REQUEST FOR PROPOSALS

FEASIBILITY STUDY FOR THE

BEACONHOUSE SCHOOLS SOLAR PHOTOVOLTAIC POWER SYSTEMS

Submission Deadline: **4:00 PM**

LOCAL TIME IN PAKISTAN

[September 1, 2010]

Submission Place:

Nassir Kasuri
Director
Educational Services Limited
10-11 Gurumangat Road
Gulberg III, Lahore, Pakistan

SEALED PROPOSALS SHALL BE CLEARLY MARKED AND RECEIVED PRIOR TO THE TIME AND DATE SPECIFIED ABOVE. PROPOSALS RECEIVED AFTER SAID TIME AND DATE WILL NOT BE ACCEPTED OR CONSIDERED.

REQUEST FOR PROPOSALS

Section 1: INTRODUCTION

The U.S. Trade and Development Agency (USTDA) has provided a grant in the amount of US$299,896 to Educational Services (Private) Limited (the "Grantee") in accordance with a grant agreement dated July 8, 2010 (the "Grant Agreement"). Educational Services (Private) Limited ("ESL") is the owner of the Beaconhouse Schools and the largest private educational services company in Pakistan. The educational process in Pakistan is often interrupted by power outages and, now that the economics behind solar photovoltaic (PV) power have become more favorable, ESL seeks to install solar PV power systems throughout its school system.

ESL has received USTDA funding support to undertake a feasibility study to determine the technical, economic and financial feasibility of installing solar photovoltaic (PV) power systems throughout their Beaconhouse school system in Pakistan. The study will establish the viability of installing solar PV panels at educational institutions, as a hedge against foreseeable fuel and energy price increases, as a back-up power supply to continue educational activities in the events of power outages, and as an asset to the educational process. A well-qualified and experienced U.S. Contractor is needed to undertake this important feasibility study.

1.1 BACKGROUND SUMMARY

Educational Services (Private) Limited / Beaconhouse School System

Educational Services (Private) Limited, a school management company based in Lahore, Pakistan and established in 1991, is the largest private educational company in Pakistan and one of the largest in the world in terms of total student strength. It owns 150 schools and operates 250 more under franchise, with more than 180,000 students in seven countries. The school system carries the Beaconhouse name, a brand first established in Lahore in 1975 as Les Anges Montessori Academy; the first Beaconhouse Public School was opened in 1979 in Lahore. The Beaconhouse Schools brand is owned by ESL, a business whose founders started the Beaconhouse schools network. [1]

Beaconhouse schools consume around $1.2 million in electricity costs each year but suffer frequent outages from load shedding. ESL is committed to environmentally sound business practices and established a subsidiary company, Beacon Energy Limited, to set up a 50 MW wind farm near Karachi which is on target to reach financial close by the end of 2010.

The feasibility study is designed to identify practical photovoltaic designs, demonstrate whether the concept is economically viable and develop a baseline design that can be adapted to other schools in the system and which ESL can use to procure and install a test array. Data and experience from the test installation will help guide the project in developing an implementation

[1] ESL also established a subsidiary in 2003, Beaconhouse Educational Services Limited, based in London, United Kingdom; this is a school management company that serves as a holding company for Beaconhouse schools outside of Pakistan, entailing more than 10,000 students in the UK and other countries.

plan for the entire Beaconhouse school system. Further, the selected U.S. Contractor will provide documentation to support ESL in filing for permits, an electricity tariff and for use in negotiations for a Power Purchase Agreement (PPA) and Interconnect Agreement with distribution and transmission utilities.

1.2 OBJECTIVE

The purpose of this project is to demonstrate the commercial viability of installing solar photovoltaic power systems at approximately 400 private schools owned or operated by the ESL. Solar power will provide uninterrupted power at a time of frequent load shedding, lower the overall cost of power, and demonstrate science at work to pupils. The objectives of the study are to identify practical photovoltaic designs, demonstrate whether the concept is commercially viable, develop a baseline design which can be adapted to other schools in the system, provide documentation to support filing for permits and tariffs, and provide reassurance to lenders and investors, and to evaluate subsidized tariff options to promote renewable energy sources at commercial sites.

The Terms of Reference (TOR) for this Feasibility Study are attached as Annex 5.

1.3 PROPOSALS TO BE SUBMITTED

Technical proposals are solicited from interested and qualified U.S. firms. The administrative and technical requirements as detailed throughout the Request for Proposals (RFP) will apply. Specific proposal format and content requirements are detailed in Section 3.

The amount for the contract has been established by a USTDA grant of US$299,896. **The USTDA grant of $US299,896 is a fixed amount. Accordingly, COST will not be a factor in the evaluation and therefore, cost proposals should not be submitted**. Upon detailed evaluation of technical proposals, the Grantee shall select one firm for contract negotiations.

1.4 CONTRACT FUNDED BY USTDA

In accordance with the terms and conditions of the Grant Agreement, USTDA has provided a grant in the amount of US$299,896 to the Grantee. The funding provided under the Grant Agreement shall be used to fund the costs of the contract between the Grantee and the U.S. firm selected by the Grantee to perform the TOR. The contract must include certain USTDA Mandatory Contract Clauses relating to nationality, taxes, payment, reporting, and other matters. The USTDA nationality requirements and the USTDA Mandatory Contract Clauses are attached at Annexes 3 and 4, respectively, for reference.

Section 2: INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called Beaconhouse Schools Solar Photovoltaic Power Systems.

2.2 DEFINITIONS

Please note the following definitions of terms as used in this RFP.

The term "Request for Proposals" means this solicitation of a formal technical proposal, including qualifications statement.
The term "Offeror" means the U.S. firm, including any and all subcontractors, which responds to the RFP and submits a formal proposal and which may or may not be successful in being awarded this procurement.

2.3 DEFINITIONAL MISSION REPORT

USTDA sponsored an expanded energy and power sector Definitional Mission (DM) for Pakistan to address technical, financial, sociopolitical, environmental and other aspects of the proposed project. A copy of the report is attached at Annex 2 for background information only. Please note that the TOR referenced in the report are included in this RFP as Annex 5.

2.4 EXAMINATION OF DOCUMENTS

Offerors should carefully examine this RFP. It will be assumed that Offerors have done such inspection and that through examinations, inquiries and investigation they have become familiarized with local conditions and the nature of problems to be solved during the execution of the Feasibility Study.

Offerors shall address all items as specified in this RFP. Failure to adhere to this format may disqualify an Offeror from further consideration.

Submission of a proposal shall constitute evidence that the Offeror has made all the above mentioned examinations and investigations, and is free of any uncertainty with respect to conditions which would affect the execution and completion of the Feasibility Study.

2.5 PROJECT FUNDING SOURCE

The Feasibility Study will be funded under a grant from USTDA. The total amount of the grant is not to exceed US$299,896.

2.6 RESPONSIBILITY FOR COSTS

Offeror shall be fully responsible for all costs incurred in the development and submission of the proposal. Neither USTDA nor the Grantee assumes any obligation as a result of the issuance of this RFP, the preparation or submission of a proposal by an Offeror, the evaluation of proposals, final selection or negotiation of a contract.

2.7 TAXES

Offerors should submit proposals that note that in accordance with the USTDA Mandatory Contract Clauses, USTDA grant funds shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in the Host Country.

2.8 CONFIDENTIALITY

The Grantee will preserve the confidentiality of any business proprietary or confidential information submitted by the Offeror, which is clearly designated as such by the Offeror, to the extent permitted by the laws of the Host Country.

2.9 ECONOMY OF PROPOSALS

Proposal documents should be prepared simply and economically, providing a comprehensive yet concise description of the Offeror's capabilities to satisfy the requirements of the RFP. Emphasis should be placed on completeness and clarity of content.

2.10 OFFEROR CERTIFICATIONS

The Offeror shall certify (a) that its proposal is genuine and is not made in the interest of, or on behalf of, any undisclosed person, firm, or corporation, and is not submitted in conformity with, and agreement of, any undisclosed group, association, organization, or corporation; (b) that it has not directly or indirectly induced or solicited any other Offeror to put in a false proposal; (c) that it has not solicited or induced any other person, firm, or corporation to refrain from submitting a proposal; and (d) that it has not sought by collusion to obtain for itself any advantage over any other Offeror or over the Grantee or USTDA or any employee thereof.

2.11 CONDITIONS REQUIRED FOR PARTICIPATION

Only U.S. firms are eligible to participate in this tender. However, U.S. firms may utilize subcontractors from the Host Country for up to 20 percent of the amount of the USTDA grant for specific services from the TOR identified in the subcontract. USTDA's nationality requirements, including definitions, are detailed in Annex 3.

2.12 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English, and only English.

2.13 PROPOSAL SUBMISSION REQUIREMENTS

Mr. Nassir Kasuri of Educational Services Limited will provide offerors with instructions to maintain a record of receipt of their proposal if electronic delivery is required or allowed.

The **Cover Letter** in the proposal must be addressed to:

Nassir Kasuri
Director
Educational Services Limited
10-11 Gurumangat Road
Gulberg III, Lahore, Pakistan

Phone: +92 42-111 232266
Fax: +92-42-357 14946

An Original and eight (8) copies of your proposal must be received at the above address no later than 4:00 PM Local Time in Pakistan, on [September 1, 2010].

Proposals may be either sent by mail, overnight courier, or hand-delivered. Whether the proposal is sent by mail, courier or hand-delivered, the Offeror shall be responsible for actual delivery of the proposal to the above address before the deadline. Any proposal received after the deadline will be returned unopened. The Grantee will promptly notify any Offeror if its proposal was received late.

Upon timely receipt, all proposals become the property of the Grantee.

2.14 PACKAGING

The original and each copy of the proposal must be sealed to ensure confidentiality of the information. The proposals should be individually wrapped and sealed, and labeled for content including "original" or "copy number x"; the original and eight (8) copies should be collectively wrapped and sealed, and clearly labeled.

Neither USTDA nor the Grantee will be responsible for premature opening of proposals not properly wrapped, sealed and labeled.

2.15 AUTHORIZED SIGNATURE

The proposal must contain the signature of a duly authorized officer or agent of the Offeror empowered with the right to bind the Offeror.

2.16 EFFECTIVE PERIOD OF PROPOSAL

The proposal shall be binding upon the Offeror for ninety (90) days after the proposal due date, and Offeror may withdraw or modify this proposal at any time prior to the due date upon written request, signed in the same manner and by the same person who signed the original proposal.

2.17 EXCEPTIONS

All Offerors agree by their response to this RFP announcement to abide by the procedures set forth herein. No exceptions shall be permitted.

2.18 OFFEROR QUALIFICATIONS

As provided in Section 3, Offerors shall submit evidence that they have relevant past experience and have previously delivered advisory, feasibility study and/or other services similar to those required in the TOR, as applicable.

2.19 RIGHT TO REJECT PROPOSALS

The Grantee reserves the right to reject any and all proposals.

2.20 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of any subcontractors. USTDA nationality provisions apply to the use of subcontractors and are set forth in detail in Annex 3. The successful Offeror shall cause appropriate provisions of its contract, including all of the applicable USTDA Mandatory Contract Clauses, to be inserted in any subcontract funded or partially funded by USTDA grant funds.

2.21 AWARD

The Grantee shall make an award resulting from this RFP to the best qualified Offeror, on the basis of the evaluation factors set forth herein. The Grantee reserves the right to reject any and all

proposals received and, in all cases, the Grantee will be the judge as to whether a proposal has or has not satisfactorily met the requirements of this RFP.

2.22 COMPLETE SERVICES

The successful Offeror shall be required to (a) provide local transportation, office space and secretarial support required to perform the TOR if such support is not provided by the Grantee; (b) provide and perform all necessary labor, supervision and services; and (c) in accordance with best technical and business practice, and in accordance with the requirements, stipulations, provisions and conditions of this RFP and the resultant contract, execute and complete the TOR to the satisfaction of the Grantee and USTDA.

2.23 INVOICING AND PAYMENT

Deliverables under the contract shall be delivered on a schedule to be agreed upon in a contract with the Grantee. The Contractor may submit invoices to the designated Grantee Project Director in accordance with a schedule to be negotiated and included in the contract. After the Grantee's approval of each invoice, the Grantee will forward the invoice to USTDA. If all of the requirements of USTDA's Mandatory Contract Clauses are met, USTDA shall make its respective disbursement of the grant funds directly to the U.S. firm in the United States. All payments by USTDA under the Grant Agreement will be made in U.S. currency. Detailed provisions with respect to invoicing and disbursement of grant funds are set forth in the USTDA Mandatory Contract Clauses attached in Annex 4.

Section 3: PROPOSAL FORMAT AND CONTENT

To expedite proposal review and evaluation, and to assure that each proposal receives the same orderly review, all proposals must follow the format described in this section.

Proposal sections and pages shall be appropriately numbered and the proposal shall include a Table of Contents. Offerors are encouraged to submit concise and clear responses to the RFP. Proposals shall contain all elements of information requested without exception. Instructions regarding the required scope and content are given in this section. The Grantee reserves the right to include any part of the selected proposal in the final contract.

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US$299,896, which is a fixed amount.

Offerors shall submit one (1) original and eight (8) copies of the proposal. Proposals received by fax cannot be accepted.

Each proposal must include the following:

Transmittal Letter,
Cover/Title Page,
Table of Contents,
Executive Summary,
Company Information,
Organizational Structure, Management Plan, and Key Personnel,
Technical Approach and Work Plan, and
Experience and Qualifications.

Detailed requirements and directions for the preparation of the proposal are presented below.

3.1 EXECUTIVE SUMMARY

An Executive Summary should be prepared describing the major elements of the proposal, including any conclusions, assumptions, and general recommendations the Offeror desires to make. Offerors are requested to make every effort to limit the length of the Executive Summary to no more than five (5) pages.

3.2 COMPANY INFORMATION

For convenience, the information required in this Section 3.2 may be submitted in the form attached in Annex 6 hereto.

3.2.1 Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information requested in sections 3.2.5 and 3.2.6 below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number.

3.2.2 Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

3.2.3 Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

3.2.4 Offeror's Representations

If any of the following representations cannot be made, or if there are exceptions, the Offeror must provide an explanation.

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____. The Offeror commits to notify USTDA and the Grantee if they become aware of any change in their status in the state in which they are incorporated. USTDA retains the right to request an updated certificate of good standing.

3. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

4. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 3 above.

5. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

6. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee.

3.2.5 Subcontractor Profile

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

3.2.6 Subcontractor's Representations

If any of the following representations cannot be made, or if there are exceptions, the Subcontractor must provide an explanation.

1. Subcontractor is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The subcontractor has all the requisite corporate power and authority to conduct its business as presently conducted, to participate in this proposal, and if the Offeror is selected, to execute and deliver a subcontract to the Offeror for the performance of the Feasibility Study and to perform the Feasibility Study. The subcontractor is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. Neither the subcontractor nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the subcontractor, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the subcontractor. The subcontractor, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The subcontractor has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The subcontractor has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected subcontractor shall notify the Offeror, Grantee and USTDA if any of the representations included in this proposal are no longer true and correct at the time of the Offeror's entry into a contract with the Grantee.

3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

Describe the Offeror's proposed project organizational structure. Discuss how the project will be managed including the principal and key staff assignments for this Feasibility Study. Identify the Project Manager who will be the individual responsible for this project. The Project Manager shall have the responsibility and authority to act on behalf of the Offeror in all matters related to the Feasibility Study.

Provide a listing of personnel (including subcontractors) to be engaged in the project, including both U.S. and local subcontractors, with the following information for key staff: position in the project; pertinent experience, curriculum vitae; other relevant information. If subcontractors are to be used, the Offeror shall describe the organizational relationship, if any, between the Offeror and the subcontractor.

A manpower schedule and the level of effort for the project period, by activities and tasks, as detailed under the Technical Approach and Work Plan shall be submitted. A statement confirming the availability of the proposed project manager and key staff over the duration of the project must be included in the proposal.

3.4 TECHNICAL APPROACH AND WORK PLAN

Describe in detail the proposed Technical Approach and Work Plan (the "Work Plan"). Discuss the Offeror's methodology for completing the project requirements. Include a brief narrative of the Offeror's methodology for completing the tasks within each activity series. Begin with the information gathering phase and continue through delivery and approval of all required reports.

Prepare a detailed schedule of performance that describes all activities and tasks within the Work Plan, including periodic reporting or review points, incremental delivery dates, and other project milestones.

Based on the Work Plan, and previous project experience, describe any support that the Offeror will require from the Grantee. Detail the amount of staff time required by the Grantee or other participating agencies and any work space or facilities needed to complete the Feasibility Study.

3.5 EXPERIENCE AND QUALIFICATIONS

Provide a discussion of the Offeror's experience and qualifications that are relevant to the objectives and TOR for the Feasibility Study. If a subcontractor(s) is being used, similar information must be provided for the prime and each subcontractor firm proposed for the project. The Offeror shall provide information with respect to relevant experience and qualifications of key staff proposed. The Offeror shall include letters of commitment from the individuals proposed confirming their availability for contract performance.

As many as possible but not more than six (6) relevant and verifiable project references must be provided for each of the Offeror and any subcontractor, including the following information:

Project name,
Name and address of client (indicate if joint venture),
Client contact person (name/ position/ current phone and fax numbers),
Period of Contract,
Description of services provided,
Dollar amount of Contract, and
Status and comments.

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to or larger in scope than the Feasibility Study as described in this RFP.

Section 4: AWARD CRITERIA

Individual proposals will be initially evaluated by a Procurement Selection Committee of representatives from the Grantee. The Committee will then conduct a final evaluation and completion of ranking of qualified Offerors. The Grantee will notify USTDA of the best qualified Offeror, and upon receipt of USTDA's no-objection letter, the Grantee shall promptly notify all Offerors of the award and negotiate a contract with the best qualified Offeror. If a satisfactory contract cannot be negotiated with the best qualified Offeror, negotiations will be formally terminated. Negotiations may then be undertaken with the second most qualified Offeror and so forth.

Scored selection criteria for competitive bidding:

- **Experience in solar photovoltaic project design, finance, and marketing (35 points) broken down as follows:**
  - Experience with drafting agreements and negotiating with electricity buyers (10 points)
  - Experience evaluating regulatory and technical limitations in selling energy back to the grid (10 points)
  - Experience raising financing for power projects and negotiating with lenders (10 points)

    - Experience with marketing and commercially deploying solar photovoltaic projects (5 points)
- **Experience in conducting feasibility studies of this type (35 points)**
- **Experience working on energy projects in Pakistan (15 points)**
- **Recent experience in Clean Development Mechanism (CDM) market utilization (10 points)**
- **Experience in the Region (5 points)**

The Contractor's team shall be comprised of the following:

- A Project Manager with at least 10 years experience in energy project management at an Architect/Engineering firm, including experience on at least one international project
- A Senior Engineer with at least 10 years experience in solar photovoltaic systems integration
- A Project Finance Specialist with at least 10 years of international Project Finance experience
- Electrical Engineer(s) with at least 6 years experience in solar photovoltaic systems integration
- Environmental Specialist(s) with at least 6 years experience in renewable energy

The Contractor selected should have the experience shown within the personnel listed or within some combination of the required experience under differing titles.

Proposals that do not include all requested information may be considered non-responsive.

Price will not be a factor in contractor selection.

ANNEX 1

FEDBIZOPPS ANNOUNCEMENT

NASSIR KASURI, DIRECTOR, EDUCATIONAL SERVICES LIMITED, 10-11 GURUMANGAT ROAD, GULBERG, III, LAHORE, PAKISTAN, PHONE 92-42-111-232266, FAX 92-42-357-14946

PAKISTAN BEACONHOUSE SCHOOLS SOLAR PHOTOVOLTAIC POWER SYSTEMS

POC: Nina Patel, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. BEACONHOUSE SCHOOLS SOLAR PHOTOVOLTAIC POWER SYSTEMS. The Grantee invites submission of qualifications and proposal data (collectively referred to as the "Proposal") from interested U.S. firms that are qualified on the basis of experience and capability to develop a feasibility study for Educational Services (Private) Limited / Beaconhouse School System to demonstrate the commercial viability of installing solar photovoltaic power systems at approximately 400 private schools owned or operated by the ESL. Solar power will provide uninterrupted power at a time of frequent load shedding, lower the overall cost of power, and demonstrate science at work to pupils. The objectives of the study are to identify practical photovoltaic designs, demonstrate whether the concept is commercially viable, develop a baseline design which can be adapted to other schools in the system, provide documentation to support filing for permits and tariffs, and provide reassurance to lenders and investors, and to evaluate subsidized tariff options to promote renewable energy sources at commercial sites.

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Beaconhouse schools consume around $1.2 million in electricity costs each year but suffer frequent outages from load shedding. ESL is committed to environmentally sound business practices and established a subsidiary company, Beacon Energy Limited, to set up a 50 MW wind farm near Karachi which is on target to reach financial close by the end of 2010.

This USTDA funded feasibility study is designed to identify practical photovoltaic designs, demonstrate whether the concept is economically viable and develop a baseline design that can be adapted to other schools in the system and which ESL can use to procure and install a test array. Data and experience from the test installation will help guide the project in developing an implementation plan for the entire Beaconhouse school system. Further, the selected U.S. Contractor will provide documentation to support ESL in filing for permits, an electricity tariff and for use in negotiations for a Power Purchase Agreement (PPA) and Interconnect Agreement with distribution and transmission utilities.

The U.S. firm selected will be paid in U.S. dollars from a $299,896 grant to the Grantee from the U.S. Trade and Development Agency (USTDA).

A detailed Request for Proposals (RFP), which includes requirements for the Proposal, the Terms of Reference, and a background definitional mission/desk study report are available from USTDA, at 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901. To request the

RFP in PDF format, please go to: https://www.ustda.gov/businessopps/rfpform.asp. Requests for a mailed hardcopy version of the RFP may also be faxed to the IRC, USTDA at 703-875-4009. In the fax, please include your firm's name, contact person, address, and telephone number. Some firms have found that RFP materials sent by U.S. mail do not reach them in time for preparation of an adequate response. Firms that want USTDA to use an overnight delivery service should include the name of the delivery service and your firm's account number in the request for the RFP. Firms that want to send a courier to USTDA to retrieve the RFP should allow one hour after faxing the request to USTDA before scheduling a pick-up. Please note that no telephone requests for the RFP will be honored. Please check your internal fax verification receipt. Because of the large number of RFP requests, USTDA cannot respond to requests for fax verification. Requests for RFPs received before 4:00 PM will be mailed the same day. Requests received after 4:00 PM will be mailed the following day. Please check with your courier and/or mail room before calling USTDA.

