REQUEST FOR PROPOSALS

FEASIBILITY STUDY FOR THE

KARACHI INTEGRATED SMART GRID SYSTEM

Submission Deadline: **4:00 PM**

LOCAL TIME IN PAKISTAN

October 7, 2010

Submission Place: Mohammed Omer Ghaznavi
General Manager – Strategy
Karachi Electric Supply Company, Ltd.
2nd Floor KESC House, 39-B, Sunset Boulevard,
D.H.A Phase-II, Karachi, 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$510,475 to Karachi Electric Supply Company Limited (the "Grantee") in accordance with a grant agreement dated July 20, 2010 (the "Grant Agreement"). Karachi Electric Supply Company Limited (KESC) is the only private distribution utility in Pakistan. KESC is under severe financial strain as a result of high electricity losses, which, between technical and administrative losses, add up to nearly 40 percent of the power it produces or purchases from other utilities. The new management of KESC has made loss reduction its highest priority and, therefore, has requested a Feasibility Study to confirm the technical and economic viability of a Smart Grid system for its distribution network.

A Smart Grid system enables utility management to improve system operations to reduce technical losses, pinpoint power losses, help assess and quantify technical problems for capital upgrades, and provide the basis for an effective metering, billing and collections system. KESC seeks a Feasibility Study to determine the viability of an integrated Smart Grid system in greater Karachi for substantially reducing electricity losses and improving the efficiency of utility operations. The study will define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project, project its financial performance, support financing, and produce specifications and international tender documents for the project. A well-qualified and experienced U.S. Contractor is needed to undertake this important Feasibility Study.

1.1 BACKGROUND SUMMARY

Karachi Electric Supply Company Limited (KESC)

KESC's 17,000 employees deliver 2,350 MW of electricity to 2.1 million customers. The company generates approximately 55 percent of its own power and purchases the remaining 45 percent from the Water and Power Development Authority (WAPDA), Pakistan Electric Power Company (PEPCO), and from several Independent Power Plants (IPPs). The largest and only private generation, transmission and distribution utility in Pakistan, KESC is also one of the oldest companies in Karachi and was established in the city prior to the creation of Pakistan in 1947.

The steps required for implementation of an integrated Smart Grid system for KESC are: (1) technical design and data exchange protocols with existing systems; (2) economic and financial analysis and preparation of an implementation plan; (3) preparation of international tender documents; (4) pilot project financing, design, procurement and implementation; (5) pilot project assessment period; and (6) expansion of the Smart Grid system to cover some 70 percent of its customers in greater Karachi. This Feasibility Study will provide support for Steps 1-3. As such, the study would define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project, project its financial performance, support financing, and produce specifications and international tender documents

for the project. The timeframe for this study is six-to-eight months. The Contractor will present the results to the Grantee in a feasibility report and presentation. Upon notification by the Grantee and Contractor that the project is viable, USTDA will advise the Contractor and Grantee in writing to proceed with the preparation of tender documents for a competitive bid for the pilot project.

The initial Smart Grid project installation will consist of approximately 25,000 metered accounts in Karachi and its suburbs. The specific number and location of accounts to be metered will be determined through the Feasibility Study. Three sets of customers have been preliminarily identified: (i) the top 2,000 industrial customers, wherever they are located in Karachi; (ii) an Integrated Business Center with multiple commercial accounts in one area, and (iii) a large set of residential and commercial customers in the "Defence Housing Society," a long-established residential area of Karachi,[1] chosen because diversion of power is common since these accounts use large amounts of power for air conditioning and luxury appliances and because most of the accounts have the ability to pay if usage is confirmed. The study will determine the physical bounds of the project and ensure a sufficient range of household incomes is covered so that the project can support decisions for future expansion of the Smart Grid into medium and low-income neighborhoods.

1.2 OBJECTIVE

KESC is in severe financial straits caused primarily by extremely high electricity losses. Some power is lost (technical losses) due to inefficiencies in the distribution system. More is lost due to electricity theft, fraud, and non-payment. Either way, KESC does not receive payment for nearly 40% of the power it produces or purchases from other utilities. This is a crippling financial burden which must be resolved urgently. This Feasibility Study will determine whether a Smart Grid system will help reduce losses to the degree needed to justify major capital investment in a large pilot project.

The study will define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project, project its financial performance, support financing, and produce specifications and international tender documents for the project.

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.

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[1] While the Defence Housing Society was long ago developed by Defence Housing Authority of Pakistan's Ministry of Defence, the vast majority of current residents are civilians and thus represent normal residential or commercial accounts, as with the remainder of Karachi.

The amount for the contract has been established by a USTDA grant of US$510,475. **The USTDA grant of $US510,475 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$510,475 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.

KESC has committed to cover, on an in-kind basis, the cost of local research, surveys, and inspections, which is estimated at $6,300. This work will be specified in the TOR attached as Annex 5.

Section 2: INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called Karachi Integrated Smart Grid System.

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$510,475. KESC has committed to cover, on an in-kind basis, the cost of local research, surveys, and inspections, which is estimated at $6,300. This work will be specified in the TOR attached as Annex 5.

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. Refer to Section 1.4 of this RFP for additional information on the applicability of USTDA's Nationality Requirements.

2.12 LANGUAGE OF PROPOSAL

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

2.13 PROPOSAL SUBMISSION REQUIREMENTS

Mr. Mohammed Omer Ghaznavi of Karachi Electric Supply Company, Ltd. 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:

Mohammed Omer Ghaznavi
General Manager – Strategy
Karachi Electric Supply Company, Ltd.
2nd Floor KESC House, 39-B, Sunset Boulevard,
D.H.A Phase-II, Karachi, Pakistan

Office Phone: +92 21-35647002
Fax: +92 21-99205192

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 October 7, 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$510,475, 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.

The selection of the Contractor will be based on the following criteria:

- Direct and recent experience in designing Smart Grid systems (35 points)
- Experience in conducting similar feasibility studies (35 points)
- Experience in Pakistan (15 points)
- Urdu language capabilities (10 points)
- Experience in the Region (5 points)

The Contractor team is encouraged to be comprised of the following:

- A Project Manager with at least 10 years of experience in project management, preferably in design or deployment of electricity distribution systems, SCADA and AMR projects, either within the utility industry or within an Architect/Engineering firm.
- A Smart Grid Specialist with at least 10 years of experience as an instrumentation and controls specialist and 3 years experience in designing Smart Grid systems.
- A Project Finance Specialist with 10 years of experience in structuring project financing.
- A Commercial Analyst with 5 years of experience dealing with utility billing, collections, and regulatory issues.

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

Grantee Contact: Mohammed Omer Ghaznavi, General Manager – Strategy, Karachi Electric Supply Company, Ltd., 2nd Floor KESC House, 39-B, Sunset Boulevard, D.H.A Phase-II, Karachi, Pakistan, Office Phone: +92 21-35647002, Fax: +92 21-99205192

Project Title: Karachi Integrated Smart Grid System; Appropriation No.: 119/101001; Activity No.: 2010-31045A; Reservation No.: 2010 310054; Grant No.: GH2010310014

POC: Nina Patel, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. KARACHI INTEGRATED SMART GRID SYSTEM. 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 the Karachi Electric Supply Company Limited to determine the viability of an integrated Smart Grid system in greater Karachi for substantially reducing electricity losses and improving the efficiency of utility operations.

BACKGROUND SUMMARY

Karachi Electric Supply Company Limited (KESC)

KESC's 17,000 employees deliver 2,350 MW of electricity to 2.1 million customers. The company generates approximately 55 percent of its own power and purchases the remaining 45 percent from the Water and Power Development Authority (WAPDA), Pakistan Electric Power Company (PEPCO), and from several Independent Power Plants (IPPs). The largest and only private generation, transmission and distribution utility in Pakistan, KESC is also one of the oldest companies in Karachi and was established in the city prior to the creation of Pakistan in 1947.

KESC's distribution system has extremely high losses by international standards: as much as 40 percent or roughly 1,000 MW is lost through technical line losses and through non-technical losses (i.e., theft, fraud, or collection failures from metered customers). This is on par with Pakistan's public distribution utilities, which also experience combined technical and administrative losses of over 30 percent on a weighted average basis. These inefficiencies have a compounded effect during peak demand periods as power is not available to paying customers, further cutting into revenues.

The steps required for implementation of an integrated Smart Grid system for KESC are: (1) technical design and data exchange protocols with existing systems; (2) economic and financial analysis and preparation of an implementation plan; (3) preparation of international tender documents; (4) pilot project financing, design, procurement and implementation; (5) pilot project assessment period; and (6) expansion of the Smart Grid system to cover some 70 percent of its customers in greater Karachi. This USTDA funded Feasibility Study will provide support for Steps 1-3. As such, the study would define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project, project its financial performance, support financing, and produce specifications and international tender documents for the project. The timeframe for this study is six-to-eight months. The Contractor will present the results of the study to the Grantee in a feasibility report and presentation. Upon notification by the Grantee and Contractor that the project is viable, USTDA will advise the

Contractor and Grantee in writing to proceed with the preparation of tender documents for a competitive bid for the pilot project.

The initial Smart Grid project installation will consist of approximately 25,000 metered accounts in Karachi and its suburbs. The specific number and location of accounts to be metered will be determined through the Feasibility Study. Three sets of customers have been preliminarily identified: (i) the top 2,000 industrial customers, wherever they are located in Karachi; (ii) an Integrated Business Center with multiple commercial accounts in one area, and (iii) a large set of residential and commercial customers in the "Defence Housing Society," a long-established residential area of Karachi, chosen because diversion of power is common since these accounts use large amounts of power for air conditioning and luxury appliances and because most of the accounts have the ability to pay if usage is confirmed. The study will determine the physical bounds of the project and ensure a sufficient range of household incomes is covered so that the project can support decisions for future expansion of the Smart Grid into medium and low-income neighborhoods.

The U.S. firm selected will be paid in U.S. dollars from a $510,475 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 4:00 PM local time in Pakistan, October 7, 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.

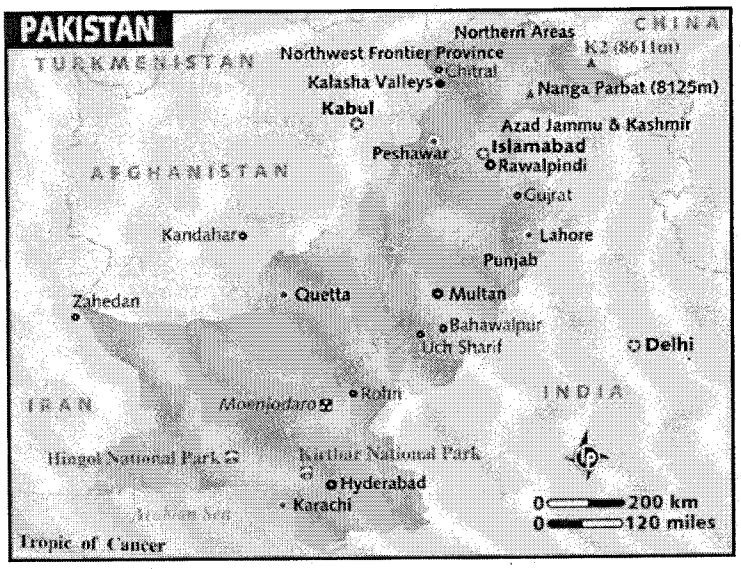
ANNEX 2

PORTIONS OF THIS DEFINITIONAL MISSION REPORT HAVE BEEN INTENTIONALLY REDACTED

ONLY RELEVANT PORTIONS OF THIS DEFINITIONAL MISSION REPORT PERTAINING TO KARACHI INTEGRATED SMART GRID SYSTEM FEASIBILITY STUDY ARE INCLUDED HEREIN.

EMG
ENERGY MARKETS GROUP

Definitional Mission: Pakistan Energy Sector Projects



FINAL REPORT

April 23, 2010

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.

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The U.S. Trade and Development Agency

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.

KESC SMART GRID
DEFINITIONAL MISSION STUDY

PURPOSE: KESC is in severe financial straits caused primarily by extremely high electricity losses. Some power is lost (technical losses) due to inefficiencies in the distribution system. More is lost due to electricity theft, fraud, and non-payment. Either way, KESC does not receive payment for nearly 40% of the power it produces or purchases from other utilities. This is a crippling financial burden which must be resolved urgently. KESC has requested USTDA assistance to perform a Feasibility Study to determine whether a Smart Grid system will help reduce losses to the degree needed to justify major capital investment in a large pilot project.

BACKGROUND: A Smart Grid system can improve system operations to reduce technical losses, help assess and quantify technical problems for capital upgrades, pinpoint power theft, and provide the basis for an effective metering, billing, and collections system. The new management of KESC has made loss reduction its highest priority.

