

REQUEST FOR PROPOSALS

**FEASIBILITY STUDY FOR THE SMART GRID PILOT IMPLEMENTATION
STRATEGY**

Submission Deadline: **1:00 PM LOCAL TIME**
THURSDAY, JUNE 23, 2011

Submission Place: Daniel Senna Guimarães
Cemig Distribuição S.A. – TD-SA/20/B2
Avenida Barbacena, 1200, 20th floor
Belo Horizonte, Minas Gerais 30190-131
Brazil
Phone: 011 55 (31) 3506-3301

**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\$710,000 to Cemig Distribuição S.A. (the "Grantee") in accordance with a grant agreement dated March 15, 2011 (the "Grant Agreement"). USTDA will fund the costs of a feasibility study ("Study") for the proposed Smart Grid Pilot Implementation Strategy Project ("Project") in Brazil ("Host Country"). The Grant Agreement is attached at Annex 4 for reference. The Grantee is soliciting technical proposals from qualified U.S. firms to provide expert consulting services to perform the Feasibility Study.

1.1 BACKGROUND SUMMARY

Cemig is a mixed economy company in which the Government of Minas Gerais is the main shareholder. It provides electricity to 18 million people and manages the largest electric power distribution network in South America, which extends more 400,000 kilometers. Its affiliate Light is the third-largest distributor of electric power in Brazil. Light's distribution territory encompasses 10,970 km and provides electricity to 10 million people.

The deployment of smart grid technologies is a high priority in Brazil, for which the national government has already approved a \$204 million stimulus plan. Moreover, grid upgrades will also enable the government to fulfill another priority, which is to expand the use of renewable energy in a distributed generation fashion, by enabling bi-directional power flow to and from the grid.

The feasibility study would be comprised of several measures to assist in the deployment of smart grid technologies within the Cemig and Light network. These include implementing a smart grid strategy and assistance with the deployment of pilot projects for both entities. If successfully implemented, the utilities would replicate the pilots in other cities until upgrades to the power grid have been completed. The study would specify the upgrades and investments necessary for Cemig and Light to successfully implement the projects. A background Desk Study is provided for reference in Annex 2.

1.2 OBJECTIVE

The Smart Grid Pilot Implementation Strategy study shall analyze various factors related to the implementation of Smart Grid technologies for Cemig Distribuição, S.A. and Light Serviços de Eletricidade S.A., including the following:

- Integrated Smart Grid Platform;
- Automatic Metering Infrastructure (AMI) Smart Metering System Planning & Implementation;
- Demand Response;
- Real-Time Distribution Grid Management, including substation automation; and
- Integration of Renewable, Distributed Storage and EV in Distribution Grid Management.

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\$710,000. **The USTDA grant of \$US710,000 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\$710,000 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 Smart Grid Pilot Implementation Strategy 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 DESK STUDY

USTDA sponsored a Desk Study to address technical, financial, sociopolitical, environmental and other aspects of the proposed project. A copy of the report is attached at Annex 2 for background information only. Please note that the TOR referenced in the report are included in this RFP as Annex 5.

2.4 EXAMINATION OF DOCUMENTS

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

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

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

2.5 PROJECT FUNDING SOURCE

The Feasibility Study will be funded under a grant from USTDA. The total amount of the grant is not to exceed US\$710,000.

2.6 RESPONSIBILITY FOR COSTS

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

2.7 TAXES

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

2.8 CONFIDENTIALITY

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

2.9 ECONOMY OF PROPOSALS

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

2.10 OFFEROR CERTIFICATIONS

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

2.11 CONDITIONS REQUIRED FOR PARTICIPATION

Only U.S. firms are eligible to participate in this tender. However, U.S. firms may utilize subcontractors from the Host Country for up to 20 percent of the amount of the USTDA grant for

specific services from the TOR identified in the subcontract. USTDA's nationality requirements, including definitions, are detailed in Annex 3.

2.12 LANGUAGE OF PROPOSAL

All proposal documents shall be prepared and submitted in English and Portuguese

2.13 PROPOSAL SUBMISSION REQUIREMENTS

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

Daniel Senna Guimarães
Cemig Distribuição S.A. – TD-SA/20/B2
Avenida Barbacena, 1200, 20th floor
Belo Horizonte, Minas Gerais 30190-131
Brazil
Phone: 011 55 (31) 3506-3301

An Original in English and Portuguese, one (1) copy in English, and three (3) copies in Portuguese of your proposal must be received at the above address no later than June 23, 2011, on 1:00pm (local time).

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 **in English and Portuguese, one (1) copy in English, and three (3) copies in Portuguese** should be collectively wrapped and sealed, and clearly labeled.

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

2.15 AUTHORIZED SIGNATURE

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

2.16 EFFECTIVE PERIOD OF PROPOSAL

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

2.17 EXCEPTIONS

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

2.18 OFFEROR QUALIFICATIONS

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

2.19 RIGHT TO REJECT PROPOSALS

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

2.20 PRIME CONTRACTOR RESPONSIBILITY

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

2.21 AWARD

The Grantee shall make an award resulting from this RFP to the best qualified Offeror, on the basis of the evaluation factors set forth herein. The Grantee reserves the right to reject any and all proposals received and, in all cases, the Grantee will be the judge as to whether a proposal has or has not satisfactorily met the requirements of this RFP.

2.22 COMPLETE SERVICES

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

2.23 INVOICING AND PAYMENT

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

Section 3: PROPOSAL FORMAT AND CONTENT

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

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

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US\$710,000, which is a fixed amount.

Offerors shall submit **one (1) original in English and Portuguese, one (1) copy in English, and three (3) copies in Portuguese** 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:

- Technical expertise of the proposed experts in smart grid projects, equipment and technologies **25%**
- Economic and financial expertise of the proposed experts in financing the complementation of smart grid projects **15%**
- Technical and economic/financial approach **25%**
- International experience of the proposed experts **20%**
- Portuguese language capabilities **15%**

Daniel Senna Guimarães, Cemig Distribuição S.A. – TD-SA/20/B2, Avenida Barbacena, 1200, 20th floor, Belo Horizonte, Minas Gerais 30190-131, Brazil, Tel.: 011 55 (31) 3506-3301

B – Brazil: Smart Grid Pilot Implementation Strategy

POC: Nina Patel, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009. SMART GRID PILOT IMPLEMENTATION STRATEGY. 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 to provide a smart grid strategy and assistance with the deployment of pilot projects for Cemig and Light.

The feasibility study would be comprised of several measures to assist in the deployment of smart grid technologies within the Cemig and Light network. The study would specify the upgrades and investments necessary for Cemig and Light to successfully implement the projects. The Terms of Reference (TOR) for this Feasibility Study are attached as Annex 5.

The U.S. firm selected will be paid in U.S. dollars from a \$710,000 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 Portuguese and English directly to the Grantee by 1:00 pm (local time), June 23, 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.



U. S. Trade and Development Agency

**Desk Study (DS): Brazil –
Smart Grid Opportunities
Project: USTDA Project
No. PO2010510013**

Final Report

March 21, 2010

Prepared by

CORE International, Inc.
5101 Wisconsin Avenue, N.W., Suite 305
Washington, DC 20016



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Mailing and Delivery Address: 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901
Phone: 703-875-4357 • **Fax:** 703-875-4009 • **Web site:** www.ustda.gov • **email:** info@ustda.gov

The U.S. Trade and Development Agency

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

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Executive Summary

Project Background

In August 2010, the U.S. Trade and Development Agency (USTDA) selected CORE International, Inc. to conduct a Desk Study and evaluate requests from CEMIG and LIGHT, two electric utilities in Brazil for assistance with the development of a smart grid implementation strategy in each of the utilities. This report provides an analysis of the work conducted by CORE and our recommendations with respect to the projects proposed by CEMIG and LIGHT.

