

REQUEST FOR PROPOSALS

TECHNICAL ASSISTANCE FOR THE

TRANSMISSION MONITORING AND DIAGNOSTIC SYSTEMS PROJECT

Submission Deadline: **4:00 PM**

LOCAL TIME

SEPTEMBER 3, 2012

Submission Place: Attention: USTDA Grant Competition
Kazakhstan Electricity Grid Operating Company
Joint Stock Company
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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.

N.B.: Any and all questions pertaining to the RFP should be sent to:
RFP_Questions@ustda.gov

REQUEST FOR PROPOSALS

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Section 1: INTRODUCTION

The U.S. Trade and Development Agency (USTDA) has provided a grant in the amount of US\$629,780 to the Kazakhstan Electricity Grid Operating Company (the “Grantee”) in accordance with a grant agreement dated September 20, 2010 as amended on June 22, 2012 (the “Grant Agreement”). This Grant would fund technical assistance (the “Technical Assistance”) for a proposed Diagnostic and Monitoring System of the overhead power and transmission lines (OHTL) (the “Project”) in Kazakhstan (the “Host Country”). The Grant Agreement is attached at Annex 4 for reference. The Grantee is soliciting technical proposals from qualified U.S. firms to provide expert consulting services to perform the Technical Assistance.

A Request for Proposals for the Project was originally issued in 2011 with no contractor selected; however, the Project’s scope of work has been augmented and funding has been added in order to complete the Terms of Reference.

1.1 BACKGROUND SUMMARY

KEGOC owns and is responsible for operating the grid and all electric power high voltage (220 kilovolts and higher) transmission lines in Kazakhstan, which constitute about 24,000 kilometers (km) of transmission lines. The grid includes 1,421 km of 1,150-kV lines, 6,419 km of 500-kV lines, 1,480 km of 330-kV and 14,662 km of 220-kV lines. As part of its system, KEGOC also owns and operates 74 substations. The company is 100% owned by the national state holding company, Samruk-Kazyna.

Electricity transmission and distribution line losses are equal to approximately 15% of all power in the system. The United States has a transmission and distribution line loss rate of only 6.5%.

KEGOC invested more than \$200 million in electric power transmission expansion and improvements in 2009, and over the next 15 years it plans to invest more than \$3.5 billion. Reduction of line losses are a key priority according to the management of KEGOC, in part because reduction of line losses represents increased capacity (and its resulting increased revenues) without building additional transmission lines. Insulation is largely responsible for the operating performance of a transmission line, and insulator (mainly glass or porcelain) performance can be significantly affected by cracks, depositions of salt, dust or chemicals from the air, or from weather conditions, such as fog. Insulators in turn support the conductors on transmission lines. The fault/defect rates of conductors on 500kV transmission lines are typically higher than for lower voltage lines and can be as high as 33%.

In order to reduce line losses, KEGOC wishes to carry out transmission line condition assessment work with technologically advanced diagnostic equipment that is available in the international market. The aim is to assess the condition of transmission lines through non-invasive means. The main problems that have been considered are the cracks in porcelain insulators and broken conductor strands. The monitoring and diagnostic systems will need to at a minimum measure the following:

- Damage to insulators;
- Conductor corrosion and vibration damage;

- Identification of problem symptoms;
- Transmission line corona;
- Gap discharge; and,
- Contamination discharge.

As KEGOC's transmission system ages, refurbishment of transmission line components increasingly becomes necessary. Refurbishment of older transmission lines typically requires replacement of selected conductors and insulators instead of reinforcement or reconstruction of towers. Refurbishment usually results in an increase of transmission capacity and the improvement of reliability parameters for the transmission line. Because the cost of refurbishment of conductors, when retaining the existing foundations and towers, is 40–50% of the cost of new line installation, this leads to a reduction of necessary investment in replacement transmission lines. By installing monitoring and diagnostic equipment, KEGOC will be able to better gauge the efficiency and fault/defect rate of its conductors and insulators, better plan its transmission line maintenance and refurbishment program, and thereby reduce line losses.

Excerpts from a background Definitional Mission is provided for reference in Annex 2.

1.2 OBJECTIVE

This technical assistance grant will fund an evaluation of implementing transmission line monitoring and diagnostic systems in Kazakhstan. The technical assistance will contribute to reduction of line losses and improving operational and maintenance programs of the Kazakhstan Electricity Grid Operating Company.

The Terms of Reference (TOR) for this Technical Assistance are attached as Annex 5.

1.3 PROPOSALS TO BE SUBMITTED

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

The amount for the contract has been established by a USTDA grant of US\$629,780. **The USTDA grant of US\$629,780 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\$629,780 to the Grantee. The funding provided under the Grant Agreement shall be used to fund the costs of the contract between the Grantee and the U.S. firm selected by the Grantee to perform the TOR. The contract must include certain USTDA Mandatory Contract Clauses relating to nationality, taxes, payment, reporting, and other matters. The USTDA nationality requirements and the USTDA Mandatory Contract Clauses are attached at Annexes 3 and 4, respectively, for reference.

Section 2: INSTRUCTIONS TO OFFERORS

2.1 PROJECT TITLE

The project is called Kazakhstan Monitoring and Diagnostic Systems Technical Assistance.

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 a Definitional Mission to address technical, financial, sociopolitical, environmental and other aspects of the proposed project. Portions of the report are 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 Technical Assistance.

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 Technical Assistance.

2.5 PROJECT Funding Source

The Technical Assistance will be funded under a grant from USTDA. The total amount of the grant is not to exceed US\$629,780.

2.6 RESPONSIBILITY FOR COSTS

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

2.7 TAXES

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

2.8 CONFIDENTIALITY

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

2.9 ECONOMY OF PROPOSALS

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

2.10 OFFEROR CERTIFICATIONS

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

2.11 CONDITIONS REQUIRED FOR PARTICIPATION

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

2.12 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English.

2.13 PROPOSAL SUBMISSION REQUIREMENTS

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

Attention: USTDA Grant Competition
Kazakhstan Electricity Grid Operating Company
Joint Stock Company
37 Beibitshilik St., Saryarka District
Astana 010000, Republic of Kazakhstan

Phone: +7 (7172) 31 95 22

Fax: +7 (7172) 97 04 55

E-Mail: Syzdykov@kegoc.kz
Uteuliyev@kegoc.kz
Nurtaza_N@kegoc.kz

An Original and five (5) copies of your proposal in English must be received at the above address no later than 4:00 PM, on SEPTEMBER 3, 2012. A copy of the proposal in English in electronic form must be received at the above E-mail addresses no later than 4:00 PM, on SEPTEMBER 3, 2012.

Previously submitted proposals will still be reviewed, and Offerors who have already submitted proposals have the option to re-submit their proposal.

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 the name of the project and designation of "original" or "copy number x." The original and five (5) copies should be collectively wrapped and sealed, and clearly labeled, including the contact name and the name of the project.

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

2.15 OFFEROR'S AUTHORIZED NEGOTIATOR

The Offeror must provide the 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.

2.16 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.

2.17 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.

2.18 EXCEPTIONS

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

2.19 OFFEROR QUALIFICATIONS

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

2.20 RIGHT TO REJECT PROPOSALS

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

2.21 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.

2.22 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.

2.23 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.

2.24 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\$629,780, which is a fixed amount.

Offerors shall submit an original and five copies of the proposals in English and a copy of the proposal in English in electronic form. Proposals received by fax cannot be accepted.

Each proposal must include the following:

- Transmittal Letter,
- Cover/Title Page,
- Table of Contents,
- Executive Summary,
- Firm Background Information,
- Completed U.S. Firm Information Form,
- 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 U.S. FIRM INFORMATION

A U.S. Firm Information Form in .pdf fillable format is attached at the end of this RFP in Annex 6. The Offeror must complete the U.S. Firm Information Form and include the completed U.S. Firm Information Form with its proposal.

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 Technical Assistance. 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 Technical Assistance.

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 Technical Assistance.

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 Technical Assistance. 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 the Technical Assistance 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:

1. **Technical Experience (50 points):** Firm and team experience in technical assistance on, or management of implementation of, similar projects involving transmission line monitoring and diagnostic equipment.
2. **Work Plan and Methodology (25 points):** Adequacy of the proposed work plan and suggested overall approach in responding to the Terms of Reference. Soundness and thoroughness of the technical approach and work plan detailed in the proposal and the overall quality of the presentation should be evaluated. The proposal should provide an organization chart of key personnel with their qualifications and a staffing schedule for each key activity.
3. **Bidding Documentation Experience (10 points):** Firm and team experience in developing bidding documents for transmission line monitoring and diagnostic equipment. Demonstrated experience with international competitive bidding and the requirements of multilateral lending institutions is preferred.
4. **Regional Experience (15 points):** Firm and team's familiarity with electricity transmission in the region, particularly in Kazakhstan, including local and international conditions, regulations and requirements.

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

Price will not be a factor in contractor selection.

ANNEX 1

KAZAKHSTAN ELECTRICITY GRID OPERATING COMPANY (KEGOC) JOINT-STOCK COMPANY, 37 BEIBITSHILIK ST., SARYARKA DISTRICT, ASTANA 010000, REPUBLIC OF KAZAKHSTAN

KAZAKHSTAN: MONITORING AND DIAGNOSTIC SYSTEMS TECHNICAL ASSISTANCE PROJECT

POC: Anthony O'Tapi, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. KAZAKHSTAN: MONITORING AND DIAGNOSTIC SYSTEMS TECHNICAL ASSISTANCE PROJECT. 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 conduct Technical Assistance to:

1. Evaluate the current status of KEGOC's transmission line monitoring equipment and program;
2. Evaluate current technologies to determine the best fit for KEGOC's current and future monitoring and diagnostic plans;
3. Develop technical specifications for updating the KEGOC's equipment, and guidelines to update KEGOC's monitoring and inspection routines;
4. Prepare tender documentation for procuring the above systems.

KEGOC owns and operates the grid and all electric power high voltage (220 kilovolts and higher) transmission lines in Kazakhstan, which constitute about 24,000 kilometers (km) of transmission lines. The grid includes 1,421 km of 1,150-kV lines, 6,419 km of 500-kV lines, 1,480km of 330-kV and 14,662 km of 220-kV lines. As part of its system, KEGOC also owns and operates 74 substations. The company is 100% owned by the national state holding company, Samruk-Kazyna. In order to reduce line losses, KEGOC wishes to carry out transmission line condition assessment work with technologically advanced diagnostic equipment that is available in the international market. The aim is to assess the condition of transmission lines through non-invasive means.

The U.S. firm selected will be paid in U.S. dollars from a \$629,780 grant to the Grantee from the U.S. Trade and Development Agency (USTDA).

A Request for Proposals for the Project was originally issued in 2011; however, the Project's scope of work has been augmented and funding has been added in order to complete the Terms of Reference.

A detailed Request for Proposals (RFP), which includes requirements for the Proposal, the Terms of Reference, and portions of a background definitional mission 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, SEPTEMBER 3, 2012 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

Project Description & Rationale

KEGOC wishes to carry out EHV line condition assessment work with technologically advanced diagnostic equipment that is available in the international market. The aim is to assess the condition of overhead lines by non-invasive means. The main problems that have been considered are the destruction of the towers, the cracks in porcelain insulators and broken conductor strands. Similar problems have also been found in overhead lines in other countries. Some of the monitoring equipment may include but not limited to the following diagnostic requirements:

- Damage to insulators;
- Conductor corrosion and vibration damage;
- Identification of problem symptoms;
- Transmission line corona;
- Gap Discharge;
- Contamination discharge;

Discussions with the KEGOC during the definitional mission also revealed that the need was not just for the procurement of diagnostic monitoring equipment but also for the education and training required for developing the state of the art inspection regime and in the use of the latest equipment and technologies. Therefore this project is being proposed as a combination of technical assistance.

Project Sponsor's Capabilities and Commitments

KEGOC is a large organization managing an operation that includes over 23,000 km of high tension transmission lines and substation capacity of over 33,699 MVA. KEGOC has already successfully managed several large investment projects for the expansion of the grid and has successfully worked with large financial institutions including the World Bank and the EBRD.

In 1999, the World Bank began disbursement of \$140 million in loans for a \$257 million "Electricity Transmission Rehabilitation Project." The five-year project was managed by KEGOC and includes refurbishment of 26 transmission substations, installation of shunt reactors at nine other substations, replacement of protective relaying and supply and installation of monitoring and control equipment at 63 substations, modernization of the dispatch control system, including supply and installation of SCADA and an Energy Management System (EMS) at the National Dispatch Center and several regional dispatch centers. It also included the reinforcement of the telecommunications system. Institutional development components included a new management information system (MIS) for KEGOC, assistance for corporate restructuring, procurement, and project management, and support for the creation of the country's wholesale spot market. The project ran from 2000-2004 and additional financing was provided by the European Bank for Reconstruction and Development (EBRD).

