries embarked on extensive rural electrification programs in an effort to promote rural development and control population shifts towards the urban sections. These forces will likely continue to influence the demand for electricity for the foreseeable future. Consequently, while the average GDP is expected to grow at 3-4% through the year 2000, the demand for electrical energy will likely increase by 4-5% in developing countries.

Most developing countries are experiencing severe power shortages that hamper their development plans and economic activities. Among Asian countries, for example, the Philippines has a power shortage of about 8 percent of demand, Pakistan over 25 percent, Bangladesh about 20 percent, and India 15 percent.

The industrial sector in developing countries has been especially affected by power shortages. In some countries, industry receives only 20 percent of its power needs during the peak demand season. The loss of production because of power cuts, estimated at over one order of magnitude higher than the actual cost of power, has considerably slowed industrial growth in these countries. In many regions of developing countries, industrial expansion is delayed because new factories cannot obtain a tie-in to the grid. To reduce the impact of power shortages, private companies are installing small, inefficient diesel generators that expensive imported fuels. Such a practice only increases the country's dependence on imported petroleum products.

To alleviate the power shortage problem, national utilities in developing countries can adopt energy efficiency and conservation strategies. Modernization of the existing power system can increase the available generating capacity to 8-10%. Studies in developing countries suggest that conservation projects using existing technologies can save an estimated 10 to 30% of the energy consumed in the industrial sector. Use of alternative sources of energy such as geothermal, hydropower, wind, solar, and biomass as well as leading new technologies including cogeneration and fluidized bed combustion can also reduce the severity of the power shortages in developing countries.

Private participation in the power sector is a viable approach for alleviating power shortages and for reducing the financial burden of power sector expansion. The private sector can improve efficiency in the power sector by introducing competitiveness through the force of the market economy. The private sector is able to attract a higher quality of technical, managerial, and financial personnel than the national utilities which are often constrained by the low wages they offer. The private sector can also inject additional financing into the power sector, a sector which currently consumes 60% of the development budget in many A.I.D.-assisted countries. Finally, the private sector can take the initiative in adopting innovative power technologies that the national utilities consider to be outside of their traditional scope.

Private participation in the power sector may take the form of complete privatization, in which the power systems are transferred from public to private ownership. Alternatively, the private sector can perform certain functions such as plan operation and maintenance as a private contractor to the public utility. The private sector may also assume temporary ownership of certain utility components under a lease-back or buy-back arrangement. The private sector can also provide much needed technical and managerial expertise to the public utilities in such areas as system planning, technology and fuel evaluation, project solicitation and review systems, plant engineering, systems maintenance, and environmental control.

The private sector can provide additional electric generating capacity through the implementation of private power projects on a Build-Own-Transfer basis, in which a private power company constructs a power facility, operates it and sells power to the public utility over a period of time, after which time the ownership of the facility is transferred to the public utility. Another private power project development arrangement is the Build-Own-Operate. This arrangement is similar to BOT, but differs in that the ownership of the generating facility is not transferred to the public utility. Finally, private companies can self-generate electricity and export excess power to the utility on a contract basis.

Although private participation in the power sector represents a significant opportunity to reduce the effects of the power shortages in developing countries, private investment in these countries still remains hampered by a number of barriers including public policies, regulations, and practices that prohibit private sector involvement.

2. Financial Analysis Summary

The purpose of financial analysis for the Private Sector Energy Development Project is to determine the value of the project as a self-contained entity. Financial analysis is only concerned with determining whether the directly quantifiable monetary benefits from the project are larger or smaller than the project's costs. The broader analysis of indirect, opportunity, and social costs is undertaken in the economic analysis.

Financial analysis for the Private Sector Energy Development Project was conducted for three purposes:

- To assess the financial returns to A.I.D. resulting from its support in this project.
- To assess the financial returns and incentives for the private firms who will perform the feasibility studies and other special studies.
- To assess the expected financial returns to the private power project facilities that will ultimately be operated as a result of this development project.

A.I.D. Financial Analysis

As is common in any foreign aid program that seeks to transfer resources to developing countries, the financial returns to A.I.D. for its participation in the Private Sector Energy Development Project are not expected to cover the costs of the program. In terms of project costs, A.I.D. and other sources from agencies will provide an estimate $15.4 million in funding for the PSED Project. In terms of project revenues, financial returns for this investment are very limited. The repayment of feasibility study funds by successful private sector participants are the only expected project revenues, estimated at $1 million or less.

Feasibility Study Fund Financial Analysis

If the PSED Feasibility Study Fund generates 5 successfully constructed subprojects each year with a profit (in present value terms) of $5 million each, then the overall value of the PSED Project would be an estimated $20.125 million. (This assumes that firms spend $25,000 for each proposed study or prefeasibility study). Note that under the assumptions of Table 2, each of the five successful utility plants need to have a lifetime present value profit of only $1,375,000 to cover the initial costs of the PSED fund.

Private Power Facility Financial Analysis

The bottom line as to whether the PSED Project is financially viable and successful, either for A.I.D. or the private sector firms depends on the operating viability of the private power facilities constructed as a result of the Project. Electric utilities in developing countries tend to be state-controlled and inefficient. Most do not generate enough revenue to cover their operating and capital investment expenses. The poor financial state of many electric utilities in developing countries is due to several factors, including:

1. Electricity rate ceilings that set the marginal revenue from an additional KWh below its marginal cost of supply,

2. Bureaucratic management, where employee-to-customer ratios are much higher than private

sector plants due in part to political pressures to hire,

3. Inefficiencies in the areas of technology used in production methods and delivery.

While private sector profit incentives should be able to correct the last two problems, more economic price policies (that allow revenues to cover costs) are required to make operating such utilities financially viable for private sector firms. In the interim period, cross-subsidies to the private sector facility operator may allow a government to slowly adjust its electricity pricing tariffs.

3. Economic Analysis

The purpose of economic analysis for the Private Sector Energy Development Project is to determine whether the Project will be a worthwhile investment for the affected countries. The analysis estimates whether the outputs from the Project are sufficiently valuable so as to cover the Project costs. Economic analysis differs from financial analysis in that it examines the full effects of a project on a country's economy. While financial analysis examines only the explicit monetary costs and benefits of a subproject, economic analysis examines hidden opportunity costs and benefits to using resources in such a way. The general principle of economic analysis is to compare the real benefits of a Project to its real costs.

In performing the economic analysis for the Private Sector Energy Development Project, it must be recognized that because the project limits its funding to feasibility studies, training, and technical assistance, no specific actual subprojects, (e.g., power plants) can be analyzed. Additionally, among these funded items, it is not realistic to attempt to quantify the economic benefits of the training sessions, seminars, and technical assistance. Although these items may provide long-term benefits in areas such as tariff restructuring, there is no way to quantify these benefits. Thus, the economic analysis focuses on the expected economic benefits of the subprojects that were facilitated by the used of the PSED Project's Feasibility Study Fund. In particular, the analysis attempts to quantify the cost of power shortages in developing countries given the general loss of productivity due to the frequent loss of power. Each new kwh of electricity produced as a result of the PSED Project Feasibility Study Fund serves to reduce the cost of power shortages in developing countries. Therefore, the economic benefits of the PSED Project can be calculated by measuring the savings accumulated from increasing the electrical generating capacity in developing countries.

The analysis suggests that the economic returns to the PSED Project are positive and that the project is economically viable. The economic Net Present Value (NPV) for the project is estimated at $805 million dollars, with an economic internal rate of return of 57%. Analysis was also performed to test the sensitivity of these results to the estimate used for the cost of unserved energy. The project NPV is positive all the way down to an estimated cost of unserved energy of $8/MWh -- while studies suggest that this cost is in the range of $500/MWh or higher.

4. Social Soundness Analysis Summary

The energy/power supply and supporting infrastructure problem has adversely affected the social and economic development of many developing countries. Social programs are constrained not only by the lack of reliable electricity available to them, but also by loss of development funds which the government must divert from social programs to the power sector development. Private investment in the energy/power and related infrastructure sectors will provide alternative forms of financing for the development of the energy/power and supporting infrastructure sectors and will improve the reliability and availability of electricity and the provision of social services.

Improved infrastructure supporting energy/power facilities should increase the effectiveness of social

delivery services for education, health care, agriculture, and industry. Some examples include:

- Education. Electricity is associated with information transfer, classroom conditions, and study habits. For instance, studies have found that children who can read by electric light spend more time reading at home than those who lack electric light.

- Vaccination. Vaccines for many human and livestock diseases require refrigeration. The total annual worldwide losses from diseases that could have been prevented by vaccination if refrigeration were more widely available are probably in the billions of dollars. Although refrigeration can be provide through non-electric technologies, expansion of electric refrigeration would simplify the effort.

- Potable Water and Sanitation. Potable water and sanitation services are essential in reducing the effects of water borne diseases. The provision of potable water and the development of sanitation facilities, both in the rural and urban areas of developing countries, will also reduce infant mortality rates significantly.

- Political Stability. Development, rather than electrification, is the key to building support for a government or political system. It is clear from anecdotal evidence, however, that failure to maintain reliable electricity services and acceptable prices of electricity for existing users can result in general public dissatisfaction and potential political instability.

5. Administrative Analysis Summary

Implementation of the PSED Project as proposed will not have any unusual requirements for A.I.D. administrative support capabilities. An expanded Administrative analysis can be found in Annex H. The PSED Project will be managed by Office of Energy and Infrastructure, which will provide centralized project supervision and a mechanism for dissemination and interpretation of project results as needed in the broader A.I.D. policy and programming process. The Project Director Core Project Staff Contractor for the PSED Project will report to the A.I.D. Project Officer appointed by the Office of Energy and Infrastructure.

The PSED Project will affect Mission workloads and may possibly affect staffing requirements. However, this will likely be minimized since the core staff and consultants will have considerable experience at operating with the A.I.D. administrative system. Project support services on the part of participating Missions are generally expected to be minimal. It is expected that this project can be successfully implemented and managed given present staffing levels within the Office of Energy and Infrastructure.

6. Environmental Analysis Summary

One objective of the private energy development projects in the developing countries is to promote the use of innovative, yet proven, technologies which can more efficiently utilize energy resources with reduced environmental impacts. The industrial countries of the world have only recently, within the last 25 years, recognized the adverse impacts of electric power production on environmental quality and human health./ The projected expansion of electricity generation in developing countries could therefore pose serious environmental problems in these areas unless appropriate measures to mitigate such impacts are incorporated in the planning and implementation process.

The construction of power generating facilities may impact the air, water, ecological, and social resources of the host country. The significance of these impacts will depend on the type of power plant installed and on the local environment. The type of plant and its associated energy source (e.g., coal, oil, gas,

or hydro) will dictate the magnitude and nature of pollutants discharged to the environment. For example, use of high sulfur coal will result in higher atmospheric emissions than if the plant was fired by natural gas. Secondary effects which impact on the social, health, and safety aspects are associated with development of natural resources for use by the power plant. Examples include coal mining, dam construction for hydropower, and diversion of water from agricultural sources. The local environment factor depends on the ability of the area to assimilate the effects of the physical plant, including its pollutant discharges and social demands such as employment and civic services.

Electric power projects can impact directly on air resources with the potential impact of sulfur dioxide, nitrogen oxides, and particular matter. Water resources can be affected by water discharges including cooling system blowdown, boiler feed water blowdown, demineralizer back wash and coal storage piles, and normal storm drainage from the plant site. Ecological impacts can include the removal of habitat by plant construction, entrapment of aquatic organisms in cooling systems and the effects of transportation systems.

Unlike the United States and other industrialized nations, many developing countries do not have adequate standards and policies in place for environmental management. However, some of the countries are in the process of establishing such policies. For instance, the Pakistan Environmental Ordinance of 1983 initiated a mechanism for establishing a national environmental policy including the development of air and water quality standards. While no standards have yet been adopted, proposed standards to restrict the discharge of pollutants into atmosphere and water have been drafted.