Requests from CEMIG and LIGHT in Brazil

Request from CEMIG

CEMIG is a joint enterprise, controlled by the Government of Minas Gerais. CEMIG provides electricity to about 18 million people in 774 municipalities of Minas Gerais and the management of the largest distribution network of electric power in South America, with more than 400 thousand kilometers of feeder network. In recent years, CEMIG has deployed a distribution automation solution to modernize the electrical system and initiated a “Cities of the Future” project, which is recognized as a foundation of the CEMIG Smart Grid architecture.

With the present and future challenges faced by CEMIG, Smart Grid is their imminent need. Smart Grids will change the way CEMIG manages its grid assets and interact with customers and the market, as well as the way customers interact with the grid.

CEMIG recognizes that the U.S. is a leader in Smart Grid technology and, therefore, the company approached the U. S. Trade and Development Agency (USTDA) for specific assistance that would accelerate the deployment of a variety of Smart Grid technologies in Brazil. CEMIG has been planning a Smart Grid project for some time and has reached the stage where it is seeking external expertise to move forward. The overall objective of this project is to test commercially available technology to provide an integrated customer-centric solution to improve service quality, environmental sustainability and return on investment that bring benefits to the utility, stakeholder and society in general.

CEMIG has selected Sete Lagoas regional area with more than 95,000 clients (200,000 customers) for its first Smart Grid project. Sete Lagoas city is located about 70 km from Belo Horizonte, the capital of the State of Minas Gerais. At this point CEMIG is identifying business objectives, regulatory requirements, project requirements, customers, and potential energy efficiency and environment benefits of this project. CEMIG is seeking funding from USTDA to fund a feasibility study of the proposed project.

Request from LIGHT

LIGHT Serviços de Eletricidade (referred to as LIGHT) provides electric power to 3.8 million residential, commercial and industrial customers in 31 cities of the Brazilian state of Rio de Janeiro. LIGHT's distribution territory encompasses 10,970 Km² and provides electricity to 10 million people, out of 15 million inhabitants in the state. In 2007, energy billed by the Company reached 18,307 GWh. LIGHT generates about 15% of its electricity supply (850 MW of capacity), buying the rest from other generators in the Brazilian energy market. Rio Minas Energia S.A. owns 78.4% of the utility, which the government privatized in 1996. Rio Minas Energia acquired the controlling stake from former owner EDF International S.A. in 2006.

LIGHT ESCO, a subsidiary of LIGHT S.A., is an Energy Services Company providing energy and infrastructure services, concerned with energy solutions for its customers. LIGHT ESCO was authorized by ANEEL to operate as trading agent through Order 823 as of April 25, 2006.

LIGHT has decided to deploy one of the most extensive R&D focused Smart Grid initiatives in the world. The program consists of multiple sub-projects and proofs of concept, which will provide practical support, standardization and interoperability to LIGHT and other utilities in Brazil. LIGHT has categorized Smart Grid implementation feasibility assessment and prototype in five different projects.

The overall objective of this project is to test commercially available technology to provide an integrated customer-centric solution to improve service quality, environmental sustainability and return on investment that would bring benefits to utility, stakeholder and society in general.

Review and Analysis by CORE International

Both CEMIG and LIGHT submitted drafts of their requests to CORE International. In addition, CORE's representatives met with the representatives from CEMIG and LIGHT as well as with the USTDA Representative from Brazil who had accompanied the Brazilians to Washington to participate in a reverse trade mission. During this meeting, we further clarified the requests from CEMIG and LIGHT. Annex 1 includes a list of key contacts.

Based on these discussions, CORE developed drafts of Terms of Reference for potential grants to USTDA. These draft TORs were sent to CEMIG and LIGHT representatives for review and comments.

In addition to the requests from CEMIG and LIGHT, CORE conducted an independent assessment of the smart grid technology status in Brazil and plans of the Government of Brazil and the utilities to embark upon developing a smart grid. This review was useful for both defining the context of the projects requests from CEMIG and LIGHT and assessing the desirability of USTDA involvement in this sector in Brazil.

CORE's review confirmed that USTDA should consider supporting the development of smart grid in Brazil. In addition, we determined that Brazil is ready and serious about undertaking a giant step toward developing smart grid in various parts of Brazil.

CORE International reviewed the projects proposed by CEMIG and LIGHT and found that the requests submitted by CEMIG and LIGHT included many common tasks. In addition, the two utilities are related entities. Therefore, combining the requests from both of them into a single feasibility study would result in considerable economy of scale. Coordination of work to be done would also not pose any difficulty as the two entities are closely related. Accordingly, CORE recommended the following project for potential funding by USTDA:

- Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil

Annex 2 includes the detailed Terms of Reference for the proposed grant to CEMIG. Annex 3 provides a detailed budget and schedule for the proposed study.

Recommendations

Based on a detailed technical and economic assessment of the project and an initial analysis of potential exports and development impacts, CORE found the requests from CEMIG and LIGHT attractive and important for USTDA's involvement. These two projects were further analyzed with respect to USTDA's criteria for funding projects which included other factors such as industry competitiveness, market entry issues, environmental and energy efficiency benefits, and the opportunity for positioning U.S. firms in a competitive position to capture the growing market for energy efficiency, smart grid technology, smart meters systems, and related transmission and distribution communications systems in Brazil. Based on this analysis and given the commonality between the two requests, CORE combined them into a single project.

Exhibit 1 provides a summary of CORE's recommendations. The rest of the report provides details of the analysis.

Exhibit 1: CORE International's Recommendations Summary

	PROPOSED ACTIVITY	PROPOSED GRANT AMOUNT	GRANTEE
1	Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil	\$710,000.00	Grantee: Companhia Energetica de Minas Gerais (CEMIG), Brazil
	TOTAL		\$710,000.00

Note: Annex 2 provides detailed Terms of Reference (TORs) for the project. Annex 3 provides a detailed budget and schedule for the project in accordance with USTDA's formats and guidelines.

1 Project Description

1.1 Brazil's Electric Utilities Background

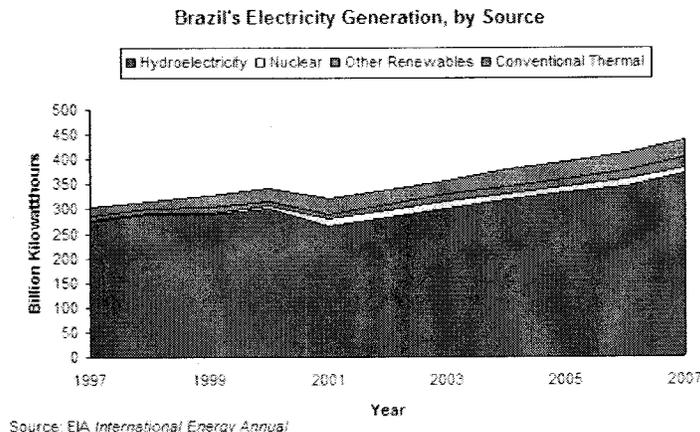
The Smart Grid deployment has moved beyond pilot project status in United States due to recent innovations and government subsidies funded via the Energy Independence & Security Act of 2007 and the American Recovery and Reinvestment Act of 2009. However, Smart Grid deployment is in a very early stage in Brazil, but it is going to change in the near future. Since 2007, there has been a growing interest in smart energy technologies among Latin American countries. In several countries, power companies have undertaken pilot projects in Smart Grids.