Only U.S. firms and individuals may bid on this USTDA financed activity. Interested firms, their subcontractors and employees of all participants must qualify under USTDA's nationality requirements as of the due date for submission of qualifications and proposals and, if selected to carry out the USTDA-financed activity, must continue to meet such requirements throughout the duration of the USTDA-financed activity. All goods and services to be provided by the selected firm shall have their nationality, source and origin in the U.S. or host country. The U.S. firm may use subcontractors from the host country for up to 20 percent of the USTDA grant amount. Details of USTDA's nationality requirements and mandatory contract clauses are also included in the RFP.

Interested U.S. firms should submit their Proposal in English directly to the Grantee by 4:00PM, September 1, 2010 at the above address. Evaluation criteria for the Proposal are included in the RFP. Price will not be a factor in contractor selection, and therefore, cost proposals should NOT be submitted. The Grantee reserves the right to reject any and/or all Proposals. The Grantee also reserves the right to contract with the selected firm for subsequent work related to the project. The Grantee is not bound to pay for any costs associated with the preparation and submission of Proposals.

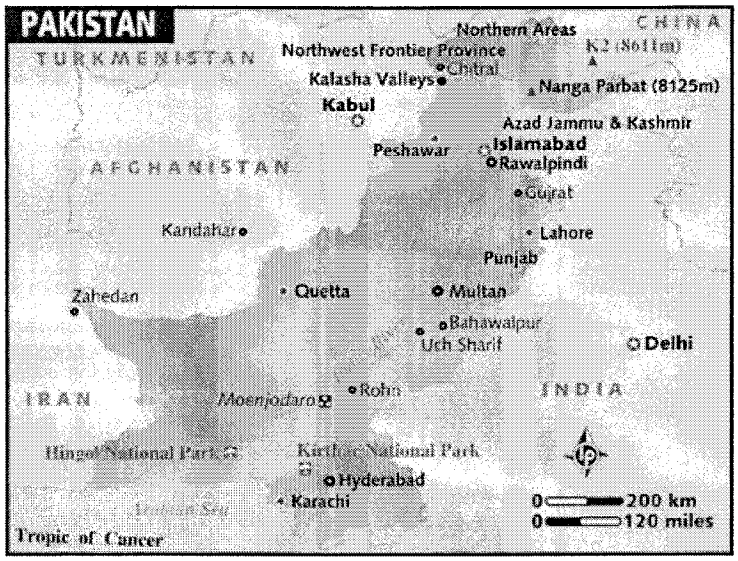
ANNEX 2

PORTIONS OF THIS DEFINITIONAL MISSION REPORT HAVE BEEN INTENTIONALLY REDACTED

ONLY RELEVANT PORTIONS OF THIS DEFINITIONAL MISSION REPORT PERTAINING TO BEACONHOUSE SCHOOLS SOLAR PHOTOVOLTAIC POWER SYSTEMS FEASIBILITY STUDY ARE INCLUDED HEREIN.

EMG
ENERGY MARKETS GROUP

Definitional Mission: Pakistan Energy Sector Projects



FINAL REPORT

April 23, 2010

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The U.S. Trade and Development Agency (USTDA) advances economic development and U.S. commercial interests in developing and middle-income countries. The agency funds various forms of technical assistance, early investment analysis, training, orientation visits and business workshops that support the development of a modern infrastructure and a fair and open trading environment.

USTDA's strategic use of foreign assistance funds to support sound investment policy and decision-making in host countries creates an enabling environment for trade, investment, and sustainable economic development. Operating at the nexus of foreign policy and commerce, USTDA is uniquely positioned to work with U.S. firms and host countries in achieving the agency's trade and development goals. In carrying out its mission, USTDA gives emphasis to economic sectors that may benefit from U.S. exports of goods and services.

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EXECUTIVE SUMMARY

Pakistan, a valued friend, ally, and trading partner of the United States, has severe shortages of fuels and electricity that threaten to hold back its economic growth. USTDA desires to find ways to provide assistance to specific project opportunities that serve the energy needs of Pakistan, that have potential to use U.S. vendors and services, and that qualify for USTDA assistance. Assistance may take the form of feasibility studies to support international bidding and financing, technical assistance and capacity development to improve the enabling environment, or assistance arranging contact with U.S. vendors and financial institutions.

USTDA contracted Energy Markets Group (EMG) to complete a Definitional Mission of the Pakistan Energy Sector. EMG was charged to identify at least 6 energy projects for which USTDA assistance would be pivotal, valuable, and timely. EMG assembled a team of its energy experts comprised of Ahmad Ghamarian, Michael Gembol, Ashfaq Mahmood, Mohammad Raziuddin, and Stratos Tavoulareas. During part of the Mission, the team was accompanied by Jacob Flewelling of USTDA.

During preparations and during a 2-week fact-finding visit to Pakistan, October 3 to 18, 2009, EMG held 82 meetings with individuals, corporations, and government agencies. These meetings identified 170 active projects that qualify in some respect for USTDA assistance. They represent over 16,000 MW of immediate projects, with potential to be replicated or "rolled out" to over 77,000 MW, roughly four times the size of Pakistan's present electricity infrastructure. Of these, 14 projects were evaluated as having the highest value and potential. Their project descriptions are attached. In discussions with USTDA, this list was narrowed down to 8 projects. For these selected projects EMG completed Terms of Reference to support the process by which USTDA will select vendors of the services to be supported by USTDA.

The selected projects will provide a total of 480 MW of urgently needed electrical generating capacity and loss reductions, and sufficient fuel for another 673 MW of generating capacity. Total capital cost of the projects is approximately $4.1 billion. Potential value of trade with U.S. vendors is approximately $1.7 billion. Many of the projects have potential to be rolled out to other sites and applications, and the total rollout potential is estimated at over 16,000 MW, or almost as much as the present total generating capacity of Pakistan. A summary table is shown on the following page.

The project selections are weighed heavily for feasibility: the Definitional Mission considered capabilities of sponsors, the policy framework of the Government of Pakistan, environmental issues, and both financial and economic viability of the proposals. In each case, USTDA assistance can reduce delays, improve the focus of the project, and increase probability of successful financial closing.

Among the 162 projects not selected for USTDA assistance, there are many good, viable, and important projects. USTDA may later find resources to support some of these projects; other agencies may as well assign resources to some.

BEACONHOUSE SCHOOLS SOLAR PV
DEFINITIONAL MISSION STUDY

EXECUTIVE SUMMARY: Beaconhouse Schools ("Beaconhouse") owns and operates private schools in Pakistan and some neighboring countries. The educational process is frequently interrupted by power outages. Beaconhouse has been considering installing solar photovoltaic ("solar PV") panels at its schools to keep the

lights on. Until recently, the economics were not favorable. However, several new factors have come into play. First, the price of solar PV has been falling rapidly. Second, new technologies have lowered prices even further. Third, changes in electricity policies now allow private owners to interconnect to the grid and sell back power to the host utility. And finally, new and successful business models have demonstrated financial feasibility of commercial-scale solar PV installations, opening access to lenders. This last factor is very important: U.S. energy companies are installing PV arrays at client sites and guaranteeing discounts off their utility rates. Given this long-term contractual guarantee of revenues, the projects qualify for favorable loan terms, making the concept viable. Since U.S. utilities have extraordinary reliability of service, the value of the solar PV systems as backup power is not an issue, and U.S. electricity rates are relatively low. In Pakistan, however, there are added factors: tariff rates are higher and backup power is needed during frequent load shedding. These added factors suggest that commercial solar PV can be implemented successfully in Pakistan.

Beaconhouse has other factors in its economic favor. Each school has a maintenance staff capable of minor system maintenance, and student activity groups may be trained to perform some maintenance and documentation tasks. The schools are generally closed after hours, so there is no need for expensive battery storage systems. The schools can sell power back to the grid on weekends, school holidays and summer/winter breaks when the schools are closed. And having nearly 400 installations, Beaconhouse can compete for volume pricing and reduce individual transaction and design costs.

The cost of solar PV can also be affected greatly by the ability of the host facility to adjust its operations around solar power availability. First, the total cost of the installation can be reduced significantly by conducting an energy efficiency audit of the host and making prudent small investments to reduce peak load and any energy waste. Second, the incremental cost of tracking mounts can be avoided if the array can be stationary, meeting early morning and later afternoon off-peak loads sufficiently.

Electricity is a major expense to the schools. Though the project economics will be slim, the solar PV systems promise to stabilize rates and safeguard against some fear of rapidly rising tariffs and more frequent power outages.

Beaconhouse is committed to environmental activism, and is sponsoring a 50-MW windfarm in southern Pakistan. They are financially capable of supporting the project, but state that the project must be shown to be a prudent business venture, with positive returns and acceptable risks.

Beaconhouse has requested USTDA assistance to perform a Feasibility Study to determine financial feasibility of installing solar PV panels at educational institutions as a capital investment, as a hedge against foreseeable fuel and energy price increases, as a backup power supply to continue educational activities in event of outages, load shedding, or damaging brownouts, and as an asset to the educational process.

To further ensure the success of its solar PV venture, Beaconhouse will install a test installation at one school during the course of the proposed Feasibility Study and Technical Assistance. The U.S. contractor selected to perform the study will develop a standard design which Beaconhouse can use to procure and install the test array. Data and experience from the test installation will help guide the project in developing an Implementation Plan for the entire Beaconhouse school system.

If all 400 Beaconhouse schools were outfitted with solar PV, considering their peak load requirements, the total installed capacity would be only about 9 MW. That is not a great amount of power on the scale of Pakistan's current deficit. However, once demonstrated commercially, similar installations could be replicated into other school systems, affluent residences, small businesses, commercial centers, and light industry. The commercial and industrial applications would have the added factor of increased productivity and profitability in support of

this project's economics, giving hope that replication could accelerate to become a major factor in Pakistan's electrical infrastructure and a favorable influence on GDP growth.

Widespread replication of the concept could have another favorable outcome: hundreds of thousands of residences, small businesses, and light industries have installed gasoline or diesel fueled generators for backup power. Their collective cost is immense, they are inefficient, they consume significant amounts of fuel in the face of fuel shortages, and they are noisy and polluting. The cost of solar PV can be partially offset by the cost of backup generators and fuel.

BACKGROUND: Beaconhouse Schools is the largest private educational company in Pakistan; it owns 150 schools and operates 250 more under franchise, with 170,000 students, altogether. The schools consume about $1.2 million of electricity each year. The schools suffer frequent outages from load shedding. Beaconhouse is a family-owned business, financially capable of carrying the investment in these solar PV power supplies for the schools if the costs can be recovered from the cost of electricity saved and from selling excess power back to the grid on weekends and school vacations.

Solar PV panels are expensive, but prices are dropping dramatically and commercial viable projects have been demonstrated in the U.S. where commercial tariffs are lower, and where there is no major problem with power interruptions.

Being primarily daytime schools, the Beaconhouse schools do not need electricity storage systems, with the high maintenance and complex control systems they entail. The schools may also be able to negotiate favorable sell-back tariffs, considering that there are national shortages of electric power and that solar installations can provide local voltage support and reduce line losses. The Policy for Development of Renewable Energy for Power Generation announced by the Government of Pakistan in 2006 allows sell back of power to the grid. There is a reasonable chance that this project can be commercially feasible and serve as an example for rollout horizontally to other school systems, and vertically to the residential, commercial, and small industrial sectors.

PROJECT DESCRIPTION:
The Project comprises these stages:

1. Selection of an independent U.S. consultant by competitive bidding within USTDA criteria
2. Feasibility Study
3. Technical Assistance
    a. Prepare a standardized design suitable for adaptation for most schools in the Beaconhouse system
    b. Support Test Installation at a single school
    c. Prepare an Implementation Plan
    d. Provide design, pricing, and performance information to support filing for a feed-in Tariff with NEPRA according to NEPRA's procedures, a Power Purchase Agreement, and an Interconnect Agreement
    e. Prepare a Financing Plan
    f. Estimate value of Clean Development Mechanism (CDM) credits
    g. Help draft international bid documents
4. Evaluation of EPC Bids by Beaconhouse according to International Standards and Practices

5. Installation of Equipment at a selected number of pilot schools
6. Verification of electrical and financial performance
7. Expansion to cover larger numbers of schools
8. Demonstration of concept for other school systems, commercial businesses, and large residential units

USTDA will support Stages 1, 2, and 3. Beaconhouse will use the following TOR to select a United States independent consultant by competitive bidding.

Contractor will conduct the Feasibility Study and provide Technical Assistance at direction of Grantee management.
Time frame of the study will be about three months. A draft Feasibility Study is required to be submitted for review and comments prior to submitting the Final Feasibility Study.

PROJECT SCHEDULE: The project Contractor should be selected by Grantee within 6 weeks of agreement with USTDA. The Feasibility Study will require about 3 months. Negotiation of tariffs, contracts, and agreements may take another 6 months in parallel with financing arrangements, but these are the most likely source of delays to the schedule. Construction can be very rapid depending on availability of components. Units can be in service within weeks, even days, of delivery. Total time to service can be within 1 year, with the entire Beaconhouse system converted in less than 2 years.

SPONSOR' S CAPABILITY AND COMMITMENT: The sponsor for the project is Educational Services (Private) Limited, the parent company of Beaconhouse Group. The Beaconhouse schools system is the largest of its kind in the world. The company has both the will and the financial resources to execute a project of this scale. Last year, the group's revenue was in excess of $55 million.

Beaconhouse is committed to solar energy, reducing its carbon footprint, and protecting the environment. Beacon Energy Ltd is setting up a 50-MW wind farm near Karachi, scheduled to be one of the first in service. Besides helping the environment and helping the schools financially, the solar PV project could be the cornerstone of a curriculum in environmental protection and renewable energy. Due to the size and commitment of Beaconhouse to the solar PV project, there is unlikely to be a better test bed for this solution anywhere in the developing world.

Within the scope of this Project, Grantee commits to provide funding for a test installation at a single school in order to provide real experience and performance data to strengthen the Feasibility Study.

As a private corporation, Grantee does not have access to the sovereign guarantee of the Government of Pakistan.

IMPLEMENTATION FINANCING: The Feasibility Study will determine the cost of the project, explore various financing options, recommend a financial structure, and identify interested investors and lenders. Beaconhouse is willing to commit equity to the project, but for any large scale implementation, debt and equity financing would be required. For the proposed demonstration project of ten schools, Beaconhouse can probably carry the debt on its balance sheet if necessary.
However, if the project is successful in demonstrating financial feasibility of the business model in Pakistan, Beaconhouse will set up a subsidiary to roll out the concept to other Beaconhouse schools and to other commercial and large residential applications. This business venture would exploit private equity and commercial debt financing to fund larger blocks of projects on more competitive terms.

Beaconhouse has sufficient financial strength to support financing of its complete school system. Note that Beaconhouse is also developing a 50-MW windpower project which will require approximately $130 million of financing. ADB is a likely lead lender. ADB has recently offered to provide counter-guarantees to the sovereign guarantee for foreign and domestic investors and lenders in Pakistan renewable energy projects. This encouragement is likely to open up participation by domestic banks. The Governor of the State Bank of Pakistan strongly emphasized that domestic banks must become aware that all sectors of their portfolios are being damaged by fuel and electricity shortages and provide more aggressive lending to renewable projects – this project relieves both problems.

USTDA's grant funds shall not be used for the purchase of any equipment associated with project. The Grantee is responsible for identifying requesting and or securing the financing needed to implement the project, outside of the scope of these USTDA-funded Terms of Reference.

ENVIRONMENTAL IMPACTS: The Feasibility Study will evaluate environmental impacts. The project is expected to have no adverse environmental impact but to have net positive environmental impact by offsetting generation from present and planned thermal power plants, reducing fossil fuel consumption, imports of fuels, and emissions of pollutants and CO_2.

U.S. EXPORT POTENTIAL:
U.S. companies have excellent competitive positions in integrated solar panel installations. Although U.S. vendors have a lead in lower-cost thin-film PV arrays, these smaller systems will probably be shown to require more compact silicon panels. U.S. vendors are now assembling panels built with inexpensive silicon PV cells produced in China. U.S. vendors specialize in the panel design, adaptation to specific site requirements, operating systems, and inverter packages. If successful in winning the bid, the vendor would contract with local companies for installation and startup services.
The U.S. trade component would be approximately 60% of the initial $450,000 for 10 school sites, or about $270,000. The entire Beaconhouse system would take roughly $13.5 million, but U.S. suppliers would probably have a smaller portion of this number, decreasing as local manufacturers developed capability to produce systems.

The contractor is specifically tasked in the following Terms of Reference to identify prospective U.S. bidders able to provide services and components competitively in Pakistan. There are now hundreds of small component manufacturers and engineering firms specializing in solar panel installations for small businesses. Several are listed:

CATEGORY	COMPANY	SPECIFIC DETAILS
Integrated Solar PV Systems	Sun Edison SunPower Corporation Integrated Power Corporation Solar Integrated GE Solar Energy Technologies … and many others	Complete systems and design

FOREIGN COMPETITION AND MARKET ENTRY ISSUES: China produces the least expensive components of a solar PV system; European countries have a larger installed base of solar PV than U.S. companies. Indeed, Pakistan companies are already manufacturing panels and other components, some in partnership with U.S. companies. None, though, has the reputation of U.S. companies for carefully integrating a system to client needs and designing a comprehensive, optimized solution. The important distinction here is

that Beaconhouse is less concerned with minimizing cost on its initial installations than it is in starting a subsidiary business using its own system as a starting point. It must find a successful business model that can be extended to its entire system of schools and to other residential and commercial installations. This model must include revolving financing at competitive terms to perform hundreds of installations. The Definitional Mission would recommend that Beaconhouse should maximize its probability of success by using U.S. components, design services, and business model development through initial stages of converting its own systems. The business model will certainly include provision in later stages for lowering costs by involving low-cost vendors when their equipment can be integrated safely, without risking the entire venture. At some point, U.S. firms will probably be priced entirely out of this market in deference to economies of local fabrication and technical design skills developed through technology transfer.

There is no market entry issue for U.S. solar PV companies in Pakistan; the Definitional Mission met with two Pakistan companies with U.S. venture partners for solar PV production and marketing. One, for example, is Advanced Engineering Technology (AET) in Islamabad, which is in partnership with Point Energy Group of Houston, Texas, to introduce solar street lighting and LED lighting systems. AET will fabricate assemblies in Pakistan, using components produced in the U.S. AET expressed interest in developing capacity to assemble panel systems for solar power to agricultural tube wells and for light commercial power supplies. Such a company would make an ideal local support group for the Beaconhouse venture.

DEVELOPMENT IMPACT: The Feasibility Study will assess and report on host country development impacts. Due to the small scale of individual systems, the entire Beaconhouse school system will total only about 9 MW of capacity, which is not really sufficient to affect fuel and electricity shortages which now hamper economic growth. However, this project could be among the first to demonstrate commercial feasibility leading to rollout into other educational institutions, including universities, and to other sectors such as affluent residences, commercial chains, and light industries, which could have enough collective effect to change Pakistan's renewable and fossil fuel balance.

Category	*Explanation*
Infrastructure	This project is minor in scale, but major in scope, dealing with major issues of distributed generation, metered sales of power back to the utility, conversion to renewables, and pricing to institutions under a situation of frequent interruptions and load shedding. If successful, the project can roll out to have major impact on Pakistan's total generation and its energy mix.
Market-Oriented Reform	Pakistan is dealing with difficult issues of subsidization of basic commodities and services, which distorts markets. This project will address the need to subsidize environmentally preferred renewable technologies to compensate for the externality costs of fossil fuels.
Human Capacity Building	One of Beaconhouse's primary objectives is to inculcate environmental awareness and pride in activism into its students, who are generally upward bound and from affluent, influential families, collectively able to provide some support to environmental issues.
Technology Transfer and Productivity Improvement	The project offers excellent opportunity for a U.S. firm to develop production facilities in Pakistan for installation services and for assembly of component equipment and solar PV panels.
Other	This project offers to introduce a valuable entrepreneurial concept to Pakistan by demonstrating financial viability of distributed generation as a business model. The concept is now successful in the U.S., and it should have greater financial benefits in Pakistan.

ALTERNATIVES: The alternative to solar PV for any small similar business is to install a small diesel backup generator or to place vital loads on uninterruptible power supplies. Both have adverse environmental effects.

IMPACT ON U.S. JOBS: U.S. businesses are leading competitors in integrated, small solar PV systems. This project will provide a modest increase in the number of U.S. jobs in high-tech solar PV equipment and instrumentation, consulting, and engineering design service jobs.

JUSTIFICATION: Beaconhouse is committed to making its facilities environmentally acceptable in the eyes of their students. USTDA support can accelerate the decision process, result in a better design and more successful project, and improve the likelihood of favorable financing.

TERMS OF REFERENCE: Beaconhouse shall be referred to hereinafter as "Grantee." To perform the Feasibility Study, Grantee shall select an independent consultant, "Contractor", in competitive bidding under USTDA guidelines. The Terms of Reference for the Request for Proposal are defined on the following pages.

The Terms of Reference for the Request for Proposal for the Feasibility Study can be found in Annex 5.

POTENTIAL OBSTACLES: Pakistan has limited borrowing capacity, especially in the capital-intensive energy sector. Financing any project will be a challenge.

Being financially responsible, Beaconhouse schools are paying customers of their local electric distribution companies. Installing private power facilities will decrease utility revenues. Grantee does not have the resources to support protracted negotiations with the utilities nor with the regulatory commissions. Note also that the electric companies have backlogs of years for normal interconnection to start service. The project will require the good will and support of the electric companies.

Risk Category	Risk Description	Possible Mitigation Strategy
Project	• The project may not be commercially feasible with current solar PV equipment prices. • The sponsor may not be able to obtain necessary cooperation from the host distribution companies.	• The project will be deferred if necessary. • The Contractor will sound out PPIB, AEDB, NEPRA, and PEPCO to ensure their support and take this into consideration in recommendations.
Operational	Small O&M staffs without technical training may not be able to operate the systems.	The systems will be simplified by not needing storage; equipment will be packaged as modules; staff will receive basic O&M training for the system.
Commercial	Host electric companies may delay or obstruct meter readings and payments for power sold back to the grid.	Contractor will discuss billing and invoicing procedures with utilities and with NEPRA.
Political	Considered a negligible risk	
Environmental	No risk	
Safety	Equipment to be operated by non-technical O&M staffs and in some cases by students.	Contractor will include extraordinary levels of safety provisions in the design.

CAPITAL COST ESTIMATES: The capital cost of the solar PV equipment for the initial pilot program at one school will be approximately $3,000 per kw of capacity, or about $45,000 for a typical school with 15 kw of demand. An installation at 10 selected schools will cost about $450,000. However, the cost of interconnection equipment, installation, inverters and instruments, training of the operating and maintenance staff, negotiation of principal agreements and tariffs, project supervision, and financing costs will be distributed over a fairly small investment base, resulting in adverse economy of scale. The schools with larger electric demand should have better economy of scale, and there may be a cutoff point at which smaller schools do not qualify until solar PV economics improve. The Feasibility Study will address these issues.