Modern Smart Grid systems use Smart Meters and communications systems to keep track of power consumption. The Smart Meters provide real-time information about line conditions, customer demand, and service interruptions. Tampering or theft can be detected immediately. Areas affected by outages can be defined immediately and the causes can be identified and corrected quickly. Smart Meters allow customers to be billed accurately and reliably without the need for manual meter readings. The Smart Grid communications system allows operators to adjust transformer taps and capacitor banks to reduce technical losses, and to operate breakers remotely to respond quickly to problems. The system can also be used to support a Demand Side Management program whereby customer feeds or even specific appliances can be controlled to prevent system overloads during peak hours.

PROJECT DESCRIPTION: Karachi Electric Supply Company is the only private distribution utility in Pakistan. The company was privatized in 2005 and placed under new management in 2008. As a private company, KESC depends on revenues from sales of electricity. Its 17,000 employees deliver 2,350 MW of electricity to 2.1 million customers. KESC provides generates approximately 55% of its own power and purchases the remaining 45% from WAPDA (Water and Power Development Authority) and PEPCO (Pakistan Electricity Company) and from several IPPs. KESC's system has extremely high losses – as much as 40% of the power it receives, roughly 1,000 MW, is lost through technical line losses and through non-technical losses (theft, fraud, or collection failures from metered customers). The losses have a compounded effect during peak demand periods, as power is not available to paying customers, further cutting into revenues. This is a financially crippling situation, especially as the utility is faced with rapidly growing demand, increasing fuel costs, and the need to make prudent capital investments to upgrade its systems to reduce losses.

KESC is already aggressively upgrading its systems with many of the building block technologies needed to locate, quantify, and correct losses. Systems already in place include a Geographic Information Systems (GIS), System Control and Data Acquisition (SCADA), Customer Relationship Management (CRM), and SIMdisc data management. KESC has AMRs on most of the 11KV feeders and transmission lines at import/export points. The application software and the system of meter data acquisition (SODA) and metering data management (BelVis) are already in place. The functional modules and the respective data base management system are installed on a redundant server in a separate Local Area Network LAN which is connected to the LAN of the SCADA/DMS at the LDC/DCC (Load Control Center/Data Collection Center). The data is polled at the LDC through PSTN modems. In this phase 1,243 AMRs (automatically read meters) are in operation.

KESC is establishing a Virtual Private Network (VPN) to provide communications to these system. The provider is the Swedish company, Telenor. KESC's distribution system software is from the U.S. company, SAP, with installed distribution and invoicing software including SAP IS-U, SAP PM (Plant Maintenance),

SAP MM (Materials Maintenance), and SAP ERP (Enterprise Resource Planning) . These existing components will support and integrate into the Smart Grid system.

KESC is also expanding its GIS system. With the help of information available from satellite data and scanned drawings and maps, a data layer has been standardized for vectorization to be used for the development of GIS. The implementation is now in process.

Under current plans, KESC will extend the Meter Management System (MMS) and 600 more AMRs will be installed at generating stations, transmission import/export points, and distribution grids where deficits are significant. Additional AMRs will be installed at the top 100 HT/LT industrial customers to serve as billing meters. The project execution would be started in mid Feb 10 and completed within 3 months. With this project in place, energy accounting from generation to 11 KV bus will be fully automatic. An Automatic Meter Management (AMM) system with a software license of 10000 meters will be placed at LDC with the capability to poll data over the VPN based upon GPRS.

With these tools, and using a methodical approach, KESC is measuring all the power inputs into its system at interconnection substations and generating plants with Automatic Metering Systems, then measuring the inputs and outputs at each distribution substation and feeder. This information can then be compared to metering at each business and residential account to identify deficit circuits.

The remaining phase is to integrate all these systems into a Smart Grid system. Then, with automatic, real-time metering, the discrepancies can be tracked down to individual accounts to identify illegal connections, bypassed meters, meters that have been tampered with, or meter readings that do not match billing because of error or fraud. Load flows and voltages can be managed with substation control and with Demand Side Management. Customers can have access to their energy consumption and billing information, and KESC can have immediate management and engineering information to identify problems and plan for their resolution.

Under the scope of the planned project, KESC will extend its Automatic Meter Reading system to three sets of customers: a set of the top 2,000 industrial customers wherever they are located in Karachi, at an Integrated Business Center with multiple commercial accounts in one area, and at the Defense Housing Society, an affluent residential area of Karachi, chosen because theft of power is rampant, because the accounts use large amounts of power for air conditioning and other luxury appliances, and because most of the accounts have the ability to pay if confronted.

KESC requests USTDA support in the form of Technical Assistance to define the project and its interface to existing programs described above, and a Feasibility Study to support financing the project.

The steps required for implementation of the pilot project integrated Smart Grid system for KESC are:

1. Selection of an independent consultant, "Contractor".
2. Determination of the project scope and interface to existing systems.
3. Feasibility Study.
4. Preparation of International Tender documents
5. International Competitive Bidding.
6. Pilot Project Financing, Design, Procurement, and Implementation.
7. Pilot Project Assessment Period.

Upon successful demonstration of the pilot project, KESC intends to expand the Smart Grid system to cover most sections of Karachi and it suburbs.

USTDA will provide support for Steps 1-4.

PROJECT LOCATION: The initial project installation will consist of approximately 25,000 metered accounts in Karachi and its suburbs. The specific number and location of accounts to be metered will be determined through the Feasibility Study. The Study will determine the physical bounds of the project and ensure a sufficient range of household incomes is covered so that the project can support future decisions for future expansion of the Smart Grid into medium and low-income neighborhoods.

SPONSOR' S CAPABILITY AND COMMITMENT: KESC is also one of the oldest companies in Karachi and was established in the city even before the creation of Pakistan in 1947. Incorporated on September 13, 1913, under the Indian Companies Act of 1882, the company was nationalized in 1952 but was re-privatized on November 29, 2005. KESC came under new management in September, 2008; a significant number of professional managers with experience in running utility and other large companies have joined under this management and will be running it until the company is turned into a best practice utility. KESC is listed on all three of Pakistan's stock exchanges: the Karachi Stock Exchange, the Lahore Stock Exchange and the Islamabad Stock Exchange.

In September 2008, the Dubai Abraaj took over the management of the company and now holds a majority of the shares. Abraaj Capital Investment Fund is the largest equity fund in the Middle East, North Africa, and South Asia region. As an investor, Abraaj expects KESC to solve long-standing problems, establish financial profitability, and provide a positive return on the investment. Abraaj has been spectacularly successful as an equity investor, averaging over 50% return on its exits, so the new management can be considered competent and prudent.

As a private utility company, KESC has a profit incentive to reduce losses; that incentive is partly lacking in public distribution companies. Besides that factor, though, KESC cannot be allowed to fail – it operates infrastructure vital to Karachi and to Pakistan. Karachi is one of the world's major cities, having a population of 17 million people. It is a major industrial city of the region. Karachi and Port Qasim in the KESC service territory also comprise the only major seaports of Pakistan. KESC is a major determinant of Pakistan's economy.

Although operating at a financial loss due primarily to the system losses described above, KESC has a financing commitment of $361 million for essential capital investments from a Dubai investor and shareholder, Abraaj Investment Management, Ltd. These private equity investments will add nearly 1,000 MW of generating capacity to the KESC system, as well as upgrading transmission, distribution, SCADA, and load dispatch systems.

It is possible that the contractor selected to conduct the Feasibility Study could choose to offer a pilot system solution as part of the study effort. In that event, the contractor shall provide a summary of the proposed pilot effort. Note, however, that USTDA's grant funding cannot be used for a pilot project. If the contractor chooses to offer a pilot as part of their proposal it will be done at cost to the contractor, as an implied cost share contribution towards the study effort.

IMPLEMENTATION FINANCING: A pilot project must be able to pay for itself from recovered losses. Contractor shall provide a financing plan, including policy research to show the design qualifies for financing from parties that may include KESC and its investors, U.S.-Exim, various MLA banks, various venture capital financiers, and various domestic and international commercial banks.

As noted in the section on Sponsor's Capability and Commitment above, Abraaj has committed to provide $361 million of capital investment to KESC to resolve its performance problems and provide a return on that investment. Abraaj has weathered the recent financial crisis in Dubai and, in January, 2010, confirmed its

intent to continue the investment. The Smart Grid is the highest priority measure being taken by KESC to reverse its financial difficulties. Abraaj has the capacity to fund the pilot project on an all-equity basis, but will provide strong comfort to investors to leverage its investment in the pilot and its expansion. The proposed Feasibility Study is a cornerstone of that financing.

Successful financing is also very much in the interest of Pakistan local banks, most of them having their headquarters in Karachi, and all of them holding portfolios in sectors of the economy which depend heavily on the electricity infrastructure. This viewpoint was emphasized powerfully by the Governor of the State Bank of Pakistan during a meeting with Definitional Mission.

In the U.S. and Pakistan, franchised utilities are regulated and the cost of their prudent investments is passed through to the ratepayers. The prudence or financial feasibility of a Smart Grid system depends on the company's use of it to reduce technical losses, and on public acceptance of the company's programs to reduce non-technical losses (theft and fraud). U.S. utilities are finding strong challenges to the prudence of Smart Grid investments. However, U.S. utility losses are generally very small, so attainable recovery is small and difficult to quantify. KESC's losses are so extraordinarily large, and the city of Karachi so vital to the Pakistan economy, the national interest is best served by strong measures to reduce the losses. There should be little doubt that the ERC will authorize inclusion in the rate base. Regulatory approval provides strong comfort to investors.

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.

U.S. EXPORT POTENTIAL: Many goods and services are involved in a Smart Grid system. These include consulting, engineering, procurement and design services; operations training and capacity building, Smart Meters, data transmissions systems, enterprise system software, Graphic Information Systems, SCADA equipment, DSM equipment, and operating contracts.

In addition, a Smart Grid system may rationally be installed with certain system upgrades to take better advantage of its capabilities, leading to increased sales of traditional equipment such as transformers, controlled breakers and relays, SCADA equipment, and DSM equipment.

U.S. Companies providing Smart Grid technology include:

CATEGORY	COMPANY	SPECIFIC DETAILS
Equipment	CISCO	Communications and Software
Equipment	GE POWER	Complete Systems
Equipment	HONEYWELL	Complete Systems
Equipment	IBM	Complete Systems
Equipment	JOHNSON CONTROLS	Complete Systems
Equipment	ITRON	Complete Systems
Equipment	SIEMENS USA	Complete Systems
System Integration	GRIDPOINT	Software
Equipment	SILVER SPRING NETWORK	Communication and Software
Equipment	AMBIENT	Communication and Software
Equipment	ELSTER	AMR Meters
System Integration	ENERNEX	Consulting
Equipment	eMETER	AMR Meters

Equipment	TENDRIL	Communication and Software
System Integration	GOOGLE	Residential System
System Integration	GREENBOX TECHNOLOGY	Residential System
System Integration	BPL	Design, Procurement
System Integration	CURRENT TECHNOLOGY	Design, Procurement

U.S. exports may be in the range of $12-24 million for the pilot project and about $176 million for the eventual complete system.

FOREIGN COMPETITION AND MARKET ENTRY ISSUES: The concept of the Smart Grid originated in the U.S. While Asian companies may have price advantages in traditional metering and interconnection equipment, the U.S. has good competitive positions compared to Asian and European vendors in smart meters, software systems, and communications systems. To take full advantage of a Smart Grid system, however, it must be integrated with the utility's existing systems: SCADA, dispatch, meter reading, billing and invoicing, accounting, customer service, distribution engineering, GIS, and others. Each utility has its own mix of systems, each has its own management methods, and each has its own set of customers with their particular culture and expectations. Other factors are involved: local industry and commerce, the regulatory environment, climate, reserve generating capacity, even local climate. The capabilities of a Smart Grid system are almost infinite in their combinations and variety, and the technology is new and evolving. For now, the U.S. has a commanding and widening lead in integrated Smart Grid systems and in utility experience using Smart Grid systems.

The real issue of foreign competition is at a component level. Smart Grid is a concept, not a piece of equipment or a software program. The major capital investments are the automatic meters themselves, the communications systems, and the software programs that read the meters, process the data, and pass selected information to dispatch operations to adjust system configurations, to engineering to correct technical problems, and to the billing and accounting departments to flag theft, fraud, and collections failures. In addition, it is a major service task to integrate the Smart Grid system with existing computer and communications systems. Each of these may be competed separately. U.S. vendors are likely to be very competitive at the integration services. The communications system is already in place as the VPN already discussed. KESC has already purchased some lines of automatically read meters of simpler, one-way communications. For use in a Smart Grid, the meters also must be capable of interacting with customer appliances, distributed generation systems, and computer systems. U.S. vendors are more competitive in these advanced, more expensive meters. The Feasibility Study will advise KESC on the metering technologies most appropriate to Karachi's situation. U.S. vendors should also be highly competitive in the higher order software systems such as fraud detection programs and customer interfaces.

Foreign competition may be expected from ABB and Landis & Gyr in Europe, and from Toshiba in Japan. There are also a great number of startup companies in China and India, but most utilities in those huge new markets are still contracting with western suppliers.