However, discussions with KEGOC and its staff provided the DM some insights as to the capabilities in this specific area of monitoring and diagnostic activities of a non-invasive nature for the transmission infrastructure. It became fairly clear that KEGOC would require some education and training if it were to fully appreciate the advances that have been made so far in the area of monitoring and diagnostics, in terms of techniques and technologies that are possible for use in this system. Thus the proposed feasibility study would necessarily need to include some education and training components in order to provide KEGOC with the tools needed for specifying and securing the necessary technology and equipment. The terms of reference therefore include not just a feasibility assessment for the equipment to be procured but also a series of seminars and training workshops and some assistance with preparing the procurement packages for the project.

The DM Contractor's meetings with KEGOC clearly indicated the commitment of the management and senior officials to completing these high priority projects as soon as possible. It was quite evident from the series of meetings held with KEGOC, that they would have to move ahead to complete the projects, albeit on a more delayed schedule, even if assistance from U.S. donors was not forthcoming. Discussions with other donors such as the World Bank and the EBRD also provided clear evidence that the project sponsors had been very responsive and committed in the implementation of past projects of these institutions.

Implementation Financing

The diagnostic, monitoring and remedial measures program could be financed through a separate financing package funded out of the general budget of KEGOC or other commercial or bank financing. However, discussions with the management of KEGOC, as well as with the Government, seemed to indicate that there is a high likelihood that KEGOC and the Government would approach the multilateral donor organizations such as the World Bank and the EBRD to provide the financing for this program. If KEGOC approaches the multilateral donors such as the World Bank or the EBRD, for the financing of its transmission projects, the financing of the diagnostic equipment and technology could well become a part of the overall project of the World Bank or the EBRD. The advantage of linking this would be the possibility of including, in addition to the hardware procurement, provisions for technical assistance funding as well. This technical assistance would be in addition to that which is to be provided under the USTDA grant and wouldn't cover the entire KEGOC organization and its preventative maintenance departments.

The multilateral financing would then most likely be complemented it by additional financing from commercial sources as well as guarantees from organizations such as OPIC, the Ex-Im Bank or perhaps Hermes. The Contractor's meetings and discussions with these organizations seem to confirm that there is interest in these organizations to support the projects in Kazakhstan. Thus, in preparing the terms of reference, the DM has taken into account the conditionalities and other requirements institutions such as these have for projects like these.

U.S. Export Potential

The estimate of U.S. export potential for a project of this nature and scope needs to take into account the competitive situation in the country. While U.S. companies do have a competitive advantage in the types of equipment that would be required for the project, it is the issue of unfair subsidies that foreign competitors might enjoy from their Government, which might create an uneven playing field for the U.S. supplier. However in order to fully understand the likely competitive scenario it is useful to take a closer look at the types of equipment and materials that are involved and which vendors have a competitive advantage in these areas.

Firstly, on the question of competitive procurement practices and policies, because the financing will most likely be provided by multilateral donors such as the World Bank and the EBRD, it is most likely that the project sponsor will follow the World Bank procurement policies which would ensure a fair and even competitive situation. But beyond procurement, one also needs to look at the type of equipment in which U.S. exporters would be most competitive. In most of the technologies and techniques for remote monitoring and diagnostics of transmission lines the U.S. is in a leadership position. Many of the U.S. firms in this market have in fact either developed the technologies that are in use today or are market leaders for these technologies. Thus it is quite likely, that given a free and open competition, the U.S. firms would be able to garner a major share of the available business for the type of equipment required.

The table below provides a brief outline of the types of equipment that would be needed and a rough estimate of the value of the procurement amounts for this type of equipment that KEGOC would need to plan for in order to fully implement its remote noninvasive diagnostic and monitoring program.

MONITORING, DIAGNOSTIC AND LIVE REMEDIAL EQUIPMENT AND SUPPLIES

| Type of Equipment | Examples | Estimated KEGOC Procurement | | Predicted US Export Sales (US\$ Millions) |
|--|---|-----------------------------|-----------------------------------|---|
| | | One Time (US\$ million) | Predicted US Market Share percent | |
| Transmission line monitoring equipment | Examples: ▪ Real time temperature monitoring and telemetering equipment; ▪ High Voltage Surge Arresters; | \$ 10.0 to \$ 20.0 | 70 | \$ 7-14.0 |
| Insulators Monitoring | Examples: ▪ Insulator Washing Equipment ▪ HV Insulator Coating | \$ 5.0 to \$ 10.0 | 60 | \$ 3-6.0 |
| Real Time Rating of Transmission Lines | Examples: ▪ Measuring equipment for wind speed, temperature, conductor sag, etc. ▪ Telemetering equipment. | \$ 15.00 to \$ 20.00 | 80 | \$ 12-24.0 |
| Transmission line Discharge monitoring equipment | Examples: ▪ Ultrasonic equipment ▪ Infrared Camera ▪ Audible noise meters. ▪ Field testing of insulators. ▪ Radio noise detection system, etc. | \$ 10.00 to \$ 15.00 | 80 | \$ 8-12.0 |
| Transmission line Towers foundation and steel structure monitoring | Examples: ▪ Foundation & Soil testing equipment; ▪ Invisible structural damage detection equipment, etc. | \$ 5.00 to \$ 7.00 | 50 | \$ 2.5-3.5 |
| Transmission line surveillance Transportation equipment | Examples: ▪ Transportation Trucks; ▪ Helicopters; etc. | \$ 20.00 | 50 | \$ 10.0 |
| | | | TOTAL | \$ 42.5 - 69.5 |

Note: Procurement cost will depend on the extent of application of KEGOC system. The cost figures given in this table is based on the minimum requirement to implement monitoring equipment in a utility system.

Foreign Competition and Market Entry Issues

As indicated by the market share figures in the table above, in the area of diagnostic and monitoring equipment for transmission and distribution, U.S. firms are likely to retain their comparative advantage in the foreseeable future. The primary reason for this is that most of the technology being used has been developed in the U.S. and also that the equipment and instrumentation is highly specialized and high value added, where the labor content in terms of value is far less than the technology value of the intellectual property content of the equipment. Also being specialized and often having to be customized for specific use, this equipment does not easily lend itself to high-volume mass production where many of the competitors to the U.S. in the area of manufacturers have an advantage. Even if these items are tendered as of part of the overall contract for the construction of the transmission lines, it is very likely that the Contractor would need to procure these items from U.S. manufacturers.

Development Impact

Infrastructure: The monitoring and diagnostic equipment will allow a more efficient deployment of the infrastructure, and more rapid response to problems and outages thereby making the availability of infrastructure services to the population more reliable.

Human Capacity Development: The monitoring and diagnostic equipment will require local linemen and other inspection personnel to become proficient in working with these sophisticated hardware and require the education and training, including on the job training, not only in terms of operating the equipment but also understanding some of the information technology that is involved. This will over time increase the human resource capabilities of the staff of KEGOG and ultimately in the utility industry in general.

Technology Transfer: The equipment being proposed has a certain level of sophistication. This would require not only the training and education to operate and work with the instrumentation and technology, but also the ability to troubleshoot and do the required repairs and maintenance when needed. Even though the suppliers may have a local presence for service and other issues, there would need to be some amount of technology transfer not only to the host country but also to neighboring and regional utilities that would, through interconnection and other means, be exposed to the technology and learn from it.

Productivity Improvements: According to an EBRD business environment survey, one of the key reasons for productivity losses in business and industry is the interruption and unreliability of utility services. As mentioned before, the monitoring and diagnostic equipment would increase the uptime of the system and result in a more efficient operation and reduced levels of technical losses. This would result in increased productivity of the system itself but also due to improved grade and level of service, improvements in productivity among the users of the utility services.

Market Oriented Reforms: The improved efficiency and responsiveness that would be the result of the use of the diagnostic and monitoring equipment in the grid would allow more accurate and flexible delivery of services and procurement of power to distributors and from generators. This additional flexibility in the system and the versatility that this would bring, would allow market oriented reforms in the system to be more easily implemented. Also the improvement in service levels to the users of the utility would increase their ability to compete and thereby strengthen market mechanisms and the various reform programs that the government may choose to introduce.

Environmental Impact

The additional flexibility and versatility of the utility system that may result from the use of the monitoring and diagnostic equipment, as mentioned above, would also allow and facilitate market entry for renewable energy producers, including small energy producers, to feed into the system. This increase in the proportion of renewable energy generation in the system would have a positive environmental impact. The real-time responsiveness and better management of the system through the use of diagnostic and monitoring equipment, would improve performance at the substation level and may have a significant impact on load and

other technical factor related damage to the environment, e.g., dioxin leakage due to overheating etc. This would also have a positive impact on the environment.

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 Technical Assistance 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 Technical Assistance 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

AMENDMENT NO. 1
TO
GRANT AGREEMENT
BETWEEN
THE U.S. TRADE AND DEVELOPMENT AGENCY
AND
KAZAKHSTAN ELECTRICITY GRID OPERATING COMPANY



Re: Monitoring and Diagnostic Systems Technical Assistance (2010-81028A)

The Grant Agreement, dated September 20, 2010, between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA"), and the Kazakhstan Electricity Grid Operating Company (KEGOC) ("Grantee") for Technical Assistance ("TA") on the Monitoring and Diagnostic Systems project is hereby amended as follows:

1. Terms of Reference

The full Terms of Reference for the Grant Agreement, including this Amendment No. 1, are set forth in Annex I hereto, which hereby replaces Annex I of the Grant Agreement in its entirety.

2. USTDA Funding

Under the existing Grant Agreement, USTDA agreed to provide a US\$392,436 grant for the TA. USTDA hereby agrees to provide the Grantee an additional US\$237,344 to fund the cost of goods and services required to perform the TA as amended. The total USTDA funding available to the Grantee for the TA is now US\$629,780.

3. Completion Date

The Completion Date in Article 8(A) and Mandatory Clause K(1) of the Grant Agreement is hereby extended to December 31, 2013. This is the date by which the parties estimate that the TA will have been completed.

4. Fiscal Data

All communication relating to the Grant Agreement and this Amendment No. 1, including all invoices, should include the following fiscal data:

Appropriation: 1109/141001
Activity No.: 2010-81028A
Reservation No.: 2012159
Grant No.: GH2010810012-799

Appropriation No.: 11X1001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 115/101001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 119/101001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

5. Grantee Address of Record

The address of record for the Grantee in Article 17 is hereby replaced with the following:

To: Kazakhstan Electricity Grid Operating Company (KEGOC) Joint-Stock Company
37 Beibitshilik St, Saryarka district,
010000 Astana
Republic of Kazakhstan
Phone: (7172) 31 95 22
Fax: (7172) 97 04 55

In all other respects and to the extent not amended by this Amendment No. 1, the terms of the Grant Agreement shall remain in full force and effect.

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IN WITNESS WHEREOF, the U.S. Trade and Development Agency and the Kazakhstan Electricity Grid Operating Company, 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 Agreement is signed in more than one language, the English language version shall govern.

**For the U.S. Trade and
Development Agency**

By: 

Date: 6/22/12

**For the Kazakhstan Electricity Grid
Operating Company**

By: 

Date: 22.06.2012



ANNEX I

TERMS OF REFERENCE

Objective

The objective of the TA is to assist the Grantee to evaluate the technical, economic, and financial feasibility of the implementation of transmission line monitoring and diagnostic equipment, as well as to provide workshops and guidelines for using such equipment in Kazakhstan. The TA will include developing a conceptual design for transmission line monitoring and diagnostic systems and preparation of bidding documents for the procurement of such systems. The Contractor shall carry out the technical assistance by completing the following tasks.

Please note that all initial data provided by the Grantee to the Contractor will be in the Russian language. Any translation of the initial data, if required, will be the responsibility of the Contractor. Any oral and written translations into Russian and English required for performance of the tasks listed below shall also be the responsibility of the Contractor. All deliverables to be submitted by the Contractor (reports, presentations, tender documents, etc.) shall be accompanied by translations in Russian.

Task 1: An Assessment of the Grantee's Present High Voltage Transmission Line Monitoring Equipment and Program

The Contractor shall carry out the following at the beginning of the assignment:

- The Contractor shall evaluate the existing situation related to the Grantee's high voltage transmission line condition monitoring equipment and program and determine the objectives and scope of work needed to develop a modern diagnostic monitoring program.
- The Contractor shall conduct a detailed review of existing diagnostic tools and equipment and Operation and Maintenance (O&M) practices by the Grantee for the high voltage (HV) lines.