It is not anticipated that the PSED Project will involve activities affecting the physical environment, because the Project will finance only technical assistance, training and feasibility studies. Of course, the actual construction of electric power generation, and transmission facilities, which themselves are outside the scope of this project, may have significant impacts on the environment. However, due to Feasibility Study Fund's commitment to sound environmental practices, appropriate training and technical assistance activities will address environmental concerns. In addition, to the extent the Project would also support feasibility studies possibly leading, at some future time, to the construction of facilities, such studies would incorporate attention to environmental aspects of the proposed energy activities as appropriate.

For private power subprojects, a prefeasibility study is undertaken to decide whether the subproject is technically and economically attractive. This study phase typically addresses the site selection; fuel type, source, and availability; technology choice; plant size and market potential; preliminary design and project economics; and legal and environmental issues. In this phase of development, a preliminary environmental characterization of the project is made.

As part of the feasibility study, a baseline environmental characterization is conducted. This activity involves collecting information on air quality, meteorological conditions, ecology, water resources, and socioeconomic aspects of the plant site and surrounding area. This information is used in the feasibility study to determine the potential environmental impacts. As part of this analysis, conformance with ambient air and water quality criteria is assessed, as well as any significant impact to the social and ecological environment. If a potential impact is found to be significant, then design alternatives must be evaluated to mitigate the effect to an acceptable level.

The feasibility study would disclose the environmental baseline and impact information that was developed for the subproject. It would also detail the proposed mitigation and monitoring procedures to be used during the construction and operating phases of the subproject.

In the absence of specific environmental regulations for power plant projects in the developing countries, it would be appropriate to use the guidelines established by the World Bank.

Recommended Environmental Threshold Decision

Section 216.2(c)(2) of the Agency Environmental Procedures (22 CFR 216) lists the categories of Agency activities for which an Initial Environmental Examination, Environmental Assessment, and Environmental Impact Assessment are not required. This covers "(i) Education, technical assistance, or training programs except to the extent such programs activities directly affecting the environment (such as the construction of facilities); (iii) Analyses, studies, academic or research workshops and meetings; (xiv) Studies, projects, or programs intended to develop the capability of recipient countries to engage in development planning, except to the extent designed to result in activities directly affecting the environment (such as the construction of facilities)."

Since this project encompasses technical assistance, training programs, analyses, studies, and developmental planning activities, it therefore falls under the categorical exclusions provisions of the Environmental procedures. The PSED Project will not fund any activities that do not meet this exclusion. The Director of the Office of Energy and Infrastructure therefore recommends that a negative determination be granted and that no further environmental investigations be taken

RECOMMENDATION: _____ _____ 12-08-92

Negative Determination | Positive Determination | Date

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ANNEXES

TO

PROJECT PAPER

PRIVATE SECTOR ENERGY

DEVELOPMENT PROJECT

(PSED)

PROJECT NUMBER 936-5738

OFFICE OF ENERGY AND INFRASTRUCTURE

BUREAU FOR SCIENCE AND TECHNOLOGY

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

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List of Annexes for PSED Project Paper

A. PID Approval Message

B. Log Frame Matrix

C. Statutory Checklist

D. Project Technical Analysis

E. Project Financial Analysis

F. Project Economic Analysis

G. Social Soundness Analysis

H. Project Administrative Analysis

I. Project Environmental Analysis

J. Country Assessment Matrix for Potential Private Sector Energy Development

K. Private Power Conference and Workshop Agenda

L. List of Interviews for PSED Project Paper

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N. Statement of work for Feasibility Fund Contract

ANNEX A

PID APPROVAL MESSAGE

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

ANNEX B

LOG FRAME MATRIX

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

Project name : PRIVATE SECTOR ENERGY DEVELOPMENT (PSED)
Date of Revision : 11/1992

Est. Completion : FY 98
Design Team : R&D/EI

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
Goal: 1 Program or Sector Goal. The broadest objective to which this project contributes: To accelerate the sustainable economic and social development of AID-assisted countries by increasing the supply of reliable, affordable energy, particularly electric power, for productive purposes.	Measures of Goal Achievement: 1.1 Increase in GNP, i.e., income, employment, investment, & production. 1.2 Increases in MW's of power produced & delivered.	1.1 Project mid-term & end of project evaluations. 1.2 Reports & statistics from Ministries of Finance, Energy, & Industry. 1.3 Annual reports on economic indicators. 1.4 CDSS's. 1.5 Contractor reports.	(Goal to Supergoal) 1 Assumptions for achieving goal targets: Developing countries acknowledge power shortages as problem, continue to accord policy priority, & commit resources to this sector.
Purpose: 1 To assist in creating a favorable environment to encourage private ownership, financing, and operation of energy and related infrastructural facilities in selected developing countries.	Conditions that will indicate purpose has been achieved: End of Project Status. 1.1 Favorable legal & institutional environments established in developing countries conducive to private participation in the energy and related infrastructural sectors. 1.2 Private sector resources mobilized. 1.3 Private sector energy and related infrastructural projects approved. 1.4 $500M committed for investment in private sector energy and related infrastructural projects. 1.5 5 private energy and related infrastructure projects implemented.	1.1 Project mid-term & end of project evaluations. 1.2 Reports & statistics from Ministries of Finance, energy, & Industry. 1.3 Contractor reports.	(Purpose to Goal) 1 Sufficient number of AID-assisted countries & AID missions interested. 2 Favorable policy & institutional environmentin host countries. 3 Private sector in U.S. & host countries interested & will commit resources.
Outputs: 1 Assessments of potential for private power and related infrastructure in selected countries. 2 Private Energy Feasibility Study Fund to cost share studies for potential private energy and related infrastructure projects with project developers. 3 Special studies of potential macro-economic impact of private power and related infrastructure on developing countries, of the requirements for local capital market development and alternative forms of private power participation. 4 Conferences & Workshops on private power with government officials, utility personnel, & private sector representatives.	Magnitude of Outputs: 1.1 21 Country Assessments. 2.1 Fund 37 prefeasibility/feasibility studies. 3.1 14 Special Studies of policies & guidelines, macro-economic impact, capital markets, financing programs, etc. 4.1 28 Conferences & Workshops.	1 Project mid-term & end of project evaluations. 2 Reports & statistics from Ministries of Finance, energy, & Industry. 3 Contractor reports.	1 Cooperation with host governments & utilities. 2 Ability to hire appropriate personnel. 3 Mission cooperation & buy-ins. 4 Willingness of private sector to commit resources.

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Outputs (con.): 5 Private energy Technical Assistance Teams to assist developing countries & project developers. 6 Energy consultants to selected AID regions. 7 Study Tours to bring officials of developing countries to the U.S. to visit private power facilities and meet with project developers, utilities, & regulators. 8 Project Technical Advisory Group to ensure coordination within U.S. government & with the private sector. 9 Cooperation arranged between AID, IFC, multilateral development & other bilateral donors to promote private power and related infrastructure. 10 Supervision of private energy database.	Magnitude of Outputs (con.): 5.1 27 Technical Assistance Team missions. 6.1 2 Reg. EY consultants in the field. 7.1 30 Study Tours. 8.1 12 Technical Advisory Group Meetings. 9.1 15 meetings with multilateral development organizations and other bilateral donors. 10.1 Maintain 1 private power database. 32 issues of Private Power reporter. 11.1 $500M from private sector invested. 12.1 8 countries with improved laws & regulations.	1 Project mid-term & end of project evaluations. 2 Reports & statistics from Ministries of Finance, energy, & Industry. 3 Contractor reports.	1 AID commitment of resources. 2 Availability of appropriate management personnel & contractors.
Activities: 1 Cost sharing arrangements for prefeasibility & feasibility studies & other studies. 2 Technical assistance. 3 Personnel: Project Office & Support Staff.	Inputs/Resources: Implementation Target: (Type & Quantity) 1 Feasibility Study Fund - $8M (R&D/EI) + $20M other. 2 Technical Assistance - $4M (R&D/EI) + $1.9M other. 3 TA Groups - $5M (R&D/EI) + $70,000 other. 4 Conferences & Workshops - $4.8M (R&D/EI). 5 Study Tours - $1.1M (R&D/EI) + $.25M other. 6 Country Assessments - $2.4M (R&D/EI) + $.5M other. 7 Special Studies - $800,000 (R&D/EI) + $300,000 other. 8 Reg. EY Consultant - $1.6M (R&D/EI) + $1.3M other.		(Activity to Output)

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ANNEX C

STATUTORY CHECKLIST

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

PRIVATE SECTOR ENERGY DEVELOPMENT
(PSED)

Project Number 936-5738

3m(2) - PROJECT CHECKLIST

Listed below are statutory criteria applicable to projects. This section is divided into two parts. Part A includes criteria applicable to all projects. Part B applies to projects funded from specific sources only: B(1) applies to all projects funded with Development Assistance; B(2) applies to projects funded with Development Assistance loans; and b(3) applies to projects funded from ESF.

CROSS REFERENCES: IS COUNTRY CHECKLIST UP TO DATE? HAS STANDARD ITEM CHECKLIST BEEN REVIEW FOR THIS PROJECT?

A. GENERAL CRITERIA FOR PROJECT

1. FY 1988 Continuing Resolution Sec. 523; FAA Sec. 634A. If money is sought to obligated for an activity not previously justified to Congress, or for an amount in excess of amount previously justified to Congress, has Congress been properly notified?

   N/A

2. FAA Sec. 611 (a)(1). Prior to an obligation in excess of $500,000, will there be (a) engineering, financial or other plans necessary to carry out the assistance, and (b) a reasonably firm estimate of the cost to the U.S. of the assistance?

   N/A

3. FAA Sec. 611 (a)(2). If legislative action is required within recipient country, what is the basis for a reasonable expectation that such action will be completed in time to permit orderly accomplishment of the purpose of the assistance?

   Assistance & projects will be undertaken in countries having the most potential for any legislative action necessary.

4. FAA Sec 617 (b), FY 1988 Continuing Resolution Sec. 501. If project is for water or water-related land resource construction, have benefits and costs been computed to the extend practicable in accordance with the principles, standards, and procedures established pursuant to the Water Resources Planning Act (42 U.S.c. 1962, et seq.)? (See A.I.D. Handbook 3 for guidelines).

   N/A

5. FAA Sec. 611 (e). If project is capital assistance (e.g., construction), and total U.S. assistance for it will exceed $1 million, has Mission Director certified and Regional Assistant Administrator taken into consideration the country's capability to maintain and utilize the project effectively?

   N/A

6. FAA Sec. 209. Is project susceptible to execution as part of regional or multilateral project? If so, why is project not so executed? Information and conclusion whether assistance will encourage regional development programs.

   N/A

7. FAA Sec 601 (a). Information and conclusions on whether projects will encourage efforts of the country to: (a) increase the flow of international trade; (b) foster private initiative and competition; (c) encourage development and use of cooperatives, credit unions, and savings and loan associations; (d) discourage monopolistic practices; (e) improve technical efficiency of industry, agriculture, and commerce; and (f) strengthen free labor unions.

   Private sector development will encourage export of U.S. equipment and services.

8. FAA Sec 601 (b). Information and conclusions on how project will encourage U.S. private trade and investment abroad and encourage private U.S. participation in foreign assistance programs (including use of private trade channels and the services of U.S. private enterprise).

   Project will promote U.S. trade & investment abroad through feasibility studies.

9. FAA Secs. 612 (b), 636 (h). Describe steps taken to assure that, to the maximum extend possible, the country is contributing local currencies to meet the cost of contractual and other services, and foreign currencies owned by the U.S. are utilized in lieu of dollars.

   This will be addressed when subprojects are undertaken.

10. FAA Sec. 612 (d). Does the U.S. own excess foreign currency of the country, and if so, what arrangements have been made for its release?

    N/A

11. FY 1988 Continuing Resolution Sec. 521. If assistance is for the production of any commodity for export, is the commodity likely to be in surplus on world markets at the time the resulting productive capacity becomes operative, and is such assistance likely to cause substantial injury to U.S. producers of the same, similar, or competing commodity?