DEVELOPMENT IMPACT:

Primary Developmental Benefits: Pakistan's economy is clearly being held back by power shortages, including lost production due to outages and load shedding, poor financial condition of KESC and other utilities, waste and imprudent use of electricity, and balance of trade problems caused by rapidly growing imports of fossil fuels. The Smart Grid system can improve many of these directly. In addition, real-time quantitative data can support policy changes needed to set standards for appliances and for system performance, social tariff issues, and for regulatory independence and market reforms.

Category	*Explanation*
Infrastructure	The KESC distribution system is vital infrastructure to Pakistan's industrial capitol, Karachi. Deficiencies in the system have a disproportionately pernicious effect on industrial productivity.
Market-Oriented Reform	KESC is a private distribution company and, as such, a conspicuous example to state-owned distribution systems; the Smart Grid project may help KESC recover from a serious problem of technical losses and failed collections.
Human Capacity Building	KESC employees and management are confronted with a stultifying environment of futility resulting from fraud, theft, and lack of political will to solve blatant problems. The Smart Grid system can help forge an environment of individual accountability.
Technology Transfer and Productivity Improvement	This will be a first major demonstration of Integrated Smart Grid technology in Pakistan. If successful in establishing KESC profitability, it will lead to enormous opportunity for replication at other distribution companies with even higher losses.
Other: Better Data to Support Decision Making	By identifying and quantifying problems, a Smart Grid system provides data needed to improve the effectiveness and focus of investments targeted at technical losses, grid control, customer service, Demand Side Management, distributed generation, and many other applications.

Alternatives: Every utility has grown in stages, adding new capabilities one at a time. The Smart Grid concept ties all these various technologies and systems together and multiplies their potential. The Smart Grid concept, then, is a stage in the evolution of a utility. KESC has been trying to solve its problems with technical losses and non-technical losses for decades; all the component systems are in place, but they have been ineffective. Maintaining the status quo is not an acceptable alternative.

KESC has experimented with Automatic Meter Reading, GIS, and various new SCADA technologies. Each of these is an aspect of a Smart Grid system, but none can deliver the benefits of an integrated Smart Grid system. Piecemeal conversion to a Smart Grid system would delay the main purpose, of reducing losses which are crippling KESC financially, so it is not an acceptable alternative.

One serious alternative supported by PEPCO for the public sector distribution companies is the use of pre-paid meters. Pre-paid meters can work well in some applications, but the Definitional Mission considers this a partial solution: it is just as easy to bypass a pre-paid meter. Pre-paid meters do nothing to help pinpoint and quantify losses and technical problems and, consequently, this is not an acceptable alternative for the overall system needs of KESC. There is one interesting application of pre-paid meters. Some customers will oppose Smart Grid meters or abuse them because they provide evidence of theft or fraud. For those customers, the pre-paid meter might be a logical alternative.

ENVIRONMENTAL IMPACT: The Smart Grid system will decrease losses, increase efficiency of existing systems, and reduce the amount of fossil fuel consumed in generating systems providing fuel to KESC. In addition, the financial strength of KESC and the economic productivity of the region will increase due to decreased outages and load shedding, and the resulting increased economic capability will allow Pakistan to make more prudent decisions in the future vis-à-vis renewable energy sources. The DM does not foresee the need for an Environmental Impact Assessment

IMPACT ON U.S. LABOR: U.S. vendors of equipment and services are likely to win major contracts from this and similar projects elsewhere in Pakistan. This project will increase the number of U.S. jobs in electronics equipment fabrication, consulting, and engineering design service jobs.

JUSTIFICATION: This project can have extremely high benefits; electricity losses in KESC are revenue loss for KESC, but they increase load shedding during peak periods, causing untold disruption to industry and commerce in Pakistan's largest city. Due to KESC's stressed financial situation, it is difficult for KESC to fund the Feasibility Study, despite the urgency. USTDA assistance can accelerate the decision process, avoid time lags in obtaining funding, and provide assurance the results will be effective in obtaining funding and implementing the project.

TERMS OF REFERENCE: KESC 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 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. However, this project has strong potential to pay for itself from recovered losses. In fact, this project has the unusual aspect that reducing losses actually increases the ability of customers to pay for electricity service by reducing outages and load shedding, which impair productivity of commercial and industrial users. In other words, major customers should not object to a 5% increase in the cost of electricity if more reliable electricity increases their earnings by 20%. The Feasibility Study is critical in ensuring the Smart Grid system is capable of delivering recoveries of losses.

A major issue is the cultural and political situation. Many of the non-paying customers are affluent and politically connected. Further, some categories of public sector consumers have large unpaid account balances. Another category of customers is truly unable to pay, yet able to arouse public protest over collections efforts despite preferential pricing and subsidies in effect.

Another issue is that various forms of corruption exist whereby employees receive illegal payments for tolerating non-payments, illegal taps, and theft, while other employees are in position to take bribes for accelerating services such as new connections. These problems have existed for many decades, and the factors that sustain them are not likely to change in the face of real-time electronic information. The Feasibility Study will provide opportunity for Grantee decision makers to interact with international experts about these considerations before committing to the project.

CAPITAL COSTS ESTIMATES: Contractor shall design a pilot project with sufficient scope to demonstrate the concept over a significant geographic area of the city of Karachi. The layout and dimensions of the system may be adjusted to maximize a balance between results and replicability. In other words, the project scope should not be restricted to a select group of high-end customers suspected of power theft. Such "cherry-picking" would limit the value of the pilot for replication into other areas and other utilities. Also, the appetite for investment by KESC and its financial backers will depend on the projected commercial results, which depend on the system scope and design. Consequently, the scope of the pilot project should be worked out during the Feasibility Study.

Capital costs for Smart Grid systems have been shown to be about $400 per metered account. Assuming the scope will be not less than 25,000 meters, the system cost will be not less than $10 million. The Feasibility Study will also include certain KESC infrastructure upgrades, training, PR, and operation support features expected to add about 50% to the pilot cost. The Feasibility Study may also recommend implementation of

certain DSM features such as the ability to manage air conditioning loads during peaks, and certain SCADA features such as ability to manage local voltage support equipment, which could add another 50%. These costs may increase the project to $20 million. The Feasibility Study should have latitude to increase the scope of the Smart Grid project by as much as 100%, or up to 50,000 meters. The capital cost range of the Smart Grid project, then is between $20 million and $40 million.

The pilot project may reasonably be replicated to 70% of KESC's 2.1 million customers, excluding only rural areas and certain unmetered accounts such as agricultural tube wells. With system infrastructure in place, and using only features which are financially feasible for low-end customers, the cost per meter may be as low as $200 per account, expanding communications, computer, and software systems installed under the pilot program, and with lessened need for training and operational support. That suggests the complete KESC conversion can be done for $294 million. If KESC losses can be cut from 1,000 MW down to 700 MW, the savings would be equivalent to the output of a 300 MW power plant costing well over $294 million, so the overall concept passes a "sanity check". Note that recovered losses would be, in effect, renewable energy in that they would actually decrease emissions and reduce dependency on the marginal fuel, imported furnace oil.

The Feasibility Study will budget components based on the scope and design of the system, and those parameters are not yet defined. A key decision factor for KESC will be a strong assurance of success in its pilot project. Specifications will be weighted toward established quality control, strong experience base, and system adaptability to potentially adverse field conditions. U.S. vendors meet these criteria more strongly than European and East Asian competitors. It is reasonable to assume, therefore, that 60% of goods and services may be provided by U.S. vendors. By that estimate, U.S. exports may be in the range of $12-24 million for the pilot project and about $176 million for the eventual complete system.

The cost of the Feasibility Study is $516,475, as shown in the following Study Budget. KESC will share part of the costs by providing office space, administrative support, collection of data not already available, and management time to interact with the Contractor. KESC shall also pay the cost of local research, surveys, and inspections, which is estimated at $6,300 on the assumption that, as KESC is already intensely involved in upgrading its distribution systems, including many of the building block components of the Smart Grid system, most of the required information is already at hand. However, if more information is required, or if special consultants or outside services are required to complete the Feasibility Study to KESC's standards, then KESC shall bear the additional costs. The USTDA grant will be for the remaining amount, $510,175.

STUDY BUDGET:

Feasibility Study of Smart Grid / Modernization of KESC
Application of GIS, Smart Metering, Billing and Collections System

DIRECT LABOR COSTS

TOR TASK	TOR TASK NAME	PRIMARY CONTRACTOR (Employee) LABOR Total Person Days		TOTAL COST
1.1	Initial Meeting	13	US$	11,900
1.2	Field Research	47		37,500
1.3	Technical Design	45		41,300
1.4	Interface	40		37,700
1.5	Performance Projection	23		20,350
2.1	Budget and Cost Estimate	25		20,800
2.1	Economic Model	32		27,650
2.3	Scenario Analysis	19		15,850
3.1	Financing Plan	32		33,250
3.2	Financial Structure	13		12,700
3.3	Risk Analysis	15		14,650
4.1	Adverse Environmental Impacts	9		7,900
4.2	Beneficial Environmental Impacts	13		12,850
5	Review Regulatory Issues	25		22,900
6	Analysis of Host Country Development Impacts	11		9,350
7	U.S. Sources of Supply	15		12,250
8.1	Implementation Plan	22		22,000
8.2	Development Path	8		7,700
9	Grantee Decision Meeting	15		14,850
10	Preparation of Bid Documents	52		48,050
11	Final Report	32		26,400

HOST COUNTRY NATIONALS

TOR TASK	TOR TASK NAME		PRIMARY CONTRACTOR (Non-Employee) LABOR Total Person Days	US$	TOTAL COST
	Local research, surveys, inspections	$105	60		$6,300
TOTAL DIRECT LABOR COSTS				US$	464,200

OTHER DIRECT COSTS

TRAVEL	PERSON-TRIPS			TOTAL COST
International Air Travel	13		(including per diem -- see labor breakdown table)	41,380
In Country Air Travel	23	$300		6,900
Ground Travel	36	$20		720
Reproduction and Binding	120	$15		1,800
Courier Services	8	$46		368
Visa Services	6	$120		720
Communication	43	$9		387
Total Other Direct Costs			US$	52,275

TOTAL COSTS (DIRECT LABOR COSTS + OTHER DIRECT COSTS)		US$	516,475
KESC Cost Sharing Host Country Nationals Expenses		US$	$6,300
PROPOSED USTDA GRANT		US$	510,175
	TOTAL	US$	516,475

DIRECT LABOR BREAKDOWN

TASK NO.	TASK DESCRIPTION	LABOR BY PERSON-DAYS							SUMMARY BY TASK			INTNAT'L TRIP RECAP BY TASK		
		Project Manager	Smart Grid Specialist	Financial Analyst	Project Finance Specialist	Commercial Specialist	Junior Analyst(s)	Admin Assistant	Total Days	Labor Cost	Local Labor	International Person-Trips	Trip Days	Trip Cost
	Discipline	Mgmt	Engineering	Finance	Finance	Economics	Economics							
1.1	Initial Meeting						1		13	11,900		5	2	12,100
1.2	Field Research	1					12		47	37,500	3,150	3	11	15,630
1.3	Technical Design	2	15	2		12	10	4	45	41,300				
1.4	Interface	2	15	1		10	10	2	40	37,700				
1.5	Performance Projection	1	5	5		5	5	2	23	20,350				
2.1	Budget and Cost Estimate	2	5	4		2	8	4	25	20,800				
2.1	Economic Model	2	2	5	2	10	10	1	32	27,650				
2.3	Scenario Analysis	1	1	2	2	4	8	1	19	15,850				
3.1	Financing Plan	2	5	2	15	1	5	2	32	33,250				
3.2	Financial Structure	2	1	1	5		2	2	13	12,700				
3.3	Risk Analysis	1	3	3	3	2	2	1	15	14,650				
4.1	Adverse Environmental Impacts	1	1		2	1	2	2	9	7,900				
4.2	Beneficial Environmental Impacts	1	5	2	1	1	2	1	13	12,850				
5	Review Regulatory Issues	2	2	5	2	10	2	2	25	22,900				
6	Analysis of Host Country Development Impacts	1	1	1		5	1	2	11	9,350				
7	U.S. Sources of Supply	2	2	1	1	2	2	5	15	12,250				
8.1	Implementation Plan	2	5	1	5	5	2	2	22	22,000				
8.2	Development Path	1	3	1		1	1	1	8	7,700				
9	Grantee Decision Meeting								15	14,850		5	3	13,650
10	Preparation of Bid Documents	5	10	5	5	12	10	5	52	48,050				
11	Final Report	4	4	2	4	2	6	10	32	26,400				
				denotes person traveling										
	Total Labor in Person-Days	41	102	43	50	102	101	67	506					
							Total Labor Cost			457,900	3,150			461,050
							Person-Trips and Days					13	43	
							Total Trip Cost							41,380

LABOR INCLUDING OVERHEAD AND GENERAL AND ADMINISTRATIVE

Daily Rate	1,200	1,200	900	1,200	900	650	450	Total	
								Labor	
Total Labor	49,200	122,400	38,700	60,000	91,800	65,650	30,150	Cost	
								457,900	

Per diem	Lodging	M&IE	Total
Other	154	63	217
Karachi	231	79	310
International Airfare			1,800

Task Completion Schedule

Feasibility Study of Smart Grid / Modernization of KESC

TASK	Months	1	2	3	4	5	6
1.1	Initial Meeting						
1.2	Field Research						
1.3	Technical Design						
1.4	Interface						
1.5	Performance Projection						
2.1	Budget and Cost Estimate						
2.1	Economic Model						
2.3	Scenario Analysis						
3.1	Financing Plan						
3.2	Financial Structure						
3.3	Risk Analysis						
4.1	Adverse Environmental Impacts						
4.2	Beneficial Environmental Impacts						
5	Review Regulatory Issues						
6	Analysis of Host Country Development Impacts						
7	U.S. Sources of Supply						
8.1	Implementation Plan						
8.2	Development Path						
9	Grantee Decision Meeting						
10	Preparation of Bid Documents						
11	Final Report						

DEFINITIONAL MISSION RECOMMENDATIONS: USTDA should support this project. It has high probability of leading to a successful Smart Grid pilot project which can expand to the rest of Karachi, to other KESC service areas, and to other Pakistan distribution companies. U.S. companies are world leaders in integrated Smart Grid systems and this project will be beneficial to the U.S. as well as to Pakistan. This project is seen as necessary in a process of global cultural change whereby energy must come to be used efficiently and prudently.