Like utilities in many countries, Brazilian utilities strive to provide reliable, efficient and low-cost services. Modern Smart Grid technology can contribute by enabling transparency and improved grid management throughout the system. A recent study by Zpryme Research and Consulting identified Brazil (due to its \$204 million Smart Grid federal stimulus investment) as one of the top 10 countries based on government investment in Smart Grid Programs. The \$204 million Smart Grid Federal Stimulus Investment Program includes a variety of projects aimed at smart grid schemes, smart metering, and demand response. The Brazilian Government is developing the details of the program and the implementation procedures.

1.2 Brazil's Electricity Supply

Brazil has the third-largest electricity sector in the Western Hemisphere, behind the United States and Canada. Brazil benefits from a very cost-effective electric infrastructure, with more than 85% of its electricity coming from hydroelectric. Brazil had 96.6 giga-watts (GWs) of installed generating capacity in 2007. In 2007, the country generated 437 billion kilo-watt-hours (Bkwh) of electric power, while consuming 402 Bkwh. Hydropower provided 85 percent of the total power, with smaller amounts coming from conventional thermal, nuclear, and other renewable energy sources. Exhibit 2 illustrates Brazil's electricity generation by source.

Exhibit 2: Brazil's Electricity Generation by Source



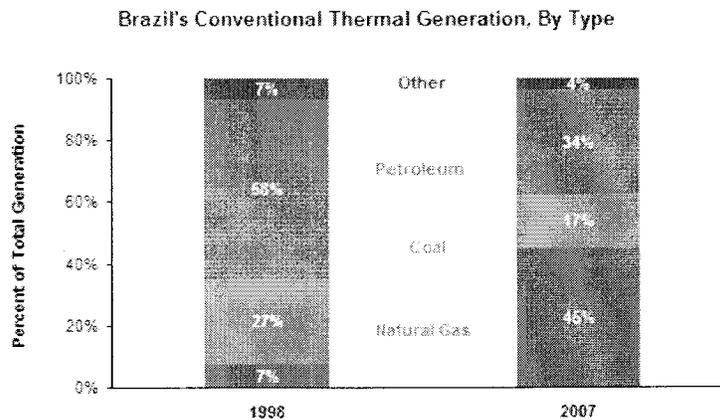
1.2.1 Hydroelectricity

Brazil generated 371 Bkwh of hydroelectric power in 2007, accounting for 85 percent of its total electricity generation. Many of Brazil's hydropower generating facilities are located far away from the main demand centers, resulting in high transmission and distribution losses. Brazil's heavy reliance on hydroelectricity has caused some supply problems in the past, especially during periods of below-average rainfall.

1.2.2 Conventional Thermal

Conventional thermal generating sources provided only a small part of Brazil's electricity supply, contributing about 8 percent in 2007. According to Brazil's Ministry of Energy and Mines, the largest contributor to Brazil's conventional thermal power generation in 2007 was natural gas (45 percent), followed by petroleum products (34 percent) and coal (17 percent). The share represented by natural gas has grown sizably in recent years, standing at only 7 percent in 1998. Exhibit 3 illustrates Brazil's electricity generation by conventional energy resources.

Exhibit 3: Conventional Thermal Generation by Type



Source: Ministry of Mines and Energy

1.2.3 Nuclear Power

Brazil has 1,980 MW nuclear power generation capacity with two nuclear power plants -- the 630-megawatt (MW) Angra-1 and the 1,350-MW Angra-2, both operated by the state-owned Eletronuclear, a subsidiary of Eletrobras.

1.3 Brazil's Electricity Demand

Until now, Brazil's demand profile has been relatively flat, but it is expected to change rapidly in the coming years as consumers spend a portion of their increasing prosperity on appliances, air conditioning, computers, and consumer goods.

Brazil's projected GDP growth between 2010 and 2013 will exceed the US, Canada, the European Union, and Russia. In fact, from 2007 to 2017, energy consumption in Brazil is expected to increase by approximately 60 percent. The economic growth will also result in increased consumption, which will result in increased demand for electricity.

In addition to being a global leader in raw materials, Brazil continues to demonstrate its ability in the area of manufacturing, where reliability of power availability is a top priority. Reliable electricity is a corner stone to any economy based on manufacturing. Acende Brasil, a Brazilian electricity-industry body, predicts a 28-32% chance of blackouts by 2012 if the economy grows at 4.8% a year (the government's forecast is 5%).

While Brazil has a growing renewable energy sector, the aging infrastructure has made incorporating renewables difficult. Renewable energy, such as biomass and wind, will account for between 16 and 34% of new generation adds over the next few years. While this may be viewed as an opportunity, integrating these renewables into the transmission and distribution grid will also present challenges, as the grid was initially designed for one-way power flow, from a central generating facility to the consumer. A Smarter Grid will be needed to help integrate this renewable power into the grid.

1.4 Brazilian Utilities Landscape

There are many similarities between the electric power grids in Brazil and the United States. The electric grid in Brazil features numerous semi-autonomous electric generation, transmission, and distribution utilities operating under the close supervision of the central government. The U.S. electric grid is composed of a complex mix of independently owned and operated, public and private sector power plants and transmission lines. In many areas of Brazil and the United States, the electric grids are aging, overused, and fragile. Both countries transmit electricity across great distances resulting in high energy losses, both have insufficient electric power generation and transmission capacity to keep up with forecasted demand, and both have placed a high priority on the development of renewable resources for power generation.

Adding new power plants and transmission lines will increase system capacity. However, the costly new equipment will not increase the reliability of existing infrastructure that is reaching the end of its useful life. Furthermore, new infrastructure will not reduce energy losses in the delivery system or permit large-scale exploitation of renewable energy sources such as wind and solar power. To address these problems, smart grid technologies must be deployed.

In order to improve the distribution system reliability and efficiency, Brazilian utilities have begun to make investments to improve the energy infrastructure. Distribution Automation and Smart Metering devices are key components in the smart grid network upgrade in Brazil. Given the sophisticated nature of smart grid networks and their components, there are enormous opportunities and challenges for U.S. companies hoping to enter the domestic Brazilian market. The Brazilian government and the country's utilities are taking steps to integrate smarter grid technologies, which will help deliver greater productivity and efficiencies, enabling utilities and consumers do more with less; optimize renewable energy sources like wind, solar and biogas;

and empower consumers with information to manage their energy usage and make choices that could save money without compromising their lifestyle.

Brazil will serve as host for both the World Cup in 2014 and the Olympics in 2016, which provides an opportunity to focus on smart grid development. Already, the Brazilian government is instituting additional incentives for the “greening” of the network, to include solar power on rooftops. Brazil and other Latin American countries are focusing fiscal stimulus dollars (also called counter-cyclical measures) on energy and infrastructure. Brazil's combination of \$3.6 billion in fiscal stimulus and \$123 billion in PAC (program for accelerated growth) funding will have a focus on energy, infrastructure and oil and gas.³

Brazil has also focused R&D dollars allocated for efficiency programs to help meet the significant challenges around energy losses. Every utility puts one percent of their revenue into a regulated fund each year, of which at least 25 percent must be spent on efficiency measures. The Agência Nacional de Energia Elétrica or ANEEL, the agency which regulates Brazilian utilities, has recently begun focusing on smart metering (with a proposed mandate for 62 million smart meters across Brazil) and time-of-use rates, which will not only help manage growing demand, but will also help give consumers choice and control over how they use and pay for power.