For purpose of estimation, it is assumed that the Feasibility Study will recommend a pilot project comprised of one school. The results of this pilot will be extrapolated to a further nine sites. The ten test schools will be selected on the basis that they should be representative of the entire Grantee system. If successful, this system could be installed across all 10 schools. Thus the installation cost, for systems at a total of 10 schools, would be approximately $450,000, with continued potential to roll out to approximately 300 schools where installation might prove financially viable. Total cost of the entire Beaconhouse school system, then, would be roughly $13,500,000. Grantee's purpose is not limited, however, to Beaconhouse schools; Grantee intends to establish a business of installing residential and commercial solar PV installations. This will ostensibly lead to hundreds of millions of dollars of solar components and services.

The estimated cost of consultancy services for the Feasibility Study and Technical Assistance is US$ 299,896 as shown in the Study Budget below. Grantee will provide cost-sharing services such as local labor for data collection, local transportation, and temporary field office space to support the project. The proposed USTDA Grant will provide $299,896.

STUDY BUDGET:

Feasibility Study of Beaconhouse Schools Solar Photovoltaic Power Supplies

DIRECT LABOR COSTS

TOR TASK	TOR TASK NAME	PRIMARY CONTRACTOR (Employee) LABOR Total Person Days		TOTAL COST
1.1	Inception Meeting	16	US$	14,400
1.2	Inception Report	5		4,650
2.1	Existing Documentation	16		13,050
2.2	Sites Selection	14		12,150
2.3	Energy Efficiency Audit	29		24,300
2.4	Conceptual Design	31		28,500
2.5	Performance Evaluation	10		9,600
3	Economic Analysis	16		12,900
4	Financing Plan	20		18,000
5.1	Adverse Environmental Impacts	7		6,150
5.2	Beneficial Environmental Impacts	15		12,900
6.1	Permit Compliance	9		7,500
6.2	Tariff Filing	24		20,250
7	Development Impacts Analysis	8		6,600
8	Implementation Plan	35		32,100
9	U.S. Sources of Supply	8		7,200
10	Final Report to BeaconHouse and USTDA	11		10,500

HOST COUNTRY NATIONALS

TOR TASK	TOR TASK NAME		PRIMARY CONTRACTOR (Non-Employee) LABOR Total Person Days	US$	TOTAL COST
	Local research, surveys, inspections	$105	80		$8,400
TOTAL DIRECT LABOR COSTS				US$	249,150

OTHER DIRECT COSTS

TRAVEL	PERSON-TRIPS			TOTAL COST
International Air Travel	15		(including per diem -- see labor breakdown table)	47,335
In Country Air Travel	0	$300		-
Ground Travel	60	$20		1,200
Reproduction and Binding	25	$20	Individual school sites	500
Courier Services	10	$46		460
Visa Services	6	$120		720
Communication	59	$9		531
Total Other Direct Costs			US$	50,746

TOTAL COSTS (DIRECT LABOR COSTS + OTHER DIRECT COSTS)	US$	299,896
COST SHARING	US$	-
PROPOSED USTDA GRANT	US$	299,896
TOTAL FUNDING	US$	299,896

DIRECT LABOR BREAKDOWN

TASK NO.	DESCRIPTION	Project Manager	Senior Engineer	Project Finance Specialist	Electrical Engineer		Financial Analyst	Environmental Specialists	Admin Assistants	Total Days	Labor Cost	Local Labor	International Person-Trips	Trip Days	Trip Cost
TASK DESCRIPTION		LABOR BY PERSON-DAYS								SUMMARY BY TASK			INTNAT'L TRIP RECAP BY TASK		
	Discipline	Mgmt	Engineering	Finance	Elec Eng		Finance	Env							
1.1	Inception Meeting									16	14,400		5	3	12,675
1.2	Inception Report	1	1		1			1	1	5	4,650				-
2.1	Existing Documentation	1					1			16	13,050				-
2.2	Sites Selection	1					1			14	12,150	4,200	4	11	17,980
2.3	Energy Efficiency Audit	1		2			5			29	24,300	4,200			-
2.4	Conceptual Design	1	6		15		2	5	2	31	28,500				-
2.5	Performance Evaluation	1	2		4		1	2		10	9,600				
3	Economic Analysis	1	2		3		5	3	2	16	12,900				
4	Financing Plan	1	1	6	3		5	2	2	20	18,000				
5.1	Adverse Environmental Impacts	1	1		1		1	2	1	7	6,150				
5.2	Beneficial Environmental Impacts	1	2		2		2	6	2	15	12,900				
6.1	Permit Compliance	1	1		2		1	2	2	9	7,500				
6.2	Tariff Filing	2	5	1	1		5	5	5	24	20,250				
7	Development Impacts Analysis	1	1		1		1	2	2	8	6,600				
8	Implementation Plan	4	4	6	5		3	6	6	35	32,100		6	4	16,680
9	U.S. Sources of Supply	1	2		1			2	2	8	7,200				
10	Final Report to BeaconHouse and USTDA	3	2	1	1		1	1	2	11	10,500				
				denotes person traveling											
	Total Labor in Person-Days	25	44	16	55	0	34	53	47	274	Emp	Non-Emp			
									Total Labor Cost		240,750	8,400			249,150
									Person-Trips and Days				15	59	
									Total Trip Cost						47,335

LABOR INCLUDING OVERHEAD AND GENERAL AND ADMINISTRATIVE

	Daily Rate	1,200	1,200	1,200	900	900	600	900	450	Total		*Per diem*	Lodging	M&IE	Total
										Labor		Other	154	63	217
	Total Labor	30,000	52,800	19,200	49,500	-	20,400	47,700	21,150	Cost		Lahore	188	57	245
										240,750		International Airfare			1,800

Task Completion Schedule

Feasibility Study of Beaconhouse Schools Solar Photovoltaic Power Supplies

TASK	Months	1	2	3	4
1.1	Inception Meeting				
1.2	Inception Report				
2.1	Existing Documentation				
2.2	Sites Selection				
2.3	Energy Efficiency Audit				
2.4	Conceptual Design				
2.5	Performance Evaluation				
3	Economic Analysis				
4	Financing Plan				
5.1	Adverse Environmental Impacts				
5.2	Beneficial Environmental Impacts				
6.1	Permit Compliance				
6.2	Tariff Filing				
7	Development Impacts Analysis				
8	Implementation Plan				
9	U.S. Sources of Supply				
10	Final Report to BeaconHouse and USTDA				

ASSESSMENT TEAM RECOMMENDATION: USTDA should support this project. This is an environmentally preferred technology of the highest order; success can be replicated many fold. The sponsors' role of educator provides an inherent means to focus attention on the project as an example to be followed in Pakistan and the rest of the developing world, as well as in prosperous countries with high energy appetites. This is a good project with a good sponsor.

The Beaconhouse solar PV project meets USTDA basic funding criteria.

An appropriate TOR for the Feasibility Study is enclosed above.

The budget, labor account, and schedule are enclosed above.

PROJECT PORTFOLIO ASSESSMENT
The Definitional Mission encountered no other USTDA sponsored projects affecting the Beaconhouse solar PV project.

List of U.S. suppliers of integrated commercial solar PV systems (not comprehensive)

Sun Edison
12500 Baltimore Avenue
Beltsville, MD 20705
(866)-SUNEDISON (866-786-3347)
Tel: (443)-909-7200
Solar Integrated
837 East Martin Luther King Jr. Blvd
Los Angeles, California 90058 USA
(323) 231-0411
1 (888) 882-5785

Integrated Power Corporation
504 Redwood Blvd Suite 230
Novato, CA 94947
(415) 884-5555

GE Solar Energy Technologies

SunPower Corporation
Corporate Headquarters
3939 N. 1st Street
San Jose, California 95134
(408) 240-5500

Point Energy Group
2500 City West Blvd., Ste. 300

Houston, TX 77042
(713) 267-2263

Advanced Engineering Technology (AET)
243-248 Industrial Triangle, Kuhata Road
Islamabad, Pakistan
92 51 300 854 4057

1.0 Definitional Mission for the Pakistan Energy Sector

BACKGROUND

On August 3, 2009, USTDA awarded a contract to EMG to perform a Definitional Mission for Pakistan Energy Sector Projects. The objective of the DM is to review and assess the current energy industry of Pakistan and identify and develop the TOR for USTDA funding consideration for at least six feasibility studies, technical assistance or other capacity building projects which would help relieve severe energy shortages in Pakistan.

EMG formed a team for the project consisting of Ahmad Ghamarian, team leader; Michael Gembol, project development specialist; Stratos Tavoulareas, coal project development specialist; Mohammad Raziuddin, oil project development specialist; and Ashfaq Mahmood, former Secretary of Water and Power of Pakistan. Ashfaq Mahmood is a Pakistan citizen and resident.

TDA provided a briefing to clarify the Scope of Work and provided current information on known projects. They emphasized renewable energy projects such as biomass, solar, and hydro. While there is some concern with coal, considering very large undeveloped reserves in coal, TDA might support coal generation, especially if it involved a Clean Coal technology such as gasification combined cycle (GCC). Viable possibilities would include upgrades or repowering at existing coal, oil, gas, and hydro plants, and at refineries. Capacity Building might be included, along with Technical Assistance if it is an instrument for enabling project execution such as advisory services for Power Purchase Agreement negotiation and Financial Package structuring. Nuclear power plants would not be considered. USTDA requested the DM Team to explore projects for potential cost sharing and coordination with other agencies such as USAID. The studies and/or technical assistance activities recommended by EMG should target the substantial implementation financing from OPIC and U.S. Ex-Im Bank as well as multilaterals such as the World Bank and ADB. USTDA prefers that four or five out of six nominated projects be from the private sector. USTDA provided relevant background information and extracts from specific project documents.

EMG initiated a series of meeting with knowledgeable and interested U.S. parties, including USAID, WB, DOE, AEAI, Chemonics, IRG, Akkadian, and Caterpillar/Solar Turbines. These led to arrangements for follow-on meetings with their field offices and counterparts in Pakistan.

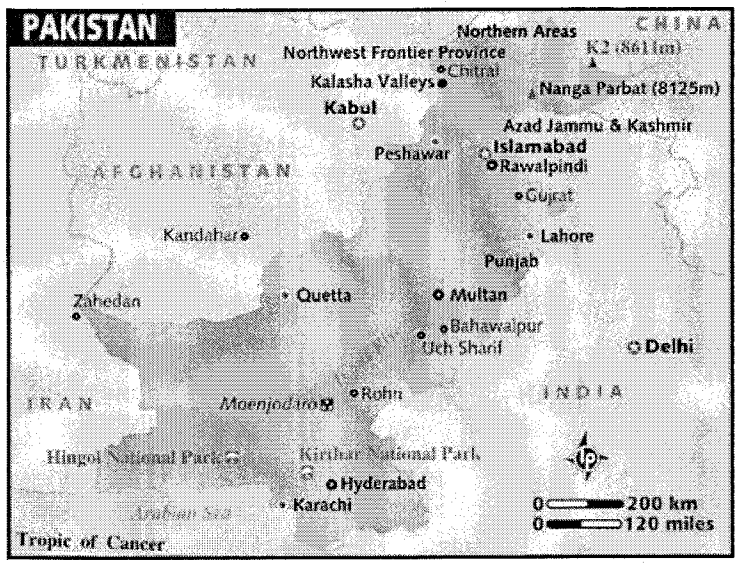
With the help of USTDA and the U.S. parties, and using EMG's own resources in the industry and within Pakistan, EMG prepared a detailed itinerary and schedule of meetings for a 2-week visit, proceeding to Islamabad, Lahore, Karachi, and Faisalabad, then back to Islamabad for checkout and

departure. EMG arranged meetings with Pakistan government agencies and officials and private sector managers through its team members in Pakistan, Ashfaq Mahmood and Mohammad Raziuddin. Originally scheduled to start August 24, the itinerary was postponed to October 1 to allow time for Pakistan counterparts to schedule the meetings, their administrative activities having been interrupted by Ramadan. This itinerary is Attachment B.

EMG prepared a Letter of Introduction describing the DM and requesting specific information on projects they may propose. The letter includes a set of *pro forma* questions needed to assess and select nominations for USTDA support. The Letter is included as an attachment to the Pre-Visit Report, Appendix A.

2.0 Pakistan's location and Economy

Location: The Islamic Republic of Pakistan is located in Asia at 30N and 70E. Pakistan occupies a very strategic position on the map of the world. It has Afghanistan and China in the North, India in the East, Afghanistan and Iran in the West, and the Arabian Sea in the South. Pakistan is viewed as a gateway for the export of energy from energy-rich Central Asian States. Its Gawadar port in the western part of Balochistan Province opens towards the Straits of Hormuz, an important energy transport corridor for Middle Eastern oil and liquefied natural gas (LNG). It has 6,774 km of land boundary comprised of 2,430 km with Afghanistan, 523 km with China, 2,912 km with India and 909 Km with Iran. It has a coastline of 1,046 km. The total area of Pakistan is 796,095 sq km[1].



Pakistan's Economy: Pakistan's total population at the end of 2008-09 was 162.4 million[2], with about 65% of its population living in rural areas[3]. The estimated population growth rate between 2007-08 and 2008-09 was about 1.7% per annum[4]. Pakistan has a relatively young population. Estimates of numbers below the poverty line vary in the range[5] of 23.9 to 36.1%.

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[1] CIA Website

[2] Pakistan Economic Survey, 2008-09, Government of Pakistan. The population at the end of June 2008 was estimated to be 161 million (page 7 Statistical Appendix)

[3] Ibid Page 94 Statistical Appendix

[4] Ibid 2 (page 7 Statistical Appendix)

[5] Ibid 2 (page 197)

The total GDP of Pakistan during 2008-09 was Rs 5.5 trillion (US$71 billion at $1=82 Rs.) The contribution to GDP from the Agricultural sector was 21.8%; from the industrial sector, 24.3%; from wholesale and trade, 17.5%; and 36.4% from other service sectors (*op. cit.*ref Economic Survey).

Pakistan's economy weathered an unprecedented set of challenges during the last couple of years. Skyrocketing oil prices followed by a price crash, the global financial crisis, and rising commodity prices in the world have severely affected the economy of Pakistan. The collapse of external demand for its exports and a sharp decline of external capital to finance its fiscal and current account deficits accentuated the economic pains. Energy shortages, particularly electric power shortages, have severely affected all segments of economy and society. These factors coupled with the change of the government in 2008 and various inherent inefficiencies in the governance system have taken their toll.

As a result of the above factors, the inflation rate reached 23%, the rupee (currency) depreciated, foreign exchange reserves fell sharply, and fiscal deficits increased. A significant collateral impact was a squeezing of the fiscal space for critical infrastructure development (such as the energy and social sectors). A summary of key financial indicators[1] is given below:

Table: Key financial indicators[2]

	2006-07	2007-08	2008-09
GDP Growth (%)	6.8	4.1	2.0
GDP per capita			$403.18
Consumer Price Index (%)	7.8	16.2	22.6
Fiscal Deficit (% of GDP)	4.3	7.6	4.3
Trade Deficit (% of GDP)	6.6	9.3	6.5
Domestic saving % of GDP			11.2

According to Pakistan government estimates, Pakistan's role in the War on Terror has resulted in an economic cost of US$ 35 billion since 2001-02. The intensification of an unprecedented domestic security challenge has also exacted enormous cost on the economy both in terms of direct costs of the fight against extremism, as well as in a consequential effect on investment inflows and market confidence. Foreign direct investment has accordingly become very shy. During 2008, FDI flow fell by 21.4% from 2007 levels.

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[1] Ibid 2

[2] Ibid 2

However, the worst seems to be over, as some of the factors responsible for this decline are receding (such as oil prices, global financial crises, etc.) and the economic performance of the country appears to be bound to improve. Positive signs have already started to emerge in the current fiscal year (2009-10). Inflation has come down to 17.2% from 25.3% in April 2009, foreign exchange reserves have increased to US$ 11 billion and GDP growth rate is being estimated at 2.0% for the fiscal year 2008-09. The law and order situation is also beginning to improve after the successful military operation against extremists in the northwestern part (Swat/Malakand and Waziristan) of the country.

Pakistan has also recently signed a 25-month US$11.3 billion Standby Agreement with the IMF. The program aims to:

- restore financial stability through a tightening of fiscal and monetary policies to bring down inflation and strengthen foreign currency reserves;
- protect the poor by strengthening the social safety net—this is a key element of the government's policy strategy; and
- raise budgetary revenues through comprehensive tax reforms to enable significant increases in public investment and social spending, needed to achieve sustainable growth.

The US Government has also approved annual assistance of US$ 1.5 billion to Pakistan with the Kerry- Lugar Bill enacted October 15, 2009. A "Friends of Pakistan Forum" comprising a number of countries sympathetic to Pakistan have also pledged significant assistance.

Looking forward, Pakistan's economy is still subject to an unusual degree of uncertainty associated with security problems, the depth and duration of the global slowdown, high inflation driven by spikes in food prices, the acute energy (particularly fuel and electric power) shortages, a bewildered stock market, continued contraction in large scale manufacturing, a slowdown in the lower services sector, and several other adverse factors.

3.0 Energy Sector of Pakistan

3.1 Overview of Pakistan's Energy Sector

1. Total energy consumption in Pakistan is comprised of 66 % from commercial energy resources and 34 % from non-commercial resources. Statistics on commercial energy are well-documented, while no recent survey of non-commercial energy resources is available.

2. The total primary commercial energy supply in Pakistan was 62.92 MTOE (million tons of oil equivalent) in 2007-08 whereas the final commercial energy consumption after accounting for transformation, transmission losses, and non-energy uses was 39.41 MTOE, or 0.39 TOE and 0.245 TOE per capita respectively).

3. The total primary commercial energy supplies were comprised of 30.5% from oil, 47.5% from natural gas, 9.2% from coal, 10.9 % from hydroelectricity, 1.2% from nuclear, 0.7% from LPG, and the remaining 0.1% from imported energy[1]. Of the total commercial energy supply, about 25 % was imported in the form of oil. This import dependence is, however, increasing due to increased oil-based power generation. At present, oil is the fuel of last resort and energy shortages are met by increases in oil imports. The total oil bill for 2007-08 was about US$12 billion[2]. This situation is non-sustainable as the country's economy may not be able to afford the required foreign exchange and increased exposure to the volatility of oil prices.

4. Final commercial energy is being consumed by various sectors of the economy, with 42.6% by industries, 29.3% by transport, 20.4% by domestic, 3.7% by commercial, 2.0% by agriculture, and 1.9% by other sectors in 2007-08[3]. The following charts show energy supply and consumption in Pakistan.

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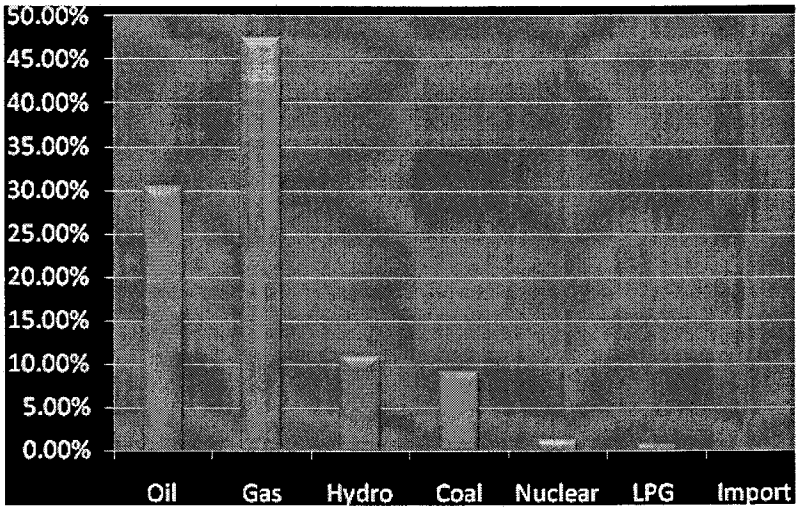
[1] Ibid

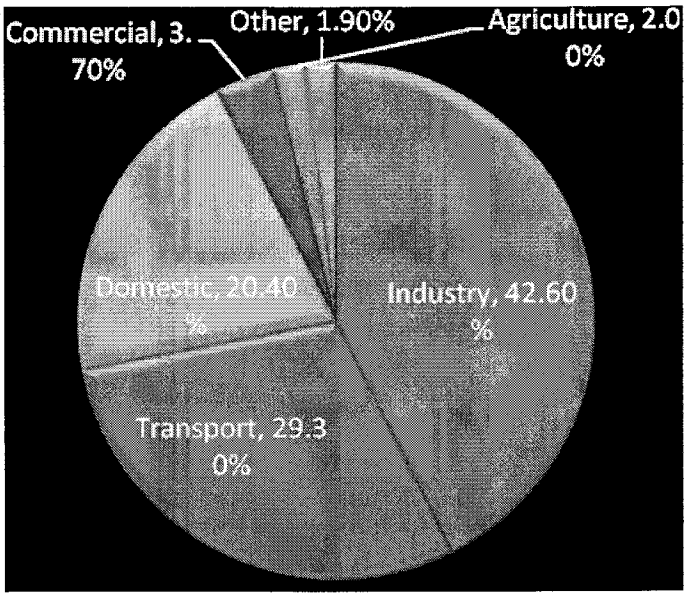
[2] Ibid 8. Pakistan Economic Survey 2008-09 shows the "expected" figure of US$ 8.7 billion

[3] Ibid 8

Energy Supply Pattern in Pakistan 2007-08



Energy Consumption Pattern 2007-08



5. Pakistan has not prepared any recent Integrated Energy Plan. It had prepared a Medium Term Development Framework (MTDF) and a Vision 2030 document for all economic sectors including the energy sector. However, these are now somewhat outdated. At present, a USAID-sponsored consultant is assisting the Planning Commission of Pakistan in the preparation of an Integrated Energy Plan. The Planning Commission has also recently constituted work for the preparation of a five-year plan for 2010-15.

6. The only recent credible projections of energy outlook for Pakistan have been prepared by Petroleum Institute of Pakistan (PIP) in June, 2008[1]. These projections are for the period 2008-2022. The projections of energy demand in this work are based on econometric models. The demand projections are based on the following two scenarios:

   Case I Based on annual compounded GDP growth rate of 4.5%

   Case II Based on annual compounded GDP growth rate of 6.5%

7. Case I is based on historical growth and can be termed as conservative, while Case II reflects the growth achieved during 2002-07, in which period the country's economy was performing much better than the historical long-term growth rates.