The KESC Smart Grid Pilot 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

KESC has been the host country sponsor for a proposed project to generate electrical power from animal wastes at the Landhi Cattle Feedlot. The project has not yet been implemented and sponsorship has been taken over by the Government of Sindh.

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.

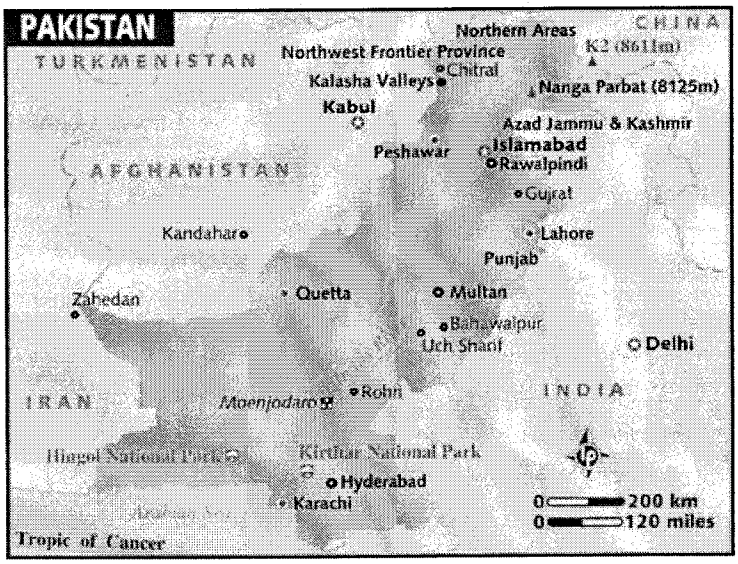
EMG initiated a series of meeting with knowledgeable and interested U.S. parties, including USAID, WB, DOE, AEAI, Chemonics, IRG, Akkadian, and Caterpillar/Solar Turbines. These led to arrangements for follow-on meetings with their field offices and counterparts in Pakistan.

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%.

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

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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)

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.

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

[1] Ibid 2
[2] Ibid 2

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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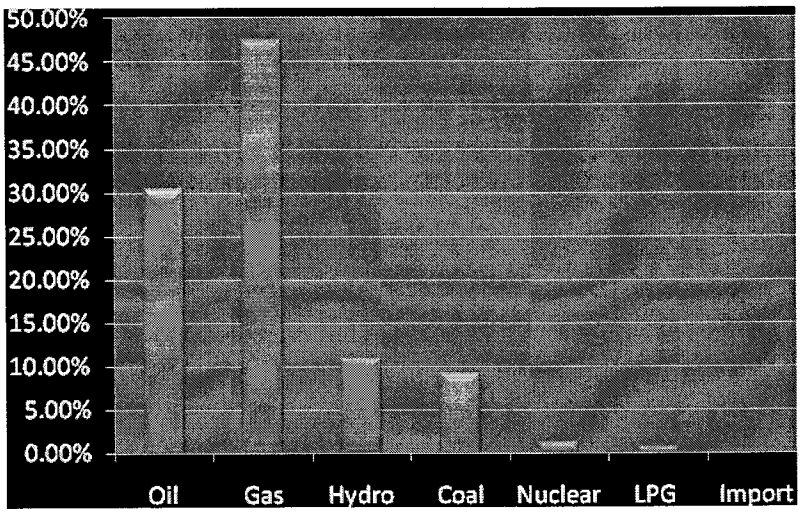
[1] Ibid

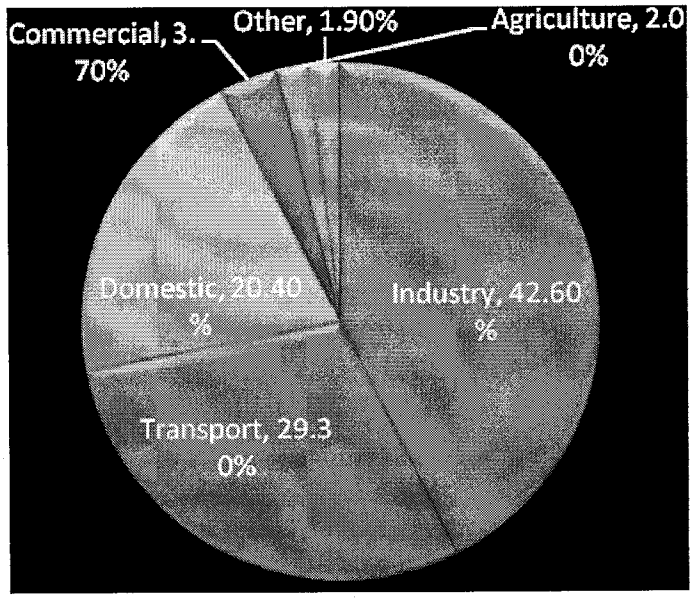
[2] Ibid 8. Pakistan Economic Survey 2008-09 shows the "expected" figure of US$ 8.7 billion

[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

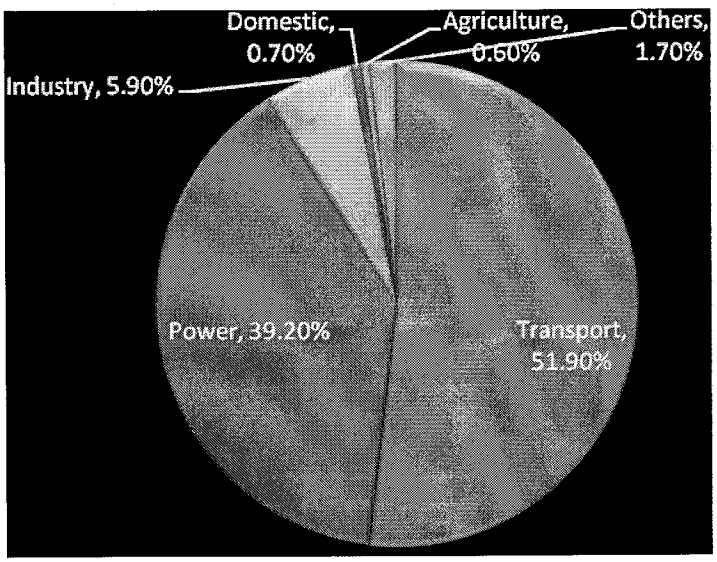
3.2 Energy Resources, demand, supply, issues and future outlook

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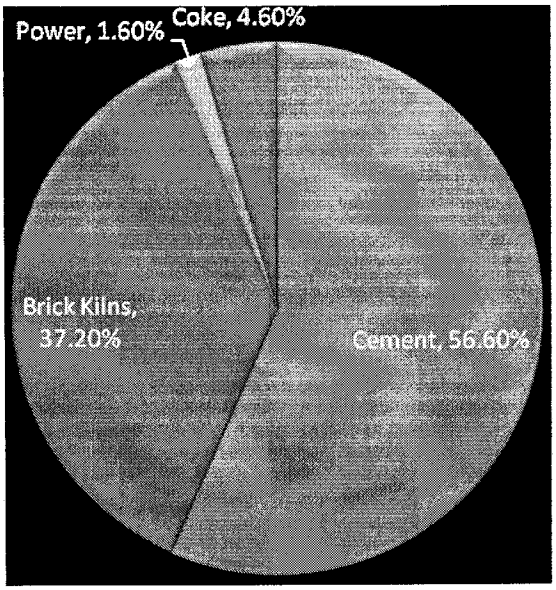
[1] Source PEPCO and PPIB
[2] Ibid 13
[3] Ibid 8



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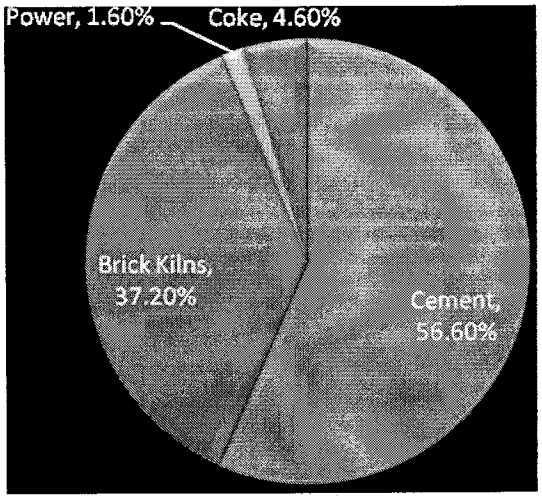
[1] Ministry of Petroleum and Natural Resources
[2] Ibid 12
[3] Ibid 8

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

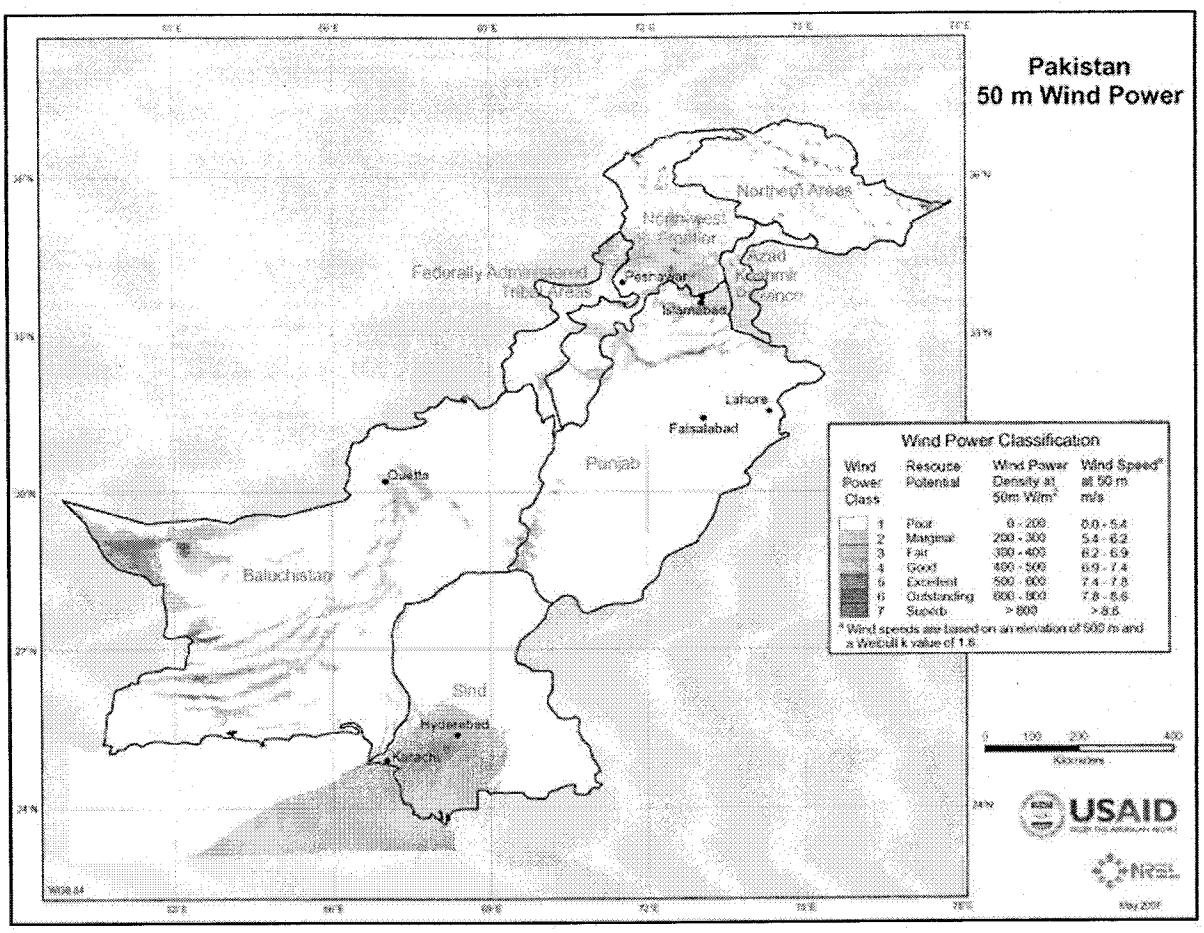
Pakistan is blessed with huge renewable energy resources, particularly wind, solar, hydropower, and biomass. Other than some large and medium hydropower development utilizing only 15% of the hydropower potential, commercial exploitation of renewable energy resources has been negligible. Mainstreaming 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