In cooperation with the Grantee, the Contractor shall select at a minimum two HV transmission line areas for inspection that are representative of the types of lines and equipment in the Grantee's HV transmission line service area. The Contractor shall:

- Visit the selected HV transmission lines service areas (including, at a minimum, 10 kilometers of the transmission line right-of-way and one substation site, one relevant workshop, and if practical one construction site), and analyze at a minimum:
 - a. existing work methods;
 - b. tools and equipment used; and,
 - c. work planning, and repair and maintenance crew structures;

- Recommend the changes required for more efficient and reliable work performance based on an analysis of costs and benefits, taking into account local conditions and workers vocational education levels; and,
- Formulate and recommend the use of new diagnostic tools and equipment (as appropriate), staff pattern work planning and crew structure with minimum changes in the existing maintenance operations.

The Contractor shall adhere to local regulations applicable to the Grantee when formulating recommendations.

The Grantee will provide transport to the HV transmission lines service areas and guides with sufficient technical knowledge on those trips.

The Contractor shall discuss the findings and the recommendations with the Grantee, including making presentations to the Grantee, and incorporate the comments and other feedback provided by the Grantee as appropriate into the final Task 1 deliverable.

Deliverable; The report to the Grantee developed in Task 1 on the requirements to develop and implement a modern transmission line monitoring program.

Task 2: Provide Workshops/Seminars to Familiarize Grantee Personnel with the Available Technologies and Monitoring and Diagnostic Technologies and Equipment

Based on the present status of the Grantee's knowledge of modern diagnostic equipment for transmission lines, the Contractor shall organize four (4) Workshops/Seminars (including simultaneous Russian-English and English-Russian translation), each lasting at least one and a half days. The four Workshops/Seminars shall cover the following four areas in order to upgrade the Grantee personnel's knowledge and to lay the groundwork for the needs of the Grantee in relation to modern diagnostic and monitoring equipment and the recommended monitoring and diagnostic system design:

a) Transmission Lines Discharge Monitoring (Workshop 1)

High frequency partial discharges have been considered as a main symptom with many of the problems that have been investigated, which theoretically generate radio noise into the ultra-high frequency range and audible noise into the ultra-sonic regions. Above normal heat generation is another symptom. Thus all the sensing systems have focused on partial discharge levels and temperatures. The main detection techniques are summarized as follows:

1. Ultrasonic detection;
2. Measurement of corona pulse current inconsistency;
3. Partial discharge detector;
4. Infrared inspection of overhead transmission lines;
5. Radio noise detection system;
6. Solar-blind power line inspection system;

7. Corona current monitor for H.V. power lines;
8. Fiber optic applications to transmission line inspections;
9. Audible noise meters; and,
10. Field testing of insulators.

The Contractor shall discuss procedures of the above monitoring techniques that require mobilization by foot or ground or air vehicle, and involve human presence in the vicinity of the line. The Contractor shall emphasize safety considerations and that the dependency on the human senses and subjectivity of inspection or live-line maintenance crews, in the noisy and physically demanding environment, are serious limitations to take full advantage of all the available technologies. Also, the Contractor shall note that none of the above techniques can monitor the entire lines automatically and in real time by the installed detectors at the two ends of a line. The Contractor shall specify the most efficient method of transmission line monitoring.

b) Transmission Lines Insulator & Conductor Monitoring (Workshop 2)

The Contractor shall provide the latest knowledge and monitoring equipment used for condition assessment of insulators and line conductors. All insulators are affected to some extent by impact, thermal and mechanical cycling, ablation from weathering, acts of God and electro-thermal causes, flexure and torsion, ionic motion, and corrosion.

Transmission line conductors are the most important and the most expensive components of high voltage lines; they are, however, susceptible to aging. One of the main reasons limiting their lifetime is unavoidable wind induced *Aeolian* vibrations.

c) Estimation of Foundation Condition (Workshop 3)

The foundation is one of the most important components of overhead line through which the load of conductors, earth wires, towers and other elements is transmitted to the earth. With respect to the possible conditions, the Contractor shall explain how to classify the condition of foundations into three groups: excellent condition, needs repair, and needs replacement. An excellent condition is when there are no signs of degradation on the foundation.

The Contractor shall explain the possible reasons for the need for foundation repair or replacement are:

- Significant corrosion resulting in weak foundation strength, so the replacement or reinforcing of some of its parts is necessary;
- Mechanical damage of tower muff;
- Required additional protection of cement surface for the prevention against chemical or physical destruction; and,
- Passive/active cracks (causing/not causing significant changes in length and width for some time).

The Contractor shall provide advice to the Grantee on developing a program on foundation repair when a foundation's building strength becomes less than the design standard.

d) Condition Assessment of Ferro-concrete, Metal Tower Structures, and Anchorage Points of Towers (Workshop 4)

Towers are exposed to corrosion, resulting in concrete and steel damage. Chemical and electrochemical corrosion of these line components is one of the most significant problems.

The Contractor shall explain non-destructive diagnostic and monitoring techniques (acoustical, electromechanical, electromagnetic, ultrasonic and others) to monitor the condition of ferro-concrete and metal tower structures, and anchorage points of towers.

Deliverable: The Contractor shall write and deliver to the Grantee a report with all presentation materials and the results of the work in Task 2.

Task 3: Develop Non-Invasive Monitoring and Inspection Guidelines

The Contractor shall prepare for the Grantee a list of non-invasive transmission line condition monitoring guidelines for the insulators and conductors, icing and lightning overvoltage, ferro-concrete and metal tower structures, and anchorage points of towers. Porcelain and toughened glass, and more recently polymeric insulators, all have characteristic degradation and pollution modes that must be considered by asset managers of the Grantee. As the electrical applied to a suspension insulator string is not uniform with the highest stress occurring close to the live conductor, the Grantee must have proper tools and equipment to monitor the following conditions:

- Destruction of ferro-concrete towers, corrosion of metal parts of towers and foundations: loss of mechanical strength that results in towers falling over;
- Porcelain Micro-Cracking: porcelain material and component manufacturing imperfections including voids can lead to the formation and growth of micro-cracks in the porcelain;
- Glass Insulator Degradation: loss of mechanical strength through pin corrosion also limits the service life of glass insulator strings;
- Polymeric Insulator Degradation: polymeric insulators have been reported with a range of failure modes; and,
- Insulator Pollution: in damp conditions a partially conducting layer of pollution on an insulator surface can increase surface leakage currents and cause surface heating and dry-band arcs.

In addition the Contractor shall discuss with the Grantee the following non-invasive guidelines for monitoring of insulators and transmission line towers with appropriate equipment:

- Use of a hand held weather station to ensure conditions are suitable and record the temperature, wind speed and relative humidity;

- Use of a video recorder to capture the video output of the corona and infrared camera; and,
- Recording of the tower identification and physical arrangement in a standard manner to ensure correct identification by field groups.

The Contractor shall develop recommendations for on-the-job training for non-invasive transmission line condition monitoring diagnostic tools and equipment operation and maintenance practices.

Deliverable: Based on above information and the Grantee's desire for upgrading its institutional capability for transmission line monitoring program, the Contractor shall develop a list of equipment, cost estimates, benefits, training recommendations and technical specifications for procurement purposes.

Task 4: Develop Technical Specifications of Selected Monitoring Equipment

The Contractor shall work with the Grantee's engineers to determine the application and recommended technical specifications of the following types of transmission line monitoring equipment:

PRODUCT: Real-time Temperature Monitoring System for Electric Transmission Lines

The Contractor shall consider in the analysis and application of this product that overhead high-voltage transmission lines are the arteries of the electric power system, and their running states directly decide the safety and benefits of the electric power system. The contact point breaking is one of the usual faults existing on the overhead electric transmission lines.

The Contractor shall consider in the analysis that real-time temperature monitoring systems for electric transmission lines are important because of the following:

- the mechanical connection parts of the connection electric power fittings such as double-line yoke plate (parallel cable clamp), strain clamp and connecting pipe in high voltage transmission lines often have many thermal defects because of oxidation corrosion, loose connection or bad fixing quality;
- when the power transmission lines run, the temperature of these parts will rise, and the aging of these parts will be speeded up, and the contact resistances will further increase, and finally the lines will be broken;
- The aging of the contact points of the lines should be monitored online and system operators warned at any moment regarding thermal defects in the electric power fittings; and,
- Implementing real-time temperature monitoring systems help with implementing repairs, predicting and preventing power breaking accidents, and ensuring the safe and stable running of the power transmission lines.

PRODUCT: High Voltage Surge Arrester

The Contractor shall consider the following in the analysis and application of high voltage surge arresters:

- high voltage surge arresters are used in order to protect other power equipment from dangerous over-voltages;
- high voltage surge arresters are employed in the most exposed location;
- under extreme adverse conditions, arresters may be overstressed;
- arresters are designed to fail safely and thus protect the other equipment even during such an event;
- both the porcelain-housed and polymer-housed designs are tested according to the stringent criteria of IEC standard 60099-4 for safe short-circuit capability;
- in a typical substation, the cost of providing adequate over-voltage protection using arresters is a very small fraction of the cost of the substation; and,
- proper selection and placement of arresters permits a reduction in the insulation withstand strength of the major equipment in a station, which can have a significant impact on reducing the overall cost of the station, making an attractive investment for both short-term and long-term profitability.

PRODUCT: Insulator Washing System

The Contractor shall consider the following in the analysis and application of insulator washing systems:

- Highly effective insulator washing systems capable of removing all persistent contamination give the surface a nice original porcelain or glass gloss;
- They are specially suited for hot line washing and are reliable with practically no chance of line to ground flashover;
- The advantages of the system consist of the disruptive effect of the treated inorganic soft particles and the proximity of the washing system, as compared to other water systems placed several meters apart;
- Energized or De-energized insulator cleaning services can cover the following:
 - High Voltage Substation Insulators (up to 500KV);
 - Transmission Towers (any type- up to 500KV);
 - Application of RTV High Voltage Insulator Coating;
 - Application of Customer Preferred Silicone/RTV Coatings to Insulators;
 - Infra Red Scanning; and,
 - Cubicle Cleaning;
- Utility industry experts recommend the application of an insulator coating product to areas where high contamination and/or corrosion will occur to prevent leakage current and flashover to all porcelain insulators; and,

- The following coating products are typically recommended:
 - High Voltage Silicone Grease Compound;
 - High Voltage Room Temperature Vulcanizing (RTV) Products;
 - High Voltage CSL Products; and,
 - High Voltage Sylgard.

PRODUCT: Real-time ratings of transmission lines

The Contractor shall consider the following in the analysis and application of real-time ratings of transmission lines:

- special devices can measure the real time tension in transmission lines, ambient temperature and wind speed, or conductor sag;
- the results of the measurements are telemetered to the control center, which then adjusts the line rating accordingly; and,
- the drawback with this technology is the high cost relative to the incremental potential increase in capacity.

PRODUCT: Methods of condition assessment of ferro-concrete, metal towers and anchorage points of towers.

The Contractor shall consider in the analysis that chemical and electro-chemical corrosion of ferro-concrete, metal towers and anchorage points of towers is one of the most significant problems facing the Grantee. The Contractor shall consider equipment, methods and products that have been developed for diagnostic monitoring of this problem, and particularly for anchorage points of towers.

In each of the five subtasks above, the Contractor will work together with Grantee personnel to develop local capacity and provide live demonstrations and computations on site where applicable and useful from a training point of view.

Deliverable: The Contractor shall prepare technical specifications for each type of monitoring product in this Task based on the following tentative criteria:

- a) Precise use of the equipment and cost;
- b) List of US Suppliers;
- c) Annual estimated hourly use of the equipment;
- d) Alternative mode of performing the monitoring task, if any;
- e) Requirement for on-line inspection;
- f) Requirements to the quantity of transmission condition for utility operation;
- g) Response time of main protection systems;
- h) Lifetime and operating period of the equipment;
- i) Impact on scheduled and forced outage of the equipment;
- j) Overall reliability during the first and subsequent years;

- k) Specific requirements;
- l) Climatic conditions on the site;
- m) Topographical survey;
- n) Testing requirements; and,
- o) Technical requirements for concurrent operation.

Task 5: Cost Estimating

The Contractor shall estimate the monitoring equipment all-in cost for the Project implementation developed in Tasks 3 and 4. Wherever possible and reasonable, the Contractor will verify estimates through actual request for quotations from US suppliers. The Contractor shall be responsible for recommending the least-cost capital investment plan associated with the implementation plan developed.

The estimate shall include the cost of materials, labor, logistics and contingencies for full implementation. The Grantee shall provide any existing cost estimates based on previous pilot projects. These estimates, if available, shall be independently assessed and verified by the Contractor. The Contractor shall also assess any additional cost which may arise due to the need for labor retraining, and pension payments for labor loss due to program implementation.

Deliverable: The Contractor shall provide a detailed least-cost investment plan for monitoring equipment.