8. Pakistan's total energy demand is projected to increase to 116 MTOE in 2022 in Case I and to 147.5 MTOE in Case II. As per the two scenarios given above, the demand for primary energy is projected to increase at annual compressed growth rates of 4.4% and 6.1% in Case I and Case II respectively, compared to the historical growth rate of 4.8% during 1992-2007.

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[11] Pakistan Energy Outlook 2008-09, prepared by Petroleum Institute of Pakistan (PIP), consultant ENAR Petrotech Services, June 2008

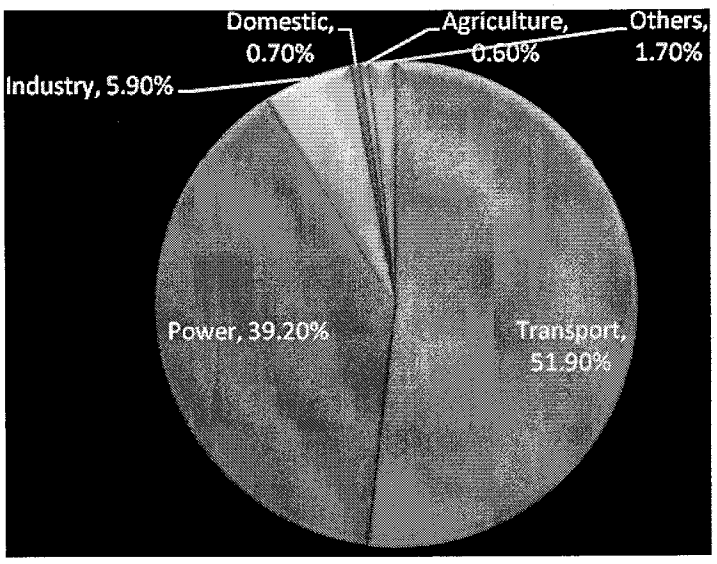
3.2 Energy Resources, demand, supply, issues and future outlook

3.2.1 Oil

1. The total resource potential of oil in the country has been estimated to be 27 billion barrels[1]. Against this potential, the total resources of oil discovered so far are 0.9 billion barrels. Out of this, the total remaining recoverable reserves at the end of 2007-08 were 326.7 million barrels (43.83 MTOE) which are only equal to 70% of one year's energy requirement, or barely equal to 2.8 years of oil demand at the present consumption level. Pakistan has about 127 discovered oil fields, but all of these are small producers[2]. The total domestic oil production during 2007-08 was 69,954 barrels per day (3.43 MTOE per annum) against a requirement of about 392,000 barrels per day. In other words, local production met only 18% of the total oil-based energy requirements.

2. The total consumption of petroleum products in Pakistan was 18.44 MTOE, with the transportation sector being the largest consumer with 51.9% share of the total consumption, followed by the power sector with 39.2%, then by the industrial sector with 5.9% share. The sector-wise consumption pattern is shown in the following chart:

Oil consumption by sectors



[1] Petroleum E&P Policy 2009 by G.A. Sabri Special Secretary, Petroleum and Natural Resources, Government of Pakistan

[2] Ibid 8

3. The annual compounded growth rate of demand for petroleum products was 1.9% during 2002-2008, but the annual growth rates recorded in 2006-07 and 2007-08 were 15.18% and 7.32%, mainly due to increased demand in the electric power sector. In the medium term, power sector demand is likely to maintain a high growth rate because about 2300 MW of rental power capacity[1], mostly oil-fired, is due for commissioning during 2009-10. Besides that, a number of other thermal plants in the private and public sectors are scheduled to be commissioned in the next several years.

4. According to PIP's Pakistan Energy Outlook, the demand for oil is expected to increase at the rate of 2.2% in Case I and 5.3% in Case II. The demand for oil has been projected at 28 MTOE for Case I and 44 MTOE for Case II. Local oil production is estimated to increase to 5.4 MTOE if there is no major departure from the current trends of exploration, development activities, and success ratios. This implies that supply deficits for oil will be in the range of 22.6 MTOE to 38.6 MTOE to be met through imports.

3.2.2 Natural Gas

1. The total estimated potential of natural gas resources in Pakistan is 280 Trillion Cubic Feet (TCF)[2]. So far, 53 trillion cubic feet of gas have been discovered in Pakistan. Out of this, the remaining recoverable resource is about 30 TCF (551 MTOE). At the current rate of production of 1.45 BCF per year, the reserves can last for about 20 years. At higher levels of consumption in future years due to growth in demand, the remaining resources may last for fewer years.

2. The total consumption of natural gas in Pakistan was 1.27 TCF (27.5 MTOE) against production of 1.45 TCF (29.87 MTOE). About 33.7% of the gas was consumed by the electric power sector, followed by 26.3% by the industrial sector and 15.7% for fertilizer in the agricultural sector. The gas utilization pattern[3] is shown in the chart below:

Natural Gas Consumption 2007-08

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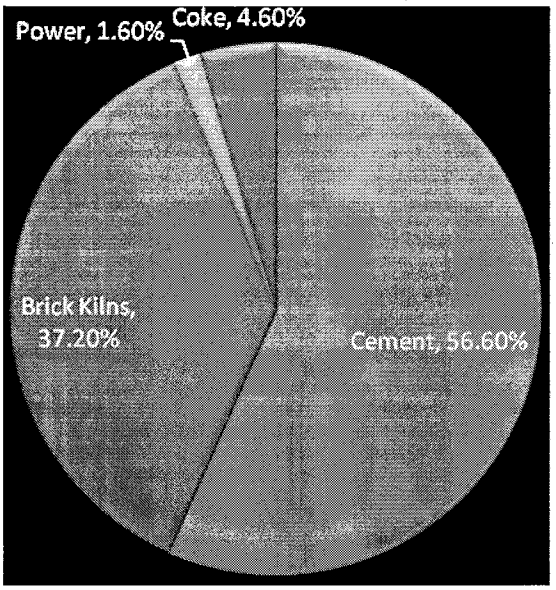
[1] Source PEPCO and PPIB
[2] Ibid 13
[3] Ibid 8



3. The annual compounded growth rate of consumption of natural gas was 7.9% over 2002-08. The annual production of natural gas is, however, less than the demand. The demand for natural gas increases in winter due to requirement for heating as well as for fuel for increased thermal power generation because hydropower production decreases in winter. For the winter 2008-09, a shortage of 750 MMCFD (million cubic feet per day) is forecast[1]. Besides, a number of new power projects had to adopt furnace oil as fuel in view of the non-availability of natural gas.

4. According to PIP's Pakistan Energy Outlook, the natural gas demand is projected to increase from 29.8 MTOE to 57.07 MTOE in 2022 in Case I and to 69.36 MTOE in Case II. The natural gas deficit is estimated to be 44.56 MTOE and 56.86 MTOE for Cases I & II respectively[2].

3.2.3 Coal

1. The total estimated resources of coal in Pakistan are 186 billion tons; of this, 3.45 billion tons are measured while the rest are in the categories of indicated inferred and hypothetical reserves. Coal constitutes about 9.2 % of the primary energy requirements in the country[3].

2. The total consumption of coal during 2007-08 was 10.11 million tons (5.8 MTOE), of which 4.12 million tons (1.85 MTOE) were domestically produced and 5.99 million tons (3.94 MTOE) were imported. About 56.6% of the coal was consumed in the cement sector as almost all the cement factories have in the recent past converted from furnace oil to coal.

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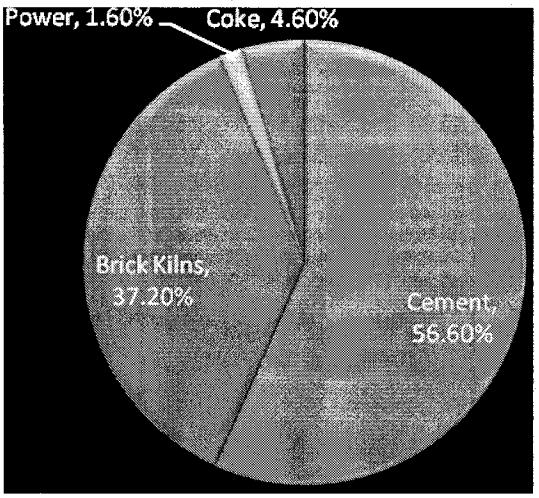
[1] Ministry of Petroleum and Natural Resources
[2] Ibid 12
[3] Ibid 8

The brick kiln industry consumed about 37.2% of coal. Use of coal in the electric power sector was only 1.6%. The coal consumption pattern[1] is shown in the chart below:

Coal Consumption Pattern 2007-08



3. Pakistan's coal resources are mostly of lignite quality most suited for consumption for power generation at the mine site. Because of high sulfur content, the coal is not suited for domestic consumption. A number of power generation proposals for utilization of coal are in the pipeline. Besides projects for conventional power generation based on coal, studies are in hand for coal gasification and harnessing of coal bed methane potential. It is expected that the consumption of coal will show a phenomenal increase in future. The annual compounded growth in coal during 2002-08 was 15.6%.

4. According to PIP's demand projections[2], it is expected that coal will contribute about 8.31 MTOE in accordance with Case I and 10.34 MTOE according to Case II in 2022. Coal's share in the final energy demand is projected to be 11% for both cases. These projections may, however, be on the lower side, considering the efforts for exploitation of the major coal resources of the coal fields in Pakistan.

5. The Definitional Mission met with government officials in Punjab and Sindh and with private developers planning various coal mining projects. One topic of investigation was Coal Bed Methane (CBM) or Coal Mine Methane (CMM). Some preliminary bore samples in the Thar Valley in Sindh were negative for methane, but there was concern the samples may have been mishandled and compromised prior to analysis. Research by the U.S. Geological

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[1] Ibid 8
[2] Ibid 12

Survey suggests that some of the reserve areas have high potential for CBM extraction. [1] CBM and CMM are particularly valuable options to Pakistan for several reasons:

- Pakistan is desperately short of fuels; CBM can be placed into service within months, compared to estimates ranging from 5 to 15 years to establish large-scale underground mining and associated coal-fired generating plants.
- CBM tends to have low BTU content, but electricity can be generated at very competitive prices at the collection area using diesels modified for gaseous fuel ignition.
- Mining will release CMM to the atmosphere, where methane has approximately 24 times the effect of the same quantity of CO_2 on the greenhouse effect causing global climate change. CBM and CMM capture techniques can both reduce methane release.
- CMM is a danger to proposed underground mining operations, particularly in a situation where the nation has no body of experience in deep mining and where mine safety standards are relatively underdeveloped.
- CBM can extract usable methane from areas in which underground mining is not feasible, such as where the overburden is loose or fractured.

For these reasons, the Definitional Mission suggested a need for further field investigations of CBM/CMM potential, and the possibility of USTDA sponsorship of an Orientation Visit to operating U.S. CBM/CMM facilities for Pakistan officials to familiarize themselves with the potential.

3.2.4 Hydropower

1. The total hydropower potential of Pakistan is about 42,000 -57,000 MW[2,3]. Of this, 6,480 MW of capacity has been harnessed so far. This represents about 15 % of the total potential. Development of hydro power, particularly large storage-based hydro power plants, has been a victim of lack of consensus amongst the provinces on allocation of water. Development of run-of-river power projects has also not been pursued vigorously. At present hydroelectricity contributes about 10.9 % of the primary energy supply by supplying 28.6 billion kwh (TWh)[4].

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[1] A primer on the occurrence of coalbed methane in low-rank coals, with special reference to its potential occurrence in Pakistan, SanFilipo, J.R., U.S. Geological Survey Open-File Report 00-293

[2] Pakistan Hydro Power Potential,PPIB,Ministry of Water and Power and WAPDA's Submission for 10 Plan

[3] Energizing Pakistan, Challenges and Opportunities in Energy Sector, Government of Pakistan 2009

[4] Ibid 8

2. PIP's Pakistan Energy Outlook[1] projects that about 7,810 MW of additional hydro power generation will be included in the power system by 2022. According to the Water and Power Development Authority (WAPDA) projects with 1,505 MW of capacity are under construction, 4,689 MW are ready for construction, and feasibility studies for 24,341 MW are in various stages.

3.2.5 Nuclear

The total installed capacity of nuclear power plants in Pakistan is 462 MW. At present one unit of 325 MW is under construction and expected to be commissioned by 2011. It is envisaged that two more units of 325 MW each are to be commissioned by 2016-17. Thereafter, the Pakistan Atomic Energy Commission plans to install units of 1,000 MW size every 3-4 years. Accordingly about 1,975 MW of additional capacity can be installed by 2022[2] . It has also been projected that Pakistan will add 8,800 MW of nuclear power capacity by 2030[3]. However, PIP's Pakistan Energy Outlook[4] envisages that by 2022 only about 900 MW of additional nuclear capacity will be realized.

3.2.6 Renewable Energy

Pakistan is blessed with huge renewable energy resources, particularly wind, solar, hydropower, and biomass. Other than some large and medium hydropower development utilizing only 15% of the hydropower potential, commercial exploitation of renewable energy resources has been negligible. Mainstreaming of renewable energy can help diversify Pakistan's energy mix, improve the environment, and reduce dependence on fossil fuel.

3.2.7.1 Wind

Significant wind resources exist in many parts of the country, especially in southern Sindh, western areas of Balochistan, Northern Punjab, and the North West Frontier (NWFP) province (reference USAID Wind Map).

Map Showing Wind Resources of Pakistan

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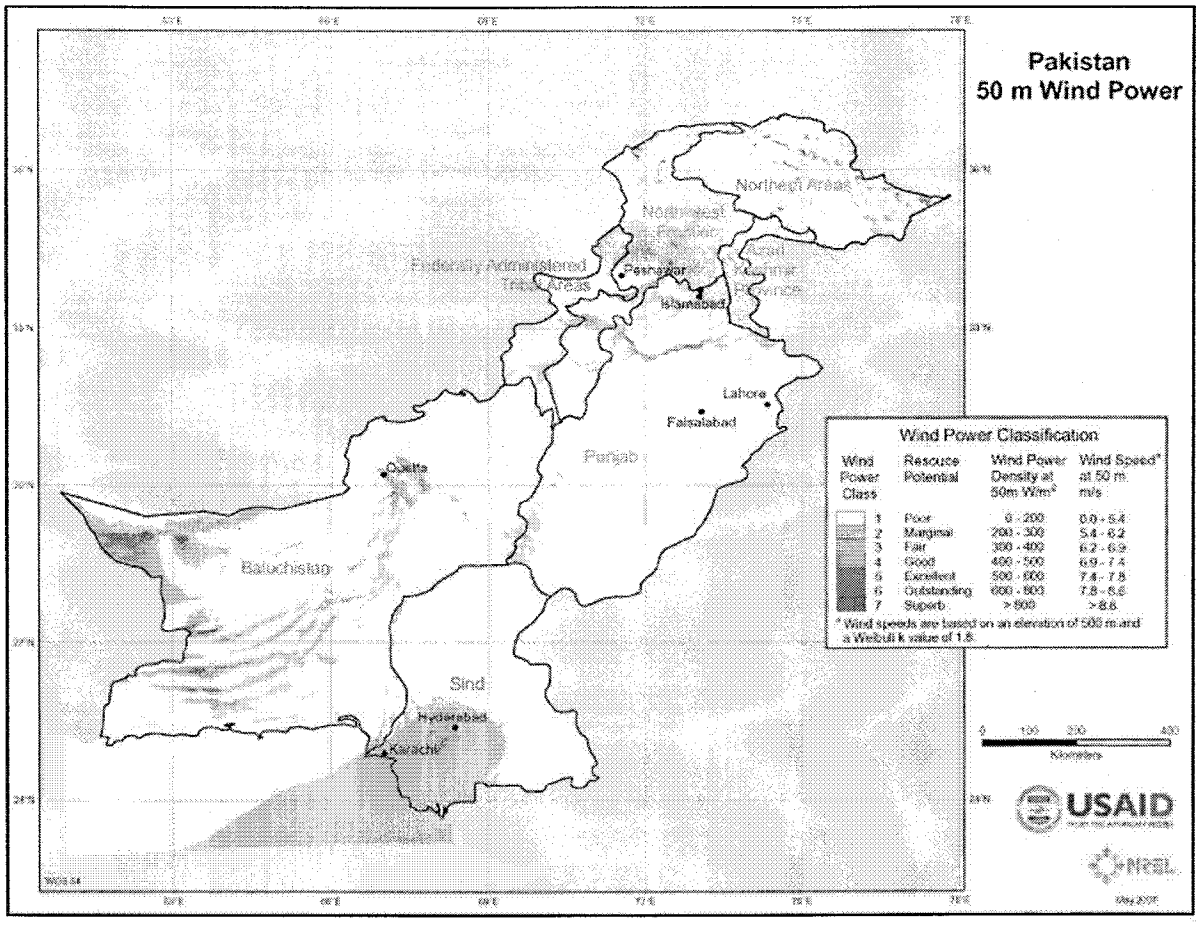
[1] Ibid 12
[2] Source PAEC
[3] Vision 2030 Planning Commission of Pakistan
[4] Ibid 12



Currently Pakistan is focusing on wind power development in the lower Sindh area in what is called the "Gharo Corridor". According to measurements and estimation done so far, wind velocities in the range of 5-11 meters/second (m/s) exist at 80-meter height (depending upon months of the year) averaging[1] up to 7 m/s[2]. Estimates show that the wind resource is equal to 340,000 MW power[3]. Other estimates reckon the wind energy potential of up to 50,000 MW[4]. Except for the Gharo Corridor, Pakistan's wind resources and the feasibility of exploitation has not yet been systemically determined. Under the circumstances, Pakistan has set a target of development of 9,700 MW of electric power by 2030[5]. This can be revised upwards in view of the huge potential for development of wind resources as indicated above.

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[1] Development of benchmark wind speed for Gharo, Jhimpir, Pakistan. Irfan Mirza, Nasim A. Khan and Naeen Memon. Renewable Energy Vol35,, issue3 ISSN 0960-1481.http://www.elsevier.com

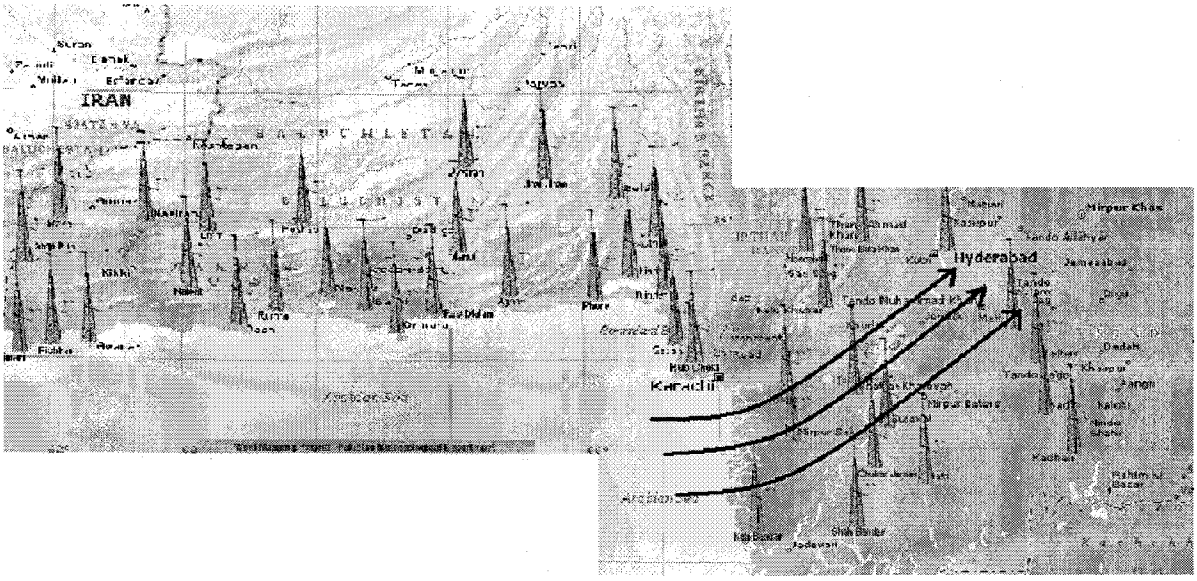
[2] Policy for Development of Renewable Energy for Power Generation 2006, Government of Pakistan

[3] Ibid 25

[4] Ibid 31

[5] Ibid 29

Map Showing Wind Regime in Sindh and Balochistan



A number of Letters of Intent (LOIs) have been issued by the Alternate Energy Development Board (AEDB) inviting investment in wind power by the private sector. About 10-12 private sector parties have made credible progress in terms of development of projects and preparation of feasibility studies, and all of these are for 50-MW projects. One investor has installed 6 turbines and is generating about 2 MW of electricity (the first turbines of a planned 50-MW project). It is expected that during the next 12-18 months, 100 MW of wind turbines will be installed.

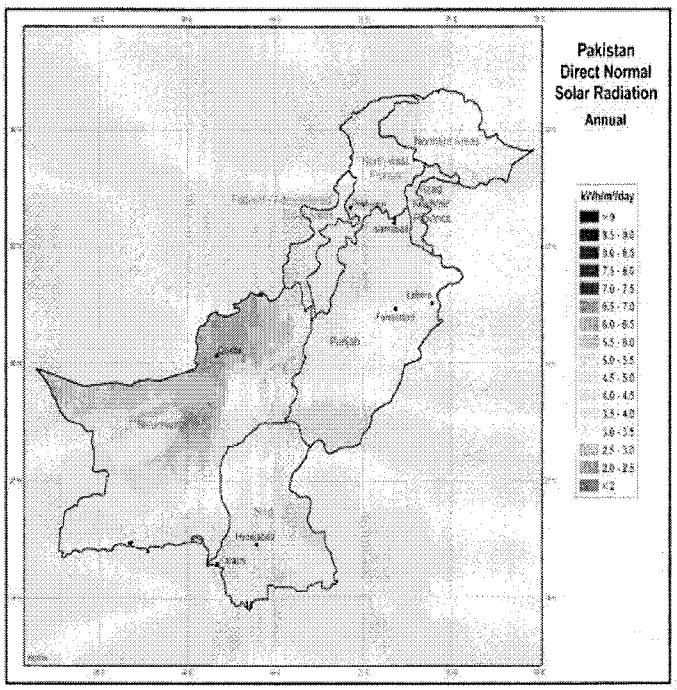
3.2.7.2 Solar

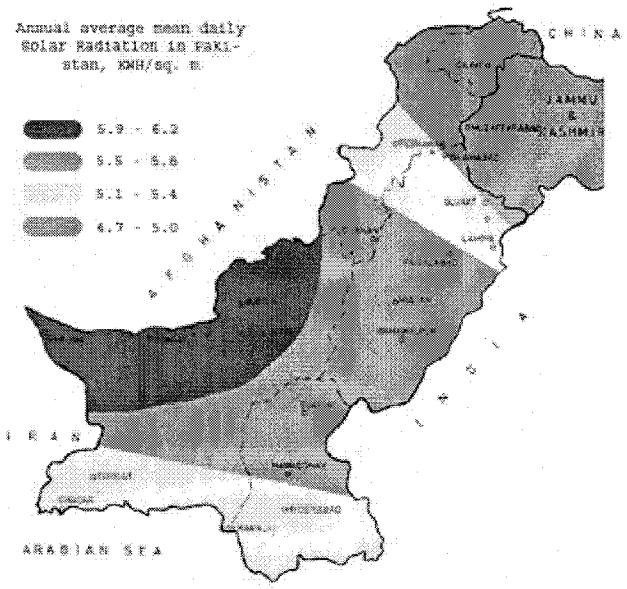
1. Pakistan receives solar radiation in the range of 4.7KWh/m^2 to 6.2 KWh/ m^2 per day on the average[1]. According to the Planning Commission, the total potential is equal to 1.2 million MW of capacity[2].