[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

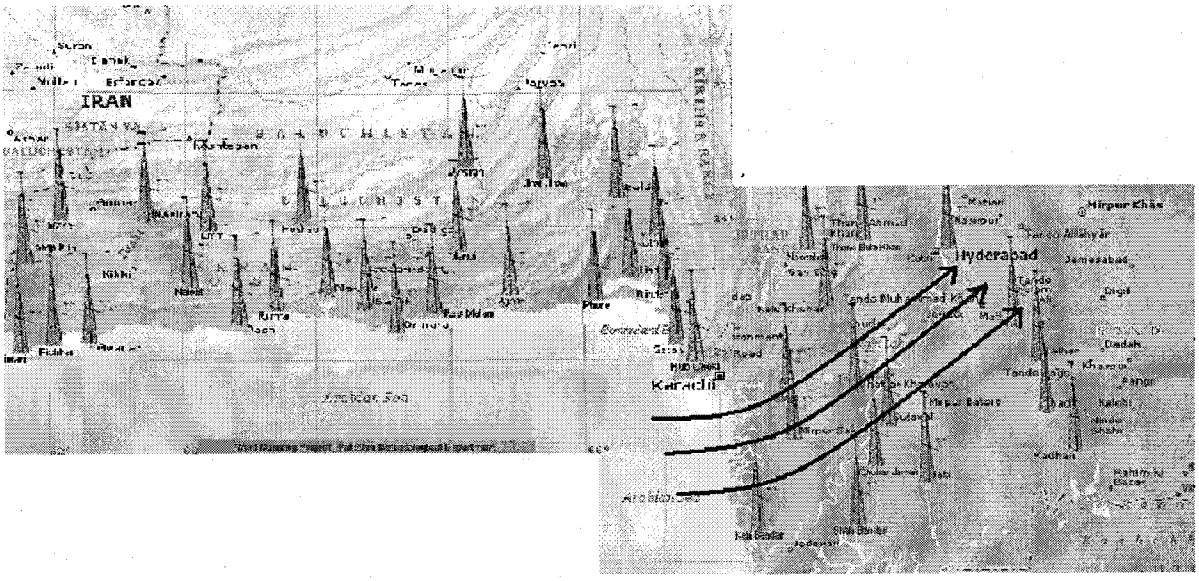
[2] Policy for Development of Renewable Energy for Power Generation 2006, Government of Pakistan

[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.

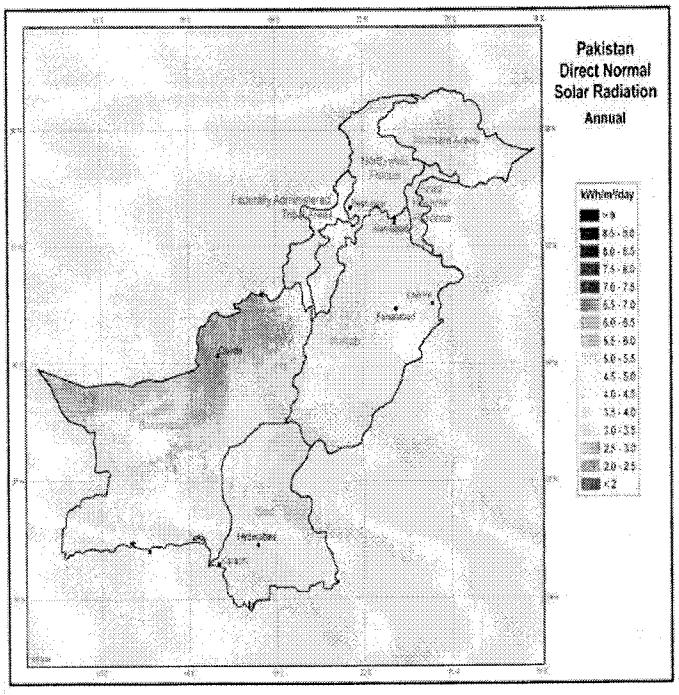
3.2.7.2 Solar

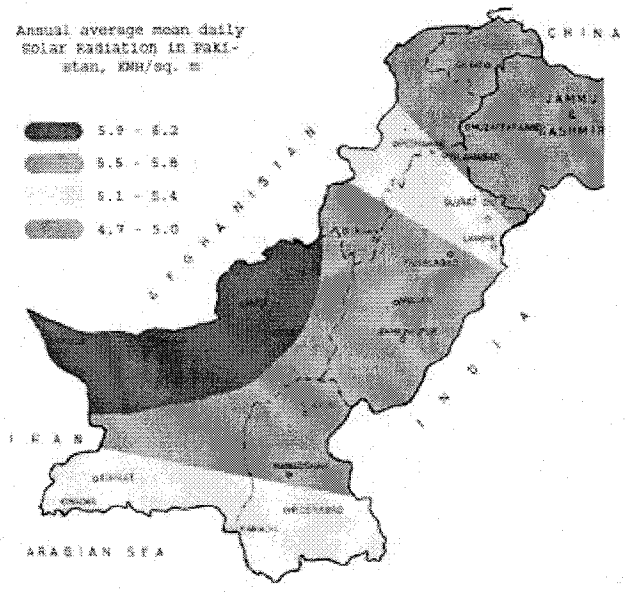
1. Pakistan receives solar radiation in the range of 4.7KWh/m^2 to 6.2 KWh/ m^2 per day on the average[1]. According to the Planning Commission, the total potential is equal to 1.2 million MW of capacity[2].

[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





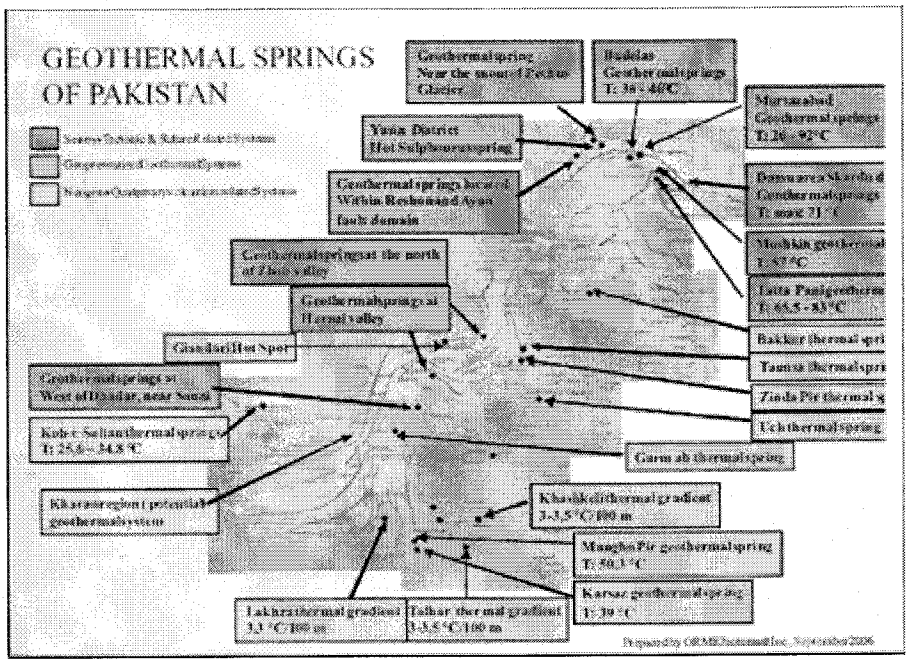
[1] Ibid 25

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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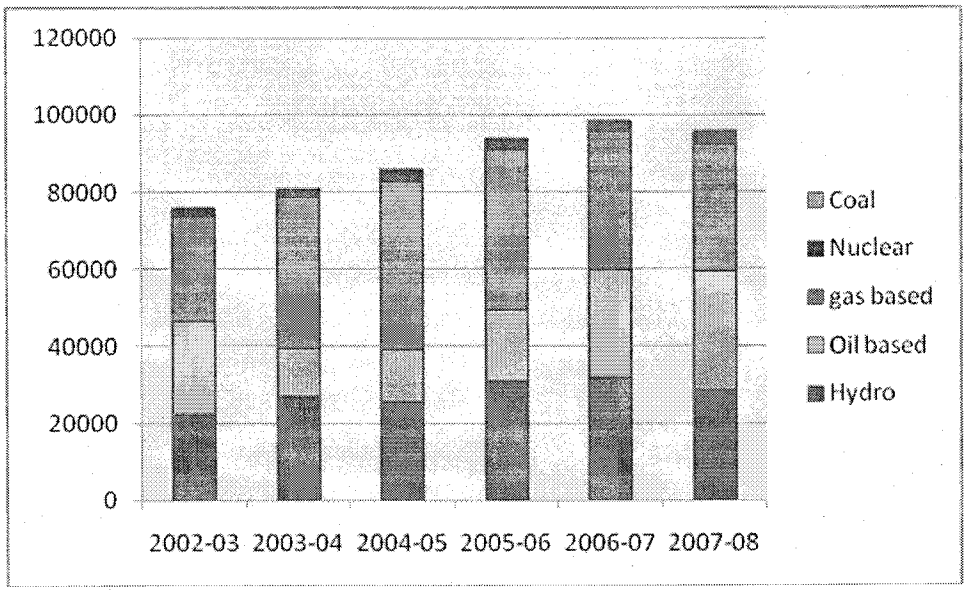
[1] AEDB Web site

[2] Ibid 8

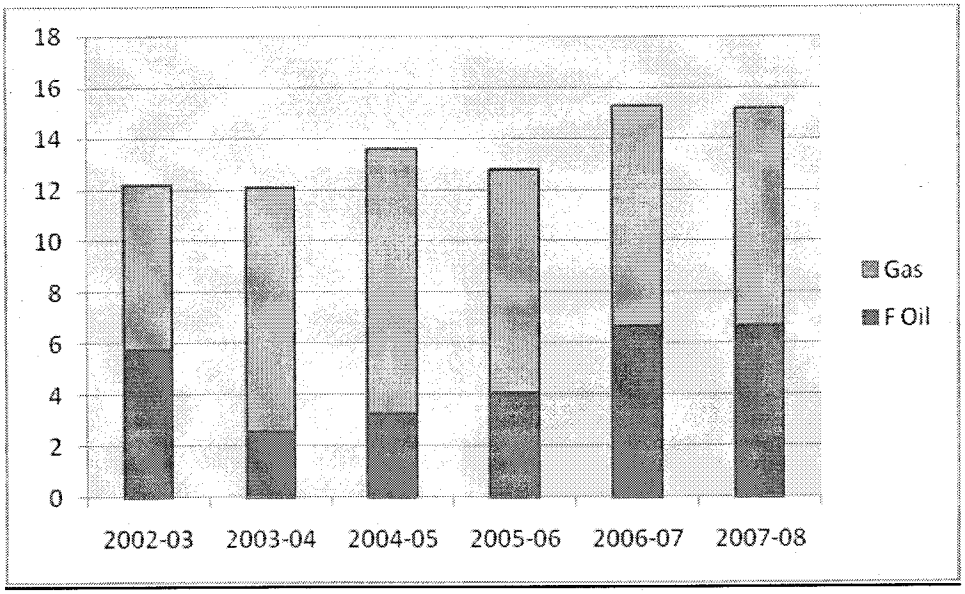


(Note: coal generation is too small to be seen on this chart.)

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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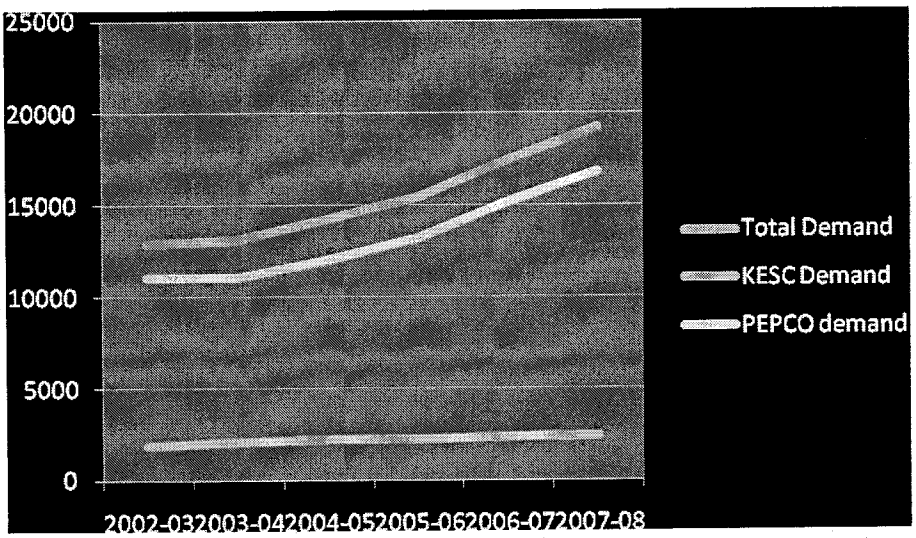
[1] WAPDA, PPIB

[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.