    N/A

12. FY 1988 Continuing Resolution Sec 553. Will the assistance (except for programs in Caribbean Basin Initiative countries under U.S. Tariff Schedule "Section 807," which allows reduced tariffs on articles assembled abroad from U.S.-made components) be used directly to procure feasibility studies, prefeasibility studies, or project profiles of potential investment in, or to assist the establishment of facilities specifically designed for, the manufacture for export to the United States or to third country

markets in direct competition with U.S. exports of textiles, apparel, footwear, handbags, flat goods (such as wallets or coin purses worn on the person), work gloves or leather wearing apparel?

N/A

13. FAA Sec. 119 (g)(4)-(6). Will the assistance (a) support training and education efforts which improve the capacity of recipient countries to prevent loss of biological diversity; (b) be provided under a long-term agreement in which the recipient country agrees to protect ecosystems or other wildlife habitats; (c) support efforts to identify and survey ecosystems in recipient countries worthy of protection; or (d) by any direct or indirect means significantly degrade national parks or similar protected areas or introduce exotic plants or animals into such areas?

    (a), (b), & (c) are not applicable. Regarding (c), assurances will be required before supporting subproject feasibility studies.

14. FAA 121 (d). If a Sahel project, has a determination been made that the host government has an adequate system for accounting for and controlling receipt and expenditure of project funds (either dollars or local currency generated therefrom)?

    N/A

15. FY 1988 Continuing Resolution. If assistance is to be made to a United States PVO (other than a cooperative development organization), does it obtain at least 20 percent of its total annual funding for international activities from sources other than the United States government?

    Probably not implemented by PVO's, however, if so, this requirement will be satisfied.

16. FY Continuing Resolution Sec. 541. Is assistance is being made available to a PVO, has that organization provided upon timely request any document, file, or record necessary to the auditing requirements of A.I.D., and is the PVO registered with A.I.D.?

    Probably not implemented by PVO, however, if so, this requirement will be satisfied.

17. FY 1988 Continuing Resolution Sec. 514. If funds are being obligated under an appropriation account to which they were not appropriated, has prior approval of the Appropriations Committees of Congress been obtained?

    N/A

18. FY Continuing Resolution Sec. 515. If deob/reob authority is sought to be exercised in the provision of assistance, are the funds being obligated for the same general purpose, and for countries within the same general region as originally obligated, and have the Appropriations Committees of both House and Congress been properly notified?

    N/A

19. State Authorization Sec. 139 (as interpreted by conference report). Has confirmation of the date of signing of the project agreement including the amount involved, been cabled to State L/T and A.I.D. LEG within 60 days of the agreement's entry into force with respect to the United States and has the full test of the agreement been pouched to those same offices? (See Handbook 3, Appendix 6G for

agreements covered by this provision).

N/A

B. FUNDING CRITERIA FOR PROJECT

1. Development Assistance Project Criteria

a. FY 1988 Continuing Resolution Sec. 552 (as interpreted by conference report). If assistance is for agricultural development activities (specifically, any testing or breeding feasibility study, variety improvement or in introduction, consultancy, publication, conference, or training), are such activities (s) specifically and principally designed to increase agricultural exports by the host country to a country other than the United States, and can the activities reasonably be expected to cause substantial injury to U.S. exporters of similar agricultural commodity; or (b) in support of research that is intended primarily to benefit U.S. producers?

N/A

b. FAA Secs. 102 (b), 111, 113, 281 (a). Describe extend to which activity will (a) effectively involve the poor in development by extending access to economy at local level, increasing labor-intensive production and the use of appropriate technology, dispersing investment from cities to small towns and rural areas, and insuring wide participation of the poor in the benefits of development on a sustained basis, using appropriate U.S. institutions; (b) help develop cooperatives, especially by technical assistance, to assist rural and urban poor to help themselves toward a better life, and otherwise encourage democratic private and local governmental institutions; (c) support the self-help efforts of developing countries; (d) promote the participation of women in the national economies of developing countries and the improvement of women's status; (e) utilize and encourage regional cooperation.

Energy projects may be undertaken in rural areas thereby dispersing investment upgrading living standards, electrifying homes and businesses.

c. FAA Secs. 103, 103A, 104, 105, 106, 120-121. Does the project fit the criteria for the source of funds (functional account) being used?

Yes

d. FAA Sec 107. Is emphasis placed on use of appropriate technology (relatively smaller, cost-saving, labor-using technologies that are generally most appropriate for small farms, small business, and small incomes of the poor)?

Studies will be done to determine most appropriate technologies.

e. FAA Secs. 110, 124 (d). Will the recipient country provide at least 25 percent of the costs of the program, project, or activity with respect to which the assistance is to be furnished (or is the latter cost-sharing requirement being waived for a "relatively least developed" country)?

N/A

f. FAA Sec. 128 (b). If the activity attempts to increase the institutional capabilities of

private organizations or the government of the country, or if it attempts to stimulate scientific and technological research, has it been designed and will it be monitored to ensure that the ultimate beneficiaries are the poor majority?

N/A

g. FAA Sec. 281 (b). Describe extent to which program recognizes the particular needs, desires, and capacities of the people of the country; utilizes the country's intellectual resources to encourage institutional development; and supports civil education and training in skills required for effective participation in governmental processes essential to self-government.

Project is designed to work with host country officials and personnel.

h. FY 1988 Continuing Resolution Sec. 538. Are any of the funds to be used for the performance of abortions as a method of family planning or to motivate or coerce any person to practice abortions?

No

Are any of the funds to be used to pay for the performance of involuntary sterilization as a method of family planning or to coerce or provide any financial incentive to any person to undergo sterilizations?

Are any of the funds to be used to pay for any biomedical research which relates, in whole or part, to methods of, or the performance of, abortions or involuntary sterilization as a means of family planning?

i. FY 1988 Continuing Resolution. Is the assistance being made available to any organization or program which has been determined to support or participate in the management of a program of coercive abortion or involuntary sterilization?

No

If assistance is from the population functional account, are any of the funds to be made available to voluntary family planning projects which do not offer, either directly or through referral to or information about access to, a broad range of family planning methods and services?

No

j. FAA Sec. 601 (e). Will the project utilize competitive selection procedures for the awarding of contracts, except where applicable procurement rules allow otherwise?

Yes

k. FY 1988 Continuing Resolution. What portion of the funds will be available only for activities of economically and socially disadvantaged enterprises, historically black colleges and universities, colleges and universities having a student body in which more than 20 percent of the students are Hispanic Americans, and private and voluntary organizations which are controlled by individuals who are black Americans, Hispanic Americans, or Native Americans, or who are economically or socially disadvantaged (including women)?

Some 8a contracts will be used on this project.

1. FAA Sec. 118 (c). Does the assistance comply with the environmental procedures set forth in A.I.D. Regulation 16? Does the assistance place a high priority on conservation and sustainable management of tropical forests? Specifically, does the assistance, to the fullest extent feasible: (a) stress the importance of conserving and sustainably managing forest resources; (b) support activities which offer employment and income alternatives to those who otherwise would cause destruction and loss of forests, and help countries identify and implement alternatives to colonizing forested areas; (c) support training programs, education efforts, and the establishment or strengthening of institutions to improve forest management; (d) help end destructive slash-and-burn agriculture by supporting stable and productive farming practices; (e) help conserve forests which have not yet been degraded by helping to increase production on lands already cleared or degraded; (f) conserve forested watersheds and rehabilitate those which have been deforested; (g) support training, research, and other actions which lead to sustainable and more environmentally sound practices for timber harvesting, removal, and processing; (h) support research to expand knowledge of tropical forests and identify alternatives to expand knowledge of tropical forests and identify alternatives which will prevent forest destruction, loss, or degradation; (i) conserve biological diversity in forest areas by supporting efforts to identify, establish, and maintain a representative network of protected tropical forest ecosystems on a worldwide basis, by making the establishment of protected areas a condition of support for activities involving forest clearance or degradation, and by helping to identify tropical forest ecosystems and species in need of protection and establish and maintain appropriate protected areas; (j) seek to increase the awareness of U.S. government agencies and other donors of the immediate and long-term value of tropical forests; and (k) utilize the resources and abilities of all relevant U.S. government agencies?

This will be addressed when project activities are undertaken.

m. FAA Sec. 118 (c) (13). If the assistance will support a program or project significantly affecting tropical forests (including projects involving the planting of exotic plant species), will the program or project (a) be based upon careful analysis of the alternatives available to achieve the best sustainable use of the land, and (b) take full account of the environmental impacts of the proposed activities on biological diversity?

N/A

n. FAA Sec. 118 (c)(14). Will assistance be used for (a) the procurement or use of logging equipment, unless an environmental assessment indicates that all timber harvesting operations involved will be conducted in an environmentally sound manner and that the proposed activity will produce positive economic benefits and sustainable forest management systems; or (b) actions which will significantly degrade national parks or similar protected areas which contain tropical forests, or introduce exotic plants or animals into such areas?

N/A

ANNEX D

PROJECT TECHNICAL ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

PROJECT TECHNICAL ANALYSIS - ANNEX D

1. Power Generation in Lesser Developed Countries (LDCs)

Electrical energy has traditionally played a key role in the agricultural, industrial, and social development of a country. In general, about 50 percent of the electricity production in developing countries is used by industry and the remainder is consumed in the agricultural, commercial and residential sections.

Recent annual statistics for electricity productions in the developing countries are presented in Table 1.0. The fairly large percentages of electrical generation attributed to hydro and geothermal sources are indicative of developing economics in these countries. By comparison, the split for electric power generation in the United States is:

Fossil Fuel - 73%, Hydro & Geothermal - 14%, Nuclear Energy - 13%

Of the developing countries, only India, Pakistan, and South Africa have nuclear power generating capabilities which account for 1-3% of their total production.

TABLE 1.0
ELECTRICAL ENERGY PRODUCTION IN
DEVELOPING COUNTRIES,

LATIN AMERICA - CARIBBEAN

COUNTRY	ELECTRICITY[2] PRODUCTION MILLION-KWH		% PRODUCTION FOSSIL FUEL	HYDRO & GEOTHERMAL	OTHER
BRAZIL	175,710		6	94	
MEXICO	87,083		71	29	
COLUMBIA	27,800	27	73		
PERU	11,769	26	74		
ECUADOR	4,400		60	40	
DOMINICAN REPUBLIC	6,009		87	13	
URUGUAY	3,637		4	93	
COSTA RICA	3,067		3	97	
JAMAICA	2,400		94	6	
PANAMA	2,360		37	63	
BOLIVIA	1,695		29	71	
EL SALVADOR	1,684		7	93	
GUATEMALA	1,625		63	37	
HONDURAS	1,060	18	82		
HAITI	375	31	69		
BARBADOS	360	100			
GRENADA	25		100		
INDIA	165,440		65	33	2
TURKEY	87,083		71	29	
EGYPT	22,870		54	46	
THAILAND	22,029		81	19	
PAKISTAN	21,873		40	59	1
INDONESIA	21,330	90	10		
PHILIPPINES	20,800		39	61	
PORTUGAL	19,033	58	42		
MOROCCO	6,617		94	6	
BANGLADESH	4,292		79	21	
TUNISIA	3,590		99	1	
JORDAN	2,304		100		

[1] Source: World Resources 1987
[2] Annual production in 1984

TABLE 1.0
ELECTRICAL ENERGY PRODUCTION IN
DEVELOPING COUNTRIES,

LATIN AMERICA - CARIBBEAN

COUNTRY	ELECTRICITY[2] PRODUCTION MILLION-KWH	% PRODUCTION FOSSIL FUEL	HYDRO & GEOTHERMAL	OTHER
SRI LANKA	2,261	8	92	
BURMA	1,726	50	50	
OMAN	1,675	31	90	
FIJI	387	26	74	
NEPAL	350	10	90	
YEMEN ARAB REP	295	100		
SOUTH AFRICA	122,283	96	1	3
ZAMBIA	10,080	1	99	
NIGERIA	8,835	76	24	
ZAIRE	4,558	3	97	
ZIMBABWE	4,538	24	76	
KENYA	2,253	23	77	
CAMEROON	2,230	5	95	
MOZAMBIQUE	1,945	21	79	
COTE d'IVOIRE	918	46	54	
GHANA	1,830	2	98	
SUDAN	1,032	50	50	
LIBERIA	897	62	38	
TANZANIA	870	29	71	
ETHIOPIA	760	25	75	
SENEGAL	684	100	--	
UGANDA	655	1	99	
BOTSWANA	621	--	--	
MALAWI	511	5	95	
GUINEA	499	84	16	
MADAGASCAR	452	45	55	
SWAZILAND	310	--	--	
SIERRA LEONE	280	100	--	
NIGER	245	100	--	
TOGO	234	64	36	
MALI	153	22	78	
DJIBOUTI	148	100	--	

[1] Source: World Resources 1987
[2] Annual production in 1984

TABLE 1.0
ELECTRICAL ENERGY PRODUCTION IN
DEVELOPING COUNTRIES[1]

LATIN AMERICA - CARIBBEAN

COUNTRY	ELECTRICITY[2] PRODUCTION MILLION-KWH	% PRODUCTION FOSSIL FUEL	HYDRO & GEOTHERMAL	OTHER
RWANDA	135	--	100	
BURKINA FASO	115	100	--	
MAURITANIA	102	100	--	
SOMALIA	75	100	--	
CHAD	65	100	--	
GAMBIA	42	100	--	
CAPE VERDE	25	100	--	
GUINEA-BISSAU	14	100	--	
BURUNDI	2	100	--	
LESOTHO	1	--	--	

[1] Source: World Resources 1987
[2] Annual production in 1984

Historically, for both developed and developing countries, there has been a direct correlation between energy use, particularly electrical energy, and the Gross Domestic Product (GDP). This relationship is evident in the summary of electricity usage for the developing countries given in Table 2.0. For each geographical region, the countries are listed according to their Gross Domestic Product. By comparison with Table 1.0, it is apparent that the GDP ranking generally corresponds to the annual electricity production for these countries.