Smart meters and time-of-use rates would also help support the integration of plug-in electric vehicle (EV). The EVs hold promise for Brazil's increasingly urban population. Brazil has affordable electricity to support these vehicles. The urban areas have traffic congestion and electric cars are very economic for this type of environment, given that they only use energy when they are moving, unlike their gasoline/diesel counterparts that consume energy even at a standstill. Lastly, these cars have significant benefits to urban areas with less automobile noise and substantially reduced emissions that would address urban smog.

1.5 What is a Smart Grid?

Like utilities everywhere, Brazilian utilities face unprecedented challenges due to stringent regulation, environmental concerns, growing demand for high-quality, reliable electricity and rising customer expectations, which require utilities to transformer traditional electricity generation, transmission and delivery system when assets are aging and experienced personnel are retiring from work force. However, a number of new technology solution commonly referred as Smart Grid are available, which use low-cost computing and telecommunications technologies, new generation options, and scalable, modular automation systems to change power generation, transmission and delivery business. Also driven by the dynamics of the new energy environment, leading utilities, technology vendors, and government organizations have created a vision of the next generation of energy delivery systems commonly referred to as the “Smart Grid”.

Smart Grid defines it as an electricity delivery system integrated with communication and information technology to provide proactive grid management. The Electric Power Research Institute ('EPRI') has defined a Smart Grid as *“a power system that can incorporate millions of sensors all connected through an advanced communication and data acquisition system”*. This

system will provide real-time analysis by a distributed computing system that will enable predictive rather than reactive responses to blink-of-the-eye disruptions.

Traditionally, power is generated at remote, centralized plants and then transmitted to load centers over high-voltage transmission lines before being distributed to the consumer. Designed and deployed decades ago, Brazil's grid infrastructures, and the systems that monitor and control them, are severely outdated and incapable of meeting tomorrow's energy needs.

The Smart Grid is a multi-faceted solution to the problem of modern energy delivery. It represents a shift toward a more flexible network topology that encourages two-way power flow between the grids and small-scale distributed energy resources. It encourages increased cooperation between consumers and utilities to reduce peak loads and optimize resource allocation and efficiency. The Smart Grid will also bring about an exponential increase in the amount of information coming from the grid and being fed to network operators, utility executives and consumers for increased visibility and control.

Fundamentally, the Smart Grid is the vision of a more reliable, environmentally friendly and economically viable power grid. Automation systems are the backbone of intelligent electric power transmission and distribution systems.

In practical terms, Smart Grids will enable integrated and safe automation of power grids, metering systems, and distributed generation and storage systems, with real-time analysis and diagnostics enabling the grid to be automatically reconfigured in response to system needs. The concept also includes demand-side management, which provides customers with incentives and the ability to shut off non-critical loads (such as air conditioners) during pre-defined periods to optimize grid resource usage and continually match power supply to demand, as well as to reduce the impacts of emergencies on customers. Benefits can also be realized through interaction with distributed generation and storage resources directly connected to the grid or consumers. Synergy gains will be achieved through interaction between the various elements of the power grid, including metering systems, grid devices, generation and storage resources and loads. The benefits to consumers will come in the form of new rate schemes, products, services and interaction channels.

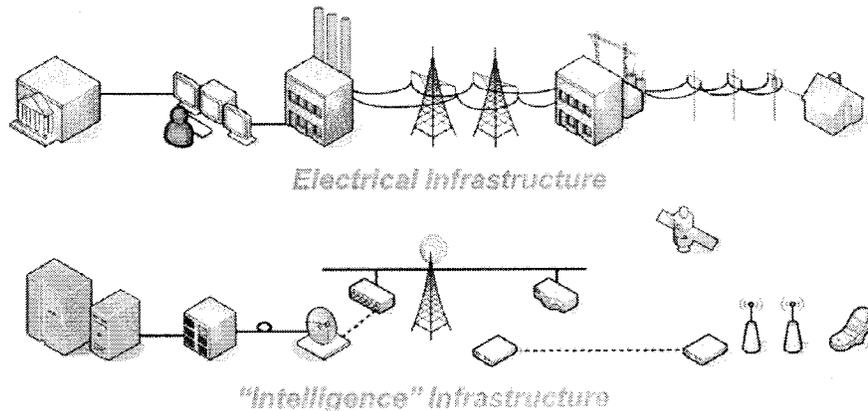
Implementation of Smart Grid systems will need to be gradual and participative because of the various challenges faced and the *status quo* needing to be overcome. For example, customers may take a negative view of interaction at their homes and in some countries, demand-side management and the ability of utilities to identify customers' load profiles have been perceived as posing a risk of privacy infringement, exposure and unwanted publicity. For these reasons, the process of researching, developing and implementing a Smart Grid should be so conducted as to educate, secure the confidence of, and provide information to customers so they perceive the benefits of their active and voluntary participation. New products and services will need to be phased in to ensure the satisfaction and engagement of the various stakeholders.

1.5.1 Smart Grid Structure:

High-speed communications embedded sensing and actionable intelligence are the keys to enabling a Smart Grid. The Energy and Environmental Economics, Inc. and EPRI Solutions, Inc.

report prepared for the California Energy Commission (CEC) on the Value of Distribution Automation (CEC Report) emphasized 'communications is a foundation for virtually all the applications and consists of high speed two-way communications throughout the distribution system and to individual customers' (Price et al. 2006, 51). The report also stated that sensors are the next basic requirement for virtually all Distribution Automation applications. High-speed communications and embedded sensing are a fundamental differentiation of a Smart Grid versus narrowband AMI systems. Exhibit 4 shows a simple illustration of a Smart Grid structure.

Exhibit 4: Smart Grid Structure



1.5.2 High Performance Communication Network

The need for real time, high-speed communications is changing the way all industries do business. Like many other industries, as communications capabilities are added to business processes, high performance communications will likely become a strategic business requirement for electric utilities. Managing the distribution grid in the 21st century – in a world increasingly focused on improving the efficiency and reliability while reducing the environmental impact of electric consumption – will necessitate monitoring electricity as it passes millions of discrete points (substation devices, HV, MV and LV power lines, capacitor banks, voltage regulators, meters, communicating thermostats, load control devices, etc.). Over the projected lifetime of the system, it is likely that a requirement for the real time optimization of the grid based on millions of data points will emerge similar to the way that telecommunication systems operate. In the electric grid, there are two key communications requirements for a Smart Grid; that the high performance communications network is linked to distributed sensors to detect the status of the electrical grid in the real time and the use of an open (Internet Protocol) IP based architecture.

1.5.3 Two-Way Communications with Sensing

An IP-based, open standard, two-way high-speed network that operates with low latency to facilitate multiple real time applications will become increasingly necessary in the electric grid. Such architecture is necessary to support the variety of consumer-initiated and utility-initiated

services presently contemplated or that will emerge over the next 10 to 20 years. Significant events, such as a major fault in the electric grid, occur in sub-second periods. A 21st-century Smart Grid network must have the bandwidth, embedded sensing and software to collect, organize, analyze and report huge volumes of information. It needs the two-way bandwidth necessary to link the real time events being measured (such as load and congestion, system stability and equipment health or outages) with the appropriate grid responses necessary to improve efficiency and reliability. Moreover, the complexity of managing distributed endpoints significantly increases when the potential for widespread use of residential and commercial solar panels, plug-in hybrid vehicles and other distributed energy sources is considered.