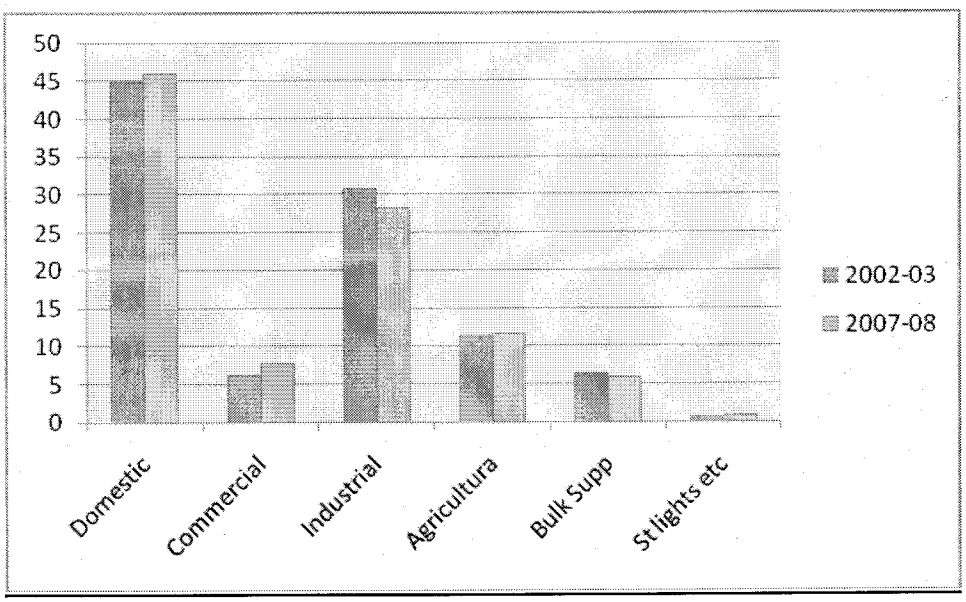
In the power distribution sector, the total number of consumers in the country at the end of June 2008 was 19.94 million. According to government estimates[2], about 53% of the population has access to electricity. The total supply of electricity by electric utilities was 95.7 TWh, while the sale to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

ANNEX 3

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

Pakistan 2010-31045A

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 Karachi Electric Supply Company Limited ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Agreement US$510,475 (Five Hundred Ten Thousand and Four Hundred Seventy-Five U.S. dollars) ("USTDA Grant") to partially fund the cost of goods and services required for a feasibility study ("Study") on the proposed Karachi Integrated Smart Grid System pilot project ("Pilot Project") in Pakistan ("Host Country").

HS
DR
PA
JJ
MB
PD
ICA
LZ
PD
JW

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. In addition, the Grantee shall contribute a cost share ("Grantee Cost Share") of $6,300 on an in-kind basis for the cost of local research, surveys, and inspections, as specified in Task 1 of the attached Terms of Reference (Annex I).

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 May 31, 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 P.

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 H 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 General Manager – Strategic Planning & Business Development. 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: General Manager – Strategic Planning & Business Development
Karachi Electric Supply Company, Limited
6th Floor, State Life Building No. 11,

Abdullah Haroon Road, Saddar
Karachi, Pakistan

Office Phone: +92 21-35647002
Fax: +92 21-99205192

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.: 2010-31045A
Reservation No.: 2010 310054
Grant No.: GH2010310014

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.

IN WITNESS WHEREOF, the Government of the United States of America and Karachi Electric Supply Company 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: Anne W. Patterson
Ambassador Anne W. Patterson

Date: June 20, 2010

Witnessed:

By:
Mr. Henry Steingass

For Karachi Electric Supply Company Limited

By: Sayed Naveed Ahmed
Mr. Naveed Ahmed

Date: 20th July, 2010

Witnessed:

By:
20/07/2010

Annex I -- Terms of Reference

Annex II – Mandatory Clauses

Annex I

Terms of Reference

Purpose and Objectives:

Karachi Electric Supply Company Limited (KESC) is facing a financial crisis caused primarily by extremely high electricity losses. Some power is lost due to inefficiencies in the distribution system (i.e., technical losses). More is lost due to electricity theft, fraud, and non-payment. As a result, at present KESC does not receive payment for nearly 40 percent of the power it produces or purchases from other utilities. The objectives of the Study are to determine whether a Smart Grid system will help reduce losses to the degree needed to justify major capital investment in a large pilot project.

The Study will define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project ("Pilot Project"), project its financial performance, support financing, and produce specifications and international tender documents for the Pilot Project.

Task 1. Technical Assessment

Task 1.1 Initial Meeting

Contractor shall meet with Grantee management in Karachi. The Contractor shall determine working and reporting relationships; establish points of contact and sources of information; review existing studies, plans, and documents that demonstrate the basis for KESC's decision to implement a Smart Grid system; determine the parameters affecting technical losses of the KESC distribution system; establish adequate understanding and characterization of the issues involved in non-technical losses; and confirm with Grantee the mutual understanding of the work plan, deliverables, schedule, expectations, requirements, and approvals process for conducting the Terms of Reference (TOR).

Contractor shall document the meeting attendees, minutes of discussions, and summary of important points.

From meeting results, Contractor shall prepare an Inception Report that shall:

(1) Summarize important points from the Initial Meeting.
(2) Describe briefly the existing KESC distribution system and losses which must be addressed.
(3) Profile background information necessary to conduct the Pilot Project to specific circumstances of the Pakistan economy, energy infrastructure, energy use, customer base, concerned government and regulatory agencies, and Grantee expectations and issues.

Task 1.2 Field Research
Contractor shall study the KESC distribution system in order to characterize and quantify the various types of losses, geographic and demographic constraints, and social acceptance issues. Contractor shall design a Pilot Project covering specified business locations and a defined geographic area, primarily residential, of Karachi or its suburbs. As part of the Grantee Cost Share, the Grantee has agreed to cover the cost of associated local research, surveys or inspections necessary for the completion of this subtask. Criteria for the Pilot Project boundaries shall include:

a. Reasonable assumptions and timelines for loss reductions by which to recover the cost of the Pilot Project.
b. Projections of other tangible and intangible benefits to KESC and to customers.
c. Inclusion of a cross-section of residential incomes, payment records, electricity demand and peak profiles, and small commercial accounts, bearing in mind that results from the Pilot Project will be used to justify expansion of the Smart Grid into other neighborhoods.
d. Approximately 25,000 metered accounts. It is recognized that this number is an estimate that may increase or decrease within reason. The Contractor shall consult with the Grantee in order to make optimum use of facilities and funds available.

Contractor shall review and discuss with Grantee its plans, previous studies, and considerations in selecting candidate neighborhoods.

Task 1.3 Technical Design
Contractor shall develop a Conceptual Design of the Pilot Project specifically to pinpoint and reduce technical losses of electricity and to identify, quantify, and document non-technical losses. To the extent feasible, Contractor shall match the system design to the present and foreseeable needs of Grantee.

Contractor shall:

a. Provide descriptions of all components and features included in the proposed system, showing incremental cost/benefit analyses of each feature.
b. Identify host facilities, buildings, and infrastructure support for system controls, computers, data storage, staffing, training, and operations.
c. Indicate which components and features are not included, showing any adverse cost/benefit analyses or other reasons for rejection.
d. Summarize the capabilities of the proposed system.

e. Review and obtain concurrence of Grantee on the design, its capabilities, and any tradeoffs necessitated in the design.
f. Provide system documentation, including graphics and demonstrations of system function which may be used to inform media and public organizations and to train workers.

This project, if implemented, would ultimately force people to pay electric bills that they have evaded paying for decades. Consequently, the project may face strong opposition. Strong public relations efforts are prudent. The project would likely have to provide the information necessary to win over the bulk of the affected customers. To this end, Contractor shall provide design information, calculations, performance projections, and policy advice as needed to Grantee; however, Grantee retains all responsibility for interface with its customers and for public relations in general.

Task 1.4 Interface

Contractor shall, at a minimum, define the software and hardware for interfaces to existing Grantee systems for meter reading, billing, Supervisory Control and Data Acquisition (SCADA), Geographic Information System (GIS), Demand Side Management, technical losses measurement and reduction programs, outage reporting and localization methods, grid monitoring and safety standards, Customer Service, load forecasting, econometric data collection, fraud and pilferage detection, accounting, meter maintenance and calibrations, distributed generation and power buyback programs. Integrate existing Automated Meter Reading (AMR), Geographical Information System (GIS), Virtual Private Network (VPN), and software systems. For each system, Contractor shall identify digital communications protocols, software and hardware in use, database formats, security features, signal prioritization, and such other features as may be needed to ensure proper operation of the Smart Grid system.

Task 1.5 Performance Projection

Using equipment characteristics and demonstrated performance of Smart Grid systems in similar countries, Contractor shall project the attainable recovery of losses and operating costs of the designed Pilot Project system and estimate the net financial benefit to Grantee. Contractor shall:

a. Compile procedures to be followed to identify technical losses, quantify the technical losses, calculate the value of recoverable losses, perform economic analysis of recovery actions, and document findings and actions.
b. Integrate technical loss recovery into the Grantee's existing work order and prioritization system.
c. Compile procedures to be followed that will address non-technical losses. Provide system documentation and performance projection to assist Grantee with vetting the procedures with regulatory agencies, the Ministry of Water and Power and its agencies, NGOs and consumer

advocacy groups, and representatives of affected residents in the Pilot Project area.

d. Work with Grantee to develop an attainable schedule and budget for reducing each category of losses by targeted amounts. Include cost of materials and equipment needed for corrective action, availability of labor, anticipated delays and obfuscation from affected residents, the time needed to take legal action against offending parties, and time to train employees to deal with problems that arise.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 1.

Task 2. Economic Analysis

Task 2.1 Budget and Cost Estimate

Contractor shall develop a Budget and Cost Estimate for the Pilot Project.

The Budget shall include, but may not be limited to: operating costs of the system, maintenance costs, property taxes on assets, carrying cost of spare parts, additional staffing, training, and supervision costs, and value of recovered electrical losses. The budget shall also include costs anticipated for repair and replacement of equipment due to vandalism.

Cost Estimate shall include: cost of all components; Engineering Procurement and Construction (EPC) fees; construction and installation costs; legal costs; financial closing costs; required reserves for debt service; cost of negotiating contracts and approvals; cost of currency conversion; public relations costs; cost of facilities and infrastructure upgrades; duties on imported equipment; cost of spare parts at economic order quantities based on expected failure rates; the cost of staffing increments and training; rotating spares for required calibration cycles; and redundancy of vital components for reliability.

Note: The intent of the Pilot Project is to determine whether the system should be extended into a full-scale Smart Grid implementation for the greater Karachi area. The financial analysis depends on the accuracy of the Budget and Cost Estimate. It will also serve as a model for the full-scale project's financial analysis. Therefore, Contractor must take great care that the Budget and Cost Estimate do not omit any costs that are often overlooked in financial analysis.

Task 2.2 Economic Model

Contractor shall develop an economic *pro forma* model showing the schedule of capital commitments, other Operating and Maintenance (O&M) costs associated with the system, projected loss recoveries, any other revenues resulting from the project capabilities, possible Clean Development Mechanism (CDM) credit sales, tax relief, net savings, debt service, taxes, equity returns, and Internal Rate of

Return (IRR). Contractor shall include cumulative IRR to indicate expected time to payback and sensitivity to assumptions.

The economic model shall also provide estimates of externality costs and values for information purposes. Grantee shall obtain and provide Government of Pakistan econometric estimates of the GDP losses attributed to load shedding. Contractor shall apportion GDP gains to any measured reduction in losses.

In the economic model, Contractor shall include formulae for estimating separately the energy savings and CO_2 emissions avoided through reduction in technical and non-technical losses. In general, correcting technical losses saves energy and results in lower CO_2 emissions, while correcting non-technical losses will result in customers being forced to pay for their actual consumption. Some customers will, as a result, choose to use less electricity, but the amount of energy saved by customer choice will be difficult to approximate. Since non-technical losses are extremely high (as much as 30 percent) this calculation is extremely important: there is an enormous difference to KESC between having a 30 percent reduction in demand and 30 percent additional revenues. Contractor shall base the formulae on customer research, econometric data, or past experience with Smart Grid systems in other countries. Note also that the decision made by individual customers to stop taking power or to start paying for that power may be influenced by the methods of public notice and customer service tactics employed by KESC. Contractor shall make recommendations for public notice and customer service in the Implementation Plan in Task 8.