Production in the developing economies also tends to emphasize energy intensive manufacturing. This reflects the desire to increase the domestic output without regard for energy efficiency, which is the keynote of the more developed economies like the United States. Consequently, the electricity usage per dollar of gross domestic product may also be used as a measure of the developing countries growth towards technical maturity. For comparison purposes, the ratio of KWH/$ GDP for the United States is about 0.6.

The energy intensity of economic activity, defined as the ratio of total energy consumption to GDP, is projected (1) to decline steadily between now and the year 2000. While this decline is expected to occur in all countries, the energy intensity is projected to remain the highest in the developing regions.

TABLE 2.0
ELECTRICAL ENERGY USAGE IN DEVELOPING COUNTRIES

LATIN AMERICA - CARIBBEAN

COUNTRY	GDP[1] BILLION $	$GDP/CAPITA	INDUS. %GDP	ELECTRICITY USE KWH/$GDP	KWH/CAPITA
BRAZIL	206.8	1,494	39	0.85	1,270
MEXICO	127.1	1,585	39	0.68	1,086
COLOMBIA	29.7	1,023	25	0.94	959
PERU	25.4	1,281	38	0.46	594
ECUADOR	11.5	1,199	42	0.38	458
GUATEMALA	7.5	911	--	0.22	198
DOMINICAN REP	5.3	800	30	0.76	607
URUGUAY	5.3	1,773	33	0.68	1,112
PANAMA	5.1	2,327	18	0.46	1,073
COSTA RICA	4.3	1,638	29	0.72	1,180
BOLIVIA	4.2	633	23	0.40	257
EL SALVADOR	4.0	812	21	0.42	344
HONDURAS	3.0	658	25	0.36	236
JAMAICA	2.4	1,012	40	0.99	1,000
HAITI	2.2	352	--	0.17	62

[1] 1986 GROSS DOMESTIC PRODUCT
Source: World Development Report 1988

TABLE 2.0 - Cont.
ELECTRICAL ENERGY USAGE IN
DEVELOPING COUNTRIES

ASIA - NEAR EAST

COUNTRY	GDP[1] BILLION $	$GDP/CAPITA	INDUS. %GDP	ELECTRICITY USE KWH/$GDP	KWH/CAPITA
INDIA	203.8	261	29	0.81	212
INDONESIA	75.2	452	32	0.28	128
TURKEY	52.6	1,022	36	0.58	595
THAILAND	41.8	794	30	0.53	419
EGYPT	40.9	822	29	0.56	460
PHILIPPINES	30.5	533	32	0.68	363
PAKISTAN	30.1	303	28	0.83	221
PORTUGAL	27.5	2,694	40	0.69	1,866
BANGLADESH	15.5	150	15	0.28	42
MOROCCO	14.8	656	30	0.45	294
BURMA	802	215	13	0.21	45
TUNISIA	7.8	1,067	33	0.46	492
OMAN	7.3	5,630	23	0.23	1,288
SRI LANKA	5.9	365	27	0.38	140
YEMEN ARAB REP.	4.8	580	16	0.06	36
JORDAN	4.0	1,111	28	0.58	640
NEPAL	2.2	129	11	0.16	21

[1] 1986 GROSS DOMESTIC PRODUCT
Source: World Development Report 1988

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TABLE 2.0 - Cont.
ELECTRICAL ENERGY USAGE IN
DEVELOPING COUNTRIES

AFRICA

COUNTRY	GDP[1] BILLION $	$GDP/CAPITA	INDUS. %GDP	ELECTRICITY USE KWH/$GDP	KWH/CAPITA
SOUTH AFRICA	56.4	1,745	46	02.17	3,789
NIGERIA	49.1	476	29	0.18	86
CAMEROON	11.3	1,074	35	0.20	212
SUDAN	7.5	330	15	0.14	46
COTE d'IVOIRE	7.3	684	24	0.26	179
ZAIRE	6.0	190	36	0.76	144
GHANA	5.7	433	17	0.32	139
ETHIOPIA	5.0	114	15	0.15	18
ZIMBABWE	4.9	568	46	0.92	522
MOZAMBIQUE	4.3	303	12	0.45	137
TANZANIA	4.0	175	10	0.22	39
SENEGAL	3.7	550	27	0.18	101
UGANDA	3.3	218	6	0.20	43
MADAGASCAR	2.7	252	16	0.17	43
SOMALIA	2.3	422	9	0.03	14
NIGER	2.1	315	16	0.17	43
GUINEA	2.0	314	22	0.25	79
RWANDA	1.9	298	23	0.07	22
ZAMBIA	1.7	240	48	6.07	1,460
MALI	1.7	217	13	0.09	20
SIERRA LEONE	1.2	310	22	0.24	74
BOTSWANA	1.2	1,045	58	0.54	565
MALAWI	1.1	149	18	0.46	69
BURUNDI	1.1	227	17	0.01	1
LIBERIA	1.0	430	28	0.91	390
TOGO	1.0	316	20	0.22	75
BURKINA FASO	0.9	115	22	0.12	14
MAURITANIA	0.8	417	24	0.14	57
LESOTHO	0.2	144	27	0.01	1

[1] 1986 GROSS DOMESTIC PRODUCT
Source: World Development Report 1988

Reduction in energy intensity, especially in the more industrial economies, results from efforts to increase energy conservation and efficiency as well as from shifting activity towards less energy intensive services and new technologies. As shown below, the energy/GDP ratio in the developing countries actual rose during the 1980-1985 period, reflecting a growth in energy consumption of about 5% per year. These countries had difficulty reducing the growth in energy usage even though the overall economic activity grew at a rate of only 1.1% per year.

Growth Rates in Developing Countries

	Annual GDP Growth, %	Energy Consumption/GDP Growth Ratio
1970 - 1980	5.4	1.31
1980 - 1985	1.1	4.45
1985 - 1990	2.9	1.00
1990 - 2000	3.8	0.79

During the 1980-1985 period, the demand for electricity in most developing countries out-paced the general growth in energy consumption and increased by 7% per year. This high growth rate was, in part, due to energy intensive industrial uses coupled with urban development which increased the residential power consumption.

Furthermore, many of these countries embarked on extensive rural electrification programs in an effort to promote rural development and control population shifts towards the urban sections. These forces will likely continue to influence the demand for electricity for the foreseeable future. Consequently, while the average GDP is expected to grow at 3-4% through the year 2000, the demand for electrical energy will likely increase by 4-5% in the developing countries.

Most developing countries are experiencing sever power shortages that hamper their development plans and economic activities. Among Asian countries, for example, the Philippines has a power shortage of about 8 percent of demand, Pakistan over 25 percent, Bangladesh about 20 percent, and India 15 percent. Since the electric utilities in developing countries are owned and operated by the government, power expansion requirements have become a major financial burden to the national budget. In most developing countries, over 20 percent of the development budget has been devoted to the power sector; a proportion that represents more than 60 percent of the budget for all energy activities. Moreover, because much of the capital invested in the power sector is borrowed from the international market, the government's ability to raise funds for other development activities has been drastically curtailed. In many countries, outstanding loans for the power sector represent over 40 percent of the national foreign

debt.

The utilities in most developing countries have been facing increasing operational, financial, and technical difficulties. In many utilities, the availability factor -- defined as the fraction of time that a power system is capable of operation -- is less than 60 percent, compared with an average of over 85 percent in the United States and other industrialized countries. And the transmission and distribution losses in the power systems of most developing countries are over 20 percent, compared with under 8 percent in the United States. Finally, utilities in developing countries are unable to raise enough revenue to recover their operating expenses. As a result, they have become major sink holes of government subsidies. Under these circumstances, utilities can neither effectively expand their generating capacity nor keep pace with the growing demand of power.

The industrial sector in developing countries has been especially affected by power shortages. In some developing countries, industry receives only 20 percent of its power needs during the peak demand season. The loss of production because of power cuts, estimated at over one order of magnitude higher than the actual cost of power, has considerably slowed industrial growth in these countries. In many regions of developing countries. In many regions of developing countries, industrial expansion is delayed because new factories cannot obtain a tie-in to the grid. To reduce the impact of power shortages, private companies are installing small, inefficient diesel generators that use expensive imported fuels. Such a practice only increases the country's dependence on imported petroleum products.

2. Technical Approaches to the Power Crisis

In general, electric power generation in developing countries is monopolized by state-controlled utilities. These large bureaucracies are relatively inefficient and lack aggressive management and creative planning abilities. Consequently, these utilities tend to follow the traditional approaches to these problems which are defined strictly as a lack of generating capacity. The usual solution is, therefore, to design and build additional power plants without considering alternative approaches, such as advanced technology, renewable energy sources, and energy conservation strategies. With the proper infrastructure and technical support, the developing countries could take advantage of numerous technical and operational innovations which have the potential to alleviate their problems.

- Modernize Existing Facilities

The majority of thermal power plants in developing countries operate at less than rated capacity and have relatively low thermal efficiencies. Furthermore, the availability of these power plants for useful production is generally below that achieved in the industrialized nations. The inefficient performance of these plants is, largely due to design deficiencies, inferior fuel quality, and poor operating management. Low plant availability is usually caused by inadequate maintenance schedules and the unavailability of spare parts. Improved plant performance could be achieve with a minimum investment of resources. Through a concerted effort of technical, operational, and managerial expertise, and analysis of plant performance could identify the causes for operating problems and inefficiencies. This analysis would provide recommendations for design improvements, operator training, fuel switching, and preventive maintenance.

While an in-depth analysis of the potential for power plant modernization in the developing countries has not been conducted, the limited information available (3) suggest that rehabilitation of inefficient systems can increase the available generating capacity by 8-10%. Furthermore, in developing economies, where peak demand grows faster than the average electrical demand, load management offers an option which can reduce the need for additional generating capacity. This approach requires the efforts of power

sector planners to coordinate reduction of peak loads with the local industrial management.

- Energy Conservation

A financially attractive alternative to increased generating capacity is to reduce energy losses associated with the distribution and end-uses of electricity. In the industrial and commercial sectors along, the developing countries could realize significant savings through adoption of energy efficient technology. For instance, factories in these countries devote 2-5 times more power to a specific operation than do modern plans in industrialized nations (4).

In most developing countries, the capital stock was not designed or built with energy efficiency in mind. In addition, production and operating practices are often wasteful of energy. Studies in developing countries indicate that conservation projects using existing techniques and processes can save an estimated 10 to 30 percent of the energy consumed in the industrial sector. Such projects in the power sector can save from 10 to 25 percent of the energy used, mostly through the rehabilitation of the electrical distribution and transmission systems.