[1] NREL Map
[2] Ibid 25

2. However, there is still no significant commercial use of solar energy in Pakistan. AEDB is developing a number of off-grid applications of solar energy. Small-scale projects of demonstration plants for solar PV-based electricity generation, solar street lights, electrification of 100 homes based on stand-alone solar PV cells, and demonstration projects of solar water heating units are being undertaken[1]. With the falling prices of solar PV, it is expected that solar energy will play a significant role in the energy sector of the country in future.

Maps Showing Solar Radiation Received by Pakistan and Solar Potential





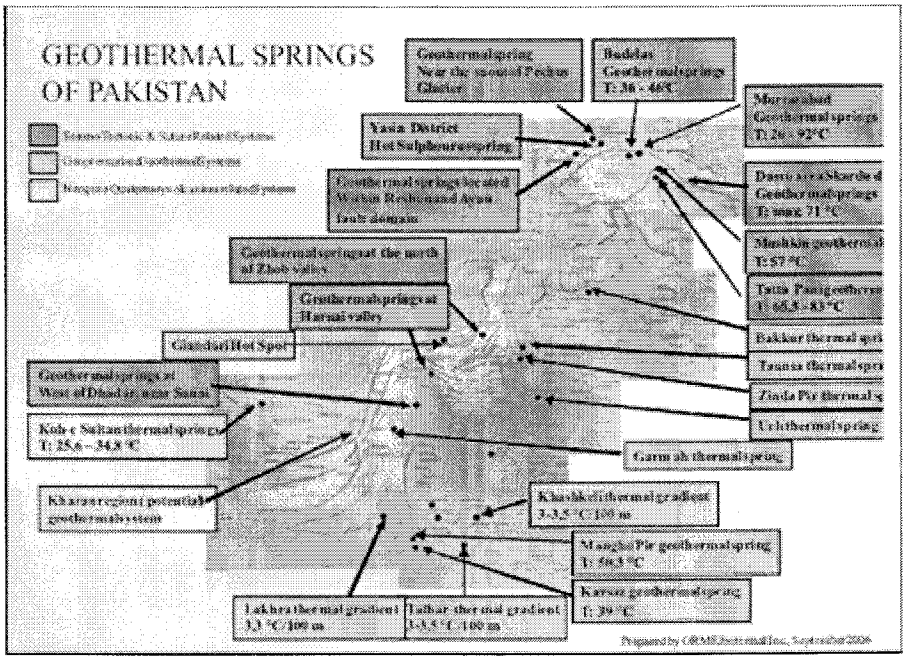
[1] Ibid 25

3.2.7.3 Small Hydroelectric

The total potential[1] of small hydro power plants in Pakistan is about 2,000 MW. Pakistan has a modest development program of small hydro development. Provinces are taking the lead in development of small hydro potential on canals, various brooks and streams, etc. The Asian Development Bank is providing assistance for installation of 50 MW of small hydropower plants in NWFP and 30 MW in Punjab[2]. Projects based on Nara and Rohri canals in Sindh are also being studied. In addition, installation of 54 MW of plants in the Gilgi-Baltistan area is also planned. Other feasibility studies for a number of small hydro plants are also being carried out.

3.2.7.4 Geothermal

Geotectonic information shows that Pakistan should not be lacking in commercially exploitable sources of geothermal energy. A number of geothermal springs have been found in Pakistan particularly at Sehwan in Sindh and Koh-e-Sultan in Balochistan. A map of geothermal potential of Pakistan[3] is shown below:



[1] Ibid 24
[2] Ibid 8
[3] AEDB Website

3.2.7.5 Biomass

Millions of tons of biomass comprised of bagasse, cotton and wheat stalks, rice husk, jute waste, other crop residues, and cow dung is produced in Pakistan annually. Except for use of this resource by rural households, mainly for cooking, the biomass is not being used for power generation or other energy uses. The use of biomass in the rural sector is also very inefficient because of inefficient cook stoves. Studies are being undertaken to generate biomass-based electric power, primarily from thermal combustion and from biogas digesters. In particular, it has been identified that the bagasse (sugar cane waste) available from sugar mills can be used to generate up to 2,000 MWs of electricity[1].

3.2.7.6 Waste-to-Energy

There is not yet significant application of waste-to-energy in Pakistan despite the fact that a number of metropolitan cities have the potential for gainful and economic use of waste-to-energy conversions. Studies are being undertaken to prepare projects for at least one or two major cities. Some companies in the private sector are already using their industrial waste for electricity and heat generation.

Cattle waste is another important source of energy. There are a several large cattle colonies near large cities which produce commercially exploitable cattle waste. Studies are being undertaken to prepare projects of power generation utilizing this important source of biomass.

One project for production of 38 MW power at Karachi (Landhi) was being developed by Karachi Electricity Supply Company (KESC). USTDA had provided funding for a formal feasibility study. The project has been delayed for 15 years due to conflicting areas of responsibility and financing uncertainty. These have now been resolved by intervention of the Alternative Energy Development Board (AEDB). The project has now been taken over by the Government of Sindh. The project has the potential to be one of the largest such projects in the world, and would produce salable CO_2 and fertilizer in addition to electricity. The project would include modular biogas digesters providing gas to 2-MW spark ignition diesel generators. ADB will provide counter-guarantees to lenders and investors to relieve uncertainty at the strength of sovereign guarantees.

The Landhi project is important for its potential to be replicated at many other cattle colonies. However, its greater potential is to serve as a development model for sewage treatment waste: Karachi produces enough domestic waste sludge to support 250-300 MW of generation and perhaps greater amounts from solid sewage sludge when treatment plants are built.

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[1] AEDB estimate

3.2.7.7 Biodiesel/Vegetable Oil[1]

Initial research on biodiesel resources in Pakistan has identified varieties of seeds and plants that can produce oil that can be converted to biodiesel or vegetable oil which can be used directly as fuel. After iterative experiments, a number of bio-resources have been identified including Pongamia Pinnate (Sukh Chane), Rape seeds, Castor Bean and Jatropha. Further research is in progress in some universities in Pakistan. Demonstration farms of Jatropha and plantation of Sukh Chane trees along the railway tracks are also envisaged.

Research is also in progress to utilize waste vegetable oil (WVO) available from restaurants and hotels, etc., for use as diesel fuel. According to one survey, an approximate quantity of 150 million liters of Bio-diesel can be produced in Pakistan from WVO.

3.3 Electric Power supply, demand, transmission, distribution, sector issues, and future outlook

Supply:

The total installed capacity in the country at the end of June 2008 was 19,420 MW. It was comprised of 6,480 MW hydro, 12,478 MW thermal (4,900 M in public sector, 5,822 MW in IPPs and 1,756 MW in KESC), and 462 MW of nuclear power. A number of power plants in the public sector and KESC are of very old vintage (1960-75) and inefficient. Their availability is also unreliable and the forced outage rate is very high. The total installed capacity in Pakistan was practically stagnant during 2003-08. During 2007-08, the total electricity generation in Pakistan was 95.86 TWh. It was comprised of 28.7 TWh hydro, 30.8 TWh oil-based, 32.9 TWh gas-based, 0.136 TWh coal-based, 3 TWh nuclear, and the rest imported electricity from Iran. The thermal generation required 8.5 MTOE of Natural gas, 6.7 MTOE of furnace oil, 0.07 MTOE of coal and 0.2 MTOE of diesel[2]. The chart below shows the trends over the last 6 years.

Electricity Generation Mix (GWh)

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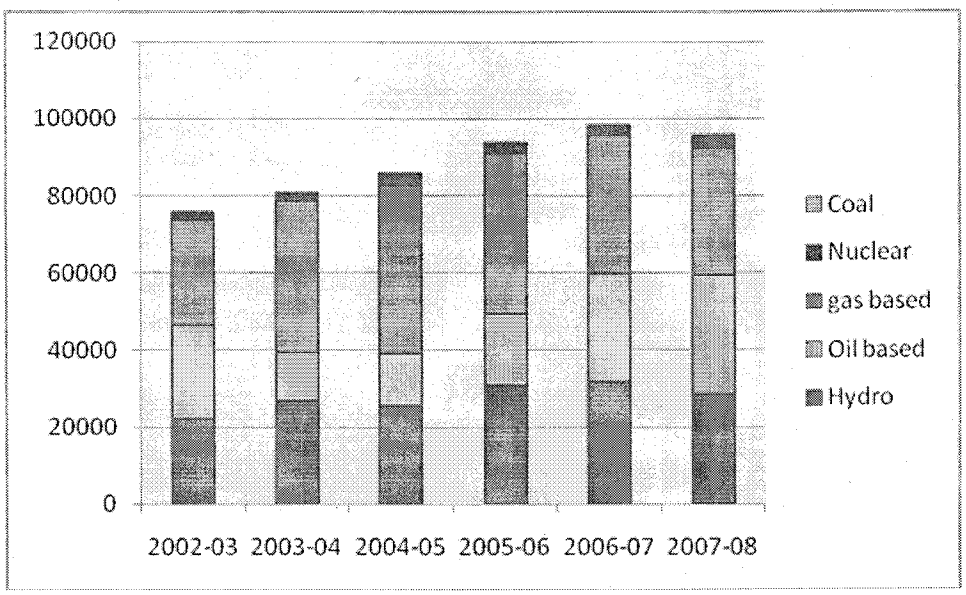
[1] AEDB Web site

[2] Ibid 8



(Note: coal generation is too small to be seen on this chart.)

For future supply, the initial response of Pakistan Electric Power Company (PEPCO) seems rather panicky as it has contracted[1],[2] about 2,300 MW of power generation capacity on rental for 3-5 years contracts to meet the immediate power shortages. This is, however, at very high prices costing about 17 cents/kWh, higher even than some authorized tariffs for renewable projects. Rental contracts had been a subject of major criticism in Pakistan. PEPCO's indicative planning is to install[3] 11,491 MWs in the period 2009-15, which will replace the rental projects on the expiry of their contracts as well as obsolete plants. The planned capacity will, however, be largely thermal as new hydropower plants require long lead times. KESC's plans envisage installation of 1,970 MW of thermal capacity[4] in the same period.

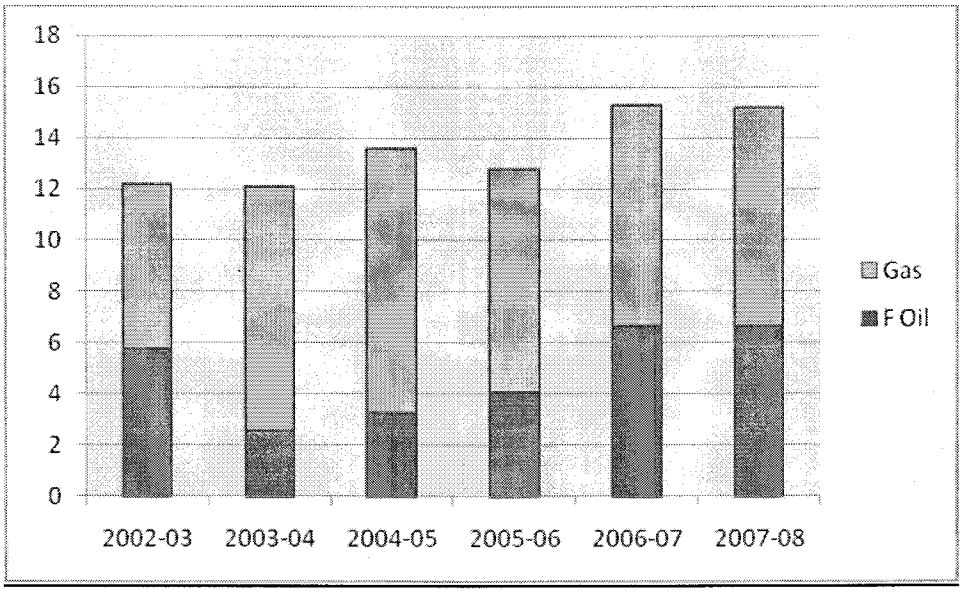
Electricity Generation Fuel Dependence (MTOE)

[1] Ibid 16

[2] 10th Five-Year Plan Approach Paper, Planning Commission of Pakistan, Government of Pakistan. June 2009

[3] Source PEPCO

[4] Source KESC



In the long term, Pakistan will be adding significant amount of hydropower capacity in the system. A number of large hydro power projects are being studied. Implementation of one large hydro power project, Diamir-Basha Dam with installed capacity of 4500 MW has recently been started. A 969-MW Neelam Jhelum hydro power project is also under implementation. Besides, the Thar Coal and Energy Board envisages development of large coal fired power plants on Thar coal. Pakistan is also studying the option of importing power through interconnections of 1,000MW each from Central Asian States and from Iran. It is already importing about 30-35 MW from Iran. Interest from private sector has also been solicited for construction of 1000-MW imported coal-based power project[1].

Demand:

The power systems of PEPCO and KESC had been experiencing load shedding in the range of 3,000 MW to 5,000 MW in the last 3 years[2]. The order of magnitude of unmet demand in peak demand months is over 25% of peak demand. This coupled with the unforeseen forced outages, fuel shortages (mainly natural gas), seasonal variation of hydropower, and unprecedented increase in demand due to air-conditioning load, etc., had been causing load shedding of 8 hrs/day in urban areas and 14-16 hrs/day in rural areas.

The computed maximum demand after taking into account the estimates of load shedding at the end of the year 2007-08 was 19,281 MW. The trend of computed maximum demand is shown in the chart below. The power demand had been growing at the rate of 10-13 % per year in the last 2-3

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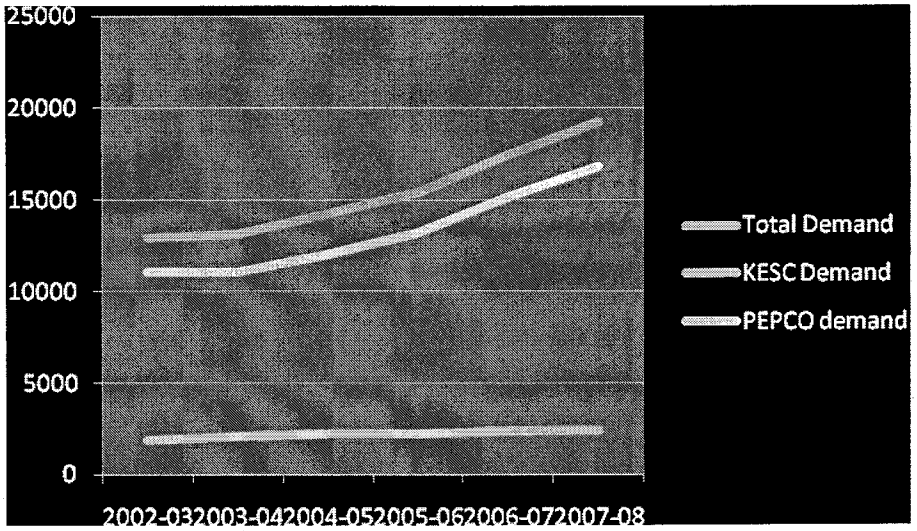
[1] WAPDA, PPIB

[2] Ibid 25

years while the growth rate over the entire period 2000-08 was in the range of 8-8.5% per annum[1]. It is being estimated that the demand would grow at the rate of 8-8.5 % for several future years (at least for 5 years).

Figure---Trend of Computed Maximum Demand



Supply and Demand Projections:

Thorough projections of demand supply balances taking into account latest data are not currently available. Tentative analyses done by PEPCO/KESC for the next five years after taking into account recent data shows that the planned generation capacity will not be adequate to meet the power demand and power shortages are likely to continue during the period in the range of 3,000-5,000MW. A working group has been formed by the Government to look into this situation and prepare a five-year plan (Tenth Five-Year Plan).

Transmission and Distribution:

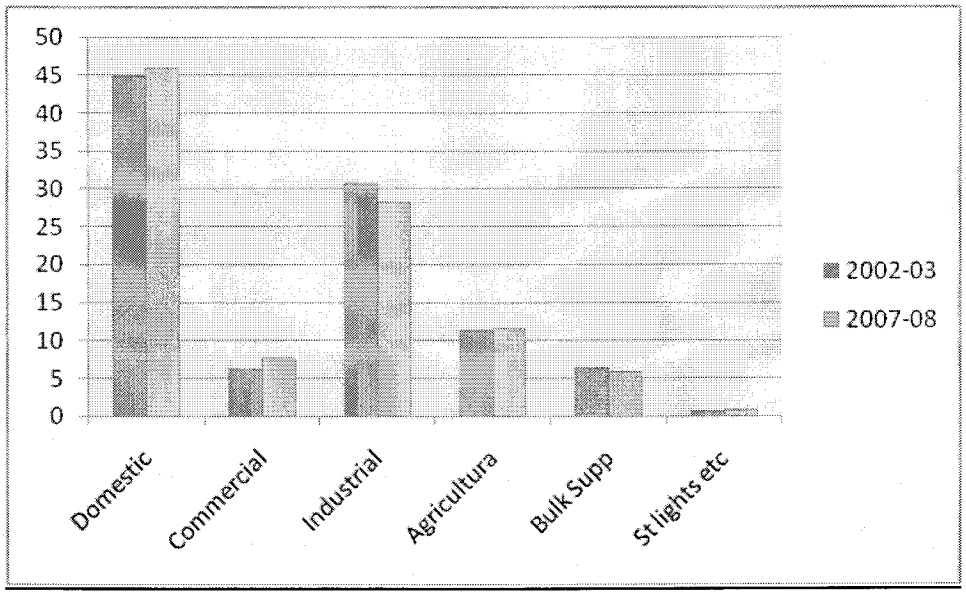
The transmission system of the country did not come under stress during the recent past years mainly because not much new generation was added to the system. Normal expansion plans and construction of transmission lines to connect new power generation are currently in hand. For the future, PEPCO is planning to construct 765KV of high capacity DC lines as a number of large hydropower, coal-fired, and gas/oil power plants are being envisaged as well as importing of power from Central Asian States.

In the power distribution sector, the total number of consumers in the country at the end of June 2008 was 19.94 million. According to government estimates[2], about 53% of the population has access to electricity. The total supply of electricity by electric utilities was 95.7 TWh, while the sale to consumers was 73.4 TWh, the difference being technical and commercial losses. Per capita

[1] Electricity Marketing Data (33rd issue) updated to June 2008, NTDC , Lahore
[2] Ibid 8

electricity generation was 594 KWh and per capita consumption was 456 KWh. On the overall basis the average losses in the system were about 23.3 %, whereas the losses in individual companies ranged from 10% to 35%[1]. About 45.9% of electricity was consumed by domestic accounts, 28.2% by industries, 11.5% by agriculture and 7.6% by the commercial sector[2]. Details are shown in the chart below.

Changes in Consumption Pattern of Electricity (%):



Distribution systems have been facing many difficulties. Due to lack of investment and poor maintenance, the distribution companies have not been able to cope with customer needs. A large percentage of transformers and lines are over loaded. Losses are high in many distribution companies (DISCOs), the metering system and bill collection system are becoming outdated, and the companies do not have effective demand management. There is also a substantive amount of electricity theft in the distribution sector.

Issues in the Energy Sector:

Some issues have been briefly discussed in the foregoing description of the energy sector. Following is the summary of major issues confronting the sector:

1. Pakistan's power generation is predominantly thermal (70%) and, in the next 5 years or so, the proportion of thermal power is going to increase further as no new medium and large hydropower plants can be commissioned in the period.

2. Electricity prices are increasingly becoming unaffordable. Over-dependence on thermal power is going to exacerbate the problem.

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[1] Ibid 52

[2] Ibid 8

3. The total amount of price subsidies to be paid by the government is becoming unsustainable.

4. The issue of "Circular Debt" needs to be addressed on top priority. Circular debt is the situation in which the state utilities are unable to collect enough revenue from customers, due to losses and to inadequate tariffs, to pay for their fuel and for power from IPPs. The IPPs then are unable to pay for their fuel bills and debt service. When the situation grows severe, generating plants run out of fuel, the utility sheds load, and customers left without power are unable to produce, so they become unable to pay their electric bills.

5. Power losses and thefts of electricity are very high.

6. There is a lack of integrated planning for energy sector.

7. Extensive load shedding in the country is adversely affecting the economy and creating public unrest.

8. Rental power generation as a stopgap arrangement is likely to provide the most expensive power, which will be unsustainable.

9. Lack of effort exists for energy conservation and demand management.

10. Foreign direct investment has slowed.

11. Implementation of power sector reforms is not being carried out effectively.

12. There is a lack of consensus on development of large hydropower power resources.

13. Very slow progress has been made in the development of renewable and alternate energy resource development.

14. Shortages of natural gas persist for distribution and for electric power generation.

15. Dependence on imported fuels continues to increase.

16. Lack of tangible progress has slowed the development of one of the world's largest lignite coal resources at Thar.

17. Failure of coordination of decisions between government agencies hampers progress.

3.4 Energy Sector Organizations

Various institutions in the energy sector and their roles are briefly described below:

1. *Planning Commission:* It is responsible for preparation of national socio-economic plans. Within the Planning Commission, the Energy Wing is responsible for integrated energy planning at the national level.

Power Sector

2. *Ministry of Water & Power:* It is responsible for formulation of water and power sector policies, supervision of performance of various power sector companies, planning of projects, budgets and investments.

3. *Private Power Infrastructure Board (PPIB):* It provides one-window support to investors in the power sector and promotes private investment.

4. *Water and Power Development Authority (WAPDA Hydel):* It is responsible for preparation implementation and operation of hydro power projects in the public sector.