The CEC report estimates system optimization could reduce distribution grid line losses by 15% or more and reduce overall electric demand by approximately 3%. Similarly, a study at Hydro Quebec quantified those savings at two billion kWh. In a large scale outage, if multiple devices are capable of communicating simultaneously to take corrective distribution automation actions, the CEC report estimates such corrective action could reduce the impact of the outage by 30% to 50% depending on the number of switches involved (Price et al. 2006, 75, 89, 111).

At the same time, distributed generation such as residential solar panels and plug-in vehicles will greatly increase the need for communications between the utility, the distribution grid and the consumer. In these examples, high-speed real-time communications between millions of data points, including but not limited to meters and advanced analytic software will be necessary as fundamental requirements to monitor and control these distributed resources. Widespread distributed renewables underscore the need for real time communications. Electricity cannot be stored or buffered and events on one part of the grid can affect other parts of the grid. One of the issues with renewables is that they are intermittent. The wind does not blow when it is hot but thunderstorms do occur, both of which often happen when electric demand is at its highest, thus reducing the output of renewables such as wind or solar at a critical time. A recent example in Texas gives some insight into the potential problem. One afternoon when wind represented 5% of the supply and demand was increasing, in the course of three hours, the wind declined by 80%. At a critical point in those three hours, the wind output was approximately 70% below the forecast made an hour prior. As a result, Texas was forced to use an emergency load reduction program to reduce 3% of its total electric usage within ten minutes to keep the grid from collapsing (Electric Reliability Council of Texas 2008). That was a centralized wind farm connected to the grid with high-speed communications. The amount of power being generated by the wind farm at the critical time that day was roughly equivalent to approximately 300,000 residential solar panels, which represents a 10% penetration in a city like Dallas. If a thunderstorm rolls in and the output of all these distributed solar panels is not being monitored in real time, a similar risk could emerge

1.5.4 Open Standard Based Communication Architecture

As Smart Grid systems evolve to achieve society's clear interest in increasing efficiency, conservation and reliability, innovation will occur to promote the achievement of these goals – but only if new ideas can be enabled by an open platform operating within the grid. Thus, more and more devices in the distribution grid will need access to high-speed communications. Smart

Grid systems utilizing standard IP-based communications will allow various grid devices to communicate with and be integrated into the system. History has shown that in any network environment, true innovation occurs when critical elements of the system are opened up to other developers and applications providers. An emerging concern is the issue of security. By using standard IP based systems instead of proprietary systems, utilities are able to take advantage of the billions of dollars that has been invested in improving security for industries such as banking.

Based on the experience of other industries, it is clear that the requirements for communications and sensing will expand rapidly as new technology is introduced. It is important that utilities invest in a robust communications capability for the 21st century, not in proprietary and limited bandwidth technology that is already outdated for most industries. This is especially important as the communication solution and elements Brazil chooses today will largely determine how much network control, reliability enhancement and consumer empowerment it will enjoy for many years

1.5.5 An Interactive Grid

Similar to the Internet, the Smart Grid will be interactive for both power generation *sources* and power consumption *sinks* (loads). Utility customers will be able to control their consumption proactively based on real-time pricing and participate in a demand response program. This will require a secure high-speed, two-way communication infrastructure, intelligent metering and electronic control technologies. Exhibit 5 shows an illustration of a Smart Grid in terms of assets and functions.

Exhibit 5: Defining the Smart Grid in Terms of Assets and Functions

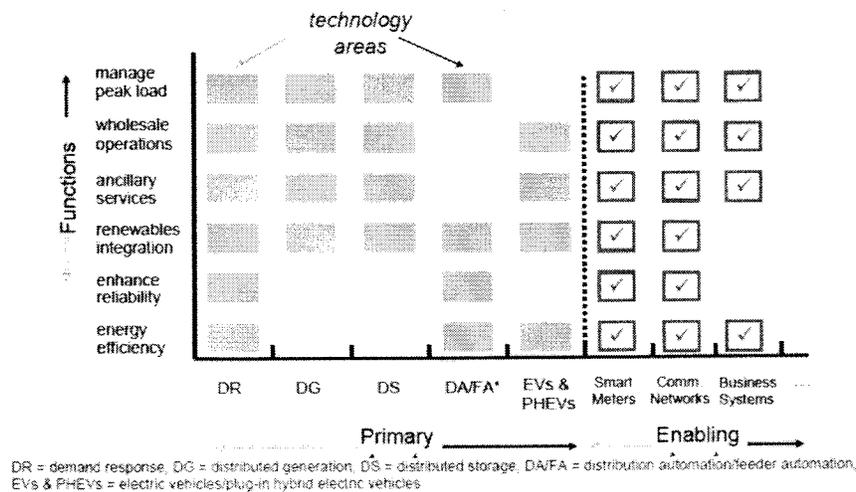


Figure 2.2. Defining the Smart Grid in Terms of Assets and Functions

Source: Pacific Northwest National Laboratory

According to Pacific Northwest National Laboratories' report *The Smart Grid: An Estimation of the Energy and CO2 Benefits*, enabling assets are the sensing, software, and information infrastructure required to coordinate the operation of the primary assets to respond to grid condition. The grid operational functions utilize smart grid assets to derive cost, reliability, and efficiency or renewable energy benefits.

1.5.6 Smart Grid Components

At the physical level, the Smart Grid is comprised of four fundamental components:

1.5.6.1 New Grid Components

Distributed Generation (DG), such as residential-scale CCHP (Combined Cycle Heat and Power) units, PHEV (Plug-in Hybrid Electric Vehicles), micro-turbines, solar photovoltaic cells, wind turbines, and grid energy storage units enable increased bi-directional power flow between power distributors and end-users.

1.5.6.2 Sensing and Control Devices

Sensors, intelligent electronic devices (IEDs) and smart meters gather information from the physical layer of the network.

1.5.6.3 Communications Infrastructure

Communication networks based on fiber optics, microwave, infrared, power line carrier (PLC), and/or wireless radio networks such as GSM and CDMA, transfer massive amounts of data.

1.5.6.4 Automation and IT Backend

High-end servers, middleware, data storage, and data management systems process and manage incoming data from the grid.

1.5.7 Smart Grid Benefits

The following are some of the key benefits of Smart grid technology:

1.5.7.1 Self-Healing and Adaptive

Smart technology and a communication enabled power grid will perform continuous self-assessments to monitor and analyze its operational status. For problems that are too large and too fast for human intervention, it will automatically restore grid components or network sections after abnormal events via "self-healing" mechanisms. It will also analyze collected grid performance data to predict potential. The self-healing grid will utilize distribution automation and communication technology to minimize disruption of service by acquiring data, executing decision-support algorithms, preventing or limiting interruptions, and dynamically controlling the flow of power. For example, probabilistic risk assessments based on historical data will identify the equipment and lines most likely to fail. Likewise, real-time contingency analysis will determine overall grid health and trigger early warnings of trends that could result in grid failure. Communications with local and remote devices will help analyze faults, low voltage, poor power

quality, overloads and other undesirable system conditions. Smart Grid technology will act as a Grid “immune system,” increasing grid’s ability to intelligently monitor, diagnoses and repair itself. This will improve grid’s overall reliability, security, affordability, power quality and efficiency.

1.5.7.2 Interaction with Consumers

Smart Grid consumer-centric devices will motivate end-users to manage their energy consumption by providing timely information. For instance, price signals and Demand Response program will encourage consumers to modify consumption based the electric system’s capacity to meet their demands. New cost-saving, energy efficiency products will plug consumers back into the network and make them active participants in the grid. With smart meters and in-home automation, utilities will be able to provide their consumers with the next generation of energy services.

