# REQUEST FOR PROPOSALS

## FEASIBILITY STUDY FOR THE

## BESCOM SMART GRID PROJECT

Submission Deadline: **4:00 PM**

**LOCAL TIME IN INDIA**

**February 4, 2011**

Submission Place: The General Manager (HRD)
Bangalore Electricity Supply Company (BESCOM)
K.R. Circle, Bangalore
India 560 001
Phone: 080-2237 4851
Fax: 080-22352484

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

## REQUEST FOR PROPOSALS


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## Section 1: INTRODUCTION

The U.S. Trade and Development Agency (USTDA) has provided a grant in the amount of US$453,350 to Bangalore Electricity Supply Company Limited (the "Grantee") in accordance with a grant agreement dated December 20, 2010 (the "Grant Agreement"). Bangalore Electricity Supply Company Limited (BESCOM) is facing the challenge of meeting the growing demand for energy from a diversified and growing customer base in its service district. There is an immediate need for BESCOM to revamp its system and incorporate the best available technologies to improve the quality, reliability, and efficiency of its distribution system. Consequently, BESCOM submitted a request for a feasibility study to support the implementation of smart grid technologies across their network serving a large portion of the Karnataka state territory.

Smart grid technologies could provide a solution to this challenge and have the ability to improve the quality and reliability of service, reduce technical and commercial power losses, and integrate consumer use with peak and off-peak demand periods, and take advantage of distributed generation potential. To test smart grid technologies and consumer acceptance, BESCOM intends to start a smart grid pilot project in one of its distribution feeder sites in Bangalore. BESCOM has requested USTDA support to obtain expert U.S. smart grid technical and consulting services to build on this work and develop the smart grid roadmap and project design with reference to U.S. and international experience. The feasibility study will assist BESCOM in final site evaluation for the pilot project, design the pilot, as well as develop a public-private partnership model for the deployment of smart grid technologies. The study will also formulate a plan for integrating smart grid technologies with BESCOM's existing IT applications and distribution automation systems. Finally, the study will assess the technological, economic, and regulatory support and financial aspects of scaling up the pilot project, and prepare a roadmap for the implementation and integration of smart grid technologies across BESCOM's service area. A well-qualified and experienced U.S. Contractor is needed to undertake this important Feasibility Study.

### 1.1 BACKGROUND SUMMARY

*Bangalore Electricity Supply Company Limited (BESCOM)*

BESCOM won the India Power Award, 2009, for Energy Efficiency, Energy Conservation & DSM, for development and demonstration of an agricultural demand-side management program. BESCOM has been conducting distribution upgrades on its system, partly with assistance from USAID/India under the DRUM program, for several years. For example, BESCOM is currently implementing a Distribution Automation System (DAS) that will automate the distribution network for monitoring, supervisory control and operation of the 11 kV network in the Bangalore City. Implementing a DAS will involve drawing 11kV new overhead lines, and installing underground cable to supplement the overhead system for distribution automation; providing SCADA system at each of the sub-stations, and establishing a Master Control Center with necessary communication, hardware and software. This upgrade has a budget of $120

million, and the Japan Bank for International Cooperation is providing about 74% of the financing. The DAS is designed to ensure uninterrupted power supply and effectively reduce the consumer hours lost because of power supply outages, thereby increasing energy sales.

The steps required for implementation of the Smart Grid project for BESCOM include: (1) strategic planning and roadmap for the project; (2) site selection for the pilot project; (3) a request for information to gather the most current information on Smart Grid technologies, services, and pricing; (4) preparation of a detailed project report and outreach to customers; (5) project implementation including advanced metering infrastructure test, smart pricing and load control, and integration of renewables; and (6) post-implementation assessment of pilot project data. The timeframe for this study is eighteen months. The Contractor will present the results to the Grantee in a feasibility report.

The site for the pilot project is Electronics City, in a 332 acre industrial park outside Bangalore with more than a 100 companies, many in the information technology (IT) industry, and numerous educational institutions. After two-and-a-half years from completion of this study, BESCOM will complete an evaluation to determine its position with regards to its original Smart Grid Roadmap. Then BESCOM will consider scaling of the implemented smart grid functionalities to other areas and also adding to the pilot other new technologies that may have developed.

## 1.2 OBJECTIVE

India's ongoing economic expansion continues to face risks related to inadequate and irregular supply of electric power. India's energy demand is predicted to more than double by 2030, requiring significant investment in generation, transmission and distribution capacity, and potentially increasing the frequency of power outages even in the most developed areas of Delhi, Mumbai, Bangalore, Ahmedabad, and other fast growing centers. Among the power sector strategies designed to meet India's ongoing needs, the government has prioritized smart grid investments, practices and technology to improve the efficiency and the economic stability of the country's power sector. The main objective of the proposed project is to assist BESCOM in final site evaluation for the pilot project, design the pilot, as well as develop a public-private partnership model for the deployment of smart grid technologies.

The study will formulate a plan for integrating smart grid technologies with BESCOM's existing IT applications and distribution automation systems. The study will assess the technological, economic, and regulatory support and financial aspects of scaling up the pilot project, and prepare a roadmap for the implementation and integration of smart grid technologies across BESCOM's service area.

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

## 1.3 PROPOSALS TO BE SUBMITTED

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

The amount for the contract has been established by a USTDA grant of US$453,350. **The USTDA grant of $US453,350 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$453,350 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 Bescom Smart Grid project.

### 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 (DM) to identify and recommend USTDA technical assistance funding for Clean Energy Sector projects in India. A copy of the report is attached at Annex 2 for background information only. Please note that the TOR referenced in the report are included in this RFP as Annex 5.

### 2.4 EXAMINATION OF DOCUMENTS

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

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

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

## 2.5 PROJECT FUNDING SOURCE

The Feasibility Study will be funded under a grant from USTDA. The total amount of the grant is not to exceed US$453,350.

## 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.

The firm and its subcontractors selected for this feasibility study will be precluded from follow on implementation work and from supplying equipment, products, software, hardware or EPS work for the full smart grid implementation project.

## 2.12 LANGUAGE OF PROPOSAL

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

## 2.13 PROPOSAL SUBMISSION REQUIREMENTS

The General Manager of BESCOM will provide offerors with instructions to maintain a record of receipt of their proposal if electronic delivery is required or allowed.

The **Cover Letter** in the proposal must be addressed to:
The General Manager (HRD)
Bangalore Electricity Supply Company (BESCOM)
K.R. Circle, Bangalore
India 560 001

Phone: 080-2237 4851
Fax: 080-22352484

**An Original and eight (8) copies of your proposal must be received at the above address no later than 4:00 PM Local Time in India, on February 4, 2011.**

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

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

## 2.14 PACKAGING

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

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

## 2.15 AUTHORIZED SIGNATURE

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

## 2.16 EFFECTIVE PERIOD OF PROPOSAL

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

## 2.17 EXCEPTIONS

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

## 2.18 OFFEROR QUALIFICATIONS

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

## 2.19 RIGHT TO REJECT PROPOSALS

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

## 2.20 PRIME CONTRACTOR RESPONSIBILITY

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

## 2.21 AWARD

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

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

## 2.22 COMPLETE SERVICES

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

## 2.23 INVOICING AND PAYMENT

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

## Section 3: PROPOSAL FORMAT AND CONTENT

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

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

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US$453,350, which is a fixed amount.

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

Each proposal must include the following:

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

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

### 3.1 EXECUTIVE SUMMARY

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

## 3.2 COMPANY INFORMATION

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

### 3.2.1 Company Profile

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

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

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

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

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

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

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

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

### 3.2.2 Offeror's Authorized Negotiator

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

### 3.2.3 Negotiation Prerequisites

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

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

### 3.2.4 Offeror's Representations

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

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

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

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

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

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

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

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

### 3.2.5 Subcontractor Profile

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

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

### 3.2.6 Subcontractor's Representations

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

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

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

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

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

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

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

## 3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

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

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

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

## 3.4 TECHNICAL APPROACH AND WORK PLAN

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

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

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

## 3.5 EXPERIENCE AND QUALIFICATIONS

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

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

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

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

# Section 4: AWARD CRITERIA

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

The selection of the Contractor will be based on the following criteria: The offerer having experience in working with Indian distribution utilities on similar projects related to smart grid shall be provided higher marks.

**Technical Proposal – 30 Points**

- Technical approach for developing design of Smart Grid pilot project, and educating power distribution company personnel, regulatory officials, and key consumers on opportunities for Smart Grid to improve efficiency and lower power costs.

- Technical approach for developing a plan for evaluating Smart Grid Pilot Project and scaling up implementation throughout extended BESCOM service area.

**Personnel and Management Plan –40 Points**

- Experience and expertise of the Project Manager in designing and supervising distribution modernization projects in an international environment (20).
- Experience and expertise of the Team personnel in fulfilling the various functions of each component of the program (20).

**Firm Technical Capability and Past Performance –30 Points**

- Experience and years of performance in power distribution consulting (10).
- Experience working with electric distribution companies and providing technical assistance to them (5).
- Experience in arranging trade missions to United States for education and introduction to U.S. vendors(5)
- Experience working with Indian distribution utilities (10)

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

**Price will not be a factor in contractor selection.**

# ANNEX 1

## FEDBIZOPPS ANNOUNCEMENT

Grantee Contact: General Manager (HRD), Bangalore Electricity Supply Company, Ltd., K.R. Circle, Bangalore, India, 560 001, Phone: 080-2237 4851, Fax: 080-22352484, E-mail: gmhrdbescom@rediffmail.com

Project Title: BESCOM Smart Grid project; Appropriation No.: 11 11/12 1001; Activity No.: 2011-31003A; Reservation No.: 2011 014; Grant No.: GH201131014

POC: Nina Patel, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. BESCOM SMART GRID 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 develop a feasibility study for the Bangalore Electricity Supply Company Limited to support the implementation of smart grid technologies across their network serving a large portion of the Karnataka state territory.

BACKGROUND SUMMARY

*Bangalore Electricity Supply Company Limited (BESCOM)*

BESCOM won the India Power Award, 2009, for Energy Efficiency, Energy Conservation & DSM, for development and demonstration of an agricultural demand-side management program. BESCOM has been conducting distribution upgrades on its system, partly with assistance from USAID/India under the DRUM program, for several years. For example, BESCOM is currently implementing a Distribution Automation System (DAS) that will automate the distribution network for monitoring, supervisory control and operation of the 11 kV network in the Bangalore City. Implementing a DAS will involve drawing 11kV new overhead lines, and installing underground cable to supplement the overhead system for distribution automation; providing SCADA system at each of the sub-stations, and establishing a Master Control Center with necessary communication, hardware and software. This upgrade has a budget of $120 million, and the Japan Bank for International Cooperation is providing about 74% of the financing. The DAS is designed to ensure uninterrupted power supply and effectively reduce the consumer hours lost because of power supply outages, thereby increasing energy sales.

The steps required for implementation of the Smart Grid project for BESCOM include: (1) strategic planning and roadmap for the project; (2) site selection for the pilot project; (3) a request for information to gather the most current information on Smart Grid technologies, services, and pricing; (4) preparation of a detailed project report and outreach to customers; (5) project implementation including advanced metering infrastructure test, smart pricing and load control, and integration of renewables; and (6) post-implementation assessment of pilot project

data. The timeframe for this study is twelve months. The Contractor will present the results to the Grantee in a feasibility report.

The probable site for the pilot project is Electronics City, in a 332 acre industrial park outside Bangalore with more than a 100 companies, many in the information technology (IT) industry, and numerous educational institutions. After two-and-a-half years from completion of this study, BESCOM will complete an evaluation to determine its position with regards to its original Smart Grid Roadmap. Then BESCOM will consider scaling of the implemented smart grid functionalities to other areas and also adding to the pilot other new technologies that may have developed.