Task 6: Economic Analysis

The Contractor shall conduct an economic analysis for the implementation plan developed in Task 4 and the capital estimate developed in Task 5. Both the cost estimate and the implementation plan may need to be revised based on the conclusions of the economic analysis conducted under this Task.

The Contractor shall prepare an analysis that will result in a set of profitability indicators, such as Net Present Value (NPV), Internal Rate of Return (IRR), payback period, and others as applicable. The Contractor shall conduct an economic sensitivity analysis of each implementation plan component reflecting variations in interest rates, electricity tariffs, volumes, and equipment costs.

The Contractor shall conduct and provide a pro-forma assessment of tariffs increase required (if any) for the sustainability of the Project.

Deliverable: The Contractor shall provide an economic analysis with the sensitivity analyses performed as stated above.

Task 7: Financing Mechanism Analysis

The Contractor shall provide a detailed analysis of various financing mechanisms that could be applied for the implementation of these monitoring and diagnostic systems. The Contractor shall evaluate the willingness of multi-lateral banks (European Bank for

Reconstruction and Development -EBRD, Asian Development Bank -ADB, and the World Bank) and the Export-Import Bank of the United States to fund the Project.

The Contractor shall discuss the Project with a number of regional and multi-lateral funding organizations such as the World Bank, the Asian Development Bank, EBRD and the Export-Import Bank of the United States to gain a better understanding of their interest in funding part or the entire implementation program.

Deliverable: The Contractor shall prepare a financing option report and analysis.

Task 8: Preparation of Bidding Documents

The Contractor shall prepare tender documents to solicit bids from the suppliers of transmission line monitoring and diagnostic equipment. The Contractor shall ensure that tender documents are consistent with the requirements of the funding agency, if any, for the monitoring and diagnostic systems. Under this task, scope of services of the Contractor will include the following tasks:

- i) Prepare functional specifications for all equipment to be tendered. These should include functional capacity for measurement under various environmental conditions;
- ii) Define the operational requirement of the equipment;
- iii) Define the type of operation desired for the transmission line and substation;
- iv) Describe the procedures to be used in evaluating the bids and award the contract;
- v) Propose the arbitration procedure to be used to settle differences;
- vi) Propose modalities for imposing penalties to be paid by the equipment supplier for non-performance; and,
- vii) Prepare and include in the tender documents, *pro forma* drafts of the various agreements required, including bid bond, performance bond, etc.

Deliverable: The Contractor shall provide the tender documents developed in this Task to the Grantee.

Task 9: Preliminary Environmental Impact Assessment

The Contractor shall review the Project with respect to all three major lending agencies' (EBRD, World Bank, and ADB) environmental requirements and local requirements based on the following three categories:

Category A: "Diverse and significant potential environmental impact requiring an environmental assessment."

Category B: "Significant potential impact which can be readily identified and quantified and, for which, remedial, measures can be prescribed without much difficulty."

Category C: "Insignificant potential impact not requiring environmental assessment."

This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment in anticipation of the Project moving forward to the implementation stage.

The Contractor shall carry out, and the Grantee will support, any field trips and inspections needed to prepare a baseline assessment of the environmental impact of existing *in situ* conditions and prepare the incremental environmental assessment relative to this baseline preliminary environmental impact assessment.

The Contractor shall consider, at a minimum, the following areas for potential environmental impacts (both positive and negative) of the Project:

- System-wide changes
 - HV lines maintenance, rehabilitation and upgrade work practices;
 - Access to the right-of-way;
 - Level of vehicular traffic for the line inspection;
- Environmental effects on communities adjacent to HV lines, if any; and,
- Institutional Strengthening and Capacity development
 - Efficiency and management capacity of the HV lines O&M practices.

Deliverable: The contractor shall prepare a preliminary environmental impact assessment.

Task 10: Host Country Development Impact Assessment

The Contractor shall also provide a report on the developmental impacts of the Project in Kazakhstan. While specific attention should be paid to the immediate impact of the Project, the Contractor shall include, where appropriate, any additional developmental benefits of the Project, including bulk power market development in the Central Asia region and seasonal power transaction with the neighboring countries, particularly hydro power capacity transfer to Kazakhstan from Kyrgyzstan. The analysis of potential benefits of the TA should be as concrete and detailed as possible. The Contractor shall provide estimates of the Project's potential benefits in the following areas:

- Incremental and decremented power costs saving due to the Project;
- Infrastructure: A brief synopsis statement on the infrastructure impact, including at a minimum the new transmission capacity available due to the Project, and estimates in terms of reduced line losses.
- Market-Oriented Reform: A description of any regulations, laws, or institutional changes that are recommended and the effect they would have if implemented.
- Human Capacity Building: A description of the number and type of positions that would be needed to construct and operate the Project. The Contractor shall also describe any training that would be required.
- Technology Transfer and Productivity Enhancement: A description of any

advanced technologies that will be implemented as a result of the Project. A description of any efficiency that will be gained (e.g. productivity gains, savings in transmission costs or lower production costs). For example, productivity gains should be estimated in terms of reduced maintenance man-hours or longer life of existing infrastructure.

- Other: Any other developmental benefits to the Project, such as a reduction in the need for new transmission lines due to decreased line losses.

Deliverable: The Contractor shall provide a preliminary developmental impact assessment with regard to the Host Country.

Task 11: Legal, Regulatory, and Institutional Review

The Contractor shall review the host country laws, permitting requirements, local building requirements and ordinance constraints that need to be taken into account before the Project can be implemented, including RD 153-34 PK.3-20.670-02 (PД 153-34 PK.3-20.670-02) "Guidelines for evaluation of technical state of 35-1150 KV overhead transmission lines and their components". Limits on U.S. company participation in Project implementation shall be clearly identified and conveyed to the Grantee.

Deliverable: The Contractor shall provide a legal and regulatory analysis in the Final Report.

Task 12: Final Report Preparation and Presentation

The Contractor shall prepare and deliver to the Grantee a substantive and comprehensive draft Final Report in Russian and English of all work performed under these Terms of Reference in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA's Mandatory Contract Clauses) and shall present its findings to the Grantee. The Draft Final Report shall be submitted to the Grantee as follows: one hard copy in English and three hard copies in Russian, one copy in Russian on electronic media and one copy in English on electronic media. It is expected that the Grantee will issue comments with regard to the Draft Final Report within four weeks.

Once the Grantee has provided comments and approved revisions to the draft Final Report, the Contractor shall prepare and deliver to the Grantee the Final Report as follows: one hard copy in English and three hard copies in Russian, one copy in Russian on electronic media and one copy in English on electronic media. The Contractor shall prepare and submit the Final Report to USTDA in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA's Mandatory Contract Clauses). The Final Report shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall incorporate all of the findings, recommendations, and conclusions of the Study and shall incorporate all other documents and/or reports provided pursuant to the Tasks of this Terms of Reference. It is the Contractor's responsibility to identify prospective U.S. Sources of Supply in the Final Report to be submitted to USTDA and the Grantee in accordance with Clause I of Annex II of the

Grant Agreement. The U.S. Sources of Supply list shall identify the capabilities, addresses, and principal points of contact for each of the suppliers.

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.**

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 Kazakhstan Electricity Grid Operating Company ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Agreement US\$392,436 ("USTDA Grant") to fund the cost of goods and services required for technical assistance ("TA") on the proposed Monitoring and Diagnostic Systems project ("Project") in Kazakhstan ("Host Country").

1. USTDA Funding

The funding to be provided under this Grant Agreement shall be used to fund the costs of a contract between the Grantee and the U.S. firm selected by the Grantee ("Contractor") under which the Contractor will perform the TA ("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 TA ("Terms of Reference") are attached as Annex I and are hereby made a part of this Grant Agreement. The TA will examine the technical, financial, environmental, and other critical aspects of the proposed Project. The Terms of Reference for the TA 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 TA.

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.

The Grantee shall not be responsible for the payment to the Contractor from the Grantee's own funds for work performed under the Contract in accordance with this Grant Agreement.

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 TA. Upon approval of this selection by USTDA, the Grantee and the Contractor shall then enter into a contract for performance of the TA. The Grantee shall notify in writing the U.S. firms that submitted unsuccessful proposals to perform the TA 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 TA. 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 TA 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 TA 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. TA Schedule

(A) TA Completion Date

The completion date for the TA, which is December 31, 2011, is the date by which the parties estimate that the TA will have been completed.

(B) Time Limitation on Disbursement of USTDA Grant Funds

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

9. USTDA Mandatory Clauses

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

10. Use of U.S. Carriers

(A) Air

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

(B) Marine

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

11. Nationality, Source and Origin

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and services funded by USTDA under the Grant Agreement: (a) for professional services, the Contractor must be either a U.S. firm or U.S. individual; (b) the Contractor may use U.S. subcontractors without limitation, but the use of subcontractors from Host Country may not exceed twenty percent (20%) of the USTDA Grant amount and may only be used for specific services from the Terms of Reference identified in the subcontract; (c) employees of U.S. Contractor or U.S. subcontractor firms responsible for professional services shall be U.S. citizens or non-U.S. citizens lawfully admitted for permanent residence in the U.S.; (d) goods purchased for performance of the TA 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 TA 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 I 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 TA, 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 TA 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 TA 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 Managing Director. The parties hereto may, by written notice, designate additional representatives for all purposes under the Grant Agreement.

17. Addresses of Record for Parties

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

To: Mr. Vladimir G. Ossochenko
Managing Director for National Power Grid Development
Kazakhstan Electricity Grid Operating Company
Joint Stock Company
37, Beibitshilik St., Saryarka District
Astana 01000, Republic of Kazakhstan

Phone: (7172) 31 95 22
Fax: (7172) 97 04 55
Email: ossochenko@kegoc.kz

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.: 11X1001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 115/101001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 119/101001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

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

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IN WITNESS WHEREOF, the Government of the United States of America and Kazakhstan Electricity Grid Operating Company, 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

For Kazakhstan Electricity Grid
Operating Company

By: 

By: 

Date: September 20,
2010

Date: 

Witnessed:
By: 

Witnessed:
By: 

Annex I -- Terms of Reference

Annex II -- USTDA Mandatory Clauses

Annex I

TERMS OF REFERENCE

Objective

The objective of the TA is to assist the Grantee to evaluate the technical, economic, and financial feasibility of the implementation of transmission line monitoring and diagnostic equipment, as well as to provide workshops and guidelines for using such equipment in Kazakhstan. The TA will include developing a conceptual design for transmission line monitoring and diagnostic systems and preparation of bidding documents for the procurement of such systems. The Contractor shall carry out the technical assistance by completing the following tasks.

Task 1: An Assessment of the Grantee's Present High Voltage Transmission Line Monitoring Equipment and Program

The Contractor shall carry out the following at beginning of the assignment:

- The Contractor shall evaluate the existing situation related to the Grantee's high voltage transmission line condition monitoring equipment and program and determine the objectives and scope of work needed to develop a modern diagnostic monitoring program.
- Submit a detailed report to the Grantee on the requirements to develop and implement a modern transmission line monitoring program taking into consideration all related applications and needs, including but not limited to equipment, training, budget, rules and procedures, etc.

Deliverable: The report to the Grantee developed in Task 1 on the requirements to develop and implement a modern transmission line monitoring program.

Task 2: Provide Workshops/Seminars to Familiarize Grantee Personnel with the Available Technologies and Monitoring and Diagnostic Technologies and Equipment

Based on the present status of the Grantee's knowledge of modern diagnostic equipment for transmission lines, the Contractor shall organize four (4) one-day Workshops/Seminars, one each in the following four areas, in order to upgrade the Grantee personnel's knowledge and to lay the groundwork for the needs of the Grantee in relation to modern diagnostic and monitoring equipment and the recommended monitoring and diagnostic system design:

a) Transmission Lines Discharge Monitoring (Day 1)

High frequency partial discharges have been considered as a main symptom with many of the problems that have been investigated, which theoretically generate radio noise into the ultra-high frequency range and audible noise into the ultra-sonic regions. Above normal heat generation is another symptom. Thus all the sensing systems have focused on partial discharge levels and temperatures. The main detection techniques are summarized as follows:

1. Ultrasonic detection;
2. Measurement of corona pulse current inconsistency;
3. Partial discharge detector;
4. Infrared inspection of overhead transmission lines;
5. Radio noise detection system;
6. Solar-blind power line inspection system;
7. Corona current monitor for H.V. power lines;
8. Fiber optic applications to transmission line inspections;
9. Audible noise meters; and,
10. Field testing of insulators.