1.5.7.3 Enhanced Cyber Security

The existing grid infrastructure is vulnerable to malicious attack and disruption. For this reason, enhanced security is an essential characteristic of the Smart Grid. Built into its architecture from conception, the Smart Grid’s integrated security systems will reduce physical and cyber vulnerabilities and improve the speed of recovery from disruptions and security breaches. Smart Grid security protocols will contain elements of deterrence, prevention, detection, response and mitigation, and a mature Smart Grid will be capable of thwarting multiple, coordinated attacks over a span of time. Enhanced security will reduce the impact of abnormal events on grid stability and integrity, ensuring the safety of society and the economy.

1.5.7.4 Improved Quality of Power

Designed and constructed over a half a century ago, existing grid infrastructure cannot meet the demands of today’s digital economy for reliable, high quality electric power. As part of the Smart Grid, new power quality standards will enable utilities to balance load sensitivity with power quality and consumers will have the option of purchasing varying grades of power quality at different prices.

Additionally, power quality events that originate at the transmission and distribution level of the grid will be minimized, and irregularities caused by certain consumer loads will be buffered to prevent propagation.

1.5.7.5 Integration of a Wide Variety of Generation Options

The Smart Grid will allow utilities to accommodate a diverse range of generation and storage options. Residential and commercial users will increasingly adopt distributed energy resources such as rooftop solar panels and advanced batteries as economically viable options for meeting on-site energy needs, and reducing their carbon footprint as good stewards of the environment. Improved grid-tie standards will enable interconnection at all voltage levels. Moreover, improved communications protocols and grid intelligence will allow distributed generation resources to seamlessly integrate with the grid in a “plug-and-play” fashion, where users can sell excess power back to the grid at peak-hours based on real-time market pricing. At the same time, large

central power plants, including environmentally friendly sources such as wind farms and advanced nuclear plants will continue to play a major role in the grid of the future.

1.5.7.6 Interaction with Energy Markets

The Smart Grid will enable energy markets to flourish, exposing and mitigating resource allocation inefficiencies. For instance, parameters such as total energy, capacity, congestion, and environmental impact may be most efficiently managed through the supply and demand interactions of markets. Market participation will be encouraged through increased transmission paths, aggregated demand response initiatives and the rise of distributed energy. Real-time pricing will allow consumers to respond dynamically to price increases, spurring lower-cost solutions and technology development. For consumers wishing to reduce their carbon footprint, they will have the option to purchase new, clean energy products from a mix of renewable sources.

1.5.7.7 Increased Grid Visibility

The Smart Grid's sensing infrastructure and backbone communications network will enable network operators to have greater grid observability into the grid's operational status, particularly with respect to the historically "blind" spots of the distribution networks. Operators will be able to quickly and accurately identify critical information, allowing them to provide essential human oversight to automated processes.

1.5.7.8 Optimized Asset and Resource Management

Increased asset life and optimized operations are a major objective for the Smart Grid. Advanced information technologies will provide a vast amount of data and information to be integrated with existing enterprise-wide systems, giving utilities the power to significantly enhance their operations and maintenance processes. This same information will allow engineers to improve equipment design, and give network planners the data they need to improve their processes. As a result, O&M and capital expenses will be more effectively managed.

1.5.7.9 Improved System Reliability

The Smart Grid will provide dynamic, real-time monitoring, control and optimization of grid operations and resources in a number of ways:

- Advanced network visualization using Distribution Automation and Distribution Management System will allow utilities to detect, analyze and restore system faults efficiently.
- Advanced outage management systems and distribution automation schemes will result in fewer blackouts and local power disruptions along with faster recovery times.

1.5.7.10 Increased Efficiency

Two-way communication, sensors and intelligent device controllers will enable optimization applications to improve grid efficiency by providing integrated Volt-VAR control, distributed

generation integration and real-time feeder monitoring to improve load imbalance and reduce technical losses.

1.5.7.11 Environmental Benefits

The threat of global warming, air pollution and resource degradation are forcing government policy makers, the public and the utility industry to question the sustainability of our present energy infrastructure. The Smart Grid enabled two-way communication and real-time sensing will allow utilities to shift peak demand, reduce technical losses, reduce demand by voltage optimization and integrate renewable sources more effectively. Effectively all this will lead to lower carbon emission. In particular, greater efficiencies in the grid will help alleviate the need for new generation.

1.5.7.12 Economic Benefits

Improved load estimates and reduced line losses will improve asset utilization and translate to long-term avoidance of capital expenditure for generation, transmission and distribution projects.

Operationally, the advantages of automated operations, predictive maintenance, self-healing mechanisms, and reduced outages will bring about major reductions in labor costs, particularly those associated with maintenance and outage recovery. From a macroeconomic perspective, the wide scale implementation of the Smart Grid will create new jobs, spur competitive technology development and revitalize a sector of the economy that is traditionally slow to change.

1.6 Smart Grid Implementation Status

The key drivers of Smart Grid implementation include the need to prepare the grid for the challenges of changing energy distribution landscape, to meet renewable portfolio standards, improve system efficiency, reduce grid operation cost, improve reliability, ability to trade power in open market by consumers and effort to reduce greenhouse gas emission.

Smart power metering is capable of effectively meeting some of the challenges above. Because of this, while smart metering systems are being implemented massively in many countries around the world, most Smart Grid programs are still in the early research and pilot phases of implementation (small and medium scale). They are developed in stages and largely focused on providing automatic meter reading function; however, grid automation is required to meet some of the above listed key drivers of Smart Grid. Though present in many countries around the world, Smart Grid initiatives are largely concentrated in Europe and the United States, where they are backed by incentives, a model that Brazil is now adapting.

The requests from CEMIG and LIGHT embody all of the above mentioned Smart grid features and also utilize an incentive model to accelerate the deployment of this technology in Brazil. Given the size of Brazilian market and the long transmission lines, Brazil represents an enormous market for U.S. Smart Grid technology.

2 Project Sponsor's Capabilities and Commitment

Both CEMIG and LIGHT are fully capable of implementing the proposed grant, as they are quite experienced in engaging a variety of external funding agencies and implementing lender-funded activities. CORE has recommended that the proposed grant be provided to CEMIG. The following is a description of the capabilities and commitment of CEMIG and LIGHT based on CORE's assessment.

2.1 CEMIG

CEMIG is a joint enterprise, controlled by the Government of Minas Gerais. CEMIG provides electricity to about 18 million people in 774 municipalities of Minas Gerais and manages the largest distribution network of electric power in South America, with more than 400 thousand kilometers of feeder network. In recent years, CEMIG has deployed a distribution automation solution to modernize the electrical system and initiated a "Cities of the Future" project, which is recognized as a foundation of the CEMIG Smart Grid architecture.

As a large power utility in the State of Minas Gerais, CEMIG has both the resources and staff capacity to implement the proposed project should USTDA decide to fund the feasibility study.

2.2 LIGHT

LIGHT Serviços de Eletricidade (referred as LIGHT) provides electric power to 3.8 million residential, commercial and industrial customers in 31 cities of the Brazilian state of Rio de Janeiro. LIGHT's distribution territory encompasses 10,970 Km² and provides electricity to 10 million people, out of 15 million inhabitants in the state. In 2007, energy billed by the Company reached 18,307 GWh. LIGHT generates about 15% of its electricity supply (850 MW of capacity), buying the rest from other generators from the Brazilian energy market. Rio Minas Energia S.A. owns 78.4% of the utility, which the government privatized in 1996. Rio Minas Energia acquired the controlling stake from former owner EDF International S.A. in 2006.