Task 2.3 Scenario Analysis
Contractor shall provide a minimum of four scenario analyses of the economic model, including base case, reasonable delays in implementation, reasonable delays in expected recoveries, and partial reduction in loss recoveries. Contractor shall demonstrate whether the economic model maintains positive IRR in adverse scenarios and combinations of adverse scenarios.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 2.

Task 3. Financial Analysis

Task 3.1 Financing Plan
Contractor shall determine the likely sources of debt and equity investment in the Pilot Project. The Contractor shall consider alternate methods of financing, including possible grants, vendor financing, concessionary financing, bond issuance, and leasing. Contractor shall obtain Letters of Intent to verify that these parties are interested and capable of financing the Pilot Project, and that the Pilot Project is consistent with their current lending policies, sector exposure limits, and strategic objectives. Contractor shall determine Grantee's ability to contribute

equity and take on debt, and its ability to recover investment costs through its regulated tariffs.

Task 3.2 Financial Structure
Contractor shall project the likely financial structure of the project financing according to the policies and requirements of the financing parties, including debt/equity ratio, debt coverage ratio requirements, recovery of development costs, covenants, term of loans, amortization methods, use of subordinated debt, reserve requirements, closing costs, and other relevant parameters. Contractor shall determine the optimum structure for the Grantee.

Task 3.3 Risk Analysis
Contractor shall conduct a risk analysis. The Contractor shall identify rational risks to the success of the Pilot Project. Contractor shall identify specific, practical measure to mitigate each risk. The risk analysis shall be in a format consistent with requirements of probable lenders.

This analysis will require follow-up if, and when, the Contractor is requested to formulate the Bid Documents (Task 10).

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 3.

Task 4. Preliminary Environmental Assessment

Contractor shall conduct a preliminary review of the Pilot Project's environmental impact with reference to local requirements and those of potential lending agencies such as the World Bank. If this review should identify potential negative impacts, Contractor shall discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment if required in anticipation of the Pilot Project moving forward to the implementation stage. The cost and duration of an environmental impact assessment is not included in the USTDA Grant.

Task 4.1 Adverse Environmental Effects
Contractor shall determine adverse environmental effects, if any, of the Pilot Project. If adverse effects are identified, Contractor shall quantify them and determine if they are prohibitive, or if they must be ameliorated, or if they are tolerable within existing environmental laws and policies of Pakistan, and within the environmental policies and restrictions of probable lenders and investors. If mitigating actions must be taken, Contractor shall identify those actions and include their costs and time requirements in Pilot Project budgets, analyses, and schedules.

Task 4.2 Beneficial Environmental Effects
Contractor shall determine and quantify beneficial environmental effects, including, but not limited to, reduction in waste of electricity and associated

reduction in fossil fuel use and resulting emissions. Contractor shall determine if expected emissions reductions can be quantified and registered for CDM credits.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 4.

Task 5. Regulatory Assessment

Contractor shall identify and analyze the regulatory issues and approvals that the Pilot Project must address. Contractor shall provide examples, documentation, and performance projections to support Grantee for regulatory approvals to include approval for inclusion in the rate base and tariff calculations; specifications, accuracy, and calibration requirements of meters; examples of utility experience with Smart Grid systems in other nations; examples of regulatory decisions regarding customer service improvements and billing and collections improvements; and anticipatory responses to possible public and political pressures against improved collections.

Contractor shall inquire with Grantee and with local authorities to determine if there are other pertinent regulatory issues, including municipal zoning and work permit practices, consumer protection agencies, communications regulation, environmental agencies, and affected labor unions.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 5.

Task 6. Developmental Impacts Assessment

The Pilot Project and eventual complete Karachi Integrated Smart Grid System are expected to improve efficiency and productivity, to reduce load shedding and power interruptions, and to improve customer service. It is important to assess these and other development impacts, as these factors will be part of a complex decision process for KESC and stakeholder parties.

Contractor shall assess the development impacts associated with the implementation of the project 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. 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 Smart Grid system implementation. Where possible, Contractor shall include quantitative estimates. Contractor shall list only 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 equipment is needed to install project equipment, and additional customer service lines).
- *Human Capacity Building*: Contractor shall estimate the number and type of jobs that would be created if Contractor's recommendations are implemented. Contractor shall comment on any prospective training recommended (the training needed after and as a result of the Pilot 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, Contractor shall 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 Pilot Project or that would result from the implementation of the Pilot Project, such as any policy changes that would result in more transparent regulatory systems and institutions or increased competition.
- *Other Benefits*: Contractor shall discuss prospective indirect development impacts of the Study recommendations, such as enhanced public safety and economic growth (including increases in investment and indirect job creation) that are not captured in the four categories listed above.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 6.

Task 7. U.S. Sources of Supply

Contractor shall identify leading U.S. equipment manufacturers and service providers for Smart Grid systems, confirm their interest and availability to bid on the Pilot Project, and provide their contact information to Grantee for inclusion in competitive bidding for the Pilot Project. The list of vendors shall include business name, point of contact, address, telephone, email, fax numbers, and types of relevant equipment and services. The list shall be included in the Final Report to USTDA (Task 11).

Task 8. Implementation Plan

Task 8.1 Implementation Plan
Contractor shall prepare an Implementation Plan by which the system will be installed, placed in service, and expanded in stages to cover the entire distribution system, each expansion supported and economically justified by loss reductions

and other benefits from preceding stages. The Contractor shall describe the Grantee's institutional structure and management plan for the Pilot Project, including public notice and customer service provisions, and describe training or capacity building needed to ensure adequate skills are available within Grantee's institution and its stakeholder counterparts such as National Electric Power Regulatory Authority (NEPRA), Pakistan Electric Power Company (PEPCO), local government, police and security forces, and others. Outline and schedule completion of documentation, contracts, approvals, and agreements necessary to implement the Pilot Project.

Task 8.2 Development Path
The initial system will be specifically designed to concentrate on loss reduction, possibly at the expense of other beneficial features. Contractor shall describe a reasonable development path to upgrade and expand the capabilities of the initial system over time, as currently available features become financially justified, or as new features may become available.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 8.

Task 9. Grantee Decision Meeting

Contractor shall present the aforementioned deliverables to Grantee management. Contractor shall support the Grantee's decision process with documentation, explanations, recommendations, and testimony regarding system experiences in other countries.

If the Grantee decides not to proceed with Task 10, the Grantee and Contractor shall notify USTDA in writing and Task 10 shall be eliminated from the Study. The Contractor shall then proceed to Task 11. If Task 10 is eliminated from the Terms of Reference, the Contractor shall not be paid for Task 10 and the Grantee shall not receive the benefit of Task 10. If Task 10 is eliminated from the Terms of Reference, the sum of $48,050, which is the budgeted costs for Task 10, shall be eliminated from the budget. Accordingly, the USTDA Grant shall be reduced by $48,050, and such funds shall be deobligated.

If the Grantee decides to move forward with Task 10, the Grantee and Contractor shall notify USTDA in writing and provide an estimated completion date of the remaining work to be performed under the Terms of Reference. USTDA will notify the Grantee and Contractor of the authority to proceed with the remaining work under these Terms of Reference.

Task 10. Bid Documents

The Contractor shall prepare a draft design specification and draft bid documents, which Grantee can adapt and integrate into Grantee's international tender documents.

The USTDA Grant does not cover bid evaluation or subsequent design changes, and the Contractor shall not be responsible for such work. The Contractor shall not be responsible for any work associated with publicizing the bidding documents or evaluating proposals under any procurement-related activity for this Pilot Project.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 10.

Task 11. 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 H 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 10 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 Pilot 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 H of Annex II of the Grant Agreement. One copy of the public report shall be provided to the U.S. Embassy in Islamabad.

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 Karachi Electric Supply Company Limited ("Client"), dated _____ ("Grant Agreement") in Pakistan ("Host Country"). The Client has selected _____ ("Contractor") to perform the feasibility study ("Study") for the Karachi Integrated Smart Grid System pilot project ("Pilot Project"). 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 P. 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. 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 H 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.

H. 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, and 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.

I. 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.

J. Study Schedule

(1) Study Completion Date

The completion date for the Study, which is May 31, 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.

K. Cost Share

The Grantee agrees that, in addition to the funding provided by the USTDA Grant, it shall be responsible for ensuring that it contributes a cost share ("Grantee Cost Share") of $6,300 on an in-kind basis for the cost of local research, surveys, and inspections, as specified in Task 1 of the attached Terms of Reference (Annex I).

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.: 2010-31045A
Reservation No.: 2010 310054
Grant No.: GH2010310014

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.

P. 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 that 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.

ANNEX 5

TERMS OF REFERENCE

Annex I

Terms of Reference

Purpose and Objectives:

Karachi Electric Supply Company Limited (KESC) is facing a financial crisis caused primarily by extremely high electricity losses. Some power is lost due to inefficiencies in the distribution system (i.e., technical losses). More is lost due to electricity theft, fraud, and non-payment. As a result, at present KESC does not receive payment for nearly 40 percent of the power it produces or purchases from other utilities. The objectives of the Study are to determine whether a Smart Grid system will help reduce losses to the degree needed to justify major capital investment in a large pilot project.

The Study will define parameters (number of meters, technical capability, geographic boundaries, cost, and interfaces) and objectives of a pilot Smart Grid project ("Pilot Project"), project its financial performance, support financing, and produce specifications and international tender documents for the Pilot Project.

Task 1. Technical Assessment

Task 1.1 Initial Meeting

Contractor shall meet with Grantee management in Karachi. The Contractor shall determine working and reporting relationships; establish points of contact and sources of information; review existing studies, plans, and documents that demonstrate the basis for KESC's decision to implement a Smart Grid system; determine the parameters affecting technical losses of the KESC distribution system; establish adequate understanding and characterization of the issues involved in non-technical losses; and confirm with Grantee the mutual understanding of the work plan, deliverables, schedule, expectations, requirements, and approvals process for conducting the Terms of Reference (TOR).

Contractor shall document the meeting attendees, minutes of discussions, and summary of important points.

From meeting results, Contractor shall prepare an Inception Report that shall:

(1) Summarize important points from the Initial Meeting.
(2) Describe briefly the existing KESC distribution system and losses which must be addressed.
(3) Profile background information necessary to conduct the Pilot Project to specific circumstances of the Pakistan economy, energy infrastructure, energy use, customer base, concerned government and regulatory agencies, and Grantee expectations and issues.

Task 1.2 Field Research
Contractor shall study the KESC distribution system in order to characterize and quantify the various types of losses, geographic and demographic constraints, and social acceptance issues. Contractor shall design a Pilot Project covering specified business locations and a defined geographic area, primarily residential, of Karachi or its suburbs. As part of the Grantee Cost Share, the Grantee has agreed to cover the cost of associated local research, surveys or inspections necessary for the completion of this subtask. Criteria for the Pilot Project boundaries shall include:

a. Reasonable assumptions and timelines for loss reductions by which to recover the cost of the Pilot Project.
b. Projections of other tangible and intangible benefits to KESC and to customers.
c. Inclusion of a cross-section of residential incomes, payment records, electricity demand and peak profiles, and small commercial accounts, bearing in mind that results from the Pilot Project will be used to justify expansion of the Smart Grid into other neighborhoods.
d. Approximately 25,000 metered accounts. It is recognized that this number is an estimate that may increase or decrease within reason. The Contractor shall consult with the Grantee in order to make optimum use of facilities and funds available.

Contractor shall review and discuss with Grantee its plans, previous studies, and considerations in selecting candidate neighborhoods.

Task 1.3 Technical Design
Contractor shall develop a Conceptual Design of the Pilot Project specifically to pinpoint and reduce technical losses of electricity and to identify, quantify, and document non-technical losses. To the extent feasible, Contractor shall match the system design to the present and foreseeable needs of Grantee.

Contractor shall:

a. Provide descriptions of all components and features included in the proposed system, showing incremental cost/benefit analyses of each feature.
b. Identify host facilities, buildings, and infrastructure support for system controls, computers, data storage, staffing, training, and operations.
c. Indicate which components and features are not included, showing any adverse cost/benefit analyses or other reasons for rejection.
d. Summarize the capabilities of the proposed system.

e. Review and obtain concurrence of Grantee on the design, its capabilities, and any tradeoffs necessitated in the design.
f. Provide system documentation, including graphics and demonstrations of system function which may be used to inform media and public organizations and to train workers.

This project, if implemented, would ultimately force people to pay electric bills that they have evaded paying for decades. Consequently, the project may face strong opposition. Strong public relations efforts are prudent. The project would likely have to provide the information necessary to win over the bulk of the affected customers. To this end, Contractor shall provide design information, calculations, performance projections, and policy advice as needed to Grantee; however, Grantee retains all responsibility for interface with its customers and for public relations in general.