Many low cost energy-saving measures can be carried out in a few months, and most other measures can be implemented within a few years. In addition, these measures are very cost-effective with paybacks of less than three years (4).

- Alternative Energy Sources

Most developing countries are emphasizing the use of indigenous energy resources for future power generation in an attempt to restrict the amount of imported oil. Based on the available data, Table 3.0 summarizes the proven reserves of fossil fuels in the developing countries. From this data, it is quite apparent that, with few exceptions, the supply options for these countries are limited. Coal and hydropower represent the dominant alternatives to imported oil for electric power generation. The available coal in many of these countries has high ash content and is a poor quality fuel. Furthermore, development of indigenous coal resources has proved to be a very costly undertaking.

Largely in response to the shock of oil price increases, some countries began pursuing renewable energy sources. Of the developing countries, Brazil, India, and the Philippines achieved some significant results but other efforts failed due to the lack of strong program management and because some technologies proved too expensive (2). The major forms of renewable energy which offer alternatives to fossil fuels for electric power generation include hydropower, geothermal, biomass, wind power, and solar power.

TABLE 3.0
COMMERCIAL ENERGY RESOURCES IN DEVELOPING COUNTRIES[1]

LATIN AMERICA - CARIBBEAN

PROVEN RESERVES

COUNTRY	COAL MILLION MT	CRUDE OIL MILLION MT	NATURAL GAS BILLION M^3
BRAZIL	23,000	371	81
MEXICO	2,243	6,907	2,134
COLOMBIA	2,073	71	140
PERU	28	116	34
ECUADOR	---	8	---
GUATEMALA	---	8	---
HONDURAS	21	---	---
HAITI	13	---	---

ASIA - NEAR EAST

PROVEN RESERVES

COUNTRY	COAL MILLION MT	CRUDE OIL MILLION MT	NATURAL GAS BILLION M^3
INDIA	27,910	471	420
TURKEY	4,210	38	15
EGYPT	25	400	85
THAILAND	470	---	112
PAKISTAN	145	13	450
INDONESIA	693	6,738	900
PHILIPPINES	170	3	---
PORTUGAL	72	---	---
MOROCCO	178	40	---
BANGLADESH	1,054	---	192
TUNISIA	---	231	135
BURMA	5	4	250
OMAN	---	351	57

[1] Source: World Resources 1987

TABLE 3.0
COMMERCIAL ENERGY RESOURCES IN
DEVELOPING COUNTRIES[1]

AFRICA

PROVEN RESERVES

COUNTRY	COAL MILLION MT	CRUDE OIL MILLION MT	NATURAL GAS BILLION M^3
SOUTH AFRICA	112,000	---	---
ZAMBIA	32	---	---
NIGERIA	338	2,251	1,200
ZAIRE	600	20	2
ZIMBABWE	1,600	---	---
CAMEROON	---	66	150
MOZAMBIQUE	240	---	---
COTE d'IVOIRE	---	43	---
TANZANIA	304	---	---
BOTSWANA	7,000	---	---
MALAWI	25	---	---
MADAGASCAR	1,075	---	---
SWAZILAND	2,020	---	---
SUDAN	---	27	3
NIGER	5	---	---

[1] Source: World Resources 1987

Hydropower

Substantial potential exists to convert falling water into electricity. Two-thirds of the unexploited hydropower potential lies in developing countries. Organization of Economic Cooperation and Development (OECD) nations have exploited about 50 percent of their usable opportunities, and the USSR and Eastern Europe have tapped about 20 percent, but developing countries have utilized only 7 percent of their available resources. Among them, Brazil, China, Colombia, India, Peru, and Zaire have the largest untapped potential. The following table shows the worldwide hydropower potential and use by geographic region.

	Technically Exploitable Potential (Megawatts)	Share of Potential Exploited (Percent)
Asia	610,100	9
South America	431,900	8
Africa	358,300	5
North America	356,400	36
USSR	250,000	12
Europe	163,000	59
Oceania	45,000	15
World Total	2,214,700	17

Most hydropower projections include only large dams, but a great deal can be expected from decentralized small-scale 1-10 megawatt stations. Because these units can use local energy sources to satisfy local needs, they can contribute to rural development in greater proportion to the amount of energy they deliver. By 1982, China had built some 80,000 small dams, averaging about 70 kilowatts. Small-scale hydro stations in the United States, many of which have come on line since 1978, numbered 1,410, with a combined capacity of 7,019 megawatts in 1983.

Further hydro development will be restricted more by lack of money and markets for the power than by a lack of possible sites for projects. Construction costs for dams have increased less sharply than for nuclear or thermal generating stations, but the World Bank projects that $50 billion will be needed for dam construction between 1982 and 1990 if hydropower is to meet the Bank's goal of 43 percent of Third World electricity production in 1995.

Geothermal

The earth's natural interior heat is enormous, but difficult to harness with present technologies. Nonetheless world geothermal capacity grew by 8.3 percent per year form 1920 to 1978 and by 16.5 percent per year from 1978 to 1985. In 1985, an estimated 4,800 megawatts were produced and by 1990, output is expected to increase to 6,400 megawatts.

The United States, which leads the world in geothermal capacity, increased the capacity more than threefold since 1975 to over 2,000 megawatts in 1985. Mexico has developed three major geothermal fields for 650 megawatts of capacity. Other countries, including the Philippines, have recently added significant

geothermal output.

Tapping geothermal resources requires procedures similar to those employed for oil exploration, and drilling costs are high. The lack of scientific surveys of potential thermal areas is also retarding rapid geothermal development. While geothermal's environmental impacts are considered minor compared to those of other energy sources, they include possible pollution of surface waters and groundwater by non-toxic chlorides, sulfates, and carbonates or silica.

Conventional geothermal resources, which draw steam or hot water from natural underground reservoirs, can be economically exploited only where molten rock lies within 3,000 meters of the earth's surface. Engineers hope to develop technologies by the year 2000 that will enable drilling and heat extraction as deep as 5,000 meters. Scientists are also trying to find ways to use more abundant, lower temperature water or steam for electricity generation.

Biomass

Wood, organic wastes, and other biomass accounted for approximately 14 percent of total global energy use in 1980. For Nepal, Ethiopia, and Tanzania, more than 90 percent of their total energy comes from biomass.

Unlike fossil fuels, biomass is a widely available resource that can be produced renewably with good management practices. Biomass can be converted to alcohol, which is an efficient clean-burning fuel for cooking or transportation, or can be burned to generate electricity. Its low-sulfur, low-ash content makes this biomass a cleaner feedstock than coal. Moreover, its production and conversion are inherently labor-intensive, an attractive feature for developing countries facing severe unemployment problems. But the low efficiency of photosynthesis requires hugh land areas for energy crops if significant quantities of biomass fuels are to be produced.

Several countries have expanded their use of biomass for electricity generation since the 1973 oil embargo. The Philippine government wants to build a 3-megawatt base-load, wood-fired power plant for each of the country's 100 rural electric cooperatives. Beginning in 1977, it identified parcels of marginal and unused federal land for 100-hectare wood plantations that are rented to groups of farmers. The Nation Electrification Administration provides loans for the cooperatives to build the power plants and for the farmers to plant the trees. Program managers estimate that the wood-fired electricity will cost 5.6 cents per kilowatt-hour, about 34 percent less than the marginal cost of electricity in 1981.

The Philippine plan originally called for 14 megawatts of capacity by 1985, but technical problems and budget constraints limited progress. Capacity reached only 12.7 megawatts in 1984, and bout three-quarters of the original plantations failed because of poor site selection and late planting caused by bureaucratic delays. Program managers now hope for 200 megawatts of capacity by 1990.

Wind Power

Wind energy machines contributed little to the global energy budget a decade ago, but more than 50,000 unites have been installed since the mid 1970's. Most machines are located at "wind farms" where clusters of small turbines line mountain passes and are connected to the electrical grid.

Wind-turbine developers have reduced average per-kilowatt costs from $3,100 in 1981 to less than $1,200 in 1986. Some turbines cost only $1,000 per kilowatt, and wind industry officials predict average costs will fall to about $700 per kilowatt within three to five years. Wind farms have also been built in Denmark, India, and the Netherlands, while planning continues in Great Britain, Mexico, Spain, Sweden, and several

islands in the Caribbean. Wind availability, of course, varies by region. Relatively few sites possess the average wind speeds of at least 24 kilometers per hour necessary to produce electricity economically. Even in appropriate areas, winds are often intermittent, and turbines tend to operate only about 30 percent of the time compared to about 60 percent for conventional power plants. Moreover, if not connected to an electrical grid, wind systems require expensive and cumbersome storage systems such as batteries, and back-up systems such as diesel engines. Simple mechanical wind machines can also be used for irrigating semi-arid regions where wind speeds average only eight miles per hour. Wind pumps provide particular opportunities for East Africa, northern Argentina, northeastern Brazil, Mexico, and Peru.

Solar Power

Photovoltaics are not yet a significant energy source, but they hold promise of providing electricity under a decentralized system and could have broad applications in the future. One of the major barriers to photovoltaic use has been its high cost. However, this cost has been steadily reduced with improved technology.

Experts believe photovoltaic systems will be installed for $46- per watt by the mid-1990's. That price is competitive with small diesel generators used throughout developing countries and in rural areas of industrialized nations. When that goal is reached, photovoltaics could compete for the multi-megawatt market in rural areas that now have little or no electrical service.

The use of renewable energy sources for power generation must be examined on a case-by-case basis. Indigenous renewable resources provide an option for small power generating facilities which are ideally suited for rural areas. Although there is considerable potential for these routes, they have been largely ignored by electric power planners in most developing countries.

- New Power Generation Technology

There are numerous advanced technologies which have been developed by the industrialized nations to produce electric power more efficiently and to reduce the environmental impact of power generation. These should be considered by the developing countries in planning for additional power generating capacity. Some of these new technologies offer the developing countries an opportunity to increase the use of their indigenous coal resources, thereby reducing their reliance on imported fuels.

Cogeneration, which is the simultaneous production of electric power and useful thermal energy, is a generating option that has not been fully utilized in the developing countries. In a conventional thermal power plant, fuel is burned to produce high-temperature, high-pressure steam that is then passed through a turbine to generate electricity. Even in the most efficient thermal steam power plants, less than 40% of the available energy contained in the fuel is converted into electricity. More than 60% of the energy in the fuel escapes to the atmosphere. Some of this thermal discharge is in the combustion gases that escape to the atmosphere through the boiler stack. But most of the waste heat is accounted for by the condensation and cooling of steam and water after they have passed through the turbine. The turbine discharge contains substantial amounts of useful heat, but this heat is at temperatures and pressures that are too low to economically generate additional electricity. Most commercial and industrial applications, however, require process steam and heat at low temperatures. Therefore, combining the production of electricity and heat in an industrial plant or at a commercial site can use the otherwise wasted energy. The cogeneration option will increase the overall energy efficiency and reduce the need for capacity expansion by the electric utilities. A recent analysis (5) of cogeneration potential in the developing countries indicates that this option could result in a ten percent increase in electricity production.

New techniques such as fluidized-bed combustion, furnace limestone injection, and coal gasification

offer dramatic environmental improvements over conventional coal-burning power plants. For countries with coal deposits, these technologies provide means to meet rising electricity demands while mitigating concerns over increased acid rain and other air pollution.

In atmospheric fluidized-bed combustion, coal is mixed with inexpensive limestone and burned in a bed of solids which is suspended by a flow of air. The limestone reacts chemically with the coal to capture most of the sulfur. Because the unit operates at lower temperatures than conventional boilers, it also reduces the emission of nitrogen oxides. The fluidized-bed combustor is also a versatile technology for coal burning in that high ash and poor quality coals can be easily processed. A more advanced version is the pressurized fluidized beds for years, the pressurized combustor for large scale power generation is not yet commercially developed.