The Contractor shall discuss procedures of the above monitoring techniques that require mobilization by foot, ground vehicle, wire tracking vehicle or air vehicle, and involve human presence in the vicinity of the line. The Contractor shall emphasize safety considerations and that the dependency on the human senses and subjectivity of inspection or live-line maintenance crews, in the noisy and physically demanding environment, are serious limitations to take full advantage of all the available technologies. Also, the Contractor shall note that none of the above techniques can monitor the entire lines automatically and in real time by the installed detectors at the two ends of a line. The Contractor shall convey that the most efficient method of inspecting a transmission line to date has been by aerial inspection, particularly using a helicopter (because helicopters have hovering capability, which is an advantage whenever a problem is located and a second look or closer investigation is desired).

b) Transmission Lines Insulator & Conductor Monitoring (Day 2)

The Contractor shall provide the latest knowledge and monitoring equipment used for condition assessment of insulators and line conductors. All insulators are affected to some extent by impact, thermal and mechanical cycling, ablation from weathering, acts of God and electro-thermal causes, flexure and torsion, ionic motion, corrosion and cement growth.

Transmission line conductors are the most important and the most expensive components of high voltage lines; they are, however, susceptible to ageing. One of the main reasons limiting their lifetime is unavoidable wind induced *Aeolian* vibrations.

c) Estimation of Foundation Condition (Day 3)

The foundation is one of the most important components of overhead line through which the load of conductors, earth wires, towers and other elements is transmitted to the earth. With respect to the possible conditions, the Contractor shall explain how to classify the condition of foundations into four groups: excellent condition, needs refurbishment, needs upgrading and needs replacement. An excellent condition is when there are no signs of degradation on the foundation.

The Contractor shall explain the possible reasons for the need for foundation refurbishment are:

- Significant corrosion resulting in weak foundation strength, so the replacement or reinforcing of some of its parts is necessary;
- Mechanical damage of tower muff;
- Required additional protection of cement surface for the prevention against chemical or physical destruction; and,
- Passive/active cracks (causing/not causing significant changes in length and width for some time).

The Contractor shall provide advice to the Grantee on developing a program on foundation upgrading when a foundation's building strength becomes less than the design standard.

d) Condition Assessment of Ferro-concrete, Metal Tower Structures, and Anchorage Points of Towers (Day 4)

Towers are exposed to corrosion, resulting in concrete and steel damage. Chemical and electrochemical corrosion of these line components is one of the most significant problems.

The Contractor shall explain non-destructive diagnostic and monitoring techniques (acoustical, electromechanical, electromagnetic, ultrasonic and others) to monitor the condition of ferro-concrete and metal tower structures, and anchorage points of towers.

Deliverable: The Contractor shall write and deliver to the Grantee a report with all presentation materials and the results of the work in Task 2.

Task 3: Develop Non-Invasive Monitoring and Inspection Guidelines

The Contractor shall prepare for the Grantee a list of non-invasive transmission line condition monitoring guidelines for the insulators and conductors, icing and lightning overvoltage, ferro-concrete and metal tower structures, and anchorage points of towers. Porcelain and toughened glass and more recently polymetric insulators all have characteristic degradation and pollution modes that must be considered by asset managers of the Grantee. As the electrical applied to a suspension insulator string is not uniform with the highest stress occurring close to the live conductor, the Grantee must have proper tools and equipment to monitor the following conditions:

- Destruction of ferro-concrete towers, corrosion of metal parts of towers and foundations: loss of mechanical strength that results in towers falling over;
- Porcelain Micro-Cracking: porcelain material and component manufacturing imperfections including voids can lead to the formation and growth of micro-cracks in the porcelain;
- Glass Insulator Degradation: loss of mechanical strength through pin corrosion also limits the mechanical life of glass insulator strings;
- Non-ceramic Insulator Degradation: polymetric insulators have been reported with a range of failure modes; and,
- Insulator Pollution: in damp conditions a partially conducting layer of pollution on an insulator surface can increase surface leakage currents and cause surface heating and dry-band arcs.

In addition the Contractor shall discuss with the Grantee the following non-invasive guidelines for monitoring transmission tower insulators with appropriate equipment:

- Use of a hand held weather station to ensure conditions are suitable and record the temperature, wind speed and relative humidity;
- Use of a video recorder to capture the video output of the corona and infrared camera; and,
- Recording of the tower identification and physical arrangement in a standard manner to ensure correct identification by field groups.

Deliverable: Based on above information and the Grantee's desire for upgrading its institutional capability for transmission line monitoring program, the Contractor shall develop a list of equipment, cost estimates, benefits, and technical specifications for procurement.

Task 4: Develop Technical Specifications of Selected Monitoring Equipment

The Contractor shall work with the Grantee's engineers to determine the application and recommended technical specifications of the following types of transmission line monitoring equipment:

PRODUCT: Real-time Temperature Monitoring System for Electric Transmission Lines

The Contractor shall consider in the analysis and application of this product that overhead high-voltage transmission lines are the arteries of the electric power system, and their running states directly decide the safety and benefits of the electric power system. The contact point breaking is one of the usual faults existing on the overhead electric transmission lines.

The Contractor shall consider in the analysis that real-time temperature monitoring systems for electric transmission lines are important because of the following:

- the mechanical connection parts of the connection electric power fittings such as double-line yoke plate (parallel cable clamp), strain clamp and connecting pipe in high voltage transmission lines often have many thermal defects because of oxidation corrosion, loose connection or bad fixing quality;
- when the power transmission lines run, the temperature of these parts will rise, and the aging of these parts will be speeded up, and the contact resistances will further increase, and finally the lines will be broken;
- The aging of the contact points of the lines should be monitored online and system operators warned at any moment regarding thermal defects in the electric power fittings; and,
- Implementing real-time temperature monitoring systems help with implementing state overhauls, predicting and preventing power breaking accidents, and ensuring the safe and stable running of the power transmission lines.

PRODUCT: High Voltage Surge Arrester

The Contractor shall consider the following in the analysis and application of high voltage surge arresters:

- high voltage surge arresters are used in order to protect other power equipment from dangerous over-voltages;
- high voltage surge arresters are employed in the most exposed location;
- under extreme adverse conditions, arresters may be overstressed;
- arresters are designed to fail safely and thus protect the other equipment even during such an event;
- both the porcelain-housed and polymer-housed designs are tested according to the stringent criteria of IEC standard 60099-4 for safe short-circuit capability;
- in a typical substation, the cost of providing adequate over-voltage protection using arresters is a very small fraction of the cost of the substation; and,
- proper selection and placement of arresters permits a reduction in the insulation withstand strength of the major equipment in a station, which can have a significant impact on reducing the overall cost of the station, making an attractive investment for both short-term and long-term profitability.

PRODUCT: Insulator Washing System

The Contractor shall consider the following in the analysis and application of insulator washing systems:

- Highly effective insulator washing systems capable of removing all adhered contamination give the surface a nice original porcelain or glass gloss;
- They are specially suited for hot line washing and are reliable with practically no chance of line to ground flashover;
- The advantages of the system consist of the disruptive effect of the treated inorganic soft particles and the proximity of the washing system, as compared to other water systems placed several meters apart;
- Energized or De-energized insulator cleaning services can cover the following:
 - High Voltage Substation Insulators (up to 500KV);
 - Transmission Towers (any type- up to 500KV);
 - Application of RTV High Voltage Insulator Coating;
 - Application of Customer Preferred Silicone/RTV Coatings to Insulators;
 - Infra Red Scanning; and,
 - Cubicle Cleaning;
- Utility industry experts recommend the application of an insulator coating product to areas where high contamination and/or corrosion will occur to prevent leakage current and flashover to all porcelain insulators; and,
- The following coating products are typically recommended:
 - High Voltage Silicone Grease Compound;
 - High Voltage Room Temperature Vulcanizing (RTV) Products;
 - High Voltage CSL Products; and,
 - High Voltage Sylgard.

PRODUCT: Real-time ratings of transmission lines

The Contractor shall consider the following in the analysis and application of real-time ratings of transmission lines:

- special devices can measure the real time tension in transmission lines, ambient temperature and wind speed, or cable sag;
- the results of the measurements are telemetered to the control center, which then adjusts the line rating accordingly; and,
- the drawback with this technology is the high cost relative to the incremental potential increase in capacity.

PRODUCT: Methods of condition assessment of ferro-concrete, metal towers and anchorage points of towers.

The Contractor shall consider in the analysis that chemical and electro-chemical corrosion of ferro-concrete, metal towers and anchorage points of towers is one of the most significant problems facing the Grantee. The Contractor shall consider equipment, methods and products that have been developed for diagnostic monitoring of this problem, and particularly for anchorage points of towers.

Deliverable: The Contractor shall prepare technical specifications for each type of monitoring product in this Task based on the following tentative criteria:

- a) Precise use of the equipment and cost;
- b) List of US Suppliers;
- c) Annual estimated hourly use of the equipment;
- d) Alternative mode of performing the monitoring task, if any;
- e) Requirement for on-line inspection;
- f) Requirements to the quantity of transmission condition for utility operation;
- g) Response time of main protection systems;
- h) Lifetime and operating period of the equipment;
- i) Impact on scheduled and forced outage of the equipment;
- j) Overall reliability during the first and subsequent years;
- k) Specific requirements;
- l) Climatic conditions on the site;
- m) Topographical survey;
- n) Testing requirements; and,
- o) Technical requirements for concurrent operation.

Task 5: Cost Estimating

The Contractor shall estimate the monitoring equipment all-in cost for the Project implementation developed in Tasks 3 and 4. The Contractor shall be responsible for recommending the least-cost capital investment plan associated with the implementation plan developed.

The estimate shall include the cost of materials, labor, logistics and contingencies for full implementation. The Grantee shall provide any existing cost estimates based on previous pilot projects. These estimates, if available, shall be independently assessed and verified by the Contractor. The Contractor shall also assess any additional cost which may arise due to the need for labor retraining, and pension payments for labor loss due to program implementation.

Deliverable: The Contractor shall provide a detailed least-cost investment plan for monitoring equipment.

Task 6: Economic Analysis

The Contractor shall conduct an economic analysis for the implementation plan developed in Task 4 and the capital estimate developed in Task 5. Both the cost estimate and the implementation plan may need to be revised based on the conclusions of the economic analysis conducted under this Task.

The Contractor shall prepare an analysis that will result in a set of profitability indicators, such as Net Present Value (NPV), Internal Rate of Return (IRR), payback period, and others as applicable. The Contractor shall conduct an economic sensitivity analysis of each implementation plan component reflecting variations in interest rates, electricity tariffs, volumes, and equipment costs.

The Contractor shall conduct and provide a pro-forma assessment of tariffs increase required (if any) for the sustainability of the Project.

Deliverable: The Contractor shall provide an economic analysis with the sensitivity analyses performed as stated above.

Task 7: Financing Mechanism Analysis

The Contractor shall provide a detailed analysis of various financing mechanisms that could be applied for the implementation of these monitoring and diagnostic systems. The Contractor shall evaluate the willingness of multi-lateral banks (European Bank for Reconstruction and Development -EBRD, Asian Development Bank -ADB, and the World Bank) and the Export-Import Bank of the United States to fund the Project.

The Contractor shall discuss the Project with a number of regional and multilateral funding organizations such as the World Bank, the Asian Development Bank, EBRD and the Export-Import Bank of the United States to gain a better understanding of their interest in funding part or the entire implementation program.

Deliverable: The Contractor shall prepare a financing option report and analysis.

Task 8: Preparation of Bidding Documents

The Contractor shall prepare tender documents to solicit bids from the suppliers of transmission line monitoring and diagnostic equipment. Under this task, scope of services of the Contractor will include the following tasks:

- i) Prepare functional specifications for all equipment to be tendered. These should include functional capacity for measurement under various environmental conditions;
- ii) Define the operational requirement of the equipment;
- iii) Define the type of operation desired for the transmission line and substation;
- iv) Describe the procedures to be used in evaluating the bids and award the contract;

- v) Propose the arbitration procedure to be used to settle differences;
- vi) Propose modalities for imposing penalties to be paid by the equipment supplier for non-performance; and,
- vii) Prepare and include in the tender documents, pro forma drafts of the various agreements required, including bid bond, performance bond, etc.

Deliverable: The Contractor shall provide the tender documents developed in this Task to the Grantee.

Task 9: Preliminary Environmental Impact Assessment

The Contractor shall review the Project with respect to all three major lending agencies' (EBRD, World Bank, and ADB) environmental requirements and local requirements based on the following three categories:

Category A: "Diverse and significant potential environmental impact requiring an environmental assessment".

Category B: "Significant potential impact which can be readily identified and quantified and, for which, remedial, measures can be prescribed without much difficulty".

Category C: "Insignificant potential impact not requiring environmental assessment".

This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment in anticipation of the Project moving forward to the implementation stage.

Deliverable: The contractor shall prepare a preliminary environmental impact assessment.