LIGHT ESCO, a subsidiary of LIGHT S.A., is an Energy Services Company providing energy and infrastructure services, concerned with energy solutions for its customers. LIGHT ESCO was authorized by ANEEL to operate as trading agent through Order 823 as of April 25, 2006.

LIGHT is fully capable of implementing the proposed grant. It is committed to the project and has the necessary resources to implement the grant.

3 Implementation Financing

Brazil has unique access to both public and private financing for implementing the proposed project. The Government of Brazil is continuously allocating large funds for research and development and demonstration of emerging technologies in a number of sectors, most notably, in the power sector.

Given the recent pattern of financing in Brazil, it is not very likely that Brazil would need any appreciable amount of development financing. Brazilian entities do engage with bilateral donors around the world where there are opportunities for the both CEMIG and LIGHT to have access to modern and next generation technologies. In addition, Brazil is a member of both the World Bank and the Inter-American Development Bank and has access to concessional loans from these institutions.

Most countries engaged in business with Brazil have export-import banks that provide tied credits to their respective companies. U.S. firms interested in investing in high technology projects in Brazil have access of financing from the U.S. Ex-Im Bank. Overseas Private Investment Corporation (OPIC) and Multilateral Investment Guarantee Agency (MIGA) provide insurance to companies investing in various countries.

The following discussion is provided for the various sources of financing that are available to both the Brazilian government and private U.S. and Brazilian firms for mobilizing financing.

3.1 Source of Financing in Brazil

In sharp contrast to many developing countries, Brazil, as an emerging economy, has considerable access to domestic financing. Some of the sources available to CEMIG and LIGHT are as follows:

- Financing from CEMIG and LIGHT retained earnings -- both utilities are well managed and finance many of their investments from internal resources.
- Financing Under the Government's Smart Grid Stimulus Investment Program – CEMIG and LIGHT may choose to participate in this program for specific smart grid projects.
- Debt financing from domestic commercial banks
- Concessional financing from the National Development Bank

3.2 U.S. Sources of Financing

In addition to domestic sources of financing, Brazil has access to many sources in the U.S. A number of organizations within the U.S. Government provide financing for infrastructure projects to emerging economies depending upon the components of the project and their respective criteria for funding. The following are some of the key sources for financing in the U.S.:

3.2.1 U.S. Agency for International Development (USAID):

USAID has a program in Brazil that supports a wide variety of activities in the country. While USAID is not a source for infrastructure financing in Brazil, it can provide valuable training and capacity building support needed for designing and implementing smart grid projects. The proposed project will undoubtedly add to economic security and growth of Brazil and would therefore qualify for support under the USAID window for financing.

3.2.2 The U.S. Export-Import Bank:

The Export-Import Bank of the United States (Ex-Im Bank) provides direct loans to foreign buyers with competitive, fixed-rate financing for their purchases from the United States. Ex-Im Bank also provides working capital guarantees to cover 90% of the principal and interest on commercial loans to creditworthy small and medium-sized companies that need funds to buy or produce U.S. goods or services for export. For project financing, long-term Ex-Im Bank guarantees of commercial loans are available for major projects, large capital goods acquisitions, and project-related services. Given the competitiveness of U.S. industry in smart grid and smart meter technology, U.S. Export-Import Bank financing will be a channel available to U.S. companies for financing projects in Brazil.

3.3 Sources of International Financing

The following are some of the international sources of concessional financing available to Brazil.

3.3.1 Equity and Debt Financing from International Finance Institutions (IFIs):

The World Bank and the Inter-American Development Bank are two of the most active IFIs in Brazil. Some of the infrastructure components of the smart grid projects could be financed by these institutions. All of the potential projects that may be implemented by CEMIG and LIGHT fit the pattern and characteristics of projects that are routinely financed by these institutions.

3.3.2 Debt Financing and Trade Financing from Commercial Banks:

Depending upon how future CEMIG and LIGHT projects are structured and packaged, certain components of the overall projects could be eligible for commercial debt financing and trade financing, especially if other components of the projects are able to generate concessional financing and if the Government is prepared to guarantee some parts of the project.

Brazil enjoys an excellent reputation among the capital markets as a “destination of choice” for major investments. Therefore, financing is not expected to be a constraint for the any smart grid projects.

3.3.3 Suppliers' Credits from Vendors

Suppliers' Credits from vendors of equipment and technology are another source of financing that are commonly used. Both CEMIG and LIGHT are very familiar with the U.S. smart grid

industry and many U.S. firms would be willing to negotiate supplier's credits for many projects on a case-by-case basis.

3.4 Estimated Financing Requirements for the Recommended Project

In consultation with the U.S. firms and discussions with selected technology vendors, the CORE Team has estimated the following financing requirements for the proposed project. The detailed investment required for the project is provided in the next section on U.S. Export Potential:

■ **Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil**

Grantee: CEMIG

CEMIG and LIGHT will most likely use funds from their own resources and incentive funds available from ANEEL, the regulator that collects 1 percent of the revenues of all utilities in Brazil of which 25 percent must be invested in energy efficiency projects. CEMIG has already selected Sete Lagoas regional area with more than 95,000 clients (250,000 consumers) and the CEMIG Corporate University (450,000 meter square area) for its pilot project. The technical parameters of the pilot project include 3 substations (138/13.8 kV), 2 power transformers (2x25 MVA), and 8 feeders at each substation serving urban and rural consumers. The overall investment in the pilot project is estimated at \$3-5 million. However, the replication potential for the pilot project to other areas in CEMIG's service area could easily reach \$50-100 million.

While LIGHT has not finalized a pilot project site, it has a much broader program for smart grid and smart meter application throughout its service area. LIGHT provides electric power to 3.8 million residential, commercial and industrial customers in 31 cities of the Brazilian state of Rio de Janeiro. LIGHT's distribution territory encompasses 10,970 Km² and provides electricity to 10 million people, out of 15 million inhabitants in the State.

Even a small pilot project in LIGHT's service area could require an investment exceeding \$10-15 million in smart grid and smart meter technologies and systems. Conservatively estimated, the total investment requirement in the LIGHT pilot project could be \$5-10 million and the total investment requirement in its service area could reach \$200-300 million.

4 U. S. Export Potential

The discussion in this section is based on conversations between CORE International and a number of U.S. suppliers of services and equipment for a variety of smart grid and smart meter technologies, equipment, and software. In addition, representatives of CORE had extensive discussions with representatives of CEMIG and LIGHT on their direct knowledge of the types of technologies and systems they would need to import as they move forward with implementing projects.

4.1 Investment Requirements and Export Potential

The projects contemplated by CEMIG and LIGHT focus on developing a strategy for deploying smart grid and smart meter technologies, including two initial pilot projects.

Brazil currently does not have the upper end of the communications technology and software required for the implementation of smart grid and smart meter/demand response projects. While Brazil may eventually be able to manufacture some of the hardware for smart grid applications in the country's transmission and distribution network, the communications software, data processing and modeling software, remote terminal units, outage management systems, and integration software would need to come from U.S. manufacturers.

CORE has estimated that approximately 50 percent of the hardware content and 100 percent of the software content of any smart grid and smart meter projects in Brazil would need to be exported from the U.S. over the next 10 years.