Attempts to capture sulfur dioxide by injecting limestone into a furnace date from the 1960s, but only recently have advancements made the procedure effective. In this process, dry pulverized limestone is fed into the furnace where it is reduce to lime and reacts with sulfur dioxide to form dry, solid calcium sulfate. Because these reactions occur most effectively at reduced temperatures, the process also suppresses the formation of nitrogen oxides.

In an integrated gasification combined cycle system, coal is converted via air and steam into a clean, gaseous fuel. The fuel gas is then combusted in a gas turbine which drives an electric generator. The combustion gases which exit the gas turbine are used to generate steam to produce additional electricity. These combined cycle systems take advantage of advanced gas turbines which have energy conversion efficiencies of over 50%. These systems can be designed as modular units. In addition to attractive costs, they offer short lead times for planning an commissioning incremental power generating capacity.

Besides being candidates for new generating plants, the above technologies can be used to repower existing plants. Repowering replaces a portion of the original facility and increases the capacity while simultaneously reducing environmental emissions.

Several retrofit technologies have also emerged within the last few years that can be integrated into existing power plants in an effort to improve environmental performance. These include:

- Advanced Coal Cleaning - techniques involving a combination of fine grinding, flotation, and selective coalescence to reduce the ash and mineral sulfur content of coals prior to combustion.

- Limestone Injection Multi-Stage Burners - a technology that injects sulfur-absorbing limestone into fuel-rich "reducing" zone of a pulverized coal burner.

- Slagging Combustors - devices that can control or remove objectionable sulfur and particulate matter from a coal-derived fuel before it is injected into retrofitted oil or gas boilers.

- Gas Reburning - a concept that injects a secondary fuel, such as natural gas, above the primary combustion zone to create a fuel-rich region in which nitrogen oxides are converted to harmless products.

- In-Duct Sorbent Injection - a technique that injects sulfur-capturing sorbents directly into a power plant's ductwork leading from the boiler to the stack.

- Advanced Flue Gas Cleanup - a variety of innovative scrubber technologies that use chemicals such as copper oxide or electron beam irradiation to improve the effectiveness of pollutant capture.

These technologies, either separately or in combination, not only control SO_2, but NO_x as well. In addition, they produce wastes which can be disposed of easily and in an environmentally safe manner. Although the SO_2 reduction potential of some of these technologies is lower than conventional flue gas scrubbing, the levels will likely be sufficient to meet possible future requirements for emission reductions at existing plants.

ANNEX E

PROJECT FINANCIAL ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

PROJECT FINANCIAL ANALYSIS - ANNEX E

I. Introduction

The purpose of financial analysis for the Private Sector Energy Development Project is to determine the value of the project as a self-contained entity. Financial analysis is only concerned with determining whether the directly quantifiable monetary benefits from the project are larger or smaller than the project's costs. The broader analysis of indirect, opportunity, and social costs is undertaken in the economic analysis.

Financial analysis for the Private Sector Energy Development Project was conducted for three purposes:

- To assess the financial returns to A.I.D. resulting from its support in this project.
- To assess the financial returns and incentives for the private firms who will perform the feasibility studies and other special studies.
- To assess the expected financial returns to the private power project facilities that will ultimately be operated as a result of this development project.

Specific feasibility studies and private power facilities have yet to be identified, thus this financial review necessarily relies on hypothesized numerical and theoretical analysis. More importantly, it should be noted that the goal of A.I.D. development efforts, is not to show a positive financial return in an of themselves. Feasibility studies, training sessions, and other special studies do not generate revenue, and thus when they are evaluated in isolation the return is negative (i.e., expected projected financial costs exceed financial benefits). Ultimately, the value of such development projects is found in the financial viability of the final private power facilities resulting from the feasibility studies, as well as economic benefits to the developing countries (as discussed in Annex C).

II. I.D. Financial Analysis

As is common in any foreign aid program that seeks to transfer resources to developing countries, the financial returns to A.I.D. for its participation in the Private Sector Energy Development Project are not expected to cover the costs of the program. In terms of project costs, A.I.D. and other sources from agencies will provide an estimated $15.4 million in funding for the PSED Project. In terms of project revenues, financial returns for this investment are very limited. The repayment of feasibility study funds by successful private sector participants are the only expected project revenues, estimated at $1 million or less. Unless other arrangements are approved, these reflows will be made to the U.S. Treasury and not to the fund.

For its $12 million investment, the A.I.D. and the other funding agencies will receive an estimated 25 feasibility studies, 6 host country energy assessments, 6 training workshops, 8 study tours, 10 technical assistance trips, and an energy database. While these studies will lead to viable private power facilities in the future, they are not revenue generators for A.I.D. in an of themselves. If 1/5 of the 25 feasibility studies end in successful projects, the U.S. Treasury could recover about $1 million in repayment. This assumes that the average cost to A.I.D. of each feasibility study will be $200,000. The negative payback precludes the calculation of net present values or internal rates of return.

III. Feasibility Study Fund Financial Analysis

Given a normal economic incentive structure, private sector firms would not undertake a series of feasibility studies without the expectations of positive financial returns from successful private power

construction projects that makes these feasibility studies financially viable. (The operating viability of the private power facilities themselves is discussed in the next section). The A.I.D. fund provides further incentive to the private sector to investigate the feasibility of private power facility projects. (Under its cost sharing approach, the Feasibility Study Fund would provide 50% of the cost of the feasibility studies).

Table 1 below depicts the expected outcomes of the Private Sector Energy Development Fund. In the initial phase, it is estimated that requests for studies will generate some 75 proposed feasibility studies over the 1989-1994 period. The feasibility fund administrators will then review these proposals for funding. This review stage will act as an initial project hurdle, in that only the most viable proposals will receive funding. (The criteria for funding the projects will include: highest projected NPV, strength of financing and bank commitments, the project country's willingness to support the project, fuel supplier and power distributor commitments, and environmental concerns). Here we estimate that 1 out of 3 private sector proposals will be funded, allowing for 25 feasibility studies.

During the feasibility study phase, the private sector firms will perform extensive analysis aimed at making a "go" or "no go" decision on the proposed project. A.I.D. and matching private sector funds will be used during the feasibility stage for many purposes, including specifications and drawings, construction cost estimates, risk analysis, demand forecasting, funding options, environmental analysis, technical analysis, and overall financial planning. The feasibility study stage will serve as a second hurdle for project acceptance -- many projects will be rejected. It is estimated that only about 1/5 (5 out of 25) of the feasibility studies will result in a "go" decision. It is estimated that the PSED Project will act as a catalyst for an investment of $500 million of private capital in vie or more power plants with total capacity of 500 megawatts.

Thus to the extent that revenues from these 5 successful utility plants provide an adequate return to the private firms, the benefits from the initial 25 feasibility studies should outweigh the costs. Table 2 presents one possible scenario for the project:

TABLE 2: EXPECTED VALUE OF PSED PROJECT

	UNIT VALUE	TOTAL VALUE
75 Proposed Studies	($25,000) each	($1,875,000)
25 Feasibility Studies	($200,000) each	($5,000,000)
5 Successful Projects	$5,000,000 profit each	$25,000,000
		$18,125,000

As suggested by the scenario presented in Table 2, if the PSED fund generates 5 successfully constructed projects with a profit (in present value terms) of $5 million each, then the overall value of the PSED Project would be estimated $20.125 million. (This assumes that firms spend $25,000 for each proposed study or prefeasibility study). Note that under the assumption of Table 2, each of the five successful utility plants need to have a lifetime present value of only $1,375,000 to cover the initial costs of the PSED fund.

IV. Private Power Facility Financial Analysis

The bottom line as to whether the PSED Project is financially viable and successful, either for A.I.D. or the private sector firms depends on the operating viability of the private power facilities constructed as a result of the Project. Electric utilities in developing countries tend to be state-controlled and inefficient. Most do not

generate enough revenue to cover their operating and capital investment expenses. The poor financial state of many electric utilities in developing countries is due to several factors, including:

1. Electricity rate ceilings that set the marginal revenue from an additional KWh below its marginal cost of supply,

2. Bureaucratic management, where employee-to-customer ratios are much higher than private sector plants due in part to political pressures to hire,

3. Inefficiencies in the areas of technology used in production methods and delivery.

While private sector profit incentives should be able to correct the last two problems, more economic price policies (that allow revenues to cover costs) are required to make operating such utilities financially viable for private sector firms. In the interim period, cross-subsidies to the private sector facility operator may allow a government to slowly adjust its electricity pricing tariffs.

The following examples from projects in Pakistan and Guatemala bring out the need for more sensible pricing policies:

Guatemala's National Electrification Plan

A.I.D. efforts in support of Guatemala's National Electrification Plan is now approaching Phase III -- the goal of which is the construction of sub-transmission and distribution lines to rural villages. While the project is worthwhile in that it provides extensive economic benefits to rural Guatemala, the project paper's financial analysis concluded that the Project's financial costs exceeded its financial benefits, with the main reason being the low level of the electricity tariff to small users. Thus the additional sales from the project provided little or no additional revenue to cover costs.

Pakistan's

While Pakistan has been active involving the private sector in energy development through its Private Power Project initiative, it has also experienced problems in the pricing of its electricity. Proposals to the Government of Pakistan for private power generation plants are being delayed because the government has been unwilling to pay an electricity price high enough to make the projects financially viable. This is due in large measure to the long tradition of underpricing electricity and using cross subsidies to finance utility revenue shortfalls.

The examples of Guatemala and Pakistan show that private sector utility plants will only be financially viable if revenues are allowed to cover costs. Ultimately, only confidence among private sector firms's that they can cover such costs in the construction of developing countries' utility plants will lead to private initiatives and financing in this area. Governments in developing countries must either be willing to price electricity to cover its generating and distribution costs, or to provide cross-subsidies to the private power facilities if below cost tariffs remain in effect.

V. Conclusion

The financial returns to performing a feasibility study in and of itself are negative -- there is a cash outflow without any incoming revenue stream. However, over the long term, the returns to the PSED feasibility studies will be positive if, as expected, they lead to the successful construction and operation of private power projects in developing countries.

ANNEX F

PROJECT ECONOMIC ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

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PROJECT ECONOMIC ANALYSIS - ANNEX F

I. Introduction

The purpose of economic analysis for the Private Sector Energy Development Project is to determine whether the Project will be a worthwhile investment for the affected countries. The analysis estimates whether the outputs from the Project are sufficiently valuable so as to cover the Project costs. Economic analysis differs from financial analysis in that it examines the full effects of a project on a country's economy. While financial analysis examines only the explicit monetary costs and benefits of a subproject, economic analysis examines hidden opportunity costs and benefits to using resources in such a way. The general principle of economic analysis is to compare the real benefits of a project to its real costs.

In performing the economic analysis for the Private Sector Energy Development Project, it must be recognized that because the project limits its funding to feasibility studies, training, and technical assistance, no specific actual subprojects, (e.g., power plants) can be analyzed. Additionally, among these funded items, it is not realistic to attempt to quantify the economic benefits of the training sessions, seminars, and technical assistance. Although these items may provide long-term benefits in areas such as tariff restructuring, there is no way to quantify these benefits. Thus, the economic analysis focuses on the expected economic benefits of the feasibility studies.

As was done in the Financial Annex, the economic analysis uses estimates of the number of successful projects resulting from the feasibility studies to gauge the economic viability of the Fund. The following analysis discusses the broad economic and social benefits expected to result from feasibility fund initiatives. These benefits are then quantified in a return on investment analysis.

II. Project Outputs and Benefits

1. Project Outputs

The major anticipated long-term output of the project is additional electricity in developing countries. in the financial analysis, it was estimated that of an expected 75 proposals for feasibility study funding under A.I.D.'s Private Sector Energy Development Project, 25 (or about 1/3) would be granted funding.

Additionally, from these 25 feasibility studies, it is estimated that the project will eventually act as a catalyst for an investment of some $500 million of private capital for new generating capacity or major rehabilitation in five or more power plants ranging from 20 to 200 MW, with a total capacity of 500 MW. The electricity generated will provide many additional benefits to developing countries.

2. Benefits of Electric Power

As discussed in the body of the text, the major impetus for the Private Sector Energy Development Project is the excess and rapidly growing demand for electric power in developing countries. The combination of high growth rates in industrial output, inefficient utility management policies, and inadequate pricing policies in many of these countries has caused the demand for electric services to rise more rapidly than supply. Many countries now face power shortages of over 10 percent of their generation capability.