Task 10. Host Country Development Impact Assessment

The Contractor shall also provide a report on the developmental impacts of the Project in Kazakhstan. While specific attention should be paid to the immediate impact of the Project, the Contractor shall include, where appropriate, any additional developmental benefits of the Project, including bulk power market development in the Central Asia region and seasonal power transaction with the neighboring countries, particularly hydro power capacity transfer to Kazakhstan from Kyrgyzstan. The analysis of potential benefits of the TA should be as concrete and detailed as possible. The Contractor shall provide estimates of the Project's potential benefits in the following areas:

- Incremental and decremented power costs saving due to the Project;
- Infrastructure: A brief synopsis statement on the infrastructure impact, including at a minimum the new transmission capacity available due to the Project, and estimates in terms of reduced line losses.

- **Market-Oriented Reform:** A description of any regulations, laws, or institutional changes that are recommended and the effect they would have if implemented.
- **Human Capacity Building:** A description of the number and type of positions that would be needed to construct and operate the Project. The Contractor shall also describe any training that would be required.
- **Technology Transfer and Productivity Enhancement:** A description of any advanced technologies that will be implemented as a result of the Project. A description of any efficiency that will be gained (e.g. productivity gains, savings in transmission costs or lower production costs). For example productivity gains should be estimated in terms of reduced maintenance man-hours or longer life of existing infrastructure.
- **Other:** any other developmental benefits to the Project, reduction in the need for new transmission lines due to reduced line losses.

Deliverable: The Contractor shall provide a preliminary developmental impact assessment.

Task 11: Legal, Regulatory, and Institutional Review

The Contractor shall review the host country laws, permitting requirements, local building requirements and ordinance constraints that need to be taken into account before the Project can be implemented, including RD 153-34 PK.3-20.670-02 (PDI 153-34 PK.3-20.670-02) "Guidelines for evaluation of technical state of 35-1150 KV overhead transmission lines and their components". Limits on U.S. company participation in Project implementation shall be clearly identified and conveyed to the Grantee.

Deliverable: The Contractor shall provide a legal and regulatory analysis in the Final Report.

Task 12 –Final Report Preparation and Presentation

The Contractor shall prepare and deliver to the Grantee a substantive and comprehensive draft Final Report of all work performed under these Terms of Reference in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA's Mandatory Contract Clauses) and shall present its findings to the Grantee. The Grantee is expected to provide comments on the draft Final Report within a four-week period.

Once the Grantee has provided comments and approved the revisions of the draft Final Report, the Contractor shall prepare and submit the Final Report to the Grantee and to USTDA in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA's Mandatory Contract Clauses). The Final Report shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall incorporate all of the findings, recommendations, and conclusions of the Study and shall incorporate all other documents and/or reports provided pursuant to the Tasks of

this Terms of Reference. It is the Contractor's responsibility to identify prospective U.S. Sources of Supply in the Final Report to be submitted to USTDA and the Grantee in accordance with Clause I of Annex II of the Grant Agreement. The U.S. Suppliers list shall identify the capabilities, addresses, and principal points of contact for each of the suppliers.

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 the Kazakhstan Electricity Grid Operating Company ("Client"), dated _____ ("Grant Agreement"). The Client has selected _____ ("Contractor") to perform the technical assistance ("TA") on the Monitoring and Diagnostic Systems project ("Project") in Kazakhstan ("Host Country"). Notwithstanding any other provisions of this contract, the following USTDA mandatory contract clauses shall govern. All subcontracts entered into by Contractor funded or partially funded with USTDA Grant funds shall include these USTDA mandatory contract clauses, except for clauses B(1), G, H, I, and J. In addition, in the event of any inconsistency between the Grant Agreement and any contract or subcontract thereunder, the Grant Agreement shall be controlling.

B. USTDA as Financier

(1) USTDA Approval of Contract

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

(2) USTDA Not a Party to the Contract

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of this contract and amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any contract funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of financing the TA 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 TA 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 TA support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions. USTDA will make available further details concerning these provisions upon request.

D. Recordkeeping and Audit

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

E. U.S. Carriers

(1) Air

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

(2) Marine

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

F. Workman's Compensation Insurance

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

G. Reporting Requirements

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

H. Disbursement Procedures

(1) USTDA Approval of Contract

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

(2) Payment Schedule Requirements

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

(3) Contractor Invoice Requirements

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

(a) Contractor's Invoice

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

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

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

(ii) For contract performance milestone payments:

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

(iii) For final payment:

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

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

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

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

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

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

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

(c) USTDA Address for Disbursement Requests

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

(4) Termination

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

I. USTDA Final Report

(1) Definition

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

(2) Final Report Submission Requirements

The Contractor shall provide the following to USTDA:

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

and

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

and

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

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

(3) Final Report Presentation

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

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

"This report was funded by the U.S. Trade and Development Agency (USTDA), an agency of the U. S. Government. The opinions, findings, conclusions or recommendations expressed in this document are those of the author(s) and do not necessarily represent the official position or policies of

USTDA. USTDA makes no representation about, nor does it accept responsibility for, the accuracy or completeness of the information contained in this report."

(b) The inside front cover of every Final Report shall contain USTDA's logo, USTDA's mailing and delivery addresses, and USTDA's mission statement. Camera-ready copy of USTDA Final Report specifications will be available from USTDA upon request.

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

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

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

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

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

J. Modifications

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

K. TA Schedule

(1) TA Completion Date

The completion date for the TA, which is December 31, 2011, is the date by which the parties estimate that the TA will have been completed.

(2) Time Limitation on Disbursement of USTDA Grant Funds

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

L. Business Practices

The Contractor agrees not to pay, promise to pay, or authorize the payment of any money or anything of value, directly or indirectly, to any person (whether a governmental official or private individual) for the purpose of illegally or improperly inducing anyone to take any action favorable to any party in connection with the TA. 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 TA 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.: 11X1001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 115/101001
Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

Appropriation No.: 119/101001

Activity No.: 2010-81028A
Reservation No.: 2010810035
Grant No.: GH2010810012

N. Definitions

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

O. Taxes

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

ANNEX 5

TERMS OF REFERENCE

Objective

The objective of the TA is to assist the Grantee to evaluate the technical, economic, and financial feasibility of the implementation of transmission line monitoring and diagnostic equipment, as well as to provide workshops and guidelines for using such equipment in Kazakhstan. The TA will include developing a conceptual design for transmission line monitoring and diagnostic systems and preparation of bidding documents for the procurement of such systems. The Contractor shall carry out the technical assistance by completing the following tasks.

Please note that all initial data provided by the Grantee to the Contractor will be in the Russian language. Any translation of the initial data, if required, will be the responsibility of the Contractor. Any oral and written translations into Russian and English required for performance of the tasks listed below shall also be the responsibility of the Contractor. All deliverables to be submitted by the Contractor (reports, presentations, tender documents, etc.) shall be accompanied by translations in Russian.

Task 1: An Assessment of the Grantee's Present High Voltage Transmission Line Monitoring Equipment and Program

The Contractor shall carry out the following at the beginning of the assignment:

- The Contractor shall evaluate the existing situation related to the Grantee's high voltage transmission line condition monitoring equipment and program and determine the objectives and scope of work needed to develop a modern diagnostic monitoring program.
- The Contractor shall conduct a detailed review of existing diagnostic tools and equipment and Operation and Maintenance (O&M) practices by the Grantee for the high voltage (HV) lines.

In cooperation with the Grantee, the Contractor shall select at a minimum two HV transmission line areas for inspection that are representative of the types of lines and equipment in the Grantee's HV transmission line service area. The Contractor shall:

- Visit the selected HV transmission lines service areas (including, at a minimum, 10 kilometers of the transmission line right-of-way and one substation site, one relevant workshop, and if practical one construction site), and analyze at a minimum:
 - a. existing work methods;
 - b. tools and equipment used; and,
 - c. work planning, and repair and maintenance crew structures;
- Recommend the changes required for more efficient and reliable work performance based on an analysis of costs and benefits, taking into account local conditions and workers vocational education levels; and,

- Formulate and recommend the use of new diagnostic tools and equipment (as appropriate), staff pattern work planning and crew structure with minimum changes in the existing maintenance operations.

The Contractor shall adhere to local regulations applicable to the Grantee when formulating recommendations.

The Grantee will provide transport to the HV transmission lines service areas and guides with sufficient technical knowledge on those trips.

The Contractor shall discuss the findings and the recommendations with the Grantee, including making presentations to the Grantee, and incorporate the comments and other feedback provided by the Grantee as appropriate into the final Task 1 deliverable.

Deliverable: The report to the Grantee developed in Task 1 on the requirements to develop and implement a modern transmission line monitoring program.

Task 2: Provide Workshops/Seminars to Familiarize Grantee Personnel with the Available Technologies and Monitoring and Diagnostic Technologies and Equipment

Based on the present status of the Grantee's knowledge of modern diagnostic equipment for transmission lines, the Contractor shall organize four (4) Workshops/Seminars (including simultaneous Russian-English and English-Russian translation), each lasting at least one and a half days. The four Workshops/Seminars shall cover the following four areas in order to upgrade the Grantee personnel's knowledge and to lay the groundwork for the needs of the Grantee in relation to modern diagnostic and monitoring equipment and the recommended monitoring and diagnostic system design:

a) Transmission Lines Discharge Monitoring (Workshop 1)

High frequency partial discharges have been considered as a main symptom with many of the problems that have been investigated, which theoretically generate radio noise into the ultra-high frequency range and audible noise into the ultra-sonic regions. Above normal heat generation is another symptom. Thus all the sensing systems have focused on partial discharge levels and temperatures. The main detection techniques are summarized as follows:

1. Ultrasonic detection;
2. Measurement of corona pulse current inconsistency;
3. Partial discharge detector;
4. Infrared inspection of overhead transmission lines;
5. Radio noise detection system;
6. Solar-blind power line inspection system;
7. Corona current monitor for H.V. power lines;
8. Fiber optic applications to transmission line inspections;
9. Audible noise meters; and,

10. Field testing of insulators.

The Contractor shall discuss procedures of the above monitoring techniques that require mobilization by foot or ground or air vehicle, and involve human presence in the vicinity of the line. The Contractor shall emphasize safety considerations and that the dependency on the human senses and subjectivity of inspection or live-line maintenance crews, in the noisy and physically demanding environment, are serious limitations to take full advantage of all the available technologies. Also, the Contractor shall note that none of the above techniques can monitor the entire lines automatically and in real time by the installed detectors at the two ends of a line. The Contractor shall specify the most efficient method of transmission line monitoring.

b) Transmission Lines Insulator & Conductor Monitoring (Workshop 2)

The Contractor shall provide the latest knowledge and monitoring equipment used for condition assessment of insulators and line conductors. All insulators are affected to some extent by impact, thermal and mechanical cycling, ablation from weathering, acts of God and electro-thermal causes, flexure and torsion, ionic motion, and corrosion.

Transmission line conductors are the most important and the most expensive components of high voltage lines; they are, however, susceptible to aging. One of the main reasons limiting their lifetime is unavoidable wind induced *Aeolian* vibrations.

c) Estimation of Foundation Condition (Workshop 3)

The foundation is one of the most important components of overhead line through which the load of conductors, earth wires, towers and other elements is transmitted to the earth. With respect to the possible conditions, the Contractor shall explain how to classify the condition of foundations into three groups: excellent condition, needs repair, and needs replacement. An excellent condition is when there are no signs of degradation on the foundation.

The Contractor shall explain the possible reasons for the need for foundation repair or replacement are:

- Significant corrosion resulting in weak foundation strength, so the replacement or reinforcing of some of its parts is necessary;
- Mechanical damage of tower muff;
- Required additional protection of cement surface for the prevention against chemical or physical destruction; and,
- Passive/active cracks (causing/not causing significant changes in length and width for some time).

The Contractor shall provide advice to the Grantee on developing a program on foundation repair when a foundation's building strength becomes less than the design standard.

d) Condition Assessment of Ferro-concrete, Metal Tower Structures, and Anchorage Points of Towers (Workshop 4)

Towers are exposed to corrosion, resulting in concrete and steel damage. Chemical and electrochemical corrosion of these line components is one of the most significant problems.

The Contractor shall explain non-destructive diagnostic and monitoring techniques (acoustical, electromechanical, electromagnetic, ultrasonic and others) to monitor the condition of ferro-concrete and metal tower structures, and anchorage points of towers.

Deliverable: The Contractor shall write and deliver to the Grantee a report with all presentation materials and the results of the work in Task 2.

Task 3: Develop Non-Invasive Monitoring and Inspection Guidelines

The Contractor shall prepare for the Grantee a list of non-invasive transmission line condition monitoring guidelines for the insulators and conductors, icing and lightning overvoltage, ferro-concrete and metal tower structures, and anchorage points of towers.