5. *Pakistan Electric Power Company (PEPCO):* It is responsible for the planning, supervision and coordination of performance of thermal power generation companies in public sector.

6. *GENCOs (Generation Companies):* Four GENCOS are responsible for thermal generation in the public sector.

7. *National Transmission and Dispatch. Company (NTDC):* It is responsible for transmission system of 220KV and above as well as National Dispatch and Control Center. It is also responsible for preparation of power sector plans

8. *Distribution Companies (DISCOS) Public Sector:* Nine DISCOS are responsible for distribution of electricity in Pakistan other than in Karachi.

9. *KESC (Karachi Electric Supply Company):* KESC is a majority privately-owned vertically integrated company (Government of Pakistan owns 25.66%) and is responsible for generation, transmission and distribution of electricity in the Karachi area.

10. *IPPs (Independent Power Producers):* Sixteen IPPs are operating under long-term contracts (typically 20-30 year) and are providing power to NTDC.

11. *RPPs (Rental Power Producers): GoP is in the process of inducting a number of power plants on rental basis*

12. *Pakistan Atomic Energy Commission:* It is responsible for planning, implementation, and operation of nuclear power in Pakistan.

Fuel Sector

13. *Ministry of Petroleum and Natural Resources:* It is responsible for fossil fuel sector, policy formulation, supervision of the preparation of various entities in the fuel sector, planning of projects, budgets, etc.

14. *OGDCL (Oil and Gas Development Company Ltd):* It is a public sector company responsible for upstream oil and gas exploration and production.

15. *SNGPL (Sui Northern Gas Pipeline Ltd.):* It is a public sector company responsible for transmission and distribution of gas in the areas North of Guddu in Pakistan. The Government and Government-controlled institutions shareholding is 54%, with the remaining 46% held by the private sector.

16. *SSGC (Sui Southern Gas Company):* It is responsible for transmission and distribution of natural gas in areas of South of Guddu in Pakistan. The Company is a public limited company listed on the Karachi, Lahore and Islamabad Stock Exchanges with 60.43% direct share holding by Government of Pakistan (GOP).

17. *ISGS(Inter State Gas Systems (Pvt) Ltd:* It is responsible for import of natural gas. ISGS is a private company owned 51% by SSGC and 49% by SNGC.

18. *PSO (Pakistan State Oil):* It is a public-sector oil marketing company

19. *Refineries:* There are seven oil refineries namely PARCO, ARL, NRL, PRL, Bosicor Refinery, Dhodak Refinery and ENAR Petrotech Refinery with a combined capacity of about 13 million tons per annum capacity.

20. *Private Oil Marketing Companies:* There are a number of oil marketing companies in the private sector.

21. *E & P Companies (Exploration and Production):* A number of E&P companies hold leases/licenses/rights in Pakistan, mostly in private sector.

22. *LPG Marketing Companies:* There are a number of LPG companies engaged in LPG Production/recovery and marketing of LPG.

23. *Thar Coal and Energy Board (TCEB):* TC&EB has been formed by Government of Sindh and is responsible for the development of the Thar Valley coal resource.

24. *Lakhara Coal Mining Company:* This is a public sector company responsible for mining of coal from Lakhara coal field and supply to the Lakhara coal field power plant.

Renewables

25. *Alternate Energy Development Board (AEDB):* It is responsible for development of alternate and renewable energy resources less than 50 MW in size by private investors.

3.5 Reforms and Restructuring

The Government of Pakistan is committed to a program of reform and restructuring of the energy sector. Under this program, it has embarked upon a program of unbundling of vertically integrated public sector entities, privatization of utilities, creation of competition, and open access markets under the supervision of independent regulators. In the power sector, WAPDA has been restructured into 4 GENCO's, one Hydro Power Company, one transmission company (TRANSCO), and 9 DISCO's. However, there are some issues regarding the true autonomy of these unbundled companies. A new entity, the National Electric Power Regulatory Authority (NEPRA) has been created by law to issue licenses, determine tariffs, bring market reforms, and supervise the functioning of the sector. NEPRA is performing these functions with some limitations. Continuing effort will improve its capabilities and independence.

In the fuel sector, unbundling, though planned for quite some time, has not been done. An office of independent regulator, Oil and Gas Regulatory Authority (OGRA) has been created. Its functions are related to mid- and downstream activities in the oil and gas sectors. It is currently performing limited functions of determination of gas tariffs, setting retail prices of oil, issuing licenses, and general supervision of the oil and gas sector. Recently it has also started examining the market prices of LPG. OGRA also needs improvements in its capability and independence.

3.5 National Energy Plan and Policies[1]

Petroleum Policy 2009

The GOP is committed to accelerate an exploration and development program in order to reverse the decline in crude oil production to increase domestic gas production & supply and to reduce the burden of imported energy which otherwise will continue to adversely affect the balance of payments and trade. Accordingly it has announced a new policy, Petroleum Policy 2009, with the following objectives:

a. "To accelerate exploration activities in Pakistan with a view to achieve maximum self sufficiency in energy by increasing oil and gas production;

b. To promote direct foreign investment in Pakistan by increasing the competitiveness of its terms of investment in the upstream sector;

c. To promote the involvement of Pakistan oil and gas companies in the country's upstream investment opportunities;

d. To train Pakistani professionals in the Exploration and Production (E&P) sector to international standards and create favorable conditions for their being retained within the country;

e. To promote increased E&P activities by providing globally competitive incentives;

f. To enable a more proactive management of resources through establishment of a strengthened Directorate General of Petroleum Concessions (DGPC) and providing the necessary control and procedures to enhance effective management of Pakistan's petroleum reserves; and

g. To undertake exploration of oil & gas resources in a socially, economically and environmentally sustainable and responsible manner".

Renewable Energy Policy

[1] Ibid 25

The Government envisages mainstreaming of renewable energy in the development plans of the country. At present there is a Short-Term – Renewable Energy Policy which was announced in 2006. It has been extended to December 2009 and it is proposed to be replaced with a new Medium Term Renewable Energy Policy before mid-year, 2010. The new policy is expected to include waste-to-energy, cogeneration, hydro, solar, wind, geothermal and other non-conventional resources. The new policy, which is being finalized through a consultative process involving all stakeholders including the Province, is likely to contain feed-in-tariffs for renewable energy projects, while maintaining most of the incentives of the existing policy.

"The Renewable Energy Policy invites investment from private sector for:

i) Independent Power Projects (IPPS) for sale of power to the grid only;

ii) Captive cum grid spillover power projects for self-use and sale to utility;

iii) Captive power projects for self or dedicated use; and iv) Isolated grid power projects (i.e. small, stand-alone).

The RE policy offers a number of incentives. Specifically, it:

a. makes purchase of electricity by the National Transmission & Distribution Company (NTDC) from qualifying renewable energy-based generation projects mandatory

b. permits an investor to generate electricity based on renewable resources at one location and receive an equivalent amount for his or her own use elsewhere on the grid at the investor's own cost of generation plus transmission changes (wheeling)

c. allows net metering and billing so that a producer can sell surplus electricity at one time and receive electricity from the grid at another time and settle accounts on a net basis

d. de-licenses and deregulates small scale power production through renewable resources (up to 5 MW for hydro and 1 MW for net metered sales) to reduce the transaction costs for such investments

e. lays down simplified and transparent principles of tariff determination

f. insulates the investor from resource variability risk, which is allocated to the power purchaser; and

g. facilitates projects to obtain Carbon Credits for avoided greenhouse gas emissions, thereby helping improve financial returns and reducing per unit costs for the purchaser".

Power Generation Policy 2002

Private sector investments in the thermal and hydroelectric sector are governed by the "Power Generation Policy 2002". Key features of the Policy include:

a. Exception from corporate income tax, turn-over tax and sales tax;

b. Protection against Force Majeure, change in law, and change in duties and taxes;

c. Compensation in case of termination;

d. Tariff adjustments for variation in currency exchange and fuel prices;

e. Remitability of foreign exchange;

f. Protection against hydrological risk in case of hydroelectric projects;

g. Determination of tariffs by the independent National Electricity Power Regulatory Authority (NEPRA), using a cost plus method.

h. Concessionary duty of 5% on import of plant and equipment

i. Payment guarantee in case of default by the power purchaser

j.

Pursuant to Policy 2002, twelve (12) projects with a cumulative capacity of 2,543 MW (investment US $ 2.446 billion) are at various advance stages of implementation; of these, two projects have already started supplying 390 MW cumulatively to the national grid.

National Power Plan & the Integrated Energy Plan – Vision 2020.

PEPCO is in the process of reviewing the National Power Plan 1994 and formulating a new Power Plan. A Request for Proposal (RFP) is being issued to firms short-listed through a process of Expression of Interest (EOI). This plan, costing US$ 10 Million, would provide a 'least-cost generation and transmission plan' along with the requirement of fuel and other resources. This would also indicate the capital outlays, required for each activity with timelines. Pakistan has also announced specific policies in the energy sector, which are investor-friendly and expected to expedite investments in this sector.

Abbreviations

1	AEDB	Alternative Energy Development Board
2	CIA	Central Intelligence Agency
3	DGPC	Director General Petroleum Concessions
4	DISCOs	Distribution Companies
5	E&P	Exploration and Production
6	ENAR	ENAR Petrotech Services, Ltd
7	EoI	Expression of Interest
8	FDI	Foreign Direct Investment
9	GDP	Gross Development Product
10	GENCOs	Generation Companies
11	GoP	Government of Pakistan
12	GWh	Giga Watt hour
13	HDIP	Hydrocarbon Development Institute of Pakistan
14	IPPs	Independent Power Producers
15	ISGS	Inter State Gas System
16	KESC	Karachi Electric Supply Company
17	KV	KiloVolt
18	KW	KiloWatt
19	KWh	KiloWatt hour
20	LNG	Liquefied Natural Gas
21	LPG	Liquefied Petroleum Gas
22	MMCFD	Million Cubic Feet per Day
23	MTDF	Medium Term Development Framework
24	MTOE	Million metric Tons Oil Equivalent

25	MW	MegaWatt
26	NEPRA	National Power Regulatory Authority
27	NTDC	National Transmission and Dispatch Company
28	NWFP	North West Frontier Province
29	OGDCL	Oil and Gas Development Corporation Ltd
30	OGRA	Oil and Gas Regulatory Authority
31	PAEC	Pakistan Atomic Energy Commission
32	PEPCO	Pakistan Electric Power Company
33	PIP	Petroleum Institute of Pakistan
34	PPIB	Private Power Infrastructure Board
35	PSO	Pakistan State Oil
36	PV	Photo Voltaic
37	RPPs	Rental Power Producers
38	Rs	Rupees
39	SNGPL	Sui Northern Gas Company Ltd
40	SSGCL	Sui Southern Gas Company Ltd
41	TC&EB	Thar Coal and Energy Board
42	TCF	Trillion Cubic Feet
43	TOE	Ton of Oil Equivalent
44	TWh	Trillion Watt hours
45	US	United States
46	USAID	United States Agency for International Development
47	USTDA	United States Trade and Development Agency
48	WAPDA	Water and Power Development Authority
49	WVO	Waste Vegetable Oil

4.0 Project Reports

4.1 Project Selection Process

Selection criteria were determined in discussions with USTDA before the start of the Definitional Meeting. The project opportunities selected by the Definitional Mission must have value in one of the following Value Criteria or in combinations, and must meet all the Compliance Criteria.

Value Criteria

A. Support the energy sector of Pakistan with:

    1. Significant increase in electricity supply by

        a. Importing electricity,

        b. Increasing generating capacity,

        c. Providing fuel to present or future generating capacity projects, or

        d. improving electric efficiency.

    2. Significant additional fuel supply by

        a. Importing fuel,

        b. Increasing domestic fuel production, or

        c. improving fuel efficiency.

B. Have potential for replication of the project concept, once demonstrated, in larger quantities by the same sponsor or by other sponsors or agencies.

C. Improve the enabling environment of policy, regulation, institutional capacity, and investor confidence in order to facilitate and accelerate investment, both domestic and foreign, in the energy sector.

Compliance Criteria

D. Have minimum feasible adverse impact on the environment and on the general population of Pakistan.

E. Have a high degree of certainty of completion through economic and financial and technical feasibility; reasonable cooperation of all involved parties; compliance with laws, policies and regulations governing the energy sector; and the commitment and resources of the sponsors.

F. Exhibit diversity with the intent of opening doors in many technologies, financing methods, locations, fuel types, involved industries, and agencies.

G. Have potential for greater than $10 million of U.S.-sourced equipment or services.

H. Require assistance of a nature which USTDA is able to provide: U.S. consultant services to conduct feasibility studies costing in the range of $250,000 to $750,000 (with cost sharing where available); Technical Assistance for analyzing specific problems or helping to complete financing packages; or Capacity Development services to provide training to government officials.

The members of the Definitional Mission acted as a panel of experts in applying these criteria subjectively during the course of meetings with sponsors and responsible agencies. In addition to their own experience as energy professionals, they sought and applied the advice of literally hundreds of counterparts.

END OF DEFINITIONAL MISSION STUDY

ANNEX3

U.S. TRADE AND DEVELOPMENT AGENCY
Arlington, VA 22209-2131

NATIONALITY, SOURCE, AND ORIGIN REQUIREMENTS

The purpose of USTDA's nationality, source, and origin requirements is to assure the maximum practicable participation of American contractors, technology, equipment and materials in the prefeasibility, feasibility, and implementation stages of a project.

USTDA STANDARD RULE (GRANT AGREEMENT STANDARD LANGUAGE):

Except as USTDA may otherwise agree, each of the following provisions shall apply to the delivery of goods and services funded by USTDA under this Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from host country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for implementation of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in host country are not subject to the above restrictions. USTDA will make available further details concerning these standards of eligibility upon request.

NATIONALITY:

1) Rule

Except as USTDA may otherwise agree, the Contractor for USTDA funded activities must be either a U.S. firm or a U.S. individual. Prime contractors may utilize U.S.

subcontractors without limitation, but the use of host country subcontractors is limited to 20% of the USTDA grant amount.

2) Application

Accordingly, only a U.S. firm or U.S. individual may submit proposals on USTDA funded activities. Although those proposals may include subcontracting arrangements with host country firms or individuals for up to 20% of the USTDA grant amount, they may not include subcontracts with third country entities. U.S. firms submitting proposals must ensure that the professional services funded by the USTDA grant, to the extent not subcontracted to host country entities, are supplied by employees of the firm or employees of U.S. subcontractor firms who are U.S. individuals.

Interested U.S. firms and consultants who submit proposals must meet USTDA nationality requirements as of the due date for the submission of proposals and, if selected, must continue to meet such requirements throughout the duration of the USTDA-financed activity. These nationality provisions apply to whatever portion of the Terms of Reference is funded with the USTDA grant.

3) Definitions

A "U.S. individual" is (a) a U.S. citizen, or (b) a non-U.S. citizen lawfully admitted for permanent residence in the U.S. (a green card holder).

A "U.S. firm" is a privately owned firm which is incorporated in the U.S., with its principal place of business in the U.S., and which is either (a) more than 50% owned by U.S. individuals, or (b) has been incorporated in the U.S. for more than three (3) years prior to the issuance date of the request for proposals; has performed similar services in the U.S. for that three (3) year period; employs U.S. citizens in more than half of its permanent full-time positions in the U.S.; and has the existing capability in the U.S. to perform the work in question.

A partnership, organized in the U.S. with its principal place of business in the U.S., may also qualify as a "U.S. firm" as would a joint venture organized or incorporated in the United States consisting entirely of U.S. firms and/or U.S. individuals.

A nonprofit organization, such as an educational institution, foundation, or association may also qualify as a "U.S. firm" if it is incorporated in the United States and managed by a governing body, a majority of whose members are U.S. individuals.

SOURCE AND ORIGIN:

1) Rule

In addition to the nationality requirement stated above, any goods (e.g., equipment and materials) and services related to their shipment (e.g., international transportation and insurance) funded under the USTDA Grant Agreement must have their source and origin in the United States, unless USTDA otherwise agrees. However, necessary purchases of goods and project support services which are unavailable from a U.S. source (e.g., local food, housing and transportation) are eligible without specific USTDA approval.

2) Application

Accordingly, the prime contractor must be able to demonstrate that all goods and services purchased in the host country to carry out the Terms of Reference for a USTDA Grant Agreement that were not of U.S. source and origin were unavailable in the United States.

3) Definitions

"Source" means the country from which shipment is made.

"Origin" means the place of production, through manufacturing, assembly or otherwise.

Questions regarding these nationality, source and origin requirements may be addressed to the USTDA Office of General Counsel.

ANNEX 4

GRANT AGREEMENT

2010-31044A Pakistan

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GRANT AGREEMENT

This Grant Agreement is entered into between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA") and Educational Services (Private) Limited ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Agreement US$299,896 ("USTDA Grant") to fund the cost of goods and services required for a feasibility study ("Study") on the proposed Beaconhouse Schools Solar Photovoltaic Power Systems ("Project") in Pakistan ("Host Country").

1. USTDA Funding

The funding to be provided under this Grant Agreement shall be used to fund the costs of a contract between the Grantee and the U.S. firm selected by the Grantee ("Contractor") under which the Contractor will perform the Study ("Contract"). Payment to the Contractor will be made directly by USTDA on behalf of the Grantee with the USTDA Grant funds provided under this Grant Agreement.

2. Terms of Reference

The Terms of Reference for the Study ("Terms of Reference") are attached as Annex I and are hereby made a part of this Grant Agreement. The Study will examine the technical, financial, environmental, and other critical aspects of the proposed Project. The Terms of Reference for the Study shall also be included in the Contract.

3. Standards of Conduct

USTDA and the Grantee recognize the existence of standards of conduct for public officials, and commercial entities, in their respective countries. The parties to this Grant Agreement and the Contractor shall observe these standards, which include not accepting payment of money or anything of value, directly or indirectly, from any person for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study.

4. Grantee Responsibilities

The Grantee shall undertake its best efforts to provide reasonable support for the Contractor, such as local transportation, office space, and secretarial support.

5. USTDA as Financier

(A) USTDA Approval of Competitive Selection Procedures

Selection of the U.S. Contractor shall be carried out by the Grantee according to its established procedures for the competitive selection of contractors with advance notice of the procurement published online through *Federal Business Opportunities (www.fedbizopps.gov)*. Upon request, the Grantee will submit these contracting procedures and related documents to USTDA for information and/or approval.

(B) USTDA Approval of Contractor Selection

The Grantee shall notify USTDA at the address of record set forth in Article 17 below upon selection of the Contractor to perform the Study. Upon approval of this selection by USTDA, the Grantee and the Contractor shall then enter into a contract for performance of the Study. The Grantee shall notify in writing the U.S. firms that submitted unsuccessful proposals to perform the Study that they were not selected.

(C) USTDA Approval of Contract Between Grantee and Contractor

The Grantee and the Contractor shall enter into a contract for performance of the Study. This contract, and any amendments thereto, including assignments and changes in the Terms of Reference, must be approved by USTDA in writing. To expedite this approval, the Grantee (or the Contractor on the Grantee's behalf) shall transmit to USTDA, at the address set forth in Article 17 below, a photocopy of an English language version of the signed contract or a final negotiated draft version of the contract.

(D) USTDA Not a Party to the Contract

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of the contract and any amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any contract funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of funding the Study and shall not be construed as making USTDA a party to the contract. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the contract or any subcontract, jointly or separately, without thereby incurring any responsibility or liability to such parties. Any approval or failure to approve by USTDA shall not bar the Grantee or USTDA from asserting any right they might have against the

Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Grantee or USTDA.

(E) Grant Agreement Controlling

Regardless of USTDA approval, the rights and obligations of any party to the contract or subcontract thereunder must be consistent with this Grant Agreement. In the event of any inconsistency between the Grant Agreement and any contract or subcontract funded by the Grant Agreement, the Grant Agreement shall be controlling.

6. Disbursement Procedures

(A) USTDA Approval of Contract Required

USTDA will make disbursements of Grant funds directly to the Contractor only after USTDA approves the Grantee's contract with the Contractor.

(B) Contractor Invoice Requirements

The Grantee should request disbursement of funds by USTDA to the Contractor for performance of the Study by submitting invoices in accordance with the procedures set forth in the USTDA Mandatory Clauses in Annex II.

7. Effective Date

The effective date of this Grant Agreement ("Effective Date") shall be the date of signature by both parties or, if the parties sign on different dates, the date of the last signature.

8. Study Schedule

(A) Study Completion Date

The completion date for the Study, which is January 30, 2011, is the date by which the parties estimate that the Study will have been completed.

(B) Time Limitation on Disbursement of USTDA Grant Funds

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this Grant Agreement for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date of the Grant Agreement.

9. USTDA Mandatory Clauses

All contracts funded under this Grant Agreement shall include the USTDA mandatory clauses set forth in Annex II to this Grant Agreement. All subcontracts funded or partially funded with USTDA Grant funds shall include the USTDA mandatory clauses, except for clauses B(1), G, H, I, and J.

10. Use of U.S. Carriers

(A) Air

Transportation by air of persons or property funded under the Grant Agreement shall be on U.S. flag carriers in accordance with the Fly America Act, 49 U.S.C. 40118, to the extent service by such carriers is available, as provided under applicable U.S. Government regulations.

(B) Marine

Transportation by sea of property funded under the Grant Agreement shall be on U.S. carriers in accordance with U.S. cargo preference law.

11. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

12. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Grantee nor the Contractor will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

13. Cooperation Between Parties and Follow-Up

The parties will cooperate to assure that the purposes of the Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report (as defined in Clause 1 of Annex II), the Grantee agrees to respond to any reasonable inquiries from USTDA about the status of the Project.

14. Implementation Letters

To assist the Grantee in the implementation of the Study, USTDA may, from time to time, issue implementation letters that will provide additional information about matters covered by the Grant Agreement. The parties may also use jointly agreed upon implementation letters to confirm and record their mutual understanding of matters covered by the Grant Agreement.

15. Recordkeeping and Audit

The Grantee agrees to maintain books, records, and other documents relating to the Study and the Grant Agreement adequate to demonstrate implementation of its responsibilities under the Grant Agreement, including the selection of contractors, receipt and approval of contract deliverables, and approval or disapproval of contractor invoices for payment by USTDA. Such books, records, and other documents shall be separately maintained for three (3) years after the date of the final disbursement by USTDA. The Grantee shall afford USTDA or its authorized representatives the opportunity at reasonable times to review books, records, and other documents relating to the Study and the Grant Agreement.

16. Representation of Parties

For all purposes relevant to the Grant Agreement, the Government of the United States of America will be represented by the U. S. Ambassador to Host Country or USTDA and Grantee will be represented by the Director. The parties hereto may, by written notice, designate additional representatives for all purposes under the Grant Agreement.