The U.S. firm selected will be paid in U.S. dollars from a $453,350 grant to the Grantee from the U.S. Trade and Development Agency (USTDA).

A detailed Request for Proposals (RFP), which includes requirements for the Proposal, the Terms of Reference, and a background definitional mission/desk study report are available from USTDA, at 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901. To request the RFP in PDF format, please go to: https://www.ustda.gov/businessopps/rfpform.asp. Requests for a mailed hardcopy version of the RFP may also be faxed to the IRC, USTDA at 703-875-4009. In the fax, please include your firm's name, contact person, address, and telephone number. Some firms have found that RFP materials sent by U.S. mail do not reach them in time for preparation of an adequate response. Firms that want USTDA to use an overnight delivery service should include the name of the delivery service and your firm's account number in the request for the RFP. Firms that want to send a courier to USTDA to retrieve the RFP should allow one hour after faxing the request to USTDA before scheduling a pick-up. Please note that no telephone requests for the RFP will be honored. Please check your internal fax verification receipt. Because of the large number of RFP requests, USTDA cannot respond to requests for fax verification. Requests for RFPs received before 4:00 PM will be mailed the same day. Requests received after 4:00 PM will be mailed the following day. Please check with your courier and/or mail room before calling USTDA.

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

Interested U.S. firms should submit their Proposal in English directly to the Grantee by 4:00 PM local time in India, February 4, 2011 at the above address. Evaluation criteria for the Proposal are included in the RFP. Price will not be a factor in contractor selection, and therefore, cost proposals should NOT be submitted. The Grantee reserves the right to reject any and/or all Proposals. The Grantee also reserves the right to contract with the selected firm for subsequent

work related to the project. The Grantee is not bound to pay for any costs associated with the preparation and submission of Proposals.

# ANNEX 2

**PORTIONS OF THIS DEFINITIONAL MISSION REPORT HAVE BEEN INTENTIONALLY REDACTED**

**ONLY RELEVANT PORTIONS OF THIS DEFINITIONAL MISSION REPORT PERTAINING TO BESCOM SMART GRID PROJECT FEASIBILITY STUDY ARE INCLUDED HEREIN.**

## 1. Bangalore Electricity Supply Company Limited (BESCOM)

### A. Executive Summary

Bangalore Electricity Supply Company Limited (BESCOM) provides electric service in the Bangalore municipality and surrounding rural areas covering 41,092 Sq. Kilometers with a population of over 16.8 million.

The company is facing the challenge of meeting the growing demand for energy from consumers and scarce generation resources. There is an immediate need for BESCOM to revamp its system and incorporate the best available technologies to improve the quality, reliability, and efficiency of its distribution system. The other requirement is to adopt best practices in outage management using advanced technologies. BESCOM has started a distribution automation project at its 11kV feeder level to address these requirements. As a next logical step, BESCOM intends to incorporate Smart Grid technology.

Smart grid technology is implemented to create an automated, widely distributed energy delivery network characterized by a two-way flow of electricity and information, capable of monitoring and responding to changes in everything from power plants to customer preferences to individual appliances. Building a 'smarter' grid is an incremental process of applying information and communications technologies to the electricity system, enabling more dynamic 'real-time' flows of information on the network and more interaction between suppliers and consumers. These technologies can help deliver electricity more efficiently and reliably. Operators will get more detailed information about supply and demand, improving their ability to manage the system and shift demand to off-peak times. Consumers are offered far more information about, and control over, their electricity use, helping reduce overall demand and shifting demand to off-peak times while providing a tool for consumers to reduce costs and carbon emissions.

To test Smart Grid technologies and consumer acceptance, BESCOM intends to start a Smart Grid Pilot Project in one of its distribution feeder sites in Bangalore. The probable site is Electronics City, in a 332 acre industrial park outside Bangalore with more than 100 companies, many in the information technology (IT) industry, and numerous educational institutions. This Smart Grid Pilot Project would be one of the first in India.

BESCOM wants to test all the relevant features of a Smart Grid that pertain to a distribution utility including: advanced metering infrastructure (AMI), meter data management (MDM), demand response (DR), smart pricing, billing and collections, asset management, integration of distributed renewable resources, and integration with other ongoing initiatives such as the distribution automation system (DAS). Through the Pilot Project, BESCOM expects to develop the required expertise and business experience required for future scaling of the Smart Grid to other areas across the utility's service area.

BESCOM has submitted an application to the Ministry of Power requesting their support for this Smart Grid Pilot Project for more than 50% of its estimated costs, and has received indications that its application will be granted.

USAID has issued an RFP for an Indian consulting firm to assist BESCOM in the Smart Grid Pilot Project. BESCOM has requested the U.S. Trade and Development Agency (USTDA)

to fund an international consulting firm to complement the work of the Indian consulting firm and validate (or critique) its preliminary conclusions with reference to international experience.

The BESCOM Smart Grid Project represents an opportunity for U.S. exports of automation hardware, information technology, software, computer hardware, integration, training and related services. The total potential for U.S. exports for the Pilot Project is estimated at one third of the projected $20.7 million budget, that is $6.9 million, and for the full scale project over $400 million. The Pilot Project would be financed in part from BESCOM's annual budget, in part from a grant from the Ministry of Power, and in part by contributions of equipment and expertise by suppliers who want to demonstrate their technologies.

U.S. suppliers of Smart Grid software, hardware, and integration and consulting services are globally competitive and well positioned in the Indian market, and several U.S. companies, including IBM, Oracle, and Sco-Unix, have already developed strategic relationships with BESCOM. Based on the positive impact on U.S. exports and job creation prospects in the United States, as well as the developmental benefits that will accrue to India, the DM Team recommends this project, with a budget of $529,150 for USTDA funding.

## B. Project Description

### Project History

USAID/India and the Government of India's Ministry of Power provided the inspiration for a Smart Grid white paper under the USAID/India Distribution Reform, Upgrades and Management (DRUM) project. This paper, "The Smart Grid Vision for India's Power Sector," was issued in March 2010 by PA Government Services, Inc., the prime contractor for the DRUM project, in collaboration with the Ministry of Power. The DRUM project has worked for many years on initiatives involving energy, power sector reform, energy efficiency, and the market development of renewable energies as well as environmental and water-energy nexus issues. These initiatives are intended to assist India to craft a sustainable model for high-growth, low-carbon economic development.

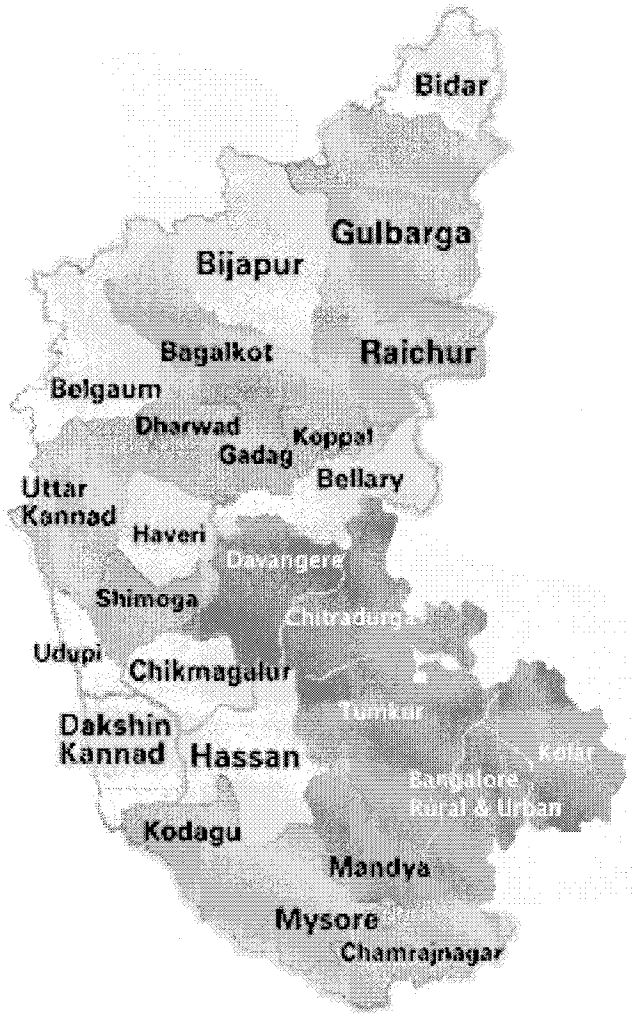
The Smart Grid Vision white paper concluded that one or more smart grid pilot projects would be a logical next step to build on the accomplishments of USAID/India's successful collaboration with the Government of India's Ministry of Power. The realities of India's power sector should determine the kind of pilot projects that are taken up, including high aggregate technical and commercial (AT&C) losses, reliability issues, and requirements for rural electrification and agricultural irrigation. Most of these issues suggest a focus on improving the distribution systems or, especially in rural areas, of implementing micro-grids. Pilot projects should also consider the need for more renewable energy and energy efficiency measures and the need to confirm the commercial viability of new techniques, technologies and/or methodologies that would contribute to a sustainable, high-growth, low-carbon model for the power sector. At this point, both NDPL in Delhi and BESCOM in Bangalore are developing smart grid pilot projects, in what can be called a healthy competition for pre-eminence in India's electricity distribution industry.

**BESCOM's Existing Network**

Estimates for 2010 (provisional)

| **Particulars** | | **BESCOM** |
|---|---|---|
| Area (in sq. km.) | | 41,092 |
| Districts | | 8 |
| Population | | 16.8 million |
| EHV (extra high voltage) Stations | | 381 |
| Consumers | | 7.32 million |
| HT (high tension/voltage) Lines in circuit kilometers (ckt kms) | | 68,692 |
| LT (low tension/voltage) Lines (in ckt kms) | | 143,544 |
| Number of distribution transformer systems (DTCs) | | 138,595 |
| Number of Employees | Sanctioned | 16,819 |
| | Working | 10,265 |
| Energy Handled (millions of units – MUs)(gigawatt hours) | | 20,317 |
| Revenue Demand | | $1.45 billion |
| Revenue Collection | | $1.4 billion |

**State of Karnataka with BESCOM service area in blue.**




**Customer Classes**

Estimates for 2010

| Category | No. of Customers | % |
|---|---|---|
| Domestic | 5.68 million | 77.66 |
| Commercial (LT) | 660,000 | 9.00 |
| Industrial (LT) | 139,000 | 1.89 |
| HT (industrial + commercial) | 7,000 | 0.10 |
| Agriculture | 648,000 | 8.88 |
| Street Light | 45,000 | 0.61 |
| Water Supply | 36,000 | 0.49 |
| Others | 100,000 | 1.37 |
| **Total** | **7.32 million** | **100** |

BESCOM projects its demand for energy will grow from 16,753 MUs (gigawatts) in FY 2006-2007 to 37,768 MUs in FY 2016-2017.

**BESCOM's Smart Grid Planning**

There is no template available for a Smart Grid in India and merely copying pilots from Western countries may not be appropriate, since some of the drivers for smart grids are different for the Indian case. Currently there is a large scale reform program being undertaken to deploy IT systems and then physical grid upgrades – the Restructured Accelerated Power Development and Reforms Programme (R-APDRP). It was designed as a comprehensive solution to rapidly bring diverse utilities up to a common capability and aggressively push for AT&C loss reduction. This included a template for system requirement specifications (SRS) created by a central committee, which was followed by the utilities and their IT consultants.