Porcelain and toughened glass, and more recently polymeric insulators, all have characteristic degradation and pollution modes that must be considered by asset managers of the Grantee. As the electrical applied to a suspension insulator string is not uniform with the highest stress occurring close to the live conductor, the Grantee must have proper tools and equipment to monitor the following conditions:

- Destruction of ferro-concrete towers, corrosion of metal parts of towers and foundations: loss of mechanical strength that results in towers falling over;
- Porcelain Micro-Cracking: porcelain material and component manufacturing imperfections including voids can lead to the formation and growth of micro-cracks in the porcelain;
- Glass Insulator Degradation: loss of mechanical strength through pin corrosion also limits the service life of glass insulator strings;
- Polymeric Insulator Degradation: polymeric insulators have been reported with a range of failure modes; and,
- Insulator Pollution: in damp conditions a partially conducting layer of pollution on an insulator surface can increase surface leakage currents and cause surface heating and dry-band arcs.

In addition the Contractor shall discuss with the Grantee the following non-invasive guidelines for monitoring of insulators and transmission line towers with appropriate equipment:

- Use of a hand held weather station to ensure conditions are suitable and record the temperature, wind speed and relative humidity;
- Use of a video recorder to capture the video output of the corona and infrared camera; and,
- Recording of the tower identification and physical arrangement in a standard manner to ensure correct identification by field groups.

The Contractor shall develop recommendations for on-the-job training for non-invasive transmission line condition monitoring diagnostic tools and equipment operation and maintenance practices.

Deliverable: Based on above information and the Grantee's desire for upgrading its institutional capability for transmission line monitoring program, the Contractor shall develop a list of equipment, cost estimates, benefits, training recommendations and technical specifications for procurement purposes.

Task 4: Develop Technical Specifications of Selected Monitoring Equipment

The Contractor shall work with the Grantee's engineers to determine the application and recommended technical specifications of the following types of transmission line monitoring equipment:

PRODUCT: Real-time Temperature Monitoring System for Electric Transmission Lines

The Contractor shall consider in the analysis and application of this product that overhead high-voltage transmission lines are the arteries of the electric power system, and their running states directly decide the safety and benefits of the electric power system. The contact point breaking is one of the usual faults existing on the overhead electric transmission lines.

The Contractor shall consider in the analysis that real-time temperature monitoring systems for electric transmission lines are important because of the following:

- the mechanical connection parts of the connection electric power fittings such as double-line yoke plate (parallel cable clamp), strain clamp and connecting pipe in high voltage transmission lines often have many thermal defects because of oxidation corrosion, loose connection or bad fixing quality;
- when the power transmission lines run, the temperature of these parts will rise, and the aging of these parts will be speeded up, and the contact resistances will further increase, and finally the lines will be broken;
- The aging of the contact points of the lines should be monitored online and system operators warned at any moment regarding thermal defects in the electric power fittings; and,
- Implementing real-time temperature monitoring systems help with implementing repairs, predicting and preventing power breaking accidents, and ensuring the safe and stable running of the power transmission lines.

PRODUCT: High Voltage Surge Arrester

The Contractor shall consider the following in the analysis and application of high voltage surge arresters:

- high voltage surge arresters are used in order to protect other power equipment from dangerous over-voltages;
- high voltage surge arresters are employed in the most exposed location;
- under extreme adverse conditions, arresters may be overstressed;
- arresters are designed to fail safely and thus protect the other equipment even during such an event;
- both the porcelain-housed and polymer-housed designs are tested according to the stringent criteria of IEC standard 60099-4 for safe short-circuit capability;
- in a typical substation, the cost of providing adequate over-voltage protection using arresters is a very small fraction of the cost of the substation; and,
- proper selection and placement of arresters permits a reduction in the insulation withstand strength of the major equipment in a station, which can have a significant impact on reducing the overall cost of the station, making an attractive investment for both short-term and long-term profitability.

PRODUCT: Insulator Washing System

The Contractor shall consider the following in the analysis and application of insulator washing systems:

- Highly effective insulator washing systems capable of removing all persistent contamination give the surface a nice original porcelain or glass gloss;
- They are specially suited for hot line washing and are reliable with practically no chance of line to ground flashover;
- The advantages of the system consist of the disruptive effect of the treated inorganic soft particles and the proximity of the washing system, as compared to other water systems placed several meters apart;
- Energized or De-energized insulator cleaning services can cover the following:
 - High Voltage Substation Insulators (up to 500KV);
 - Transmission Towers (any type- up to 500KV);
 - Application of RTV High Voltage Insulator Coating;
 - Application of Customer Preferred Silicone/RTV Coatings to Insulators;
 - Infra Red Scanning; and,
 - Cubicle Cleaning;
- Utility industry experts recommend the application of an insulator coating product to areas where high contamination and/or corrosion will occur to prevent leakage current and flashover to all porcelain insulators; and,
- The following coating products are typically recommended:
 - High Voltage Silicone Grease Compound;

- High Voltage Room Temperature Vulcanizing (RTV) Products;
- High Voltage CSL Products; and,
- High Voltage Sylgard.

PRODUCT: Real-time ratings of transmission lines

The Contractor shall consider the following in the analysis and application of real-time ratings of transmission lines:

- special devices can measure the real time tension in transmission lines, ambient temperature and wind speed, or conductor sag;
- the results of the measurements are telemetered to the control center, which then adjusts the line rating accordingly; and,
- the drawback with this technology is the high cost relative to the incremental potential increase in capacity.

PRODUCT: Methods of condition assessment of ferro-concrete, metal towers and anchorage points of towers.

The Contractor shall consider in the analysis that chemical and electro-chemical corrosion of ferro-concrete, metal towers and anchorage points of towers is one of the most significant problems facing the Grantee. The Contractor shall consider equipment, methods and products that have been developed for diagnostic monitoring of this problem, and particularly for anchorage points of towers.

In each of the five subtasks above, the Contractor will work together with Grantee personnel to develop local capacity and provide live demonstrations and computations on site where applicable and useful from a training point of view.

Deliverable: The Contractor shall prepare technical specifications for each type of monitoring product in this Task based on the following tentative criteria:

- a) Precise use of the equipment and cost;
- b) List of US Suppliers;
- c) Annual estimated hourly use of the equipment;
- d) Alternative mode of performing the monitoring task, if any;
- e) Requirement for on-line inspection;
- f) Requirements to the quantity of transmission condition for utility operation;
- g) Response time of main protection systems;
- h) Lifetime and operating period of the equipment;
- i) Impact on scheduled and forced outage of the equipment;
- j) Overall reliability during the first and subsequent years;
- k) Specific requirements;

- l) Climatic conditions on the site;
- m) Topographical survey;
- n) Testing requirements; and,
- o) Technical requirements for concurrent operation.

Task 5: Cost Estimating

The Contractor shall estimate the monitoring equipment all-in cost for the Project implementation developed in Tasks 3 and 4. Wherever possible and reasonable, the Contractor will verify estimates through actual request for quotations from US suppliers. The Contractor shall be responsible for recommending the least-cost capital investment plan associated with the implementation plan developed.

The estimate shall include the cost of materials, labor, logistics and contingencies for full implementation. The Grantee shall provide any existing cost estimates based on previous pilot projects. These estimates, if available, shall be independently assessed and verified by the Contractor. The Contractor shall also assess any additional cost which may arise due to the need for labor retraining, and pension payments for labor loss due to program implementation.

Deliverable: The Contractor shall provide a detailed least-cost investment plan for monitoring equipment.

Task 6: Economic Analysis

The Contractor shall conduct an economic analysis for the implementation plan developed in Task 4 and the capital estimate developed in Task 5. Both the cost estimate and the implementation plan may need to be revised based on the conclusions of the economic analysis conducted under this Task.

The Contractor shall prepare an analysis that will result in a set of profitability indicators, such as Net Present Value (NPV), Internal Rate of Return (IRR), payback period, and others as applicable. The Contractor shall conduct an economic sensitivity analysis of each implementation plan component reflecting variations in interest rates, electricity tariffs, volumes, and equipment costs.

The Contractor shall conduct and provide a pro-forma assessment of tariffs increase required (if any) for the sustainability of the Project.

Deliverable: The Contractor shall provide an economic analysis with the sensitivity analyses performed as stated above.

Task 7: Financing Mechanism Analysis

The Contractor shall provide a detailed analysis of various financing mechanisms that could be applied for the implementation of these monitoring and diagnostic systems. The Contractor shall evaluate the willingness of multi-lateral banks (European Bank for

Reconstruction and Development -EBRD, Asian Development Bank -ADB, and the World Bank) and the Export-Import Bank of the United States to fund the Project.

The Contractor shall discuss the Project with a number of regional and multi-lateral funding organizations such as the World Bank, the Asian Development Bank, EBRD and the Export-Import Bank of the United States to gain a better understanding of their interest in funding part or the entire implementation program.

Deliverable: The Contractor shall prepare a financing option report and analysis.

Task 8: Preparation of Bidding Documents

The Contractor shall prepare tender documents to solicit bids from the suppliers of transmission line monitoring and diagnostic equipment. The Contractor shall ensure that tender documents are consistent with the requirements of the funding agency, if any, for the monitoring and diagnostic systems. Under this task, scope of services of the Contractor will include the following tasks:

- i) Prepare functional specifications for all equipment to be tendered. These should include functional capacity for measurement under various environmental conditions;
- ii) Define the operational requirement of the equipment;
- iii) Define the type of operation desired for the transmission line and substation;
- iv) Describe the procedures to be used in evaluating the bids and award the contract;
- v) Propose the arbitration procedure to be used to settle differences;
- vi) Propose modalities for imposing penalties to be paid by the equipment supplier for non-performance; and,
- vii) Prepare and include in the tender documents, *pro forma* drafts of the various agreements required, including bid bond, performance bond, etc.

Deliverable: The Contractor shall provide the tender documents developed in this Task to the Grantee.

Task 9: Preliminary Environmental Impact Assessment

The Contractor shall review the Project with respect to all three major lending agencies' (EBRD, World Bank, and ADB) environmental requirements and local requirements based on the following three categories:

Category A: "Diverse and significant potential environmental impact requiring an environmental assessment."

Category B: "Significant potential impact which can be readily identified and quantified and, for which, remedial, measures can be prescribed without much difficulty."

Category C: "Insignificant potential impact not requiring environmental assessment."

This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for full environmental impact assessment in anticipation of the Project moving forward to the implementation stage.

The Contractor shall carry out, and the Grantee will support, any field trips and inspections needed to prepare a baseline assessment of the environmental impact of existing *in situ* conditions and prepare the incremental environmental assessment relative to this baseline preliminary environmental impact assessment.

The Contractor shall consider, at a minimum, the following areas for potential environmental impacts (both positive and negative) of the Project:

- System-wide changes
 - HV lines maintenance, rehabilitation and upgrade work practices;
 - Access to the right-of-way;
 - Level of vehicular traffic for the line inspection;
- Environmental effects on communities adjacent to HV lines, if any; and,
- Institutional Strengthening and Capacity development
 - Efficiency and management capacity of the HV lines O&M practices.

Deliverable: The contractor shall prepare a preliminary environmental impact assessment.

Task 10: Host Country Development Impact Assessment

The Contractor shall also provide a report on the developmental impacts of the Project in Kazakhstan. While specific attention should be paid to the immediate impact of the Project, the Contractor shall include, where appropriate, any additional developmental benefits of the Project, including bulk power market development in the Central Asia region and seasonal power transaction with the neighboring countries, particularly hydro power capacity transfer to Kazakhstan from Kyrgyzstan. The analysis of potential benefits of the TA should be as concrete and detailed as possible. The Contractor shall provide estimates of the Project's potential benefits in the following areas:

- Incremental and decremented power costs saving due to the Project;
- Infrastructure: A brief synopsis statement on the infrastructure impact, including at a minimum the new transmission capacity available due to the Project, and estimates in terms of reduced line losses.
- Market-Oriented Reform: A description of any regulations, laws, or institutional changes that are recommended and the effect they would have if implemented.
- Human Capacity Building: A description of the number and type of positions that would be needed to construct and operate the Project. The Contractor shall also describe any training that would be required.
- Technology Transfer and Productivity Enhancement: A description of any advanced technologies that will be implemented as a result of the Project. A description of any

efficiency that will be gained (e.g. productivity gains, savings in transmission costs or lower production costs). For example, productivity gains should be estimated in terms of reduced maintenance man-hours or longer life of existing infrastructure.

- Other: Any other developmental benefits to the Project, such as a reduction in the need for new transmission lines due to decreased line losses.

Deliverable: The Contractor shall provide a preliminary developmental impact assessment with regard to the Host Country.

Task 11: Legal, Regulatory, and Institutional Review

The Contractor shall review the host country laws, permitting requirements, local building requirements and ordinance constraints that need to be taken into account before the Project can be implemented, including RD 153-34 PK.3-20.670-02 (PД 153-34 PK.3-20.670-02) “Guidelines for evaluation of technical state of 35-1150 KV overhead transmission lines and their components”. Limits on U.S. company participation in Project implementation shall be clearly identified and conveyed to the Grantee.