POWER GENERATION SHORTAGES	
COUNTRY AT PEAK	SHORTAGE, DEMAND MINUS SUPPLY
Dominican Republic	15+ percent
Sierra Leone	10 percent
India	10 percent
Pakistan	25+ percent

As a result of such power shortages, local industry must face periods of load shedding, use private and comparatively expensive diesel generators, and adjust production with night shifts and other methods. Thus there is a strong relationship between electric power generation and the economic development of a country -- and a high cost to power shortages. PSED Project feasibility funds would benefit countries reducing the cost of these power shortages and load shedding.

In addition to problems faced by industry in countries where electricity must be rationed by load shedding, much of the population of these countries remains without electric power. As the following chart for a selection of countries with data available show, the complete lack of electrical services is particularly acute in rural areas:

PERCENT OF POPULATION WITHOUT ELECTRICAL SERVICE		
Country	Total	Rural
Costa Rica	25%	55%
El Salvador	60%	89%
Guatemala	75%	93%
Honduras	%70	95%
Egypt	54%	81%
Pakistan	69%	85%
Philippines	72%	93%
Sudan	74%	N/A

For residents of these and other countries who live without electric power, the benefits of electricity are many. Not only would cheaper electric power replace candles, gas generators, and batteries for these residents, but major economic benefits would be forthcoming in areas of health care, education, agriculture, and industry. Economic multiplier effects would further increase these benefits.

3. Relationship Between Economic Growth and Electricity Use

Over time, there is a strong correlation between the economic growth rate in a country and its use of

electricity. Electricity has a large role in a country's development process (although cause and effect relationships are hard to establish). From 1970 to 1980, GDP in developing countries great at about 3.5-5.5 percent per year, while total energy consumption use grew by 5.9 percent and consumption of modern energy forms, i.e. electricity, grew about 7 percent annually.

Economic growth in many developing countries is constrained by shortages of electric power, as mentioned above. With each 1 percent increase in GDP corresponding to a 1 to 2 percent increase in energy use and electricity use, power shortages can be a major impediment to economic growth. (The use of modern energy forms such as electricity tend to grow faster than GDP as more productive uses for energy replace unproductive ones. Electric stoves may replace wood stoves, for example). While it is unrealistic to attempt to measure the effect that the PSED Project will have on overall GDP growth rates in developing countries, past evidence suggests that any additional electricity generated as a result of the project will lead to additional economic growth.

III. Quantifying the Economic Benefits

The results of the economic analysis suggest that the Private Sector Energy Development Project is a viable economic investment. However, because the PSED Project will be used to fund feasibility studies for potential developing countries' utility projects, no specific projects or countries can be examined to determine the economic benefits of the PSED Project. (Such analysis, however, will be conducted as part of the analysis of potential projects to receive funding). Conservative estimates of the economic benefits of the feasibility study funds can be made.

1. Economic Cost of Power Shortages

The major requirement needed to estimate the economic returns to building an electric utility generation plant in a developing country is an estimate of the opportunity cost of the power shortages, load shedding, and total lack of electricity mentioned above. While few studies have attempted to estimate the incremental benefits in health care, education, agriculture, and other areas, extensive work has been done to estimate the cost of load shedding and shortages. This work focuses on the efficiencies gained with electric power when compared to the use of candles and expensive gas generators, and the general loss of production in an economy. Exhibit F-1 presents estimates of the cost of power shortages in selected developing countries. Note in particular that the range of the estimates is well above the average price of a KwH of power generated with electricity (about 8 to 12 cents). The estimates of the cost of power shortages from Exhibit F-1 are the key to assessing the economic benefits of the PSED Fund. Every additional kWh of electricity produced as a result of the PSED Project will save industries and households the cost of a shortage. (Note that in Exhibit F-1, the range of estimates is from $0.06 - $6.00/kWh. For the analysis that follows, and estimate of $0.50/kWh or $500/MWh is used for the cost of a shortage. This is conservative in that it is at the low range of the estimates from Exhibit F-1, and the numbers in the Exhibit F-1 are in 1978 dollars).

2. Discount Analysis of PSED Benefits

In order to determine the economic benefits of the PSED Project, a discounted cash flow analysis was performed. The economic benefits of the Private Sector Energy Development Project are found not in the feasibility studies per se, but in the successful projects generated from these studies. This analysis assumes that the feasibility studies generate five successful plants with a total capacity of about 500 MW. Additionally, financial estimates for the private investment dollars required to build and operate the utility plants, as well as the revenue received from these plants, are left out of the analysis. Here it is assumed that in financial terms, these plants would have to project a viable return on investment or the private firms would not build them to begin with. (Given this assumption, the financial NPV for these plants would be and can be removed from the economic analysis).

Using these assumptions and an opportunity (shortage) cost estimate of $500/MWh from Exhibit F-1, Exhibit F-2 presents an analysis of the economic benefits that can be attributed to the successful power plants resulting from the feasibility studies. (Note that this analysis does not attempt to quantify benefits from improvements in health care, education, and other social areas).

The steps and assumptions behind the analysis are as follows. First, we assume that plants with a total capacity of 500 MW are constructed. Next, using a plant factor (utilization) of 40% and multiplying by 24 hours/day and 365 days/year, we estimate the total generated electricity per year at 1,752,000 MWh. We then assume that only half of this new generation is used for shortages and that losses from generation to distribution are 15%. Finally, we value each MWh of newly distributed electricity at $500/MWh (from Exhibit F-1). This produces an estimate of the economic benefits per year -- which can then be projected out over the life of the project and discounted back to arrive at a net present value.

3. Results

This analysis suggests that the economic returns to the PSED Project are positive and that the project is economically viable. The economic NPV for the project under this scenario is estimated at $805 million dollars, with an economic internal rate of return of 57%.

Analysis was also performed to test the sensitivity of these results to the estimate used for the cost of unserved energy. Exhibit F-2 presents this sensitivity analysis. Note that the project NPV is positive all the way down to an estimated cost of unserved energy of $8/MWh -- while studies suggest that this cost is in the range of $500/MWh or higher.

ANNEX G

PROJECT SOCIAL SOUNDNESS ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

SOCIAL ANALYSIS - ANNEX G

The power supply problem has adversely affected the social and economic development of many developing countries. Social programs are constrained not only by the lack of reliable electricity available to them, but also by loss of development funds which the government must divert from social programs to the power sector development. Private investment in the power sector will provide alternative forms of financing for the development of the power sector and will improve the reliability and availability of electricity.

Specifically, an improved power supply should increase the amount of power available for education, health care, agriculture, and industry. The A.I.D. Report to Congress on Power Shortages in Developing Countries addresses areas in which electricity can improve socioeconomic conditions. Some examples include:

- Education. Electricity is associated with information transfer, classroom conditions, and study habits. For instance, studies have found that children who can read by electric light spend more time reading at home than those who lack electric light.

- Vaccination. Vaccines for many human and livestock diseases require refrigeration. The total annual worldwide losses from diseases that could have been prevented by vaccination if refrigeration were more widely available are probably in the billions of dollars. Although refrigeration can be provide through non-electric technologies, expansion of electric refrigeration would simplify the effort.

- Potable Water and Sanitation. Potable water and sanitation services are essential in reducing the effects of water borne diseases. The provision of potable water and the development of sanitation facilities, both in the rural and urban areas of developing countries, will also reduce infant mortality rates significantly.

- Political Stability. Development, rather than electrification, is the key to building support for a government or political system. It is clear from anecdotal evidence, however, that failure to maintain reliable electricity services and acceptable prices of electricity for existing users can result in general public dissatisfaction and potential political instability.

In addition to the direct benefits of an improved power supply, social problems will also benefit as governments are able to free up funds and resources from their power sector development programs and focus more resources on the development of education, health care, and other critical social programs.

Furthermore, the expansion of the power supply should have a substantial impact on employment. The power sector, clearly, will experience an increased need for managers, and skilled and unskilled labor. In addition, increased power available for industrial and business uses should produce a considerable number of employment opportunities. Increased employment and productivity can have a significant effect on individual income levels and gross national product.

1. Impact on Women

The project is unlikely to have significant direct impact on the development of women in developing countries. However, it will foster improved living and working conditions through the power supply improvements it promotes. Specific impacts will be seen in employment opportunities, living conditions, and the overall standards of living.

Although the most direct impact on employment will be felt by males, who are the dominant labor force in the power sector, other employment opportunities should arise for women in secondary industries which are attracted to new power plant sites and in other areas which benefitted from the availability of electricity. One are specifically targeted to attract women is the microenterprise, a small business which relies on electrical machines and appliances to function. Current efforts are being made to promote the growth of these small businesses and the availability of reliable and affordable power should further encourage their development.

Reliable power will definitely have a positive effect on the living and working conditions of women. For instance, in the home, additional power will be available for preparing wood, heating and cooling the home, and using other labor saving devices. For women who live on farms, additional power can also be used for irrigation to relieve women of the burden of carrying water to the fields. In addition, many other labor saving devices, made available through reliable and affordable energy, will have positive long term effects on the development of women.

Through improvements discussed above and the strengthening of the economy that result from the project, the standards of living for households will improve. Women will benefit, for instance, from the increased family income which enhanced employment opportunities provide. Overall, the project should strengthen the conditions and development of women.

ANNEX H

PROJECT ADMINISTRATIVE ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

PROJECT ADMINISTRATIVE ANALYSIS - ANNEX H

Careful evaluation and analysis was made during the preparation of the PSED Project Paper to ensure that proposed project activities would not present an unnecessary administrative burden on A.I.D. Missions, the Bureau for Science and Technology, or the geographic Bureaus.

Implementation of the PSED Project as proposed will not have any unusual requirements for A.I.D. administrative support capabilities. The PSED Project will be managed by Office of Energy, which will provide centralized project supervision and a mechanism for dissemination and interpretation of project results as needed in the broader A.I.D. policy and programming process. The Project Director Core Project Staff Contractor for the PSED Project will report to the A.I.D. Project Officer appointed by the Office of Energy.

The PSED Project, as proposed, 1 will affect Mission workloads and may possibly affect staffing requirements. However, this will likely be minimized since the core staff and consultants will have considerable experience at operating with the A.I.D. administrative system. Project support services on the part of participating Missions are generally expected to be minimal. It is expected that this project can be successfully implemented and managed given present staffing levels within the Office of Energy.

ANNEX I

PROJECT ENVIRONMENTAL ANALYSIS

PROJECT PAPER

PRIVATE SECTOR ENERGY DEVELOPMENT PROJECT

(PSED)

Project Number 936-5738

PROJECT ENVIRONMENTAL CONSIDERATIONS - ANNEX I

1. Impact of Power Generation Facilities

One objective of the private energy development projects in the developing countries is to promote the use of innovative, yet proven, technologies which can more efficiently utilize energy resources with reduced environmental impacts. The industrial countries of the world have only recently, within the last 25 years, recognized the adverse impacts of electric power production on environmental quality and human health. The projected expansion of electricity generation in developing countries could therefore pose serious environmental problems in these areas unless appropriate measures to mitigate such impacts are incorporated in the planning and implementation process.

The construction of power generating facilities may impact the air, water, ecological, and social resources of the host country. The significance of these impacts will depend on the type of power plant installed and on the local environment. The type of plant and its associated energy source (e.g., coal, oil, gas, or hydro) will dictate the magnitude and nature of pollutants discharged to the environment. For example, use of high sulfur coal will result in higher atmospheric emissions than if the plant was fired by natural gas. Secondary effects which impact on the social, health, and safety aspects are associated with development of natural resources for use by the power plant. Examples include coal mining, dam construction for hydropower, and diversion of water from agricultural sources. The local environment factor depends on the ability of the area to assimilate the effects of the physical plant, including its pollutant discharges and social demands such as employment and civic services.