However, such an SRS does not exist for a Smart Grid, and BESCOM believes it would be good to create a template roadmap to act as a guide for Indian utilities. This roadmap could define requirements based on functionalities so that different utilities could tailor this document according to their desired functionalities. BESCOM proposes to create such a roadmap template in the course of developing its own roadmap during the Smart Grid Pilot Project.

**Roadmap for Smart Grid Deployment at BESCOM**

A Smart Grid is an evolving paradigm with many challenges and unanswered questions, and it requires planning and a coordinated multi-year phased implementation strategy. This has been the experience around the world, and these are still works in progress; there are no examples of a complete Smart Grid anywhere in the world which can be looked to as a guide. In the case of Indian distribution companies the situation is even more complex with respect to the level of IT and ongoing reform programs, such as R-APDRP, which are at different stages of implementation in different utilities.

As of now, Indian utilities in many cases lack the basic hardware or software which would be required to deploy a Smart Grid. With a few exceptions, most utilities have not yet adopted on a large scale what are considered basic enterprise IT systems (i.e., Geographical Information System (GIS), Outage Management System (OMS), Supervisory Control and Data Acquisition (SCADA), Distribution Automation, or Management Information System (MIS)).

The Smart Grid is a continuum of functionality and implementation, where technology itself is evolving. But there are some basic systems – both hardware and software – that need to be in place, before the utility can move towards a Smart Grid. Further, Indian utilities will have to invest in capacity building and training of their workforce to be able to integrate and operate Smart Grid solutions. Therefore the transition to Smart Grid would be a multi-year project, even in a well-defined pilot area. There is a need for BESCOM to develop a comprehensive roadmap for Smart Grid implementation, and define the objectives, strategy, utility aspects, customer aspects, functionalities, business case, and implementation approach. This roadmap may also guide other Indian utilities looking at smart grid pilots.

As part of the roadmap, first the international experience with regards to smart grid pilots and processes will be examined for extracting relevant lessons for the Indian case. Then the

roadmap will outline the approach for BESCOM and other Indian utilities to deploy smart grids in urban areas, and incorporate the following:

- Objectives of a smart grid deployment
- Criteria for selection of a target site
- Utility aspects and planning requirements
- Prerequisites for smart grid
- Integration needs for legacy components
- Options for leveraging ongoing initiatives (such as R-APDRP)
- Analysis of potential impacts on customers
- Plan for involving customers through active participation
- Design and functionality based specifications
- Metrics framework (including Key Performance Indicators)
- Identification of regulatory issues
- Identification of available standards
- Strategy for deployment of functionalities in a phased manner
- Suggested sequence for implementing key components and identification of dependencies
- Timeline and milestones for achieving key functionalities
- Plan for future phases
- Articulation of unknowns and variables that could become obstacles

**Deployment Timeline**

The deployment of many Smart Grid functionalities is dependent on certain pre-requisites specific to Indian utilities. Every Indian utility considering a smart grid pilot and eventual deployment should have a plan and sequence the various components in phases.
Deployment of various Smart Grid elements, including smart sensors on distribution lines, smart meters, smart devices in homes, and distributed sources of renewable energy, will require an interoperability framework. Without standards, there is the potential for technologies developed or implemented with sizable investments to become obsolete prematurely, fail to interoperate, or to be implemented without measures necessary to ensure security.

**BESCOM's Smart Grid Pilot Process**

BESCOM wants to engage Smart Grid experts to assist it for the duration of the Smart Grid Pilot Project.

P 1) Planning Phase

BESCOM will proceed on three parallel tracks in the planning phase (i.e. Phase 1).

*P 1.1) BESCOM's Strategy and Roadmap*

BESCOM will look at the details and challenges specific to its case and accordingly draw up the template roadmap. This task will include:

- Prerequisite evaluation
- Issues of existing legacy systems
- Integration of other ongoing initiatives:
    - Distribution Automation System (DAS)
    - IT systems under R-APDRP
    - SCADA of Karnataka Power Transmission Corporation, Ltd (KPTCL)
- Gap Analysis

*P 1.2) Site Selection*

In addition to the Roadmap BESCOM will evaluate if its target location of Electronics City is a suitable site for its proposed Pilot Project, or whether a different site needs to be selected. BESCOM will look at the following attributes:

- Scale of pilot
- Consumer mix
- Load profile
- Distribution infrastructure
- Potential for adding distributed resources
- Organizational structure
- Scope of benefits and their achievability, measurability, and ability to be generalized

*P 1.3) Request for Information (RFI)*

Through a RFI process BESCOM will seek the most current information on Smart Grid technologies, services, and pricing. This process will not select specific vendors, but is intended to familiarize BESCOM with the key Smart Grid technologies.

- BESCOM will issue an RFI call to get detailed information about products, software and services, functionality, availability, and pricing for the Pilot Project and mass deployment.
- BESCOM will hold workshops and discussions with select vendors.

P 2) Project Phase

*P 2.1) Preparation*

*P 2.1.a) Detailed Project Report*

When the Smart Grid strategy and roadmap for BESCOM is finalized, then it will create a Detailed Project Report (DPR). The DPR will include:

- Executive Summary
- Profile of BESCOM
- Project area details
- 'As Is' summary of IT systems
- Customer details
- Asset information
- Desired functionality requirements
- Metrics/Key performance indicators (KPI) framework
- Cost estimate
- Implementation schedule
- Description of potential benefits:
    - To BESCOM
    - To Customers
    - Societal

*P 2.1.b) Customer Outreach*

Once the site is finalized BESCOM will conduct customer outreach

- Customer education through brochures/booklets and its website to inform customers of the Smart Grid program and the benefits of Smart Grid
- Workshop for interaction and explanation of Smart Grid solutions

*P 2.1.c) Public Private Partnership*

BESCOM is considering a Public-Private-Partnership model for the Smart Grid Pilot Project. The private partner(s) would bear 50% of this cost and 50% may be borne by Government of India. The cost of implementation of the Pilot Project is estimated at $20.7 million.

*P 2.2) Bidding*

Finally at the end of the above process BESCOM will move to the bidding stage, where it will:

- Decide on technical evaluation criteria for bids
- Issue Request for Proposals (RFP)
- Conduct pre-bid meeting(s)

- Evaluate bids and shortlist vendors and implementing agencies (who will be the lead partner and system integrator in case of a consortium)
- Short listed vendors/implementing agencies may be asked for lab demos
- Select Implementing Agency

BESCOM will create RFPs and seek bids for each phase of the Smart Grid Pilot Project according to the timeline outlined in its Smart Grid Roadmap. Bids will be accepted from vendors (if they have a complete solution) and implementing agencies.

*P 2.3) Implementation*

Selected vendor/implementing agency will begin implementation according to the timeline in the RFP.

*P 2.3.a) Advanced Metering Infrastructure (AMI) Field Test and Deployment*

Initially a test deployment will be done on a small scale in the field. Once the field test is successful then deployment will be rolled out for the entire target area. The roll-out may be done in batches. Vendor/implementing agency will collect detailed data as required for metrics/KPI evaluation, which will be used for post-implementation analysis.

*P 2.3.b) Smart Pricing and Load Control*

Once one batch of AMI has been running successfully for a sufficient period and if regulatory approval has been obtained, then roll out of Smart Pricing and Load Control can begin. Another pre-requisite for this is the successful deployment of advanced billing systems and other related IT under R-APDRP. The meter data from AMI may have to be integrated with the Billing software.

Roll out of this functionality for subsequent AMI batches can be done over time as and when they are deployed and ready.

*P 2.3.c) Self Healing and Integration of Renewables*

A self-healing feature is included in the DAS system. Once it is ascertained through tests that renewables and other distributed generation can be safely connected, this functionality can also be included. Distributed energy resources may require net metering or sub-metering to be implemented.

*P 2.4) Post-Implementation*

The pilot will provide a large amount of data related to consumption and other parameters. BESCOM (or a designated knowledge partner (consultant)) will conduct analysis of this data to assess the impact of the pilot.

An international consulting firm (funded by USTDA) would work with an Indian consulting firm, as described in the Terms of Reference (Section L), for all phases of the Smart Grid Pilot Project described above. The Indian consulting firm is expected to begin the Planning

Phase before engagement of the international consulting firm and thereafter work together with the international firm.

**Proposed Pilot Area**

Given the need for a relatively sophisticated consumer profile, BESCOM is considering the Keonic City area of Electronic City on the outskirts of Bangalore for its Smart Grid Pilot Project. The Electronic City area has a suitable mix of consumers, in terms of large number of industrial, commercial and high end domestic consumers. It is expected that a lot of smart grid functionalities can be tested here as the network is both underground and overhead. A more detailed study of suitability of this area will be done.

**System, Network, Consumer and Consumption Data for pilot project feeder in Electronic City Meter Data**

Total number of customers: 17409
Total number of metered: 17364

| Sr No | Age (years) | Electro-mechanical | Electronic/Static | Meters having load survey data storage capability * | Meters having communication facility # |
|---|---|---|---|---|---|
| 1 | < 2 | 3565 | 35 | 90 | - |
| 2 | 2 to 7 | 4200 | 45 | 30 | - |
| 3 | > 7 | 9299 | 55 | 45 | - |

* Number of meters out of electronic meters
\# Number of meters having load survey data storage capability

**Consumer Data**

| Sl. No. | Category | No. of customers | Connected Load (MW) | Consumption (MU) | | | |
|---|---|---|---|---|---|---|---|
| | | | | Q1 | Q2 | Q3 | Q4 |
| 1 | Domestic | 15177 | 7.588 | 3.37 | 3.72 | 3.49 | 3.92 |
| 2 | Commercial | 1886 | 1.415 | 0.95 | 0.88 | 0.92 | 1.02 |
| 3 | Agricultural | 46 | 0.276 | 0.01 | 0.01 | 0.01 | 0.01 |
| 4 | LT Industrial | 169 | 3.38 | 0.43 | 0.44 | 0.39 | 0.49 |
| 5 | Public water works | 23 | 0.138 | 0.01 | 0.01 | 0.01 | 0.01 |
| 6 | HT Industrial | 108 | 98.2 | 53.68 | 51.35 | 52.2 | 54.5 |
| | **TOTAL** | **17409** | **111** | **58.4** | **56.41** | **57.02** | **59.95** |

**Network Data**

| | 33 kV (ckt km) | 11 kV (ckt km) |
|---|---|---|
| **Overhead mains** | | |
| Rabbit | - | 5.7 |
| Coyote | - | 21.4 |

| | | |
|---|---|---|
| **Underground mains** | | |
| 3 × 400 sq mm | - | 20.8 |

**Distribution transformer data:**

| Capacity (kVA) | Numbers |
|---|---|
| 25 | 4 |
| 63 | 6 |
| 100 | 104 |
| 250 | 56 |
| 500 | 3 |
| **Total** | **173** |

BESCOM is considering ring fencing the pilot area (i.e., separating its costs and revenues for ratemaking purposes) and making it a separate section for revenue and O&M purposes, for easier management.

BESCOM is considering inclusion of all industrial and commercial customers in this pilot while the residential and other smaller consumers may be included on a voluntary basis. The following four key features are being considered as high potential interventions:

1. Advanced Metering including Demand Response (through load control and smart pricing).
2. Integrating Renewable Energy Sources and other captive generation of industries.
3. Grid Self Healing and Power Quality Improvement
4. AT&C Loss Minimization

**Preliminary Cost Estimate**

The preliminary, tentative cost estimate, which will need to be validated, for the Pilot Project is as follows:

| Sr. No. | Description | Amount (INR) |
|---|---|---|
| 1 | Advanced Metering Infrastructure and demand side integration (incl. load control) | 67,67,63,200 |
| 2 | Integration of renewable and distributed energy resources | 1,70,00,000 |
| 3 | Self Healing and Power Quality | 14,90,00,000 |
| 4 | AT&C Loss Minimization | 94,00,000 |
| 5 | Others – Management and administrative cost | 9,63,34,156 |
| 6 | Knowledge partner fees | 2,15,02,644 |
| | **TOTAL** | **97,00,00,000** (US $20.7 million) |

This embeds cost of planning, analysis, technology, deployment, etc.