Deliverable: The Contractor shall provide a legal and regulatory analysis in the Final Report.

Task 12: Final Report Preparation and Presentation

The Contractor shall prepare and deliver to the Grantee a substantive and comprehensive draft Final Report in Russian and English of all work performed under these Terms of Reference in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA’s Mandatory Contract Clauses) and shall present its findings to the Grantee. The Draft Final Report shall be submitted to the Grantee as follows: one hard copy in English and three hard copies in Russian, one copy in Russian on electronic media and one copy in English on electronic media. It is expected that the Grantee will issue comments with regard to the Draft Final Report within four weeks.

Once the Grantee has provided comments and approved revisions to the draft Final Report, the Contractor shall prepare and deliver to the Grantee the Final Report as follows: one hard copy in English and three hard copies in Russian, one copy in Russian on electronic media and one copy in English on electronic media. The Contractor shall prepare and submit the Final Report to USTDA in accordance with the requirements of Clause I of Annex II of the Grant Agreement (USTDA's Mandatory Contract Clauses). The Final Report shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall incorporate all of the findings, recommendations, and conclusions of the Study and shall incorporate all other documents and/or reports provided pursuant to the Tasks of this Terms of Reference. It is the Contractor's responsibility to identify prospective U.S. Sources of Supply in the Final Report to be submitted to USTDA and the Grantee in accordance with Clause I of Annex II of the Grant Agreement. The U.S. Sources of Supply list shall identify the capabilities, addresses, and principal points of contact for each of the suppliers.

Notes:

- (1) The Contractor is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of the Terms of Reference.
- (2) The Contractor and the Grantee shall be careful to ensure that the public version of the Final Report contains no security or confidential information.
- (3) The Grantee and USTDA shall have an irrevocable, worldwide, royalty-free, non-exclusive right to use and distribute the Final Report and all work product that is developed under these Terms of Reference.

ANNEX 6



USTDA-Funded Feasibility Study, Technical Assistance, or Training Grant

U.S. Firm Information Form

This form is designed to enable the U.S. Trade and Development Agency ("USTDA") to obtain information about entities and individuals proposed for participation in USTDA-funded activities. Information in this form is used to conduct screening of entities and individuals to ensure compliance with legislative and executive branch prohibitions on providing support or resources to, or engaging in transactions with, certain individuals or entities with which USTDA must comply.

USTDA Activity Number *[To be completed by USTDA]*

| | | | |
|---|--|---|--|
| Activity Type <i>[To be completed by USTDA]</i> | <input type="checkbox"/> Feasibility Study | <input type="checkbox"/> Technical Assistance | <input type="checkbox"/> Other (specify) |
|---|--|---|--|

Activity Title *[To be completed by USTDA]*

Full Legal Name of U.S. Firm

Business Address (street address only)

| | | | | | |
|-----------|--|-----|--|---------|--|
| Telephone | | Fax | | Website | |
|-----------|--|-----|--|---------|--|

Year Established (include any predecessor company(s) and year(s) established, if appropriate).
Please attach additional pages as necessary.

Please provide a list of directors and principal officers as detailed in Attachment A. Attached? Yes

| | |
|-------------------|--|
| Type of Ownership | <input type="checkbox"/> Publicly Traded Company |
| | <input type="checkbox"/> Private Company |
| | <input type="checkbox"/> Other (please specify) |

If Private Company or Other (if applicable), provide a list of shareholders and the percentage of their ownership. In addition, for each shareholder that owns 15% or more shares in U.S. Firm, please complete Attachment B.

| | |
|--|------------------------------|
| Is the U.S. Firm a wholly-owned or partially owned subsidiary? | <input type="checkbox"/> Yes |
| | <input type="checkbox"/> No |

If so, please provide the name of the U.S. Firm's parent company(s). In addition, for any parent identified, please complete Attachment B.

| | |
|--|------------------------------|
| Is the U.S. Firm proposing to subcontract some of the proposed work to another firm? | <input type="checkbox"/> Yes |
| | <input type="checkbox"/> No |

| | |
|---|---|
| If yes, U.S. Firm shall complete Attachment C for each subcontractor. Attached? | <input type="checkbox"/> Yes |
| | <input type="checkbox"/> Not applicable |

Project Manager

| | | |
|-----------|------------|--|
| Name | Surname | |
| | Given Name | |
| Address | | |
| Telephone | | |
| Fax | | |
| Email | | |

Negotiation Prerequisites

Discuss any current or anticipated commitments which may impact the ability of the U.S. Firm or its subcontractors to complete the Activity as proposed and reflect such impact within the project schedule.

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

U.S. Firm may attach additional sheets, as necessary.

U.S. Firm's Representations

U.S. Firm shall certify to the following (or provide any explanation as to why any representation cannot be made):

1. U.S. Firm is a [check one] Corporation LLC Partnership Sole Proprietor Other:
 duly organized, validly existing and in good standing under the laws of the State of:
 The U.S. Firm 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 USTDA Activity. The U.S. Firm 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 U.S. Firm has included herewith, a copy of its Articles of Incorporation (or equivalent charter or document issued by a designated authority in accordance with applicable laws that provides information and authentication regarding the legal status of an entity) and a Certificate of Good Standing (or equivalent document) issued within 1 month of the date of signature below by the State of:
 The U.S. Firm commits to notify USTDA and the Grantee if it becomes aware of any change in its status in the state in which it is incorporated. USTDA retains the right to request an updated certificate of good standing.
3. Neither the U.S. Firm nor any of its principal officers have, within the ten-year period preceding the submission of this proposal, 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 U.S. Firm, 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 U.S. Firm. The U.S. Firm, has not, within the three-year period preceding the submission of this proposal, been notified of any delinquent federal or state taxes in an amount that exceeds US\$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 U.S. Firm has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself of its debts under any bankruptcy, insolvency or other similar law. The U.S. Firm has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law.
7. The U.S. Firm certifies that it complies with USTDA Nationality, Source, and Origin Requirements and shall continue to comply with such requirements throughout the duration of the USTDA-funded activity. The U.S. Firm commits to notify USTDA and the Grantee if it becomes aware of any change which might affect U.S. Firm's ability to meet the USTDA Nationality, Source, and Origin Requirements.

The U.S. Firm shall notify USTDA if any of the representations are no longer true and correct.

U.S. Firm certifies that the information provided in this form is true and correct. U.S. Firm understands and agrees that the U.S. Government may rely on the accuracy of this information in processing a request to participate in a USTDA-funded activity. If at any time USTDA has reason to believe that any person or entity has willfully and knowingly provided incorrect information or made false statements, USTDA may take action under applicable law. The undersigned represents and warrants that he/she has the requisite power and authority to sign on behalf of the U.S. Firm.

| | | | |
|--------------|----------------------|-----------|----------------------|
| Name | <input type="text"/> | Signature | <input type="text"/> |
| Title | <input type="text"/> | | |
| Organization | <input type="text"/> | Date | <input type="text"/> |



ATTACHMENT B

USTDA-Funded Feasibility Study, Technical Assistance, or Training Grant

U.S. Firm Information Form – Shareholder(s) and Parent Company(s)

If applicable, U.S. Firm provided a list of shareholders and the percentage of their ownership. This form shall be completed for each shareholder that owns 15% or more shares in U.S. Firm, as well as any parent corporation of the U.S. Firm ("Shareholder"). In addition, this form shall be completed for each shareholder identified in Attachment B that owns 15% or more shares in any Shareholder, as well as any parent identified in Attachment B.

| | |
|--|--|
| USTDA Activity Number [To be completed by USTDA] | |
|--|--|

| | |
|---|--|
| Activity Title [To be completed by USTDA] | |
|---|--|

| | |
|------------------------------|--|
| Full Legal Name of U.S. Firm | |
|------------------------------|--|

| | |
|--------------------------------|--|
| Full Legal Name of Shareholder | |
|--------------------------------|--|

| | |
|---|--|
| Business Address of Shareholder (street address only) | |
|---|--|

| | | | |
|------------------|--|------------|--|
| Telephone number | | Fax Number | |
|------------------|--|------------|--|

| | |
|---|--|
| Year Established (include any predecessor company(s) and year(s) established, if appropriate). Please attach additional pages as necessary. | |
|---|--|

| | |
|--|--|
| Country of Shareholder's Principal Place of Business | |
|--|--|

| | |
|--|-----|
| Please provide a list of directors and principal officers as detailed in Attachment A. Attached? | Yes |
|--|-----|

| | |
|-------------------|--|
| Type of Ownership | <input type="checkbox"/> Publicly Traded Company |
| | <input type="checkbox"/> Private Company |
| | <input type="checkbox"/> Other |

| | |
|---|--|
| If applicable, provide a list of shareholders and the percentage of their ownership. In addition, for each shareholder that owns 15% or more shares in Shareholder, please complete Attachment B. | |
|---|--|

| | |
|--|------------------------------|
| Is the Shareholder a wholly-owned or partially owned subsidiary? | <input type="checkbox"/> Yes |
| | <input type="checkbox"/> No |

| | |
|--|--|
| If so, please provide the name of the Shareholder's parent(s). In addition, for any parent identified, please complete Attachment B. | |
|--|--|

Shareholder may attach additional sheets, as necessary.



ATTACHMENT C

USTDA-Funded Feasibility Study, Technical Assistance, or Training Grant

Subcontractor Information Form

This form is designed to enable the U.S. Trade and Development Agency ("USTDA") to obtain information about entities and individuals proposed for participation in USTDA-funded activities. Information in this form is used to conduct screening of entities and individuals to ensure compliance with legislative and executive branch prohibitions on providing support or resources to, or engaging in transactions with, certain individuals or entities with which USTDA must comply.

| | |
|---|--|
| USTDA Activity Number <i>[To be completed by USTDA]</i> | |
|---|--|

| | |
|--|--|
| Activity Title <i>[To be completed by USTDA]</i> | |
|--|--|

| | |
|---|--|
| Full Legal Name of Prime Contractor U.S. Firm ("U.S. Firm") | |
|---|--|

| | |
|----------------------------------|--|
| Full Legal Name of Subcontractor | |
|----------------------------------|--|

| | |
|---|--|
| Business Address of Subcontractor (street address only) | |
|---|--|

| | |
|------------------|--|
| Telephone Number | |
|------------------|--|

| | |
|------------|--|
| Fax Number | |
|------------|--|

| | |
|---|--|
| Year Established (include any predecessor company(s) and year(s) established, if appropriate). Please attach additional pages as necessary. | |
|---|--|

Subcontractor Point of Contact

| | | |
|------|------------|--|
| Name | Surname | |
| | Given Name | |

| | |
|---------|--|
| Address | |
|---------|--|

| | |
|-----------|--|
| Telephone | |
|-----------|--|

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| Fax | |
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| Email | |
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Subcontractor's Representations

Subcontractor shall provide the following (or any explanation as to why any representation cannot be made), made as of the date of the proposal:

| | | | | | |
|--|--------------------------------------|------------------------------|--------------------------------------|--|--------------------------------|
| 1. Subcontractor is a <i>[check one]</i> | <input type="checkbox"/> Corporation | <input type="checkbox"/> LLC | <input type="checkbox"/> Partnership | <input type="checkbox"/> Sole Proprietor | <input type="checkbox"/> Other |
|--|--------------------------------------|------------------------------|--------------------------------------|--|--------------------------------|

duly organized, validly existing and in good standing under the laws 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 U.S. Firm is selected, to execute and deliver a subcontract to the U.S. Firm for the performance of the USTDA Activity and to perform the USTDA Activity. 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 ten-year period preceding the submission of the Offeror's proposal, 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.

6. The Subcontractor certifies that it complies with the USTDA Nationality, Source, and Origin Requirements and shall continue to comply with such requirements throughout the duration of the USTDA-funded activity. The Subcontractor commits to notify USTDA, the Contractor, and the Grantee if it becomes aware of any change which might affect U.S. Firm's ability to meet the USTDA Nationality, Source, and Origin Requirements.

The selected Subcontractor shall notify the U.S. Firm, Grantee and USTDA if any of the representations included in its proposal are no longer true and correct.

Subcontractor certifies that the information provided in this form is true and correct. Subcontractor understands and agrees that the U.S. Government may rely on the accuracy of this information in processing a request to participate in a USTDA-funded activity. If at any time USTDA has reason to believe that any person or entity has willfully and knowingly provided incorrect information or made false statements, USTDA may take action under applicable law. The undersigned represents and warrants that he/she has the requisite power and authority to sign on behalf of the Subcontractor.

| | | | |
|--------------|--|-----------|--|
| Name | | Signature | |
| Title | | | |
| Organization | | Date | |