17. Addresses of Record for Parties

Any notice, request, document, or other communication submitted by either party to the other under the Grant Agreement shall be in writing or through a wire or electronic medium which produces a tangible record of the transmission, such as a telegram, cable or facsimile, and will be deemed duly given or sent when delivered to such party at the following:

To: Nassir Kasuri
Director
Educational Services Limited

10-11 Gurumangat Road
Gulberg III, Lahore, Pakistan

Phone: 92-42-111 232266
Fax: 92-42-357 14946

To: U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

All such communications shall be in English, unless the parties otherwise agree in writing. In addition, the Grantee shall provide the Commercial Section of the U.S. Embassy in Host Country with a copy of each communication sent to USTDA.

Any communication relating to this Grant Agreement shall include the following fiscal data:

Appropriation No.: 119/101001
Activity No.: 2010-31044A
Reservation No.: 2010310055
Grant No.: GH2010310015

18. Termination Clause

Either party may terminate the Grant Agreement by giving the other party thirty (30) days advance written notice. The termination of the Grant Agreement will end any obligations of the parties to provide financial or other resources for the Study, except for payments which they are committed to make pursuant to noncancellable commitments entered into with third parties prior to the written notice of termination.

19. Non-waiver of Rights and Remedies

No delay in exercising any right or remedy accruing to either party in connection with the Grant Agreement shall be construed as a waiver of such right or remedy.

20. U.S. Technology and Equipment

By funding this Study, USTDA seeks to promote the project objectives of the Host Country through the use of U.S. technology, goods, and services. In recognition of this purpose, the Grantee agrees that it will allow U.S. suppliers to compete in the procurement of technology, goods and services needed for Project implementation.

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IN WITNESS WHEREOF, the Government of the United States of America and Educational Services (Private) Limited, each acting through its duly authorized representative, have caused this Agreement to be signed in the English language in their names and delivered as of the day and year written below. In the event that this Grant Agreement is signed in more than one language, the English language version shall govern.

For the Government of the United States of America

By: _____
Carmela Conroy
Consul General, Lahore

Date: 8 July 2010

For Educational Services (Private) Limited

By: _____
Nassir Kasuri
Director, ESL

Date: 8 July 2010

Witnessed:

By: _____

Witnessed:

By: _____

Annex I -- Terms of Reference

Annex II -- USTDA Mandatory Clauses

Annex I

Terms of Reference

Purpose and Objectives: The purpose of this Study is to determine the technical, economic and financial viability of installing solar photovoltaic power systems at approximately 400 private schools owned or operated by Educational Services (Private) Limited. Solar power has the potential to provide uninterrupted power at a time of frequent load shedding, lower the overall cost of power, and demonstrate science at work to pupils. The objectives of the Study are to identify practical photovoltaic designs; demonstrate whether the concept is economically viable; develop a baseline design that can be adapted to other schools in the system and which the Grantee can use to procure and install a Test array; and provide documentation to support the Grantee in filing for permits and an electricity tariff and for use in negotiations for a Power Purchase Agreement and Interconnect Agreement with distribution and transmission utilities.

Task 1. Kick-Off Meeting and Report

Subtask 1.1 Inception Meeting
Contractor shall meet with Grantee in Lahore to agree on details of work and methods of the Study, establish working and reporting relationships, inspect selected representative school sites, obtain copies of available information, and make arrangements for field data collection as needed.

Subtask 1.2 Inception Report
Following the meeting, Contractor shall prepare an Inception Report for the Study, documenting attendance at the meeting, topics discussed, and any insights gained from discussions. Contractor shall include in the Inception Report a concise statement of the Purpose and Objectives of the Study, adding perspectives of the Grantee.

Task 2. Technical Assessment

Subtask 2.1 Existing Documentation
Contractor shall review existing studies and documentation relevant to the Project:

a. Solar resource studies for possible school sites
b. Adjustments to solar resource for urban smog, haze, and array fouling where applicable
c. Site electricity usage and billing history
d. Previous studies on technical, economic, and environmental aspects of the Project as Grantee or its Contractors may have available
e. Civil requirements for construction permits and electrical codes
f. Host electric distribution company policies and procedures for interconnection

Subtask 2.2 Selection of Sites
Contractor shall identify 10 schools representing a cross-section of the Beaconhouse schools with respect to size, electricity demand, and location across Pakistan. At least one of the selected sites must be within Lahore or its vicinity to enable direct inspection without excessive in-country travel. The selected site at Lahore will be the designated site ("Site" singular) for design; all other site designs will be covered by extrapolation from the designated site.

Grantee will install a test solar PV system ("Test") using U.S. technology at the Site during the course of the Study, as further detailed in Subtask 2.4 below. Grantee shall be responsible for all costs associated with the Test at the site, including but not limited to those costs associated with procurement and installation. Notwithstanding Grantee installation of the Test at the Site, the Contractor shall be responsible for full completion of the Terms of Reference.

Subtask 2.3 Energy Efficiency Audit
Contractor shall conduct an energy efficiency audit to determine energy consumption profiles at the Site.

- The audit shall determine any electricity efficiency or conservation measures which can be taken to reduce electrical demand, thereby reducing the size requirement for the solar PV panel installation.
- The audit shall also determine daily demand profiles and identify any activities which can be shifted to more closely match solar PV peak profiles.
- The audit shall identify other, non-electrical energy efficiency measures which may be prudently and economically undertaken by the Site, such as solar hot water heaters.
- The audit shall determine a seasonal baseline for the Site electricity and fuel use.

Subtask 2.4 Conceptual Design
Contractor shall design a solar PV installation within the constraints of cost, available space, and ability of Site personnel to perform preventive maintenance and basic operating tasks, and optimized to meet remaining Site needs *after* energy efficiency audit and demand shifting activities. The design shall interconnect to the grid through appropriate metering in accordance with the host utility interconnect policies.

Contractor shall integrate the solar PV system into the Site electrical wiring system according to applicable local electrical codes, making provision for vital loads, load shedding, and backup power from auxiliary generators and uninterruptible power supplies if needed.

During the Study, Grantee will install a Test array at the selected Site in Lahore. The Test is anticipated to be in the range of two to ten kilowatts and is intended to provide actual experience and data to support the development of the Conceptual Design and Implementation Plan. To serve its purpose, the Test must necessarily be placed in service early in course of the Study. Therefore, Contractor shall provide a preliminary design to

Grantee and shall provide advice on procurement and installation to allow the Test to proceed as rapidly as possible. It is recognized that the Test installation will not be optimized for the Site's requirements and may later require some redesign and corrections, for which the Contractor shall be responsible for providing input. It is also recognized that some issues addressed during the Study may not be resolved until after the Test is procured and installed by the Grantee, requiring compromises to be made by the Grantee within the managerial judgment of Grantee. For example, if an interconnection agreement and feed-in tariff cannot be negotiated soon enough, the Test may be limited to the production of electricity for use by the school rather than also selling power back to the utility.

Specifically, Contractor shall evaluate whether solar tracking mounts are financially feasible for the system to broaden the daily peak generation profile.

Specifically, Contractor shall take precautions in the physical and electrical design of the system with the understanding that students of any age may have access to the system.

Specifically, Contractor shall provide instrumentation showing insolation, solar electricity produced, and electricity imported or exported from the grid.

Specifically, Contractor shall provide Operating and Maintenance procedures for the systems, recommend preventive maintenance schedules, and recommend training for Site maintenance and management personnel to operate the system effectively.

Specifically, Contractor shall assess performance of the Test installation and address any problems in the final Conceptual Design and Implementation Plan. The Scope of this Project does not provide funding for Contractor to make separate trips to Pakistan to supervise installation of the Test or to gather performance data. Contractor shall make arrangements for exchange of such information, primarily by Internet, during the Inception Meeting, Subtask 1.1.

Subtask 2.5 Performance Evaluation

Contractor shall project the solar generation of the Conceptual Design with adaptations to match the needs of each of the 10 selected sites, showing electricity the solar PV system will produce under the insolation available at the site, making adjustments for weather, urban smog, array fouling, deterioration of the array, any shading, and incident light from clouds and reflective surfaces.

Specifically, Contractor shall compare projected performance of the pilot project with any actual performance data recorded to date by the Test installation managed by Grantee and shall account for any significant variance in cost, insolation, generation, energy savings, or revenues.

Task 3. Project Economic Analysis

Contractor shall conduct a *pro forma* spreadsheet economic evaluation of the Conceptual Design, showing baseline energy use, investments in energy efficiency upgrades, debt service under the proposed Financing Plan (Task 4), investment in solar PV equipment, savings in purchased electricity, and revenues from sales to the grid. Include estimated value of Clean Development Mechanism (CDM) credits, if any, which Grantee may aggregate from avoided CO_2 emissions at the 10 sites as determined in Task 5.2.

Task 4. Project Financial Analysis

Contractor shall prepare a Financing Plan for solar PV installations at the 10 selected sites consistent with Grantee's financial resources and borrowing capacity. The Financing Plan shall indicate probable sources of equity and debt and confirm that the Project conforms to the standards and portfolio policies of major multilateral lenders. The Financing Plan shall include a proposed Financial Structure of the project financing according to the policies and requirements of the likely financing parties, including debt/equity ratio, debt coverage ratio requirements, recovery of development costs, covenants, term of loans, amortization methods, reserve requirements, closing costs, and other relevant parameters.

Task 5. Environmental Assessment

Subtask 5.1 Adverse Environmental Effects
Contractor shall make a preliminary review of the Project's environmental impact with reference to local requirements and those of multilateral lending agencies (such as the International Finance Corporation). This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment, if required. Normally, a power plant project requires an environmental impact assessment. In this instance, where the site has permits for a greater source of emissions and pollutants, Contractor shall determine and document whether the assessment is required under Pakistan law and policy.

The USTDA grant does not cover a full environmental impact assessment, and the Contractor shall not be responsible for such work.

If mitigating actions must be taken, Contractor shall identify those actions and include their costs and time requirements in project budgets, analyses, and schedules. Contractor shall ensure that mitigating actions identified in this task are included in drafting bid documents (Task 8).

Subtask 5.2 Beneficial Environmental Effects
Contractor shall determine and quantify beneficial environmental effects, including calculation of avoided CO_2 emissions under the host utility's generating mix, fuel supplies, and demonstrated plant efficiencies, compared to the baseline electricity use determined in Subtask 2.2.

Task 6. Review of Regulatory Issues

Subtask 6.1 Permit compliance
Contractor shall confirm that the Conceptual Design conforms to the requirements of existing building permits and electrical codes. Contractor shall provide documentation, calculations, and examples to support Grantee in filings for waivers, extensions, or new permits as may be required.

Specifically, Contractor shall produce standardize permit filing packages for any permit found necessary which may be used by individual mills with minor alterations according to their specific circumstances.

Subtask 6.2 Tariff Filing
Contractor shall provide documents, calculations, and examples for purposes of the Grantee's submission of a filing for a tariff for power sold to the host utility.

Specifically, Contractor shall provide design, price, and performance data which Grantee will require to submit a standardized tariff filing package compliant with the procedures of Pakistan's National Electric Power Regulatory Authority (NEPRA), which may be used by individual sites with minor alterations according to their specific circumstances.

In completing Subtask 6.2, the Contractor shall note that, if possible, Grantee may file once for its entire system of schools, or at least one time for each host electricity distribution company in which several schools may be located. The next preferable situation is that each school may file a standardized tariff request with minor changes. These options are intended to prevent the adverse situation of having to prepare separate, unique tariff filings for every school, which would add an unacceptable administrative burden to the Project.

The Contractor shall also note that Grantee may elect to initiate a filing for a special, subsidized tariff to promote renewable energy sources at commercial sites.

Task 7. Development Impacts Analysis

Contractor shall assess the development impacts associated with the implementation of the Project defined during the Study and the methodology for measuring those benefits/adverse impacts. The assessment shall include examples of the development impacts that would be expected if the Project is implemented as outlined in the Final Report. The Contractor shall develop a methodology for assessing these impacts over time, and shall identify where to obtain this information in the future (e.g., Government of Pakistan and other regional governmental statistics, and the Asian Development Bank).

Contractor shall evaluate the categories listed below to determine which are likely to result from the recommended Project. Where possible, the Contractor shall include

quantitative estimates. The Contractor shall only list benefits in the categories that are applicable. The categories to be considered are as follows:

- *Infrastructure:* Contractor shall estimate the expected scale of infrastructure development and improvements (e.g., what type of construction equipment is needed to carry out the Project and special utility metering).
- *Human Capacity Building:* Contractor shall estimate the number and type of jobs that would be created if the Project is implemented. Contractor shall comment on any prospective training recommended (the training needed after and as a result of the Project) in the Final Report, including an estimate of the number of persons to be trained, type of training needed, and the desired outcome of the training.
- *Technology Transfer and Productivity Improvement:* Contractor shall discuss potential commercial contracts for licensing new technologies that are recommended, as well as the expected productivity benefits of any such technologies. More generally, discuss the expected efficiency gains related to the recommendations, such as improved systems or processes that enhance productivity or result in a more efficient use of resources.
- *Market-Oriented Reform:* Contractor shall discuss any market-oriented reforms that would facilitate implementation of the Project or that would result from the implementation of the Project, such as any policy changes that would result in more transparent regulatory systems and institutions or increased competition, or policy changes to promote renewable and energy efficiency technologies.
- *Other Benefits:* Contractor shall discuss prospective indirect development impacts of the Project, such as enhanced education and economic growth (including increases in investment and indirect job creation) that are not captured in the four categories listed above.

Contractor shall include the Host Country Development Impacts Analysis in the Final Report (Task10).

Task 8. Implementation Plan

Contractor shall prepare an Implementation Plan including but not limited to schedules and timelines for all Project activities, contracts, agreements, staffing and training, regulatory consent, financing, ownership and management decisions.

Specifically, Contractor shall provide a standardized Power Purchase and Interconnect Agreement, which may be used by individual sites with minor alterations according to their specific circumstances.

Specifically, Contractor shall provide a package of standardized draft bid documents, which Grantee may use with minor alterations according to their specific circumstances to initiate international competitive bidding.

The USTDA grant does not cover the cost of any work associated with publicizing the bid documents or evaluating proposals under any procurement related activity for this Project, and the Contractor shall not be responsible for any such work.

Task 9. Identify U.S. Sources of Supply

Contractor shall, depending on the option selected and on the equipment included in the conceptual design, identify qualified U.S. vendors of equipment and services to be included in the competitive bidding at the discretion of Grantee. The Contractor shall contact each company and obtain confirmation the company is competitive in Pakistan on the selected option and willing to participate in the Project. Contractor shall provide name of company, contact person, telephone, fax and email contact information, and descriptions of equipment and services provided in accordance with USTDA Mandatory Clause I(3)(e). Contractor shall include the list of contacts in the Final Report to USTDA (Task 10).

Task 10. Final Report

The Contractor shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all work performed under these Terms of Reference ("Final Report"). The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the Grant Agreement. The Final Report shall contain the key findings, recommendations, and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 9 above. The Final Report shall be a substantive and comprehensive report of work performed to carry out all of the tasks set forth in the Terms of Reference and shall include, among other things, an Executive Summary and all deliverables. Each task of the Terms of Reference shall form a separate chapter of the Final Report.

The Final Report shall also include a comprehensive list of suppliers, including potential sources of U.S. equipment and services relevant to the implementation of each component of the Project as outlined in the Study.

The Contractor shall submit the Final Report in English. The Contractor shall provide five (5) hard copies and one (1) electronic version of both the confidential and public versions of the Final Report to the Grantee and shall provide copies to USTDA in accordance with Clause I of Annex II of the Grant Agreement. One copy of the public report shall be provided to the U.S. Embassy in Islamabad.

Contractor shall also deliver the following to the Grantee at the end of the Study:

1. Three printed copies of the Implementation Plan, Financing Plan, and bid documents, and digital files of all work product.

2. Electronic copies of all computer models including at least the financial/business models, design of the Project, and performance analysis.
3. The Contractor may submit interim papers for discussions on demand, energy efficiency and conservation measures, student involvement, and school surveys.

Notes:

(1) **The Contractor is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of the Terms of Reference.**

(2) **The Contractor and the Grantee shall be careful to ensure that the public version of the Final Report contains no security or confidential information.**

(3) **The Grantee and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.**

Annex II

USTDA Mandatory Contract Clauses

A. USTDA Mandatory Clauses Controlling

The parties to this contract acknowledge that this contract is funded in whole or in part by the U.S. Trade and Development Agency ("USTDA") under the Grant Agreement between the Government of the United States of America acting through USTDA and Educational Services (Private) Limited ("Client"), dated _____ ("Grant Agreement") for the Beaconhouse Schools Solar Photovoltaic Power Systems project ("Project") in Pakistan ("Host Country"). Notwithstanding any other provisions of this contract, the following USTDA mandatory contract clauses shall govern. All subcontracts entered into by Contractor funded or partially funded with USTDA Grant funds shall include these USTDA mandatory contract clauses, except for clauses B(1), G, H, I, and J. In addition, in the event of any inconsistency between the Grant Agreement and any contract or subcontract thereunder, the Grant Agreement shall be controlling.

B. USTDA as Financier

(1) USTDA Approval of Contract

All contracts funded under the Grant Agreement, and any amendments thereto, including assignments and changes in the Terms of Reference, must be approved by USTDA in writing in order to be effective with respect to the expenditure of USTDA Grant funds. USTDA will not authorize the disbursement of USTDA Grant funds until the contract has been formally approved by USTDA or until the contract conforms to modifications required by USTDA during the contract review process.

(2) USTDA Not a Party to the Contract

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of this contract and amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any contract funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of financing the Study and shall not be construed as making USTDA a party to the contract. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the contract or any subcontract, jointly or separately, without thereby incurring any responsibility or liability to such parties. Any approval or failure to approve by USTDA shall not bar the Client or USTDA from asserting any right they might have against the

Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Client or USTDA.

C. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the Study and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and (e) goods and services incidental to Study support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

D. Recordkeeping and Audit

The Contractor and subcontractors funded under the Grant Agreement shall maintain, in accordance with generally accepted accounting procedures, books, records, and other documents, sufficient to reflect properly all transactions under or in connection with the contract. These books, records, and other documents shall clearly identify and track the use and expenditure of USTDA funds, separately from other funding sources. Such books, records, and documents shall be maintained during the contract term and for a period of three (3) years after final disbursement by USTDA. The Contractor and subcontractors shall afford USTDA, or its authorized representatives, the opportunity at reasonable times for inspection and audit of such books, records, and other documentation.

E. U.S. Carriers

(1) Air

Transportation by air of persons or property funded under the Grant Agreement shall be on U.S. flag carriers in accordance with the Fly America Act, 49 U.S.C. 40118, to the extent service by such carriers is available, as provided under applicable U.S. Government regulations.

(2) Marine

Transportation by sea of property funded under the Grant Agreement shall be on U.S. carriers in accordance with U.S. cargo preference law.

F. Workman's Compensation Insurance

The Contractor shall provide adequate Workman's Compensation Insurance coverage for work performed under this Contract.

G. Reporting Requirements

The Contractor shall advise USTDA by letter as to the status of the Project on March 1st annually for a period of two (2) years after completion of the Study. In addition, if at any time the Contractor receives follow-on work from the Client, the Contractor shall so notify USTDA and designate the Contractor's contact point including name, telephone, and fax number. Since this information may be made publicly available by USTDA, any information which is confidential shall be designated as such by the Contractor and provided separately to USTDA. USTDA will maintain the confidentiality of such information in accordance with applicable law.

H. Disbursement Procedures

(1) USTDA Approval of Contract

Disbursement of Grant funds will be made only after USTDA approval of this contract. To make this review in a timely fashion, USTDA must receive from either the Client or the Contractor a photocopy of an English language version of a signed contract or a final negotiated draft version to the attention of the General Counsel's office at USTDA's address listed in Clause M below.

(2) Payment Schedule Requirements

A payment schedule for disbursement of Grant funds to the Contractor shall be included in this Contract. Such payment schedule must conform to the following USTDA requirements: (1) up to twenty percent (20%) of the total USTDA Grant amount may be used as a mobilization payment; (2) all other payments, with the exception of the final payment, shall be based upon contract performance milestones; and (3) the final payment may be no less than fifteen percent (15%) of the total USTDA Grant amount, payable upon receipt by USTDA of an approved Final Report in accordance with the specifications and quantities set forth in Clause I below. Invoicing procedures for all payments are described below.

(3) Contractor Invoice Requirements

USTDA will make all disbursements of USTDA Grant funds directly to the Contractor. The Contractor must provide USTDA with an ACH Vendor Enrollment Form (available from USTDA) with the first invoice. The Client shall request disbursement of funds by USTDA to the Contractor for performance of the contract by submitting the following to USTDA:

(a) Contractor's Invoice

The Contractor's invoice shall include reference to an item listed in the Contract payment schedule, the requested payment amount, and an appropriate certification by the Contractor, as follows:

(i) For a mobilization payment (if any):

"As a condition for this mobilization payment, the Contractor certifies that it will perform all work in accordance with the terms of its Contract with the Client. To the extent that the Contractor does not comply with the terms and conditions of the Contract, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA. "

(ii) For contract performance milestone payments:

"The Contractor has performed the work described in this invoice in accordance with the terms of its contract with the Client and is entitled to payment thereunder. To the extent the Contractor has not complied with the terms and conditions of the Contract, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA."

(iii) For final payment:

"The Contractor has performed the work described in this invoice in accordance with the terms of its contract with the Client and is entitled to payment thereunder. Specifically, the Contractor has submitted the Final Report to the Client, as required by the Contract, and received the Client's approval of the Final Report. To the extent the Contractor has not complied with the terms and conditions of the Contract, including the USTDA mandatory provisions contained therein, it will, upon USTDA's request, make an appropriate refund to USTDA."

(b) Client's Approval of the Contractor's Invoice

(i) The invoice for a mobilization payment must be approved in writing by the Client.

(ii) For contract performance milestone payments, the following certification by the Client must be provided on the invoice or separately:

"The services for which disbursement is requested by the Contractor have been performed satisfactorily, in accordance with applicable Contract provisions and the terms and conditions of the USTDA Grant Agreement."

(iii) For final payment, the following certification by the Client must be provided on the invoice or separately:

"The services for which disbursement is requested by the Contractor have been performed satisfactorily, in accordance with applicable Contract provisions and terms and conditions of the USTDA Grant Agreement. The Final Report submitted by the Contractor has been reviewed and approved by the Client. "

(c) USTDA Address for Disbursement Requests

Requests for disbursement shall be submitted by courier or mail to the attention of the Finance Department at USTDA's address listed in Clause M below.