**Energy / Power Data**

| Months | Input Energy (MU) | Billed Energy (MU) | Revenue collection (INRCr.) | Peak Demand (MW) | Substation capacity (MVA) |
|---|---|---|---|---|---|
| **08-09** | | | | | 7x20MVA 1.Keonic City 3 x 20MVA 2.Electronic City 2x20MVA 3.Electronic City-II 2x20MVA (EHT-31.5MVA) |
| Jul-08 | 19.734 | 18.734 | 12.85 | 36.5 | |
| Aug-08 | 19.914 | 18.918 | 12.55 | 37.9 | |
| Sep-08 | 21.603 | 20.738 | 12.22 | 33.8 | |
| Oct-08 | 21.214 | 20.05 | 12.68 | 22.5 | |
| Nov-08 | 18.687 | 17.814 | 12.42 | 34.8 | |
| Dec-08 | 19.67 | 18.548 | 11.71 | 30.8 | |
| Jan-09 | 19.617 | 18.871 | 11.97 | 29.3 | |
| Feb-09 | 18.066 | 17.524 | 11.70 | 30.7 | |
| Mar-09 | 21.144 | 20.615 | 11.70 | 32.4 | |
| **09-10** | | | | | |
| Apr-09 | 20.907 | 20.091 | 12.80 | 37.3 | |
| May-09 | 20.908 | 20.259 | 13.11 | 37.2 | |
| Jun-09 | 20.194 | 19.588 | 13.55 | 33.6 | |
| Jul-09 | 25.2403 | 24.5802 | 12.52 | 49.2 | |
| Aug-09 | 25.1991 | 24.5415 | 12.42 | 48.2 | |
| Sep-09 | 26.2376 | 25.4881 | 12.59 | 48.5 | |
| Oct-09 | 26.3793 | 25.5505 | 12.19 | 48.5 | |
| Nov-09 | 25.3576 | 24.7433 | 12.22 | 49.5 | |
| Dec-09 | 25.8422 | 25.1568 | 12.07 | 50 | |
| Jan-10 | 24.8394 | 24.2111 | 13.11 | 50.24 | |

**Future**

At the end of 2.5 years BESCOM will do an evaluation to determine its position vis-à-vis its original Smart Grid Roadmap. Next it will consider scaling of the implemented smart grid functionalities to other areas and also adding to the pilot other new technologies that may have developed.

## C. Developmental Impacts

BESCOM has been working to implement a system-wide distribution automation program for the last few years, most recently with assistance for a series of a USAID/India-funded pilot projects at Doddaballapur: Installation of Switched Capacitors, Fault Passage Indicators, and Auto Reclosures on 11 KV Feeders; Reduction in Distribution Transformer (DTR) failure rate and Remote monitoring of Reliability Indices. These projects were funded as part of USAID's Distribution Reforms, Upgrades and Management (DRUM) program. As a result of BESCOM's automation strategy, it was able to reduce AT&C losses (from 34% to 17.5% over the past five years) in the system through improved monitoring and more efficient management – using SCADA, substation automation, OMS and/or Distribution Management System (DMS).

The proposed project would also have significant developmental impacts if fully implemented, including the following:

**Infrastructure** – The overall economic development of India continues to be severely constrained by the inadequate and irregular supply of electric power. More installed capacity is urgently needed, but the existing, dysfunctional distribution mechanisms have to be corrected also – in order to justify building more generation capacity. India's energy demand is predicted to more than double by 2030, potentially increasing the frequency of power outages even in the most developed areas of Delhi, Mumbai and Bangalore. These outages would have a significant adverse impact on the economy and, as a result, the government of India is looking to Smart Grid technologies to improve the efficiency and the economic stability of the country's power sector.

- Part of India's growing power demands could soon be met with Smart Grid technologies that improve efficiency and reliability for businesses and consumers.
- Smart Grid solutions would immediately help BESCOM in its ongoing efforts to improve the quality and reliability of service while reducing technical and commercial power losses.
- Increased efficiency and effectiveness of BESCOM's operations through smart metering, billing, and collection systems, would bring more revenues into the system to cover capital and operating costs of the system.

The reduction of loss and increased availability of electric power would stimulate commercial and industrial development. It would make commercial activities more efficient and open up industrial opportunities. In short it would spur economic activity and should contribute to increased economic development and improved quality of life in India. (Curtailment of AT&C losses, primarily theft of electric service, will increase power costs to those benefiting from free power, but the costs of these losses will benefit other customers or taxpayers by allocating the costs of power more equitably.)

**Human Capacity Building** – Implementation of the proposed Smart Grid project will require considerable training in new technologies. Training is typically provided as part of a procurement package for new systems.

**Technology Transfer and Productivity Improvement** – The project would introduce a wide range of IT and automation technologies not currently used at BESCOM. The use of those technologies is expected to dramatically improve the capacity of BESCOM staff to manage the distribution system.

**Other Developmental Impacts:** Government Revenues: One of the most important developmental impacts of an invigorated and expanded electric distribution system sector and the resulting stimulation of economic activity everywhere would be the expected increase in state and local government revenues. That would stimulate further development of the infrastructure of the region, providing means to better roads, transportation systems, street lights, and general government, including social services. The success of this project in Bangalore, the nation's leading IT center, would serve as an example to other utilities around the country, and its effect could be multiplied many times as the lessons learned and successes achieved are adopted by other distribution companies.

## D. Project Sponsor's Commitment

BESCOM has won the India Power Award, 2009, for Energy Efficiency, Energy Conservation & DSM, for development and demonstration of an agricultural demand-side management program. Its project under the WENEXA-USAID program demonstrated the potential for energy savings in irrigation pumps. It was implemented on four 11-Kv feeders in Doddaballapur sub-division of BESCOM's service area. About 650 existing irrigation pumps were replaced by more energy-efficient pumps under the program.

BESCOM has been conducting distribution upgrades on its system, with assistance from USAID/India, under the DRUM program for several years. For example, BESCOM is currently implementing a Distribution Automation System (DAS) that will automate the distribution network for monitoring, supervisory control and operation of the 11 kV network in the Bangalore City. Implementing a DAS will involve drawing 11kV new overhead lines, and installing underground cable to supplement the overhead system for distribution automation; providing SCADA system at each of the sub-stations, and establishing a Master Control Center with necessary communication, hardware and software. This upgrade has a budget of $120 million, and the Japan Bank for International Cooperation is providing about 74% of the financing. The DAS upgrades that began in FY 2008-09 are scheduled to be completed in FY 2011-12. The DAS will ensure uninterrupted power supply and effectively reduce the consumer hours lost because of power supply outages, thereby increasing energy sales.

BESCOM's Smart Grid Pilot Project is an outcome of the work commissioned by DRUM on The Smart Grid Vision for India's Power Sector. In April 2010, USAID/India DRUM issued a Request for Proposal for Consultancy Services for Design and Development of a Smart Grid Project for BESCOM. BESCOM has submitted an application to the Ministry of Power of the Government of India for approximately 50% of its anticipated budget for the Smart Grid Pilot, and has received preliminary indications of favorable action on the application.

BESCOM is committed to spend its own internally generated funds in addition to grants and loans for project implementation.

## E. Implementation Financing

BESCOM's preliminary cost estimate for the Smart Grid Pilot Project is $20.7 million. BESCOM anticipates funding of slightly more than one-half from the Ministry of Power. Moreover, BESCOM has received informal indications from various private sector partners who provide Smart Grid equipment, software, and services that they will consider contributing to the project as a means of demonstrating the potential effectiveness of their goods and services to enhance the efficiency and economic performance of BESCOM. The companies whose technologies, processes and services proved effective in the Pilot Project would thus become prime candidates for providing goods and services when these technologies are implemented in other customer service areas of BESCOM.

BESCOM is preparing a formal request for Expressions of Interest from such potential partners. As part of the consulting study recommended in this report, associated with implementing and evaluating the Pilot Project, BESCOM is asking potential partners to state whether they want to become equity investors in the project, and to indicate what percentage of the project costs they are interested in financing. Furthermore, the Terms of Reference below indicate that BESCOM wants a study of models of Public Private Partnerships (PPPs) utilized in the United States and other countries for Smart Grid implementation, and an evaluation of the advantages and disadvantages of several proposed models. The study should identify interested private sector players, and a proposal for a cost-sharing arrangement between BESCOM and the private sector parties for different PPP models for implementing Smart Grid technologies system-wide.

Financing of the scale up from the Pilot Project to the rest of BESCOM's system could be financed through equity and debt capital from private partners and inclusion of the Smart Grid investment in BESCOM's rate base, for recovery through customer rates. Such investment in U.S. exported products would be eligible for long-term concessional financing from US EXIM bank.

## F. U.S. Export Potential

U.S. exports expected from this Smart Grid project include both products and services. The products will include computer hardware, system software (operating system), application software, networking equipment, and field devices. The services will range from systems integration, custom programming, project management, training and data processing. On the hardware, software product and systems side, several U.S.-based firms stand out in their market share of electrical utility smart metering and enterprise applications interface systems. BESCOM estimates the cost of it Smart Grid Pilot Project will be $20.7 million. The Pilot Project will be implemented in an area with 17,409 metered customers, thus, a cost of $1,189 per customer. Although BESCOM anticipates significant contributions of equipment and software systems to the Pilot Project, we would estimate a potential of $ 6.9 million of U.S. exports. Assuming BESCOM extends the facilities installed for the Pilot Project to its industrial and commercial customers, and one-fourth of its agricultural and residential customers – i.e. 2.4 million – and the average cost per customer is reduced to approximately

$500, due to economies of scale and avoidance of the non-recurring costs of the pilot project, the investment in the Smart Grid facilities and installation might be $1.2 billion. If one third of these total costs were attributable to exports of goods and service from U.S. companies, the total U.S. export contribution would be $400 million. U.S. exports would come from the following components (with potential U.S. suppliers):

- Smart metering suppliers (ITRON, E-meters, GE).
- Operating system companies (Microsoft, IBM).
- System integrators (IBM, Accenture).
- Computer companies: (Sun Microsystems, HP, IBM, and Dell).
- Enterprise applications interface solution providers (IBM, Oracle, TIBCO Network communications hardware suppliers: Cisco)

In connection with upgrading its distribution with assistance from the DRUM program, partially funded by USAID, BESCOM utilized the services of IBM for development of an IT roadmap under USAID assistance in the year 2009. Several solutions for integrating BESCOM's various IT systems use the software from ORACLE, Microsoft, and SCO-UNIX. BESCOM has also adopted several U.S. companies' software solutions for its basic business of distributing power supply, accurate billing and collection process, and uses HP hardware for these functions.

BESCOM currently uses a Geographical Information System (GIS) solution of ESRI (ArcGIS), an American firm. Moreover BESCOM is in the process of implementing the ORACLE 11i database for all of its core business modules: Customer Care & Billing, Master Data Management, and Work and Asset Management System. Based on the strong involvement of U.S. companies with BESCOM, the prospects are very good for U.S. suppliers gaining a significant share of procurements during the Smart Grid Pilot Project and the full scale Smart Grid deployment.