The potential impacts of electric power projects on the specific resource areas are as follows:

Air Resources - The principal considerations with air quality are concerns about the potential emissions of sulfur dioxide, nitrogen oxides, and particulate matter. These are directly related to the general issue of "acid rain" and its detrimental effects on human health as well as animal and plant life. One estimate (1) projects that, without extensive use of technologies to control sulfur dioxide emissions from the expanding power sector, total sulfur dioxide discharged into the atmosphere will triple over the next 20 years.

Another issue is the global concern over the "greenhouse effect" resulting from the increasing levels of carbon dioxide in the earth's atmosphere. The potential climatic changes associated with a rise in global temperature are predicted to worsen with the continued burning of fossil fuels.

Although contributions of the developing countries to worldwide degradation of air quality are expected to be small compared to those of the industrialize nations, appropriate actions to minimize such contributions should be encouraged.

Water Resources - Electric power projects involve the consumptive use of water for cooling purposes and for plant service requirements. The other aspect is related to the discharge of contaminated and heated water to the environment.

Where fresh water supplies are limited, the overall plant water requirement must be fully evaluation during the feasibility phases of the project. The use of dry cooling systems, once-through cooling systems using sea water, and recirculating water systems must be considered during the plant design.

Potential water discharges from power projects include
cooling system blowdown; boiler feed water blowdown; demineralizer back wash and resin waste waters; ash transport waste water; runoff from ash and coal storage piles; and normal storm drainage from the site area. Several of the large waste water streams are relatively clean, e.g., cooling system and boiler blowdown, and

can either be discharged to a surface body of water with minimal effect or recycled in the plant. Other streams can economically be handled using evaporation ponds. In the case of oil fired plants, the potential for spillage into surface waters will require a design for total containment.

Ecological Resources - The potential ecological impacts of power projects include the removal of habitat by plant construction, effects of air pollutants, entrapment of aquatic organisms in cooling systems, and effects of transportation systems. The significance of such impacts depends on the specific plant design and the ecological systems affected.

Socio-Economic Resources - As a result of increased electrical power, social development will benefit through increased industrial and agricultural activities. However, socioeconomic impacts will occur from changes in land use, employment and economic shifts, increases in the demand for facilities and social services, increases in the use of transportation systems, and losses of cultural, historical, and archaeological resources.

2. Environmental Guidelines

Unlike the United States and other industrialized nations, many developing countries do not have adequate standards and policies in place for environmental management. However, some of the countries are in the process of establishing such policies. For instance, the Pakistan Environmental Ordinance of 1983 initiated a mechanism for establishing a national environmental policy including the development of air and water quality standards. While no standards have yet been adopted, proposed standards to restrict the discharge of pollutants into atmosphere and water have been drafted.

In the absence of specific environmental regulations for power plant projects in developing countries, it would be appropriate to use the guidelines established by the World Bank. Table 1.0 lists the applicable criteria which were developed from the World Bank guidelines, together with technological considerations, and drafted for private sector power projects in Pakistan (2).

The air emission criteria are listed for fossil fuel fired plants, gas turbines, and diesel engines. For the steam electric facilities, the criteria can generally be achieved with good combustion practices and without pollution control equipment. Coal fired plants would likely be require to install either an electrostatic precipitator or a baghouse filter to control particulate matter, as well as low NO_x burners. The use of high sulfur coal may also require a sulfur dioxide removal system. The limits specified for gas turbines reflect the actual type of fuel used and good operational practices.

Ambient air quality limitations reflect the protection of the health and welfare of the general public. these were based on World Bank Standards and are consistent with World Health Organization criteria.

Table 1.0

Environmental Criteria for Electric Power Plants

AIR EMISSIONS

1. Fossil Fuel Fired Steam Generators:

- Sulfur dioxide - 454 MT/Day/Plant (rural areas)
  - 91 MT/Day/Plant (rural areas)
  - Maximum concentration in stack gas should not exceed 5,000 mg/m^3
- Nitrogen oxides - 0.6 lb/million BTU
- Particulate matter - 150 mg/m^3 in stack gas (rural)
  - 100 mg/m^3 in stack gas (urban)
  - Visible emissions should not exceed 20% opacity

2. Gas Turbines:

- Sulfur dioxide - Maximum 0.8% sulfur in fuel oil
- Nitrogen oxides - Maximum 200 ppm in stack gas
- Particulate matter - Visible emissions should not exceed 20 % opacity

3. Diesel Engines:

- Particulate matter - Visible emissions should not exceed 20 % opacity

AMBIENT AIR QUALITY

1. Sulfur Dioxide - 100 ug/m^3 annual average
   - 500 ug/m^3 hour average
2. Nitrogen oxides - 100 ug/m^3 annual average
3. Particulate matter - 100 ug/m^3 annual geometric mean
   - 500 ug/m^3 maximum 24 hour average

STACK PARAMETERS

1. Stack Height - Minimum stack height is based on the following equation:

$$S.H. = 0.9 (H + 1/2L), \text{ where}$$

H = building height, m

L = lesser dimension of either the height or width of the largest nearby building, m

2. Stack Velocity - not less than 15 m/sec.

WATER DISCHARGE

1. No allowable discharge of polychlorinated biphenyl compounds (PCB).
2. No allowable discharge of water used to transport ash.
3. The PH of all aqueous discharge will be within the range of 6 - 9.
4. Maximum total suspended solids - 100 mg/1
5. Maximum oil and grease - 20 mg/1
6. Chlorine concentration - 0.5 mg/1 maximum; 0.2 mg/1 average
7. Thermal conditions of aqueous discharges to surface bodies of water are limited to a maximum of 8 degrees C above the intake water temperature.

LAND/SOLID WASTE

1. Where appropriate, evaporation ponds should be used as much as practical to avoid surface water discharge.
2. Land disposal of oily wastes should not be employed.
3. Sedimentation and erosion control plan must be developed.

NOISE LEVELS

1. Working environment: Maximum 90 dBA for an 8-hour shift. Hearing protection is recommended.
2. At property boundary: 70 dBA average
3. Residential: 60 dBA day time; 55 dBA night time

Waste water discharges from power plants do not generally contain significant quantities of toxic materials. Consequently, most power plant waste waters can be safely discharged after conventional treatment. The water discharge criteria, therefore, recognize the use of neutralization, sedimentation, and oily water

separation technologies.

Toxic materials, such as PCBs, must not be discharged into surface waters. In addition, land disposal of these materials should conform to accepted practices, i.e., in sealed drums and covered with an impervious material such as clay. Incineration of PCBs is the preferred method for disposal. For proper incineration, the processing temperature should be maintained at 1000 degrees Centigrade for at least 1.5 seconds.

Any water used to transport bottom ash or fly as may contain various quantities of toxic heavy metals, such as mercury, arsenic, selenium, and vanadium. Such water streams should not be discharged to the environment. Recycle of these aqueous streams or disposal in evaporation ponds is recommended. Maintenance cleaning waste waters should be neutralized and also disposed of in evaporation ponds. However, the location of evaporation ponds must consider the possibility of contamination of ground water and nearby wells.

Fuel storage should be constructed with an embankment which surrounds the tank for primary containment. The volume between the tank and the dike must be sufficient to hold the full volume of the tank. Primary containment should also be considered around fuel oil handling facilities.

Noise limitations reflect the protection of workers from hearing loss and reducing the potential for the plant operation disturbing the nearby residential areas.

In performing an environmental assessment for a power plant, the potential for secondary effects from land development should be addressed. Social impacts on the people, such as loss of land, must be mitigated and compensation should be made to the displaced people.

3. Environmental Assessment of Power Projects

The issue of environmental impacts for a proposed power plant should be addressed during all phases of project development, from prefeasibility studies to facility construction and operation.

For private power projects, a prefeasibility study is undertaken to decide whether the project is technically and economically attractive. This study phase typically addresses the site selection; fuel type, source, and availability; technology choice; plant size and market potential; preliminary design and project economics; legal and environmental issues. In this phase of development, a preliminary environmental characterization of the project is made. Basically, this effort identifies the sources of anticipated plant discharges as well as providing estimates of emission quantities, e.g.

- plant heat rate and capacity factor
- fuel usage and fuel characteristics
- stack parameters
  - number and location
  - dimensions
  - temperature and velocity
- air emission rates
  - particulate matter
  - sulfur dioxide
  - nitrogen oxides
  - carbon monoxide

- overall plant water balance
  - specify intake water streams
  - specify aqueous discharge streams
- solid waste streams
  - specify type and quantity
- facility plot plan
- plant staffing requirements

This characterization is used in conjunction with the appropriate environmental criteria to identify potential problem areas which need further attention as the project proceeds.

After some assurance is given that the project is acceptable, a feasibility study is undertaken to develop project details. This effort includes engineering designs, equipment specifications and bid packages, detailed cost estimates and financial plans, fuel supply and grid connection plans, project schedules, and environmental mitigation measures.

As parallel effort with the feasibility study, a baseline environmental characterization is conducted. This activity involves collecting information on the air quality, meteorological conditions, ecology, water resources, and socio-economic aspects of the plant site and surrounding area. This information is used in the feasibility study to determine the potential environmental impacts. As part of this analysis, conformance with ambient air and water quality criteria is assessed, as well as any significant impact to the social and ecological environment. If a potential impact is found to be significant, then design alternatives must be evaluated to mitigate the effect to an acceptable level.

The feasibility study would disclose the environmental baseline and impact information that was developed for the project. It would also detail the proposed mitigation and monitoring procedures to be used during the construction and operating phases of the project.

4. Literature Reference

(1) "Power Shortages in Developing Countries; Magnitude, Impacts, Solutions, and the Role of the Private Sector," U.S. Agency for International Development, March 1988

(2) "Pakistan - Private Sector Power" Project Paper, U.S Agency for International Development, August 1988

ANNEX J

COUNTRY ASSESSMENT MATRIX FOR POTENTIAL PRIVATE SECTOR ENERGY DEVELOPMENT

Country Assessment for Potential Private Sector Energy Development

AFRICA

	LEGAL SYSTEM	FINANCIAL SITUATION	HEALTH OF ECONOMY	HEALTH OF UTILITY	LEVEL OF INTEREST
Botswana					
Burkina Faso					
Burundi					
Cameroon					
Cape Verde					
Chad					
Cote d'Ivoire					
Djibouti					
Ethiopia					
The Gambia					
Ghana					
Guinea					
Guinea-Bissau					
Kenya					
Lesotho					
Liberia					
Madagascar					
Malawi					
Mali					
Mauritania					
Mozambique					
Niger					
Nigeria					

Key: 1 = Below Average
2 = Average
3 = Above Average

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AFRICA (CONT.)

	LEGAL SYSTEM	FINANCIAL SITUATION	HEALTH OF ECONOMY	HEALTH OF UTILITY	LEVEL OF INTEREST
Rwanda					
Senegal					
Sierra Leone					
Somalia					
South Africa					
Sudan					
Swaziland					
Tanzania					
Togo					
Uganda					
Zaire					
Zambia					
Zimbabwe					

Key: 1 = Below Average
2 = Average
3 = Above Average

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Country Assessment for Potential Private Sector Energy Development
ASIA / NEAR EAST

	LEGAL SYSTEM	FINANCIAL SITUATION	HEALTH OF ECONOMY	HEALTH OF UTILITY	LEVEL OF INTEREST
Bangladesh					
Burma					
Fiji					
Indonesia					
India					
Nepal					
Pakistan					
Philippines					
Sri Lanka					
Thailand					
Egypt					
Jordan					
Morocco					
Oman					
Portugal					
Tunisia					
Yemen Arab Rep.					

Key: 1 = Below Average
2 = Average
3 = Above Average

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Country Assessment for Potential Private Sector Energy Development
LATIN AMERICA / CARIBBEAN

	LEGAL SYSTEM	FINANCIAL SITUATION	HEALTH OF ECONOMY	HEALTH OF UTILITY	LEVEL OF INTEREST
Barbados					
Belize					
Bolivia					
Brazil					
Colombia					
Costa Rica					
Dominican Republic					
Ecuador					
El Salvador					
Grenada					
Guatemala					
Haiti					
Honduras					
Jamaica					
Mexico					
Panama					
Peru					
Uruguay					

Key: 1 = Below Average
2 = Average
3 = Above Average

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