(4) Termination

In the event that the Contract is terminated prior to completion, the Contractor will be eligible, subject to USTDA approval, for reasonable and documented costs which have been incurred in performing the Terms of Reference prior to termination, as well as reasonable wind down expenses. Reimbursement for such costs shall not exceed the total amount of undisbursed Grant funds. Likewise, in the event of such termination, USTDA is entitled to receive from the Contractor all USTDA Grant funds previously disbursed to the Contractor (including but not limited to mobilization payments) which exceed the reasonable and documented costs incurred in performing the Terms of Reference prior to termination.

I. USTDA Final Report

(1) Definition

"Final Report" shall mean the Final Report described in the attached Annex I Terms of Reference or, if no such "Final Report" is described therein, "Final Report" shall mean a substantive and comprehensive report of work performed in accordance with the attached Annex I Terms of Reference, including any documents delivered to the Client.

(2) Final Report Submission Requirements

The Contractor shall provide the following to USTDA:

(a) One (1) complete version of the Final Report for USTDA's records. This version shall have been approved by the Client in writing and must be in the English language. It is the responsibility of the Contractor to ensure that confidential information, if any, contained in this version be clearly marked. USTDA will maintain the confidentiality of such information in accordance with applicable law.

and

(b) One (1) copy of the Final Report suitable for public distribution ("Public Version"). The Public Version shall have been approved by the Client in writing and must be in the English language. As this version will be available for public distribution, it must not contain any confidential information. If the report in (a) above contains no confidential information, it may be used as the Public Version. In any event, the Public Version must be informative and contain sufficient Project detail to be useful to prospective equipment and service providers.

and

(c) Two (2) CD-ROMs, each containing a complete copy of the Public Version of the Final Report. The electronic files on the CD-ROMs shall be submitted in a commonly accessible read-only format. As these CD-ROMs will be available for public distribution, they must not contain any confidential information. It is the responsibility of the Contractor to ensure that no confidential information is contained on the CD-ROMs.

The Contractor shall also provide one (1) copy of the Public Version of the Final Report to the Foreign Commercial Service Officer or the Economic Section of the U.S. Embassy in Host Country for informational purposes.

(3) Final Report Presentation

All Final Reports submitted to USTDA must be paginated and include the following:

(a) The front cover of every Final Report shall contain the name of the Client, the name of the Contractor who prepared the report, a report title, USTDA's logo, USTDA's mailing and delivery addresses. If the complete version of the Final Report contains confidential information, the Contractor shall be responsible for labeling the front cover of that version of the Final Report with the term "Confidential Version." The Contractor shall be responsible for labeling the front cover of the Public Version of the Final Report with the term "Public Version." The front cover of every Final Report shall also contain the following disclaimer:

> "This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U. S. Government. The opinions, findings, conclusions or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report."

(b) The inside front cover of every Final Report shall contain USTDA's logo, USTDA's mailing and delivery addresses, and USTDA's mission statement.

Camera-ready copy of USTDA Final Report specifications will be available from USTDA upon request.

(c) The Contractor shall affix to the front of the CD-ROM a label identifying the Host Country, USTDA Activity Number, the name of the Client, the name of the Contractor who prepared the report, a report title, and the following language:

"The Contractor certifies that this CD-ROM contains the Public Version of the Final Report and that all contents are suitable for public distribution."

(d) The Contractor and any subcontractors that perform work pursuant to the Grant Agreement must be clearly identified in the Final Report. Business name, point of contact, address, telephone and fax numbers shall be included for Contractor and each subcontractor.

(e) The Final Report, while aiming at optimum specifications and characteristics for the Project, shall identify the availability of prospective U.S. sources of supply. Business name, point of contact, address, telephone and fax numbers shall be included for each commercial source.

(f) The Final Report shall be accompanied by a letter or other notation by the Client which states that the Client approves the Final Report. A certification by the Client to this effect provided on or with the invoice for final payment will meet this requirement.

J. Modifications

All changes, modifications, assignments or amendments to this contract, including the appendices, shall be made only by written agreement by the parties hereto, subject to written USTDA approval.

K. Study Schedule

(1) Study Completion Date

The completion date for the Study, which is January 30, 2011, is the date by which the parties estimate that the Study will have been completed.

(2) **Time Limitation on Disbursement of USTDA Grant Funds**

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this contract for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date of the Grant Agreement.

L. Business Practices

The Contractor agrees not to pay, promise to pay, or authorize the payment of any money or anything of value, directly or indirectly, to any person (whether a governmental official or private individual) for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the Study. The Client agrees not to receive any such payment. The Contractor and the Client agree that each will require that any agent or representative hired to represent them in connection with the Study will comply with this paragraph and all laws which apply to activities and obligations of each party under this Contract, including but not limited to those laws and obligations dealing with improper payments as described above.

M. USTDA Address and Fiscal Data

Any communication with USTDA regarding this Contract shall be sent to the following address and include the fiscal data listed below:

U.S. Trade and Development Agency
1000 Wilson Boulevard, Suite 1600
Arlington, Virginia 22209-3901
USA

Phone: (703) 875-4357
Fax: (703) 875-4009

Fiscal Data:
Appropriation No.: 119/101001
Activity No.: 2010-31044A
Reservation No.: 2010310055
Grant No.: GH2010310015

N. Definitions

All capitalized terms not otherwise defined herein shall have the meaning set forth in the Grant Agreement.

O. Taxes

USTDA funds provided under the Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country. Neither the Client nor the Contractor will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.

ANNEX 5

TERMS OF REFERENCE

Annex I

Terms of Reference

Purpose and Objectives: The purpose of this Study is to determine the technical, economic and financial viability of installing solar photovoltaic power systems at approximately 400 private schools owned or operated by Educational Services (Private) Limited. Solar power has the potential to provide uninterrupted power at a time of frequent load shedding, lower the overall cost of power, and demonstrate science at work to pupils. The objectives of the Study are to identify practical photovoltaic designs; demonstrate whether the concept is economically viable; develop a baseline design that can be adapted to other schools in the system and which the Grantee can use to procure and install a Test array; and provide documentation to support the Grantee in filing for permits and an electricity tariff and for use in negotiations for a Power Purchase Agreement and Interconnect Agreement with distribution and transmission utilities.

Task 1. Kick-Off Meeting and Report

Subtask 1.1 Inception Meeting
Contractor shall meet with Grantee in Lahore to agree on details of work and methods of the Study, establish working and reporting relationships, inspect selected representative school sites, obtain copies of available information, and make arrangements for field data collection as needed.

Subtask 1.2 Inception Report
Following the meeting, Contractor shall prepare an Inception Report for the Study, documenting attendance at the meeting, topics discussed, and any insights gained from discussions. Contractor shall include in the Inception Report a concise statement of the Purpose and Objectives of the Study, adding perspectives of the Grantee.

Task 2. Technical Assessment

Subtask 2.1 Existing Documentation
Contractor shall review existing studies and documentation relevant to the Project:

a. Solar resource studies for possible school sites
b. Adjustments to solar resource for urban smog, haze, and array fouling where applicable
c. Site electricity usage and billing history
d. Previous studies on technical, economic, and environmental aspects of the Project as Grantee or its Contractors may have available
e. Civil requirements for construction permits and electrical codes
f. Host electric distribution company policies and procedures for interconnection

Subtask 2.2 Selection of Sites
Contractor shall identify 10 schools representing a cross-section of the Beaconhouse schools with respect to size, electricity demand, and location across Pakistan. At least one of the selected sites must be within Lahore or its vicinity to enable direct inspection without excessive in-country travel. The selected site at Lahore will be the designated site ("Site" singular) for design; all other site designs will be covered by extrapolation from the designated site.

Grantee will install a test solar PV system ("Test") using U.S. technology at the Site during the course of the Study, as further detailed in Subtask 2.4 below. Grantee shall be responsible for all costs associated with the Test at the site, including but not limited to those costs associated with procurement and installation. Notwithstanding Grantee installation of the Test at the Site, the Contractor shall be responsible for full completion of the Terms of Reference.

Subtask 2.3 Energy Efficiency Audit
Contractor shall conduct an energy efficiency audit to determine energy consumption profiles at the Site.

- The audit shall determine any electricity efficiency or conservation measures which can be taken to reduce electrical demand, thereby reducing the size requirement for the solar PV panel installation.
- The audit shall also determine daily demand profiles and identify any activities which can be shifted to more closely match solar PV peak profiles.
- The audit shall identify other, non-electrical energy efficiency measures which may be prudently and economically undertaken by the Site, such as solar hot water heaters.
- The audit shall determine a seasonal baseline for the Site electricity and fuel use.

Subtask 2.4 Conceptual Design
Contractor shall design a solar PV installation within the constraints of cost, available space, and ability of Site personnel to perform preventive maintenance and basic operating tasks, and optimized to meet remaining Site needs *after* energy efficiency audit and demand shifting activities. The design shall interconnect to the grid through appropriate metering in accordance with the host utility interconnect policies.

Contractor shall integrate the solar PV system into the Site electrical wiring system according to applicable local electrical codes, making provision for vital loads, load shedding, and backup power from auxiliary generators and uninterruptible power supplies if needed.

During the Study, Grantee will install a Test array at the selected Site in Lahore. The Test is anticipated to be in the range of two to ten kilowatts and is intended to provide actual experience and data to support the development of the Conceptual Design and Implementation Plan. To serve its purpose, the Test must necessarily be placed in service early in course of the Study. Therefore, Contractor shall provide a preliminary design to

Grantee and shall provide advice on procurement and installation to allow the Test to proceed as rapidly as possible. It is recognized that the Test installation will not be optimized for the Site's requirements and may later require some redesign and corrections, for which the Contractor shall be responsible for providing input. It is also recognized that some issues addressed during the Study may not be resolved until after the Test is procured and installed by the Grantee, requiring compromises to be made by the Grantee within the managerial judgment of Grantee. For example, if an interconnection agreement and feed-in tariff cannot be negotiated soon enough, the Test may be limited to the production of electricity for use by the school rather than also selling power back to the utility.

Specifically, Contractor shall evaluate whether solar tracking mounts are financially feasible for the system to broaden the daily peak generation profile.

Specifically, Contractor shall take precautions in the physical and electrical design of the system with the understanding that students of any age may have access to the system.

Specifically, Contractor shall provide instrumentation showing insolation, solar electricity produced, and electricity imported or exported from the grid.

Specifically, Contractor shall provide Operating and Maintenance procedures for the systems, recommend preventive maintenance schedules, and recommend training for Site maintenance and management personnel to operate the system effectively.

Specifically, Contractor shall assess performance of the Test installation and address any problems in the final Conceptual Design and Implementation Plan. The Scope of this Project does not provide funding for Contractor to make separate trips to Pakistan to supervise installation of the Test or to gather performance data. Contractor shall make arrangements for exchange of such information, primarily by Internet, during the Inception Meeting, Subtask 1.1.

Subtask 2.5 Performance Evaluation

Contractor shall project the solar generation of the Conceptual Design with adaptations to match the needs of each of the 10 selected sites, showing electricity the solar PV system will produce under the insolation available at the site, making adjustments for weather, urban smog, array fouling, deterioration of the array, any shading, and incident light from clouds and reflective surfaces.

Specifically, Contractor shall compare projected performance of the pilot project with any actual performance data recorded to date by the Test installation managed by Grantee and shall account for any significant variance in cost, insolation, generation, energy savings, or revenues.

Task 3. Project Economic Analysis

Contractor shall conduct a *pro forma* spreadsheet economic evaluation of the Conceptual Design, showing baseline energy use, investments in energy efficiency upgrades, debt service under the proposed Financing Plan (Task 4), investment in solar PV equipment, savings in purchased electricity, and revenues from sales to the grid. Include estimated value of Clean Development Mechanism (CDM) credits, if any, which Grantee may aggregate from avoided CO_2 emissions at the 10 sites as determined in Task 5.2.

Task 4. Project Financial Analysis

Contractor shall prepare a Financing Plan for solar PV installations at the 10 selected sites consistent with Grantee's financial resources and borrowing capacity. The Financing Plan shall indicate probable sources of equity and debt and confirm that the Project conforms to the standards and portfolio policies of major multilateral lenders. The Financing Plan shall include a proposed Financial Structure of the project financing according to the policies and requirements of the likely financing parties, including debt/equity ratio, debt coverage ratio requirements, recovery of development costs, covenants, term of loans, amortization methods, reserve requirements, closing costs, and other relevant parameters.

Task 5. Environmental Assessment

Subtask 5.1 Adverse Environmental Effects
Contractor shall make a preliminary review of the Project's environmental impact with reference to local requirements and those of multilateral lending agencies (such as the International Finance Corporation). This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment, if required. Normally, a power plant project requires an environmental impact assessment. In this instance, where the site has permits for a greater source of emissions and pollutants, Contractor shall determine and document whether the assessment is required under Pakistan law and policy.

The USTDA grant does not cover a full environmental impact assessment, and the Contractor shall not be responsible for such work.

If mitigating actions must be taken, Contractor shall identify those actions and include their costs and time requirements in project budgets, analyses, and schedules. Contractor shall ensure that mitigating actions identified in this task are included in drafting bid documents (Task 8).

Subtask 5.2 Beneficial Environmental Effects
Contractor shall determine and quantify beneficial environmental effects, including calculation of avoided CO_2 emissions under the host utility's generating mix, fuel supplies, and demonstrated plant efficiencies, compared to the baseline electricity use determined in Subtask 2.2.

Task 6. Review of Regulatory Issues

Subtask 6.1 Permit compliance

Contractor shall confirm that the Conceptual Design conforms to the requirements of existing building permits and electrical codes. Contractor shall provide documentation, calculations, and examples to support Grantee in filings for waivers, extensions, or new permits as may be required.

Specifically, Contractor shall produce standardize permit filing packages for any permit found necessary which may be used by individual mills with minor alterations according to their specific circumstances.

Subtask 6.2 Tariff Filing

Contractor shall provide documents, calculations, and examples for purposes of the Grantee's submission of a filing for a tariff for power sold to the host utility.

Specifically, Contractor shall provide design, price, and performance data which Grantee will require to submit a standardized tariff filing package compliant with the procedures of Pakistan's National Electric Power Regulatory Authority (NEPRA), which may be used by individual sites with minor alterations according to their specific circumstances.

In completing Subtask 6.2, the Contractor shall note that, if possible, Grantee may file once for its entire system of schools, or at least one time for each host electricity distribution company in which several schools may be located. The next preferable situation is that each school may file a standardized tariff request with minor changes. These options are intended to prevent the adverse situation of having to prepare separate, unique tariff filings for every school, which would add an unacceptable administrative burden to the Project.

The Contractor shall also note that Grantee may elect to initiate a filing for a special, subsidized tariff to promote renewable energy sources at commercial sites.

Task 7. Development Impacts Analysis

Contractor shall assess the development impacts associated with the implementation of the Project defined during the Study and the methodology for measuring those benefits/adverse impacts. The assessment shall include examples of the development impacts that would be expected if the Project is implemented as outlined in the Final Report. The Contractor shall develop a methodology for assessing these impacts over time, and shall identify where to obtain this information in the future (e.g., Government of Pakistan and other regional governmental statistics, and the Asian Development Bank).

Contractor shall evaluate the categories listed below to determine which are likely to result from the recommended Project. Where possible, the Contractor shall include

quantitative estimates. The Contractor shall only list benefits in the categories that are applicable. The categories to be considered are as follows:

- *Infrastructure:* Contractor shall estimate the expected scale of infrastructure development and improvements (e.g., what type of construction equipment is needed to carry out the Project and special utility metering).
- *Human Capacity Building:* Contractor shall estimate the number and type of jobs that would be created if the Project is implemented. Contractor shall comment on any prospective training recommended (the training needed after and as a result of the Project) in the Final Report, including an estimate of the number of persons to be trained, type of training needed, and the desired outcome of the training.
- *Technology Transfer and Productivity Improvement:* Contractor shall discuss potential commercial contracts for licensing new technologies that are recommended, as well as the expected productivity benefits of any such technologies. More generally, discuss the expected efficiency gains related to the recommendations, such as improved systems or processes that enhance productivity or result in a more efficient use of resources.
- *Market-Oriented Reform:* Contractor shall discuss any market-oriented reforms that would facilitate implementation of the Project or that would result from the implementation of the Project, such as any policy changes that would result in more transparent regulatory systems and institutions or increased competition, or policy changes to promote renewable and energy efficiency technologies.
- *Other Benefits:* Contractor shall discuss prospective indirect development impacts of the Project, such as enhanced education and economic growth (including increases in investment and indirect job creation) that are not captured in the four categories listed above.

Contractor shall include the Host Country Development Impacts Analysis in the Final Report (Task10).

Task 8. Implementation Plan

Contractor shall prepare an Implementation Plan including but not limited to schedules and timelines for all Project activities, contracts, agreements, staffing and training, regulatory consent, financing, ownership and management decisions.

Specifically, Contractor shall provide a standardized Power Purchase and Interconnect Agreement, which may be used by individual sites with minor alterations according to their specific circumstances.

Specifically, Contractor shall provide a package of standardized draft bid documents, which Grantee may use with minor alterations according to their specific circumstances to initiate international competitive bidding.

The USTDA grant does not cover the cost of any work associated with publicizing the bid documents or evaluating proposals under any procurement related activity for this Project, and the Contractor shall not be responsible for any such work.

Task 9. Identify U.S. Sources of Supply

Contractor shall, depending on the option selected and on the equipment included in the conceptual design, identify qualified U.S. vendors of equipment and services to be included in the competitive bidding at the discretion of Grantee. The Contractor shall contact each company and obtain confirmation the company is competitive in Pakistan on the selected option and willing to participate in the Project. Contractor shall provide name of company, contact person, telephone, fax and email contact information, and descriptions of equipment and services provided in accordance with USTDA Mandatory Clause I(3)(e). Contractor shall include the list of contacts in the Final Report to USTDA (Task 10).

Task 10. Final Report

The Contractor shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all work performed under these Terms of Reference ("Final Report"). The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the Grant Agreement. The Final Report shall contain the key findings, recommendations, and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 9 above. The Final Report shall be a substantive and comprehensive report of work performed to carry out all of the tasks set forth in the Terms of Reference and shall include, among other things, an Executive Summary and all deliverables. Each task of the Terms of Reference shall form a separate chapter of the Final Report.

The Final Report shall also include a comprehensive list of suppliers, including potential sources of U.S. equipment and services relevant to the implementation of each component of the Project as outlined in the Study.

The Contractor shall submit the Final Report in English. The Contractor shall provide five (5) hard copies and one (1) electronic version of both the confidential and public versions of the Final Report to the Grantee and shall provide copies to USTDA in accordance with Clause I of Annex II of the Grant Agreement. One copy of the public report shall be provided to the U.S. Embassy in Islamabad.

Contractor shall also deliver the following to the Grantee at the end of the Study:

1. Three printed copies of the Implementation Plan, Financing Plan, and bid documents, and digital files of all work product.

2. Electronic copies of all computer models including at least the financial/business models, design of the Project, and performance analysis.
3. The Contractor may submit interim papers for discussions on demand, energy efficiency and conservation measures, student involvement, and school surveys.

Notes:

(1) **The Contractor is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of the Terms of Reference.**

(2) **The Contractor and the Grantee shall be careful to ensure that the public version of the Final Report contains no security or confidential information.**

(3) **The Grantee and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.**

ANNEX 6

COMPANY INFORMATION

A. Company Profile

Provide the information listed below relative to the Offeror's firm. If the Offeror is proposing to subcontract some of the proposed work to another firm(s), the information below must be provided for each subcontractor.

1. Name of firm and business address (street address only), including telephone and fax numbers:

2. Year established (include predecessor companies and year(s) established, if appropriate).

3. Type of ownership (e.g. public, private or closely held).

4. If private or closely held company, provide list of shareholders and the percentage of their ownership.

5. List of directors and principal officers (President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer; provide full names including first, middle and last). Please place an asterisk (*) next to the names of those principal officers who will be involved in the Feasibility Study.

6. If Offeror is a subsidiary, indicate if Offeror is a wholly-owned or partially-owned subsidiary. Provide the information requested in items 1 through 5 above for the Offeror's parent(s).

7. Project Manager's name, address, telephone number, e-mail address and fax number .

B. Offeror's Authorized Negotiator

Provide name, title, address, telephone number, e-mail address and fax number of the Offeror's authorized negotiator. The person cited shall be empowered to make binding commitments for the Offeror and its subcontractors, if any.

C. Negotiation Prerequisites

1. Discuss any current or anticipated commitments which may impact the ability of the Offeror or its subcontractors to complete the Feasibility Study as proposed and reflect such impact within the project schedule.

2. Identify any specific information which is needed from the Grantee before commencing contract negotiations.

D. Offeror's Representations

Please provide exceptions and/or explanations in the event that any of the following representations cannot be made:

1. Offeror is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The Offeror has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the Feasibility Study. The Offeror is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment, or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. The Offeror has included, with this proposal, a certified copy of its Articles of Incorporation, and a certificate of good standing issued within one month of the date of its proposal by the State of _____. The Offeror commits to notify USTDA and the Grantee if they become aware of any change in their status in the state in which they are incorporated. USTDA retains the right to request an updated certificate of good standing.

3. Neither the Offeror nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

4. Neither the Offeror, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 3 above.

5. There are no federal or state tax liens pending against the assets, property or business of the Offeror. The Offeror, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

6. The Offeror has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The Offeror has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected Offeror shall notify the Grantee and USTDA if any of the representations included in its proposal are no longer true and correct at the time of its entry into a contract with the Grantee.

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____

E. Subcontractor Profile

1. Name of firm and business address (street address only), including telephone and fax numbers.

2. Year established (include predecessor companies and year(s) established, if appropriate).

F. Subcontractor's Representations

If any of the following representations cannot be made, or if there are exceptions, the subcontractor must provide an explanation.

1. Subcontractor is a corporation *[insert applicable type of entity if not a corporation]* duly organized, validly existing and in good standing under the laws of the State of _____. The subcontractor has all the requisite corporate power and authority to conduct its business as presently conducted, to participate in this proposal, and if the Offeror is selected, to execute and deliver a subcontract to the Offeror for the performance of the Feasibility Study and to perform the Feasibility Study. The subcontractor is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority.

2. Neither the subcontractor nor any of its principal officers have, within the three-year period preceding this RFP, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

3. Neither the subcontractor, nor any of its principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above.

4. There are no federal or state tax liens pending against the assets, property or business of the subcontractor. The subcontractor, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required.

5. The subcontractor has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The subcontractor has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.

The selected subcontractor shall notify the Offeror, Grantee and USTDA if any of the representations included in this proposal are no longer true and correct at the time of the Offeror's entry into a contract with the Grantee.

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____