## G. Foreign Competition

Computer hardware, operating systems, application software, networking hardware and integration service components are all supplied by European and Asian firms as well as U.S. firms. Non-US firms are strong competitors in each of these areas. There is an active worldwide market for these products.

Following is a list of both U.S .and non-US suppliers, by category:

| | |
|---|---|
| Smart Meter: | Itron (US), GE (US), Landis+Gyr (Switzerland) |
| Communications Network: | CISCO (US), Corning (US); Farukawa (Japan); LG (Korea); GE Multiline (Canada); Siemens (Germany); ABB (Europe); WiLAN (Canada); Motorola (US); |
| System integrators: | IBM (US), Accenture (US), Reliance |

| | |
|---|---|
| | Infrastructure (India), Infotech Enterprises Ltd (India), Infosys (India) |
| Automated Meter reading (AMR): | D-Link (US); WebCom (France); Sony Ericsson (Japan); HP (US); IBM (US); Dell (US) |
| GIS and Management Systems: | InterGraph (US); GE Network Systems (US); ABB (Sweden); Leica (Switzerland); Canon (Japan), ESRI (US) |

## H. Impact on the Environment

The project is not expected to have any negative environmental impact. The project will likely have a positive impact on the environment. An integrated Smart Grid allows customers to better plan and manage their energy consumption while optimizing the grid through real-time generation and distribution control management. Smart Grid implementation will result in potential carbon footprint reduction as a result of lowered residential peak demand and energy consumption, reduced distribution losses and increased conservation options. The Smart Grid will also facilitate the integration of renewable energy (i.e. wind, solar) into BESCOM's distribution system. Nevertheless, an environmental impact evaluation is a key component of the proposed Terms of Reference.

## I. Impact on U.S. Labor

Based upon our review, we found that the project does not provide: (a) any financial incentive to a business enterprise currently located in the United States for the purpose of inducing such an enterprise to relocate outside the United States if such incentive or inducement is likely to reduce the number of employees of such business enterprise in the United States because United States production is being replaced by such enterprise outside the United States; (b) assistance for any project or activity that contributes to the violation of internationally recognized workers rights; or (c) direct assistance for establishing or expanding production of any commodity for export by any country other than the United States, if the commodity is likely to be in surplus on world markets at the time the resulting productive capacity is expected to become operative and if the assistance will cause substantial injury to United States producers of the same, similar, or competing commodity.

This project will assist BESCOM to modernize its delivery of electric power, which will be locally consumed in India. Therefore, the project is not expected to have any negative impact on U.S. industry or reduce employment in the U,S. Positive impacts on U.S. labor in the form of exports and jobs in the electric power industry are expected if the project is implemented.

## K. JUSTIFICATION

Lack of reliable electric service in the urban areas of India and lack of electricity for many off-grid rural areas are some of the major barriers to the kind of development that India is seeking to implement. Smart Grid technology and processes offer significant opportunities

for U.S. exports that will promote clean energy in India by greatly improving energy efficiency, in addition to greater reliability.

India is also pursuing development of its renewable energy resources: solar, wind, geothermal, biomass, and others. But in many situations, investment in improving energy efficiency results in greater benefits in relation to costs than increasing energy resources. In many circumstances, improving the efficiency of existing electric generation, transmission and distribution systems will yield a greater increase in usable energy than the same investment in almost any form of additional generation. Smart Grid brings the most advanced sensor and control capabilities to the distribution level, and can even be used "behind the meter" by individual customers.

By giving customers real time price signals, and the capability to adjust their patterns of electricity consumption in response to those prices, existing generation capacity can provide adequate and more reliable electricity 24 hours a day, throughout the various seasons. The Government of India, through its Ministry of Power, is providing significant resources to Indian electric distribution systems to increase their efficiency and reliability through its Restructured Accelerated Power Development and Reforms Programme (R-APDRP). And, as BESCOM points out, funding for Smart Grid is the next logical extension of the various upgrades of distribution systems that program supports.

BESCOM is already acknowledged as one of the leading electric distribution companies in India, with respect to its level of upgraded and automated distribution systems. Furthermore, BESCOM wants to maintain its leadership by proceeding to adopt Smart Grid technologies and processes that will improve the performance and reliability of its system for the benefit of its customers. Supporting BESCOM with a world-class consulting firm, with experience in the most advanced developments in adoption of Smart Grid technologies, will be a significant benefit to BESCOM and the Indian electric sector's capacity to improve its efficiency. Improving India's energy efficiency, by reducing the need for additional carbon emitting generation resources, will also reduce the environmental impacts of electric generation and distribution.

Finally, this project is an opportunity to implement the Memorandum of Understanding between the United States and India, entered into in November 2009, and initiatives of U.S. and Indian governments pursuant to that MOU, for mutual cooperation in implementing development of clean energy through improved energy efficiency of a leading Indian electric distribution company.

**L. Terms of Reference:** BESCOM would like to engage a U.S.-based international firm with expertise and experience in designing, developing and implementing Smart Grid technologies that can assist BESCOM in developing and implementing their proposed Pilot Project and to develop a detailed road map for implementation across BESCOM's greater service area. The international consultant is broadly expected to address the following needs:

- Engineer a design of the BESCOM Smart Grid Pilot Project;
- Formulate a plan for integration of BESCOM's IT applications, business processes and infrastructure, work undertaken under the Government of India's Restructured Accelerated Power Development & Reforms Program (R-APDRP) and the distribution automation systems project being supported by Japan International Cooperation Agency (JICA) funds;
- Conduct outreach workshops to build capacity of key stakeholders such as the state and federal government, regulators, consumers, BESCOM staff, technology providers, and manufacturers of renewable energy technology;
- Validate key performance indicators (KPIs) and establish base lines before implementation of Smart Grid in the pilot area;
- Develop the methodology to measure, monitor and analyze the performance of the Smart Grid Pilot (and later, the build-out project when Smart Grid is implemented across the greater service area).
- Validate the feasibility report outlining financing and economic models prepared by national consultant and prepare the design and engineering basis for the proposed pilot. The report should also present approaches that can be used for increasing customer and regulatory acceptance, and plans and procedures for the installation and integration of Smart Grid technology in the proposed pilot; and
- Develop a detailed roadmap for BESCOM, including preliminary financial, technical and economic analysis, for implantation and integration of Smart Grid technologies across its greater service area.

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

## N. Recommendation

The proposed integration of BESCOM's existing automation systems, and the smart metering and other elements of the smart feeder Pilot Project will, when implemented for all of BESCOM's customers for whom such smart meters may be useful, greatly enhance BESCOM's delivery operations. These will provide accurate power system network information and analysis tools to support various engineering tasks ranging from planning and design through operations and maintenance, and will provide substantial time and cost savings and quality improvement in the performance of all of these tasks. Accurate information will also facilitate accurate investment decisions and optimization of network design that will result in more efficient investment for power system network construction.

The new systems will permit BESCOM to quickly detect, analyze and repair outages; prevent cascading outages; minimize technical and non-technical losses; efficiently provide new hook-ups and service; and greatly reduce electricity theft, loss and waste. The feasibility study is necessary to establish the requirements, detailed functional specifications, and a roadmap to implement Smart Grid technologies from a pilot project to an enterprise wide system.

The overall conclusion with respect to the economic and financial prospects of the project is that the BESCOM Smart Grid automation project represents an opportunity for U.S. exports of automation hardware, information technology, software, computer hardware, integration, training and related services. The total U.S. export contribution is estimated to be $406.9 million.

We have concluded that the USTDA project sponsored by BESCOM represents an opportunity for U.S. exports, and there is a strong prospect that the project will be replicated at other urban distribution utilities throughout India.

The proposed grantee, BESCOM, is a financially sound company that has made, and continues to make, capital investments of tens of millions of dollars annually to improve its system. There is no doubt that BESCOM is intent on going forward with this work; it has already committed substantial internal resources to development of the Pilot Project for customers on one of its typical feeder circuits. Based on the positive impact on U.S. exports and job creation prospects in the United States, as well as the developmental benefits that will accrue to India, the DM Team recommends this project, with a budget of $521,200 for USTDA funding.

**General Background on Smart Grid**

The Characteristics of a Smart Grid are described by the U.S. Energy Independence and Security Act of 2007:

1. increased use of digital information and controls technology to improve reliability, security, and efficiency of the electric grid;
2. dynamic optimization of grid operations and resources, with full cyber-security;
3. deployment and integration of distributed resources and generation, including renewable resources;
4. development and incorporation of demand response, demand-side resources, and energy efficiency resources;
5. deployment of "smart" technologies (real-time, automated, interactive technologies that optimize the physical operation of appliances and consumer devices) for metering, communications concerning grid operations and status, and distribution automation;
6. integration of "smart" appliances and consumer devices;
7. deployment and integration of advanced electricity storage and peak-shaving technologies, including plug-in electric and hybrid electric vehicles, and thermal storage air conditioning;
8. provision to consumers of timely information and control options;
9. development of standards for communication and interoperability of appliances and equipment connected to the electric grid, including the infrastructure serving the grid; and
10. identification and lowering of unreasonable or unnecessary barriers to adoption of smart grid technologies, practices, and services.

**The Smart Grid isn't a "thing" but rather a "vision"**

According to the National Energy Technology Laboratory Smart Grid white paper "A Vision For Smart Grid," to be complete, the Smart Grid vision must be expressed from various perspectives – its values, its characteristics, and the milestones for achieving it. The principal characteristics of the "smart grid vision" describe the features of the grid in terms of its functionality rather than in terms of specific technologies that may ultimately be needed. Achieving a vision that includes the following seven characteristics will enable the Smart Grid to generate value in the areas discussed above.

First, it will enable active participation by consumers. The active participation of consumers in electricity markets will bring tangible benefits to both the grid and the environment. The smart grid will give consumers information, control, and options that allow them to engage in new "electricity markets." Grid operators will treat willing consumers as resources in the day-to-day operation of the grid. Well informed consumers will have the ability to modify consumption based on balancing their demands and resources with the electric system's capability to meet those demands. Demand-response (DR) programs will satisfy a basic consumer need — greater choice in energy purchases. The ability to reduce or shift peak demand allows utilities to minimize capital expenditures and operating expenses while also providing substantial environmental benefits by reducing line losses and minimizing the operation of inefficient peaking power plants.

Second, it will accommodate all generation and storage options. It will seamlessly integrate all types and sizes of electrical generation and storage systems using simplified interconnection processes and universal interoperability standards to support a "plug-and-play" level of convenience. Large central power plants including environmentally friendly sources, such as wind and solar farms and advanced nuclear plants, will continue to play a major role even as large numbers of smaller distributed resources, including plug-in electric vehicles, are deployed.

Various capacities from small to large will be interconnected at essentially all voltage levels and will include distributed energy resources such as photovoltaic, wind, advanced batteries, plug-in hybrid vehicles, and fuel cells. It will be easier and more profitable for commercial users to install their own generation such as highly efficient combined heat and power installations and electric storage facilities.

Third, it will enable new products, services, and markets. The Smart Grid will link buyers and sellers together. It will support the creation of new electricity markets ranging from the home energy management system at the consumers' premises to the technologies that allow consumers and third parties to bid their energy resources into the electricity market. Consumer response to price increases felt through real-time pricing will mitigate demand and energy usage, driving lower-cost solutions and spurring new technology development. New, clean energy-related products will also be offered as market options. The Smart Grid will enable more market participation through increased transmission paths, aggregated demand response initiatives, and the placement of energy resources including storage within a more reliable distribution system located closer to the consumer.