Task 1.4 Interface
Contractor shall, at a minimum, define the software and hardware for interfaces to existing Grantee systems for meter reading, billing, Supervisory Control and Data Acquisition (SCADA), Geographic Information System (GIS), Demand Side Management, technical losses measurement and reduction programs, outage reporting and localization methods, grid monitoring and safety standards, Customer Service, load forecasting, econometric data collection, fraud and pilferage detection, accounting, meter maintenance and calibrations, distributed generation and power buyback programs. Integrate existing Automated Meter Reading (AMR), Geographical Information System (GIS), Virtual Private Network (VPN), and software systems. For each system, Contractor shall identify digital communications protocols, software and hardware in use, database formats, security features, signal prioritization, and such other features as may be needed to ensure proper operation of the Smart Grid system.

Task 1.5 Performance Projection
Using equipment characteristics and demonstrated performance of Smart Grid systems in similar countries, Contractor shall project the attainable recovery of losses and operating costs of the designed Pilot Project system and estimate the net financial benefit to Grantee. Contractor shall:

a. Compile procedures to be followed to identify technical losses, quantify the technical losses, calculate the value of recoverable losses, perform economic analysis of recovery actions, and document findings and actions.
b. Integrate technical loss recovery into the Grantee's existing work order and prioritization system.
c. Compile procedures to be followed that will address non-technical losses. Provide system documentation and performance projection to assist Grantee with vetting the procedures with regulatory agencies, the Ministry of Water and Power and its agencies, NGOs and consumer

advocacy groups, and representatives of affected residents in the Pilot Project area.

d. Work with Grantee to develop an attainable schedule and budget for reducing each category of losses by targeted amounts. Include cost of materials and equipment needed for corrective action, availability of labor, anticipated delays and obfuscation from affected residents, the time needed to take legal action against offending parties, and time to train employees to deal with problems that arise.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 1.

Task 2. Economic Analysis

Task 2.1 Budget and Cost Estimate

Contractor shall develop a Budget and Cost Estimate for the Pilot Project.

The Budget shall include, but may not be limited to: operating costs of the system, maintenance costs, property taxes on assets, carrying cost of spare parts, additional staffing, training, and supervision costs, and value of recovered electrical losses. The budget shall also include costs anticipated for repair and replacement of equipment due to vandalism.

Cost Estimate shall include: cost of all components; Engineering Procurement and Construction (EPC) fees; construction and installation costs; legal costs; financial closing costs; required reserves for debt service; cost of negotiating contracts and approvals; cost of currency conversion; public relations costs; cost of facilities and infrastructure upgrades; duties on imported equipment; cost of spare parts at economic order quantities based on expected failure rates; the cost of staffing increments and training; rotating spares for required calibration cycles; and redundancy of vital components for reliability.

Note: The intent of the Pilot Project is to determine whether the system should be extended into a full-scale Smart Grid implementation for the greater Karachi area. The financial analysis depends on the accuracy of the Budget and Cost Estimate. It will also serve as a model for the full-scale project's financial analysis. Therefore, Contractor must take great care that the Budget and Cost Estimate do not omit any costs that are often overlooked in financial analysis.

Task 2.2 Economic Model

Contractor shall develop an economic *pro forma* model showing the schedule of capital commitments, other Operating and Maintenance (O&M) costs associated with the system, projected loss recoveries, any other revenues resulting from the project capabilities, possible Clean Development Mechanism (CDM) credit sales, tax relief, net savings, debt service, taxes, equity returns, and Internal Rate of

Return (IRR). Contractor shall include cumulative IRR to indicate expected time to payback and sensitivity to assumptions.

The economic model shall also provide estimates of externality costs and values for information purposes. Grantee shall obtain and provide Government of Pakistan econometric estimates of the GDP losses attributed to load shedding. Contractor shall apportion GDP gains to any measured reduction in losses.

In the economic model, Contractor shall include formulae for estimating separately the energy savings and CO_2 emissions avoided through reduction in technical and non-technical losses. In general, correcting technical losses saves energy and results in lower CO_2 emissions, while correcting non-technical losses will result in customers being forced to pay for their actual consumption. Some customers will, as a result, choose to use less electricity, but the amount of energy saved by customer choice will be difficult to approximate. Since non-technical losses are extremely high (as much as 30 percent) this calculation is extremely important: there is an enormous difference to KESC between having a 30 percent reduction in demand and 30 percent additional revenues. Contractor shall base the formulae on customer research, econometric data, or past experience with Smart Grid systems in other countries. Note also that the decision made by individual customers to stop taking power or to start paying for that power may be influenced by the methods of public notice and customer service tactics employed by KESC. Contractor shall make recommendations for public notice and customer service in the Implementation Plan in Task 8.

Task 2.3 Scenario Analysis
Contractor shall provide a minimum of four scenario analyses of the economic model, including base case, reasonable delays in implementation, reasonable delays in expected recoveries, and partial reduction in loss recoveries. Contractor shall demonstrate whether the economic model maintains positive IRR in adverse scenarios and combinations of adverse scenarios.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 2.

Task 3. Financial Analysis

Task 3.1 Financing Plan
Contractor shall determine the likely sources of debt and equity investment in the Pilot Project. The Contractor shall consider alternate methods of financing, including possible grants, vendor financing, concessionary financing, bond issuance, and leasing. Contractor shall obtain Letters of Intent to verify that these parties are interested and capable of financing the Pilot Project, and that the Pilot Project is consistent with their current lending policies, sector exposure limits, and strategic objectives. Contractor shall determine Grantee's ability to contribute

equity and take on debt, and its ability to recover investment costs through its regulated tariffs.

Task 3.2 Financial Structure
Contractor shall project the likely financial structure of the project financing according to the policies and requirements of the financing parties, including debt/equity ratio, debt coverage ratio requirements, recovery of development costs, covenants, term of loans, amortization methods, use of subordinated debt, reserve requirements, closing costs, and other relevant parameters. Contractor shall determine the optimum structure for the Grantee.

Task 3.3 Risk Analysis
Contractor shall conduct a risk analysis. The Contractor shall identify rational risks to the success of the Pilot Project. Contractor shall identify specific, practical measure to mitigate each risk. The risk analysis shall be in a format consistent with requirements of probable lenders.

This analysis will require follow-up if, and when, the Contractor is requested to formulate the Bid Documents (Task 10).

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 3.

Task 4. Preliminary Environmental Assessment

Contractor shall conduct a preliminary review of the Pilot Project's environmental impact with reference to local requirements and those of potential lending agencies such as the World Bank. If this review should identify potential negative impacts, Contractor shall discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment if required in anticipation of the Pilot Project moving forward to the implementation stage. The cost and duration of an environmental impact assessment is not included in the USTDA Grant.

Task 4.1 Adverse Environmental Effects
Contractor shall determine adverse environmental effects, if any, of the Pilot Project. If adverse effects are identified, Contractor shall quantify them and determine if they are prohibitive, or if they must be ameliorated, or if they are tolerable within existing environmental laws and policies of Pakistan, and within the environmental policies and restrictions of probable lenders and investors. If mitigating actions must be taken, Contractor shall identify those actions and include their costs and time requirements in Pilot Project budgets, analyses, and schedules.

Task 4.2 Beneficial Environmental Effects
Contractor shall determine and quantify beneficial environmental effects, including, but not limited to, reduction in waste of electricity and associated

reduction in fossil fuel use and resulting emissions. Contractor shall determine if expected emissions reductions can be quantified and registered for CDM credits.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 4.

Task 5. Regulatory Assessment

Contractor shall identify and analyze the regulatory issues and approvals that the Pilot Project must address. Contractor shall provide examples, documentation, and performance projections to support Grantee for regulatory approvals to include approval for inclusion in the rate base and tariff calculations; specifications, accuracy, and calibration requirements of meters; examples of utility experience with Smart Grid systems in other nations; examples of regulatory decisions regarding customer service improvements and billing and collections improvements; and anticipatory responses to possible public and political pressures against improved collections.

Contractor shall inquire with Grantee and with local authorities to determine if there are other pertinent regulatory issues, including municipal zoning and work permit practices, consumer protection agencies, communications regulation, environmental agencies, and affected labor unions.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 5.

Task 6. Developmental Impacts Assessment

The Pilot Project and eventual complete Karachi Integrated Smart Grid System are expected to improve efficiency and productivity, to reduce load shedding and power interruptions, and to improve customer service. It is important to assess these and other development impacts, as these factors will be part of a complex decision process for KESC and stakeholder parties.

Contractor shall assess the development impacts associated with the implementation of the project 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. 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 Smart Grid system implementation. Where possible, Contractor shall include quantitative estimates. Contractor shall list only 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 equipment is needed to install project equipment, and additional customer service lines).
- *Human Capacity Building*: Contractor shall estimate the number and type of jobs that would be created if Contractor's recommendations are implemented. Contractor shall comment on any prospective training recommended (the training needed after and as a result of the Pilot 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, Contractor shall 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 Pilot Project or that would result from the implementation of the Pilot Project, such as any policy changes that would result in more transparent regulatory systems and institutions or increased competition.
- *Other Benefits*: Contractor shall discuss prospective indirect development impacts of the Study recommendations, such as enhanced public safety and economic growth (including increases in investment and indirect job creation) that are not captured in the four categories listed above.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 6.

Task 7. U.S. Sources of Supply

Contractor shall identify leading U.S. equipment manufacturers and service providers for Smart Grid systems, confirm their interest and availability to bid on the Pilot Project, and provide their contact information to Grantee for inclusion in competitive bidding for the Pilot Project. The list of vendors shall include business name, point of contact, address, telephone, email, fax numbers, and types of relevant equipment and services. The list shall be included in the Final Report to USTDA (Task 11).

Task 8. Implementation Plan

Task 8.1 Implementation Plan

Contractor shall prepare an Implementation Plan by which the system will be installed, placed in service, and expanded in stages to cover the entire distribution system, each expansion supported and economically justified by loss reductions

and other benefits from preceding stages. The Contractor shall describe the Grantee's institutional structure and management plan for the Pilot Project, including public notice and customer service provisions, and describe training or capacity building needed to ensure adequate skills are available within Grantee's institution and its stakeholder counterparts such as National Electric Power Regulatory Authority (NEPRA), Pakistan Electric Power Company (PEPCO), local government, police and security forces, and others. Outline and schedule completion of documentation, contracts, approvals, and agreements necessary to implement the Pilot Project.

Task 8.2 Development Path
The initial system will be specifically designed to concentrate on loss reduction, possibly at the expense of other beneficial features. Contractor shall describe a reasonable development path to upgrade and expand the capabilities of the initial system over time, as currently available features become financially justified, or as new features may become available.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 8.

Task 9. Grantee Decision Meeting

Contractor shall present the aforementioned deliverables to Grantee management. Contractor shall support the Grantee's decision process with documentation, explanations, recommendations, and testimony regarding system experiences in other countries.

If the Grantee decides not to proceed with Task 10, the Grantee and Contractor shall notify USTDA in writing and Task 10 shall be eliminated from the Study. The Contractor shall then proceed to Task 11. If Task 10 is eliminated from the Terms of Reference, the Contractor shall not be paid for Task 10 and the Grantee shall not receive the benefit of Task 10. If Task 10 is eliminated from the Terms of Reference, the sum of $48,050, which is the budgeted costs for Task 10, shall be eliminated from the budget. Accordingly, the USTDA Grant shall be reduced by $48,050, and such funds shall be deobligated.

If the Grantee decides to move forward with Task 10, the Grantee and Contractor shall notify USTDA in writing and provide an estimated completion date of the remaining work to be performed under the Terms of Reference. USTDA will notify the Grantee and Contractor of the authority to proceed with the remaining work under these Terms of Reference.

Task 10. Bid Documents

The Contractor shall prepare a draft design specification and draft bid documents, which Grantee can adapt and integrate into Grantee's international tender documents.

The USTDA Grant does not cover bid evaluation or subsequent design changes, and the Contractor shall not be responsible for such work. The Contractor shall not be responsible for any work associated with publicizing the bidding documents or evaluating proposals under any procurement-related activity for this Pilot Project.

Deliverable: The Contractor shall submit an interim report to the Grantee containing all documents collected, work performed, and analyses completed under Task 10.

Task 11. 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 H 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 10 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 Pilot 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 H of Annex II of the Grant Agreement. One copy of the public report shall be provided to the U.S. Embassy in Islamabad.

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 Karachi Electric Supply Company Limited ("Client"), dated _____ ("Grant Agreement") in Pakistan ("Host Country"). The Client has selected _____ ("Contractor") to perform the feasibility study ("Study") for the Karachi Integrated Smart Grid System pilot project ("Pilot Project"). 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 P. 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. 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 H 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.

H. 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, and 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.

I. 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.

J. Study Schedule

(1) Study Completion Date

The completion date for the Study, which is May 31, 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.

K. Cost Share

The Grantee agrees that, in addition to the funding provided by the USTDA Grant, it shall be responsible for ensuring that it contributes a cost share ("Grantee Cost Share") of $6,300 on an in-kind basis for the cost of local research, surveys, and inspections, as specified in Task 1 of the attached Terms of Reference (Annex I).

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.: 2010-31045A
Reservation No.: 2010 310054
Grant No.: GH2010310014

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.

P. 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 that 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.

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: _____