Fourth, the Smart Grid will provide power quality for the digital economy. It will monitor, diagnose, and respond to power quality deficiencies, leading to a dramatic reduction in the business losses currently experienced by consumers due to insufficient power quality. New power quality standards will balance load sensitivity with delivered power quality. The Smart Grid will supply varying grades of power quality at different pricing levels. Additionally, power quality events that originate in the transmission and distribution elements of the electrical power system will be minimized and irregularities caused by certain consumer loads will be buffered to prevent impacting the electrical system and other consumers.

Fifth, it will optimize asset utilization and operate efficiently. Operationally, the Smart Grid will improve load factors, lower system losses, and dramatically improve outage management performance. The availability of additional grid intelligence will give planners and engineers the knowledge to build what is needed when it is needed, extend the life of assets, repair equipment *before* it fails unexpectedly, and more effectively manage the work force that maintains the grid. Operational, maintenance, and capital costs will be reduced thereby keeping downward pressure on electricity prices.

Sixth, it will anticipate and respond to system disturbances (self-heal). It will heal itself by performing continuous self-assessments to detect and analyze issues, take corrective action to mitigate them and, if needed, rapidly restore grid components or network sections. It will also handle problems too large or too fast-moving for human intervention. Acting as the grid's "immune system," self-healing will help maintain grid reliability, security, affordability, power quality and efficiency. The self-healing grid will minimize disruption of service by employing modern technologies that can acquire data, execute decision-support algorithms, avert or limit interruptions, dynamically control the flow of power, and restore service quickly. Real-time contingency analyses will determine overall grid health, trigger early warnings of trends that could result in grid failure, and identify the need for immediate investigation and action. Communications with local and remote devices will help analyze faults, low voltage, poor power quality, overloads, and other undesirable system conditions. Then appropriate control actions will be taken, automatically or manually as the need determines, based on these analyses.

Seventh and finally, the Smart Grid will operate resiliently against attack and natural disaster. The Smart Grid will incorporate a system-wide solution that reduces physical and cyber vulnerabilities and enables a rapid recovery from disruptions. Its resilience will deter would-be attackers, even those who are determined and well equipped. Its decentralized operating model and self healing features will also make it less vulnerable to natural disasters than today's grid. Security protocols will contain elements of deterrence, detection, response, and mitigation to minimize impact on the grid and the economy. A less susceptible and more resilient grid will make it a more difficult target for terrorists.

**India's Smart Grid Implementations**

According to World Resources Institute (WRI), India's electricity grid has the highest transmission and distribution losses in the world – a whopping 27%, much of which is due to

theft. In India, the installation of various smart grid technologies permit the detection and deterrence of these technical and non-technical losses, long a major problem for the economic viability of Indian electric service providers. The Smart Grid, coupled with effective local enforcement, can reduce these losses dramatically.

Several utilities in India have led the way in terms of reducing losses through distribution automation programs. North Delhi Power Limited (NDPL) has been the frontrunner in implementing power distribution reforms in the capital city and is acknowledged for its implementation of advanced distribution system technologies and best practices. Since privatization, the aggregate technical and commercial (AT&C) losses in the NDPL service area have shown a record decline. Today they stand at 14 %, which is a significant reduction from a previous loss level of 53%. This demonstrates the significant advances that can be made with the right investment strategy as well as the accompanying policy measures taken by the government to enforce penalties for electricity theft.

With a total installed generating capacity of around 150,000 MW, even a 10% loss reduction nationwide would be equivalent to building 15,000 MW of new power generation capacity. Recognizing the significant gains to be captured in this area, India's Ministry of Power has recently initiated the Restructured Accelerated Power Development and Reforms Program (R-APDRP), a successor to the successful APDRP, which began in 2003. The focus of the program is on actual, demonstrable performance in terms of sustained loss reduction. Projects under the program are implemented in two parts in urban areas – towns and cities with population of more than 30,000. Part-A projects are for establishment of baseline data and IT applications for energy accounting/ auditing and IT based consumer service centers and Part-B is regular distribution strengthening projects. The government has earmarked $20 billion for implementation of information and operational technologies in state utilities for R-APDRP.

**END OF DEFINITIONAL MISSION STUDY**

# ANNEX 3

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

## NATIONALITY, SOURCE, AND ORIGIN REQUIREMENTS

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

### USTDA STANDARD RULE (GRANT AGREEMENT STANDARD LANGUAGE):

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

### NATIONALITY:

1) Rule

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

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

2) Application

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

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

3) Definitions

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

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

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

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

**SOURCE AND ORIGIN:**

1) Rule

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

2) Application

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

3) Definitions

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

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

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

# ANNEX 4

# GRANT AGREEMENT

India 2011-31003A

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U.S. TRADE AND DEVELOPMENT AGENCY

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# GRANT AGREEMENT

This Grant Agreement is entered into between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA") and Bangalore Electricity Supply Company Limited ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Agreement US$453,350 ("USTDA Grant") to fund the cost of goods and services required for a feasibility study ("Study") on the proposed BESCOM Smart Grid ("Project") in India ("Host Country").

## 1. USTDA Funding

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

## 2. Terms of Reference

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

## 3. Standards of Conduct

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

## 4. Grantee Responsibilities

The Grantee shall undertake its best efforts to provide reasonable support for the Contractor, such as office space as well as to ensure that Central Power Research Institute (CPRI), or whoever the chosen local Indian consulting firm gathering data and building information baseline is, cooperates in all respects with the Contractor by facilitating communications and organizing meetings and discussions between the Contractor and CPRI, or the chosen Indian consulting firm, to meet the requirements detailed in the Terms of Reference as attached as Annex I.

## 5. USTDA as Financier

### (A) USTDA Approval of Competitive Selection Procedures

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

### (B) USTDA Approval of Contractor Selection

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

### (C) USTDA Approval of Contract Between Grantee and Contractor

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

### (D) USTDA Not a Party to the Contract

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

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

**(E) Grant Agreement Controlling**

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

**6. Disbursement Procedures**

**(A) USTDA Approval of Contract Required**

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

**(B) Contractor Invoice Requirements**

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

**7. Effective Date**

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

**8. Study Schedule**

**(A) Study Completion Date**

The completion date for the Study, which is May 25, 2012, is the date by which the parties estimate that the Study will have been completed.

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

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

**9. USTDA Mandatory Clauses**

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

**10. Use of U.S. Carriers**

**(A) Air**

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

**(B) Marine**

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

**11. Nationality, Source and Origin**

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

**12. Taxes**

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

**13. Cooperation Between Parties and Follow-Up**

The parties will cooperate to assure that the purposes of the Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report (as defined in Clause 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 Study, USTDA may, from time to time, issue implementation letters that will provide additional information about matters covered by the Grant Agreement. The parties may also use jointly agreed upon implementation letters to confirm and record their mutual understanding of matters covered by the Grant Agreement.

**15. Recordkeeping and Audit**

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

**16. Representation of Parties**

For all purposes relevant to the Grant Agreement, the Government of the United States of America will be represented by the U. S. Ambassador to Host Country or USTDA and Grantee will be represented by the 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:

The General Manager(HRD)

Bangalore Electricity Supply Company (BESCOM)
K.R.Circle, Bangalore
India 560 001

Phone: 080-2237 4851
Fax: 080-22352484
Email: gmhrdbescom@rediffmail.com

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.:11 11/12 1001
Activity No.: 2011-31003A
Reservation No.: 2011 014
Grant No.: GH 2011 31014

**18. Termination Clause**

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

**19. Non-waiver of Rights and Remedies**

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

**20. U.S. Technology and Equipment**

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

**[THE REMAINDER OF THIS PAGE IS INTENTIONALLY LEFT BLANK]**

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

**For the Government of the United States of America**

By: _____
Mr. Blair P Hall
Minister Counselor for EEST Affairs
American Embassy, New Delhi

Date: 20 Dec 2010

**For Bangalore Electricity Supply Company Limited**

By: _____
Mr. B N Sathyaprema Kumar
General Manager

Date: 20th Dec 2010

Witnessed:

By: _____

Witnessed:

By: _____

**Annex I -- Terms of Reference**

**Annex II -- USTDA Mandatory Clauses**

## Annex I

### Terms of Reference

### Terms of Reference

The main objective of the proposed project is to assist the Grantee in developing and implementing the proposed pilot project and to develop and design a detailed road map for smart grid implementation across the Grantee's service area. The feasibility study will formulate a plan for integrating smart grid technologies with the Grantee's existing IT applications and distribution automation systems. The study would assess the technological, economic, and regulatory support and financial aspects of scaling up the pilot project, and prepare a roadmap for the implementation and integration of smart grid technologies.

### Task 1: Document Review, Kickoff Meeting, Stakeholder Consultations, and Work Plan

The Contractor shall review all information and relevant studies, to be made available by the Grantee, on the current electricity distribution system structure, operation, management and operating guidelines, as well as relevant information concerning the types and state of equipment used in the distribution system.

The Contractor shall meet with the Grantee and all stakeholders or other parties identified by the Grantee to discuss the pilot project and to understand the perspectives and priorities of officials within relevant departments of the Grantee and government agencies. The Grantee shall ensure that CPRI cooperates in all respects with the Contractor, for the duration of this Study. The Contractor shall prepare a report on the Grantee's distribution system and shall propose a work plan for the project. The Contractor shall work with the Grantee to develop a consensus and agreement on the work plan.

**Deliverable**: The Contractor shall provide the Grantee with a report on its review of the Grantee's existing distribution facilities and business processes, a summary of the initial meetings with the Grantee and others, and a work plan for the Project.

### Task 2: Review Distribution System and Modernization Plans

The Contractor shall meet with the Grantee's staff to review the current system for managing company resources and the delivery of power to customers. The Contractor shall identify the major obstacles in meeting the demand for reliable power. The Contractor shall perform a high level review of the overall distribution system, including infrastructure, operations, and management. This shall include a review of all

infrastructure plans for the system. The Contractor shall examine all IT, automation, and management systems and tools currently in use by the Grantee.

The Contractor shall assess the Grantee's planned modernization and expansion plans for its distribution system, including plans for incorporating new automation, IT, and management systems and tools into its operations, whether or not these plans are part of the smart grid pilot or eventual scale up. This assessment shall be done with reference to a recognized smart grid maturity model.

**Deliverable:** The Contractor shall provide to the Grantee a detailed report assessing the state of efficiency and shortcomings in the Grantee's existing distribution system through the use of the smart grid maturity model. The report shall specifically focus on preparedness of the Grantee to implement a smart grid pilot project.

**Task 3: Smart Grid Technology Assessment**

The Contractor shall review and assess, in consultation with the Grantee, the specific technologies and processes the Grantee intends to test in the smart grid pilot project. The Contractor shall identify the technological and economic advantages and benefits the rationale for the specific smart grid technologies and processes that the Grantee proposes to include in the pilot project.

The Contractor shall research, review and evaluate three international case studies of smart grid pilot projects that utilize similar technologies and processes planned for the smart grid pilot project. The Contractor shall analyze and evaluate the technologies and processes to be tested in the pilot project, and shall prepare a presentation suitable for electricity utility regulators describing their findings.

**Deliverable:** The Contractor shall prepare a report for the Grantee on the three pertinent case studies from other countries, including an assessment of the of specific smart grid technologies and processes that the Grantee proposes to incorporate into the pilot project, and an evaluation of the technologies and processes for scaling up the Grantee's entire distribution system.

**Task 4: Financial, Economic and Regulatory Analysis**

The Contractor shall perform a financial analysis of the proposed systems, including internal rate of return and return on investment, and shall recommend financing options. The Contractor shall conduct a cost-benefit analysis and articulate the business case for investments in each smart grid technology or process that the Grantee proposes to include in the pilot project. The Contractor shall identify the most appropriate methods for electricity regulators for recovering costs of smart grid investments through electricity rates and processes identified by the Grantee for the pilot project.

**Deliverable:** Given the financial, economic and regulatory analysis performed in the task above and the technology assessment in task 3, the contractor shall prepare a report recommending the specific smart grid technologies and processes that should be incorporated into the pilot project. The Contractor shall describe address the advantages

and disadvantages of the technologies as well as the costs associated with the investment to demonstrate project viability to electricity regulators.

**Task 5: Site Selection, Preparation of Detailed Project Report and Pilot Project Partners**

The Contractor shall build on the work of the CPRI, which will be provided by the Grantee, to develop a detailed report on the site best suited for the implementation of the smart grid pilot project. The Contractor shall validate the preliminary choice or suggest a different site on the basis of criteria to be agreed to by the Grantee and the Contractor.

The Contractor shall support the Grantee in selecting partners for the pilot project and evaluation of the project. The Grantee shall ensure the cooperation and assistance of the CPRI in this effort as may be requested by the Contractor, for the duration of this Study. The Contractor shall:

- Provide inputs on a guide for vendor responses which would form part of the request for information from vendors on smart grid technologies, services, and pricing;
- Review the selection criteria for pilot project partner;
- Review the technical, financial and economic feasibility analysis of the DPR and the draft Request for Proposal provided by the Grantee and recommend improvements; and

**Deliverable:** The Contractor shall provide a report including the selection of the appropriate site for the pilot project, the selection of appropriate partners for the Grantee for the smart grid pilot project, the design of selection criteria for the partners, and the review of the DPR and draft RFP.

**Task 6: Draft Regulations and Tariff Provisions**

The Contractor shall identify and propose draft policies and regulations based on case studies and experience in the United States and other countries to foster implementation of smart grid technologies and processes. The Contractor shall identify retail tariff structures appropriate to recover costs of technologies and processes, recognizing the costs and benefits of implementation.

**Deliverable:** The Contractor shall provide to the Grantee its proposals for regulatory policies, regulations and tariff structures based on the case studies and its other research and analysis.

**Task 7: Smart Grid Workshops**

The Contractor shall conduct two workshops on the design of the pilot project in two of the following three cities: Bangalore, New Delhi, or Mumbai. The workshops shall be presented to government officials, private sector companies, nongovernmental organizations, and consulting firms and/or policy institutes with a particular interest in,

and/or expertise in smart grid technologies. The Contractor shall prepare all materials, presentations, and invitations and organize all the logistics for the workshops. The workshops shall provide at least seven hours of formal and informal presentations and discussions.

**Deliverables:** The Contractor shall plan and deliver two workshops in India. The Contractor shall prepare a report for the Grantee that includes all materials distributed, describes the workshops and includes feedback from participants

**Task 8: Customer Outreach and Support**

The Contractor will assist the Grantee in developing a customer outreach strategy and assist in consumer education. The strategy may include:

- Community meetings or workshops to educate consumer bodies/associations on potential advantages of smart grid technologies.
- The creation of pamphlets for customer education, which the Grantee can distribute to targeted customers.
- Creation of a smart grid pilot project website.

The Contractor shall provide inputs in designing the consumer awareness strategy and community workshops, and review, comment, and make editorial suggestions on all materials used in the community meetings, educational pamphlets, and website.

**Deliverable:** The Contractor shall submit a report to the Grantee describing their comments and recommendations on the consumer awareness strategy and the materials for implementing the strategy.

**Task 9: Road Map for Smart Grid Implementation**

The Contractor shall develop an implementation roadmap describing the sequencing and grouping of long-term activities, including recommendations for additional pilot projects, if needed, funding approaches, and regulatory approvals required to execute the smart grid strategy.

The Contractor shall meet with pertinent government agencies, such as Karnataka Electricity Regulatory Commission, and the electric companies with whom the Grantee is interconnected, and ascertain how the pilot project and subsequent scale-up of the smart grid project will affect its tariff and relationships with the interconnected companies.
The Contractor shall identify and evaluate various options to implement the smart grid project and provide functional definitions of the scope of each phase of the project. Using a business maturity model, the Contractor shall define the most efficient sequence for implementing and integrating smart grid technologies and processes into the Grantee's existing business procedures on a system-wide basis. The Contractor shall

prepare a financial, economic and technical analysis on probable results of implementing smart grid technologies across the Grantee's greater service area for inclusion in the roadmap. The Contractor shall investigate the advantages and disadvantages of alternative approaches to implementation and recommend the best solution.

**Deliverable:** The Contractor shall prepare a smart grid implementation roadmap and integration strategy report.

**Task 10: Development of Public Private Partnership**

In consultation with the Grantee, the Contractor will prepare a report on advantages and disadvantages of several PPP models, identify interested private sector players, and propose business cases for a cost-sharing arrangement between the Grantee and the private sector parties for different PPP models, based on experience in the United States or other countries. The Contractor shall support the Grantee in publicizing the selected PPP model to stakeholders, including soliciting expressions of interest from technology providers, service providers and equipment manufacturers.

**Deliverable:** The Contractor shall provide a report to the Grantee describing its recommendations for developing a public private partnership (PPP) for operating the smart grid system. The report shall also include proposals and literature for publicizing the opportunities for private participation in providing equipment and services to the scale-up of the pilot project system-wide.

**Task 11: Developmental Impact Assessment**

The Contractor shall report on the potential developmental impact of the pilot project. While specific focus should be paid to the immediate impact of the project, the Contractor shall include, where appropriate, any additional developmental benefits to the project, including spin-off and demonstration effects. The analysis of potential benefits of the project shall be as concrete and detailed as possible. The Contractor shall provide estimates of the project's potential benefits in the following areas:

**Infrastructure:** The Contractor shall provide a description of the infrastructure impact in the portion of the Grantee's service area where the pilot project is implemented, specifically addressing the smart grid distribution systems implemented, modernization of existing systems, the expected effects on the ability of the Grantee to increase the quality and reliability of power to its customer base, and an assessment of the ability of customers to reduce their use of power due to smart grid systems.

**Human Capacity Building**: The Contractor shall address the number and type of positions that would be needed to construct and operate the proposed pilot project as well as the number of people who will receive training and a brief description of the training program.

**Technology Transfer and Productivity Enhancement**: The Contractor shall provide a description of any advanced technologies that will be implemented as a result of the pilot project and an estimate of the quantity of smart grid systems that would be implemented when the pilot project is scaled up to the entire Grantee distribution system. The Contractor shall provide a description of how a scale-up of the pilot project system-wide would affect the efficiency of its system and provide opportunities to reduce consumption during periods of system peak demand.

**Other**: The Contractor shall identify any other developmental benefits to the project, including any spin-off or demonstration effects on other Indian distribution companies.

**Deliverable**: The Contractor shall prepare a developmental impact assessment report.

**Task 12: Preliminary Environmental Impact Assessment**

The Contractor shall conduct a preliminary review of the Pilot Project's anticipated impact on the environment with reference to local requirements and those of multilateral lending agencies (such as the World Bank). This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for a full environmental impact assessment if and when the Pilot Project moves forward to the system-wide implementation stage. This includes the identification of steps that will need to be undertaken by the Grantee subsequent to the completion of the Pilot Project and prior to system-wide implementation.

**Deliverable:** The Contractor shall prepare a preliminary environmental impact assessment report.

**Task 13: Prepare Procurement Related Documents and Specifications**

The Contractor shall provide the Grantee preliminary procurement documents describing the specifications, performance criteria, terms of reference and materials necessary to implement smart grid technologies. These documents shall provide guidance to the Grantee for the subsequent drafting of procurement documents for the full smart grid implementation throughout the Grantee's service area.

**Deliverable:** The Contractor shall prepare preliminary procurement documents and specifications.

**Task 14: U.S. Sources of Supply**

The Contractor shall assess the availability of potential U.S. services and equipment needed in the implementation of the recommended Project and shall list the business names, points of contact, addresses, telephone-, e-mail, and fax numbers of principal prospective U.S. suppliers. The Contractor shall contact at least 20 U.S. companies to discuss the project and prospective procurement opportunities.

**Deliverable:** The Contractor shall prepare a report that includes a list of U.S. companies, and summary of discussions with U.S. companies.

**Task 15: Final Report**

The Contractor shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all work performed under these Terms of Reference ("Final Report"). The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the Grant Agreement.

**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 Bangalore Electricity Supply Company Limited ("Client"), dated _____ ("Grant Agreement"). The Client has selected _____ ("Contractor") to perform the feasibility study ("Study") for the BESCOM Smart Grid project ("Project") in India ("Host Country"). Notwithstanding any other provisions of this contract, the following USTDA mandatory contract clauses shall govern. All subcontracts entered into by Contractor funded or partially funded with USTDA Grant funds shall include these USTDA mandatory contract clauses, except for clauses B(1), G, H, I, and J. In addition, in the event of any inconsistency between the Grant Agreement and any contract or subcontract thereunder, the Grant Agreement shall be controlling.

### B. USTDA as Financier

#### (1) USTDA Approval of Contract

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

#### (2) USTDA Not a Party to the Contract

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

bar the Client or USTDA from asserting any right they might have against the Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Client or USTDA.

**C. Nationality, Source and Origin**

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

**D. Recordkeeping and Audit**

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

**E. U.S. Carriers**

**(1) Air**

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

**(2) Marine**

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

**F. Workman's Compensation Insurance**

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

**G. Reporting Requirements**

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

**H. Disbursement Procedures**

**(1) USTDA Approval of Contract**

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

**(2) Payment Schedule Requirements**

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

**(3) Contractor Invoice Requirements**

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

USTDA to the Contractor for performance of the contract by submitting the following to USTDA:

**(a) Contractor's Invoice**

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

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

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

(ii) For contract performance milestone payments:

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

(iii) For final payment:

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

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

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

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

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

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

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

**(c) USTDA Address for Disbursement Requests**

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

**(4) Termination**

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

**I. USTDA Final Report**

**(1) Definition**

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

**(2) Final Report Submission Requirements**

The Contractor shall provide the following to USTDA:

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

and

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

and

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

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

**(3) Final Report Presentation**

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

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

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

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

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

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

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

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

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

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

## J. Modifications

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

## K. Study Schedule

### (1) Study Completion Date

The completion date for the Study, which is May 25, 2012, is the date by which the parties estimate that the Study will have been completed.

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

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

**L. Business Practices**

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

**M. USTDA Address and Fiscal Data**

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

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

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

Fiscal Data:
Appropriation No.:11 11/12 1001
Activity No.: 2011-31003A
Reservation No.: 2011 014
Grant No.: GH 2011 31014

**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

## Terms of Reference

The main objective of the proposed project is to assist the Grantee in developing and implementing the proposed pilot project and to develop and design a detailed road map for smart grid implementation across the Grantee's service area. The feasibility study will formulate a plan for integrating smart grid technologies with the Grantee's existing IT applications and distribution automation systems. The study would assess the technological, economic, and regulatory support and financial aspects of scaling up the pilot project, and prepare a roadmap for the implementation and integration of smart grid technologies.

## Task 1: Document Review, Kickoff Meeting, Stakeholder Consultations, and Work Plan

The Contractor shall review all information and relevant studies, to be made available by the Grantee, on the current electricity distribution system structure, operation, management and operating guidelines, as well as relevant information concerning the types and state of equipment used in the distribution system.

The Contractor shall meet with the Grantee and all stakeholders or other parties identified by the Grantee to discuss the pilot project and to understand the perspectives and priorities of officials within relevant departments of the Grantee and government agencies. The Grantee shall ensure that CPRI cooperates in all respects with the Contractor, for the duration of this Study. The Contractor shall prepare a report on the Grantee's distribution system and shall propose a work plan for the project. The Contractor shall work with the Grantee to develop a consensus and agreement on the work plan.

**Deliverable**: The Contractor shall provide the Grantee with a report on its review of the Grantee's existing distribution facilities and business processes, a summary of the initial meetings with the Grantee and others, and a work plan for the Project.

## Task 2: Review Distribution System and Modernization Plans

The Contractor shall meet with the Grantee's staff to review the current system for managing company resources and the delivery of power to customers. The Contractor shall identify the major obstacles in meeting the demand for reliable power. The Contractor shall perform a high level review of the overall distribution system, including infrastructure, operations, and management. This shall include a review of all infrastructure plans for the system. The Contractor shall examine all IT, automation, and management systems and tools currently in use by the Grantee.

The Contractor shall assess the Grantee's planned modernization and expansion plans for its distribution system, including plans for incorporating new automation, IT, and management systems and tools into its operations, whether or not these plans are part of the smart grid pilot or eventual scale up. This assessment shall be done with reference to a recognized smart grid maturity model.

**Deliverable:** The Contractor shall provide to the Grantee a detailed report assessing the state of efficiency and shortcomings in the Grantee's existing distribution system through the use of the smart grid maturity model. The report shall specifically focus on preparedness of the Grantee to implement a smart grid pilot project.

**Task 3: Smart Grid Technology Assessment**

The Contractor shall review and assess, in consultation with the Grantee, the specific technologies and processes the Grantee intends to test in the smart grid pilot project. The Contractor shall identify the technological and economic advantages and benefits the rationale for the specific smart grid technologies and processes that the Grantee proposes to include in the pilot project.

The Contractor shall research, review and evaluate three international case studies of smart grid pilot projects that utilize similar technologies and processes planned for the smart grid pilot project. The Contractor shall analyze and evaluate the technologies and processes to be tested in the pilot project, and shall prepare a presentation suitable for electricity utility regulators describing their findings.

**Deliverable:** The Contractor shall prepare a report for the Grantee on the three pertinent case studies from other countries, including an assessment of the of specific smart grid technologies and processes that the Grantee proposes to incorporate into the pilot project, and an evaluation of the technologies and processes for scaling up the Grantee's entire distribution system.

**Task 4: Financial, Economic and Regulatory Analysis**

The Contractor shall perform a financial analysis of the proposed systems, including internal rate of return and return on investment, and shall recommend financing options. The Contractor shall conduct a cost-benefit analysis and articulate the business case for investments in each smart grid technology or process that the Grantee proposes to include in the pilot project. The Contractor shall identify the most appropriate methods for electricity regulators for recovering costs of smart grid investments through electricity rates and processes identified by the Grantee for the pilot project.

**Deliverable**: Given the financial, economic and regulatory analysis performed in the task above and the technology assessment in task 3, the contractor shall prepare a report recommending the specific smart grid technologies and processes that should be incorporated into the pilot project. The Contractor shall describe address the advantages and disadvantages of the technologies as well as the costs associated with the investment to demonstrate project viability to electricity regulators.

**Task 5: Site Selection, Preparation of Detailed Project Report and Pilot Project Partners**

The Contractor shall build on the work of the CPRI, which will be provided by the Grantee, to develop a detailed report on the site best suited for the implementation of the smart grid pilot project. The Contractor shall validate the preliminary choice or suggest a different site on the basis of criteria to be agreed to by the Grantee and the Contractor.

The Contractor shall support the Grantee in selecting partners for the pilot project and evaluation of the project. The Grantee shall ensure the cooperation and assistance of the CPRI in this effort as may be requested by the Contractor, for the duration of this Study. The Contractor shall:

- Provide inputs on a guide for vendor responses which would form part of the request for information from vendors on smart grid technologies, services, and pricing;
- Review the selection criteria for pilot project partner;
- Review the technical, financial and economic feasibility analysis of the DPR and the draft Request for Proposal provided by the Grantee and recommend improvements; and

**Deliverable:** The Contractor shall provide a report including the selection of the appropriate site for the pilot project, the selection of appropriate partners for the Grantee for the smart grid pilot project, the design of selection criteria for the partners, and the review of the DPR and draft RFP.

**Task 6: Draft Regulations and Tariff Provisions**

The Contractor shall identify and propose draft policies and regulations based on case studies and experience in the United States and other countries to foster implementation of smart grid technologies and processes. The Contractor shall identify retail tariff structures appropriate to recover costs of technologies and processes, recognizing the costs and benefits of implementation.

**Deliverable:** The Contractor shall provide to the Grantee its proposals for regulatory policies, regulations and tariff structures based on the case studies and its other research and analysis.

**Task 7: Smart Grid Workshops**

The Contractor shall conduct two workshops on the design of the pilot project in two of the following three cities: Bangalore, New Delhi, or Mumbai. The workshops shall be presented to government officials, private sector companies, nongovernmental organizations, and consulting firms and/or policy institutes with a particular interest in, and/or expertise in smart grid technologies. The Contractor shall prepare all materials, presentations, and invitations and organize all the logistics for the workshops. The workshops shall provide at least seven hours of formal and informal presentations and discussions.

**Deliverables:** The Contractor shall plan and deliver two workshops in India. The Contractor shall prepare a report for the Grantee that includes all materials distributed, describes the workshops and includes feedback from participants

**Task 8: Customer Outreach and Support**

The Contractor will assist the Grantee in developing a customer outreach strategy and assist in consumer education. The strategy may include:

- Community meetings or workshops to educate consumer bodies/associations on potential advantages of smart grid technologies.

- The creation of pamphlets for customer education, which the Grantee can distribute to targeted customers.

- Creation of a smart grid pilot project website.

The Contractor shall provide inputs in designing the consumer awareness strategy and community workshops, and review, comment, and make editorial suggestions on all materials used in the community meetings, educational pamphlets, and website.

**Deliverable:** The Contractor shall submit a report to the Grantee describing their comments and recommendations on the consumer awareness strategy and the materials for implementing the strategy.

**Task 9: Road Map for Smart Grid Implementation**

The Contractor shall develop an implementation roadmap describing the sequencing and grouping of long-term activities, including recommendations for additional pilot projects, if needed, funding approaches, and regulatory approvals required to execute the smart grid strategy.

The Contractor shall meet with pertinent government agencies, such as Karnataka Electricity Regulatory Commission, and the electric companies with whom the Grantee is interconnected, and ascertain how the pilot project and subsequent scale-up of the smart grid project will affect its tariff and relationships with the interconnected companies.
The Contractor shall identify and evaluate various options to implement the smart grid project and provide functional definitions of the scope of each phase of the project. Using a business maturity model, the Contractor shall define the most efficient sequence for implementing and integrating smart grid technologies and processes into the Grantee's existing business procedures on a system-wide basis. The Contractor shall prepare a financial, economic and technical analysis on probable results of implementing smart grid technologies across the Grantee's greater service area for inclusion in the roadmap. The Contractor shall investigate the advantages and disadvantages of alternative approaches to implementation and recommend the best solution.

**Deliverable:** The Contractor shall prepare a smart grid implementation roadmap and integration strategy report.

**Task 10: Development of Public Private Partnership**

In consultation with the Grantee, the Contractor will prepare a report on advantages and disadvantages of several PPP models, identify interested private sector players, and propose

business cases for a cost-sharing arrangement between the Grantee and the private sector parties for different PPP models, based on experience in the United States or other countries. The Contractor shall support the Grantee in publicizing the selected PPP model to stakeholders, including soliciting expressions of interest from technology providers, service providers and equipment manufacturers.

**Deliverable:** The Contractor shall provide a report to the Grantee describing its recommendations for developing a public private partnership (PPP) for operating the smart grid system. The report shall also include proposals and literature for publicizing the opportunities for private participation in providing equipment and services to the scale-up of the pilot project system-wide.

**Task 11: Developmental Impact Assessment**

The Contractor shall report on the potential developmental impact of the pilot project. While specific focus should be paid to the immediate impact of the project, the Contractor shall include, where appropriate, any additional developmental benefits to the project, including spin-off and demonstration effects. The analysis of potential benefits of the project shall be as concrete and detailed as possible. The Contractor shall provide estimates of the project's potential benefits in the following areas:

**Infrastructure**: The Contractor shall provide a description of the infrastructure impact in the portion of the Grantee's service area where the pilot project is implemented, specifically addressing the smart grid distribution systems implemented, modernization of existing systems, the expected effects on the ability of the Grantee to increase the quality and reliability of power to its customer base, and an assessment of the ability of customers to reduce their use of power due to smart grid systems.

**Human Capacity Building**: The Contractor shall address the number and type of positions that would be needed to construct and operate the proposed pilot project as well as the number of people who will receive training and a brief description of the training program.

**Technology Transfer and Productivity Enhancement**: The Contractor shall provide a description of any advanced technologies that will be implemented as a result of the pilot project and an estimate of the quantity of smart grid systems that would be implemented when the pilot project is scaled up to the entire Grantee distribution system. The Contractor shall provide a description of how a scale-up of the pilot project system-wide would affect the efficiency of its system and provide opportunities to reduce consumption during periods of system peak demand.

**Other**: The Contractor shall identify any other developmental benefits to the project, including any spin-off or demonstration effects on other Indian distribution companies.

**Deliverable**: The Contractor shall prepare a developmental impact assessment report.

**Task 12: Preliminary Environmental Impact Assessment**

The Contractor shall conduct a preliminary review of the Pilot Project's anticipated impact on the environment with reference to local requirements and those of multilateral lending agencies (such as the World Bank). This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for a full environmental impact assessment if and when the Pilot Project moves forward to the system-wide implementation stage. This includes the identification of steps that will need to be undertaken by the Grantee subsequent to the completion of the Pilot Project and prior to system-wide implementation.

**Deliverable:** The Contractor shall prepare a preliminary environmental impact assessment report.

**Task 13: Prepare Procurement Related Documents and Specifications**

The Contractor shall provide the Grantee preliminary procurement documents describing the specifications, performance criteria, terms of reference and materials necessary to implement smart grid technologies. These documents shall provide guidance to the Grantee for the subsequent drafting of procurement documents for the full smart grid implementation throughout the Grantee's service area.

**Deliverable:** The Contractor shall prepare preliminary procurement documents and specifications.

**Task 14: U.S. Sources of Supply**

The Contractor shall assess the availability of potential U.S. services and equipment needed in the implementation of the recommended Project and shall list the business names, points of contact, addresses, telephone-, e-mail, and fax numbers of principal prospective U.S. suppliers. The Contractor shall contact at least 20 U.S. companies to discuss the project and prospective procurement opportunities.

**Deliverable:** The Contractor shall prepare a report that includes a list of U.S. companies, and summary of discussions with U.S. companies.

**Task 15: Final Report**

The Contractor shall prepare and deliver to the Grantee and USTDA a substantive and comprehensive final report of all work performed under these Terms of Reference ("Final Report"). The Final Report shall be organized according to the above tasks, and shall include all deliverables and documents that have been provided to the Grantee. The Final Report shall be prepared in accordance with Clause I of Annex II of the Grant Agreement.

**Notes:**

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

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

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

# ANNEX 6

## COMPANY INFORMATION

### A. Company Profile

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

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

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

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

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

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

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

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

### B. Offeror's Authorized Negotiator

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

## C. Negotiation Prerequisites

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

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

## D. Offeror's Representations

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

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

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

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

destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property.

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

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

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

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

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____

## E. Subcontractor Profile

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

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

## F. Subcontractor's Representations

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

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

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

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

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

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

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

Signed: _____
(Authorized Representative)

Print Name: _____

Title: _____

Date: _____