Over the next ten years CEMIG and LIGHT plan to implement smart grid and smart meter technology in over 50 percent of their transmission network and consumer base. The specific types and unit prices of systems and software needed for smart grid and smart meter technology are estimated as follows:

- Metering Hardware (\$30 per unit)
- Metering Software (\$70 per unit)
- Demand Response (DR) Server (\$10,448 per unit)
- DR Client Software (\$3,358 per unit)
- Energy Management System (\$10,000 per unit)
- Optimization Software (\$10,000 per unit)
- Sensors (\$16,567 per unit)
- Sub-metering (\$16,567 per unit)

This represents a total of \$68,000 per building. Given the number of consumers for implementation planned by CEMIG and LIGHT, the total cost of the equipment needed for the pilot projects will be approximately \$3-5 million for CEMIG and \$5-10 million for LIGHT. In the medium to long term, the investment requirements for CEMIG and LIGHT are conservatively expected to be \$50-100 million and \$100-300

million respectively.

This section provides (i) the estimates of the investments required for the proposed smart grid and smart meter projects and (ii) the estimates of the likely exports that may result if the projects are implemented by the proposed Grantees. Exhibit 6 provides the likely investments both in the near term for CEMIG and LIGHT pilot projects and in the medium- to long term in replication projects in the respective service areas of CEMIG and LIGHT.

Exhibit 6: Potential Investment Requirements for the Proposed Projects

No.	TYPE OF INVESTMENT	RANGE OF INVESTMENT REQUIREMENT
1	Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil A. CEMIG <ul style="list-style-type: none"> • Pilot Project • Service Area <p style="text-align: center;">TOTAL INVESTMENT IN THE MEDIUM TO LONG TERM</p> B. LIGHT <ul style="list-style-type: none"> • Pilot Project • Service Area <p style="text-align: center;">TOTAL INVESTMENT IN THE MEDIUM TO LONG TERM</p> (Proposed Feasibility Study Funding by USDA - \$700,000.00)	<p style="text-align: center;">\$3-5 million \$50-100 million</p> <p style="text-align: center;">\$50-100 Million</p> <p style="text-align: center;">\$5-10 million \$50-100 million</p> <p style="text-align: center;">\$200-300 Million</p>
	TOTAL POTENTIAL INVESTMENT BY CEMIG AND LIGHT	\$250-400 Million

Assuming that CEMIG and LIGHT would need to import approximately 60% of the total investment requirements, the total export potential could reach as follows:

- Potential Exports from the CEMIG Project \$30-60 million
- Potential Exports from the LIGHT Project \$60-180 million

4.2 Potential U.S. Suppliers of Smart Grid and Smart Meter Technology

Exhibit 7 provides a selected list of potential U.S. suppliers of equipment and services for the proposed smart grid and smart meter projects.

This list of companies is a representative list only. The inclusion of a company on this list does not constitute an endorsement of that firm. Similarly, the exclusion of companies that may otherwise be very competitive is not intentional and does not imply any adverse comments on such firms.

In addition, to the key U.S. firms listed in Exhibit 7, a large number of other firms manufacture specialty products, software, and communications systems for smart meter and demand response programs.

Exhibit 7: List of Companies Manufacturing Smart Meter Technologies and Systems

U. S. COMPANIES	SMART GRID AND SMART METER TECHNOLOGIES AND SYSTEMS AND SERVICES
1. General Electric Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
2. Honeywell Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
3. IBM Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
4. Oracle Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
5. Johnson Control Various facilities across	<ul style="list-style-type: none"> ▪ Control Systems and Measuring Devices ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing

U. S. Export Potential

U. S. COMPANIES	SMART GRID AND SMART METER TECHNOLOGIES AND SYSTEMS AND SERVICES
the U.S.	<ul style="list-style-type: none"> ▪ service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
6. Cisco Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
6. Microsoft	<ul style="list-style-type: none"> ▪ Operations and enterprise IT systems ▪ The integration platform unifying a diverse array of smart grid products, such as communications, smart meters, and sensors ▪ The visualization capabilities to better observe and manage intelligent device components
7. Itron Corporation, Spokane, Washington Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Software layer between “raw” data from the grid and the utility’s existing operations and enterprise IT systems ▪ The integration platform unifying a diverse array of smart grid products, such as communications, smart meters, and sensors ▪ The visualization capabilities to better observe and manage intelligent device components
8. Silver Springs Network Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
9. Tendril Networks, Boulder Colorado	<ul style="list-style-type: none"> ▪ Utilities Meter Data Management: a commercial off-the-shelf application to support the loading, validation, editing and estimation of meter data ▪ Utilities Network Management System: improves trouble management, outage analysis, operations dispatch, crew management, switching order development, safety documentation, and reporting network operations while also managing assets, monitoring real-time performance and delivery security, and providing alerts regarding outage situations.
10. Greenbox Technology, San Bruno, California	<ul style="list-style-type: none"> ▪ Demand response software and communications systems ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
11. Johnson Controls Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Automatic control systems ▪ Sensors and measuring devices ▪ Calibration equipment and software ▪ T&D Automation: Optimize asset utilization and improve efficiency/reliability ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing

U. S. Export Potential

U. S. COMPANIES	SMART GRID AND SMART METER TECHNOLOGIES AND SYSTEMS AND SERVICES
	<ul style="list-style-type: none"> service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
12. Echelon Corporation, San Jose, California	<ul style="list-style-type: none"> ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
13. Sentilla Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint ▪ Variety of two-way communications devices
14. Arch Rock Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint ▪ Variety of two-way communications devices
15. Millennial Net Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint ▪ Variety of two-way communications devices
16. eMeter Corporation, San Mateo, California	<ul style="list-style-type: none"> ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
17. Ecologic Analytics, Bloomington, Minnesota	<ul style="list-style-type: none"> ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
18. EnerNoc Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Energy management systems ▪ Distribution management systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
19. Comverge,	<ul style="list-style-type: none"> ▪ Network solutions and IT integration

U. S. Export Potential

U. S. COMPANIES	SMART GRID AND SMART METER TECHNOLOGIES AND SYSTEMS AND SERVICES
Hanover, New Jersey	<ul style="list-style-type: none"> ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
20. GridPoint Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid technology and systems ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
21. NKG Insulators Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
22. Xcel Energy Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid technology and systems ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service ▪ Energy consumption monitoring systems ▪ Business/Home Energy Management: Optimize energy usage and reduce costs and carbon footprint
23. Cekgard, Charlotte, North Carolina	<ul style="list-style-type: none"> ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service
24. Elster Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service
25. GridNet Corporation Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service
26. Newton-Evans Research Company Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service

U. S. Export Potential

U. S. COMPANIES	SMART GRID AND SMART METER TECHNOLOGIES AND SYSTEMS AND SERVICES
27. Vanguard Communications Various facilities across the U.S.	<ul style="list-style-type: none"> ▪ Smart Grid communications systems ▪ Network solutions and IT integration ▪ Smart Grid Security: Threat defense and physical security ▪ Smart Meter Communication: Increase transparency and improve billing service

This is a partial list of companies that have shown interest in exporting their products and systems to overseas markets including Brazil. There are literally hundreds of companies in the U.S. that are involved in various facets of smart grid and smart meter technologies.

5 Foreign Competition and Market Entry Issues

This section discusses the competition that U.S. firms face in the Brazilian market for smart grid, smart meter, and green technologies for energy efficiency applications. In addition, a discussion on the market entry issues is included.

5.1 Foreign Competition

In a number of sectors, Brazil has developed unique national standards as the basis for its technical requirements, despite the existence of well-established international standards. However, ANEEL, the national regulator, is actively engaged in revising many of the smart grid and smart meter standards in line with international and U.S. standards. Until the new standards are fully in place, any Brazil-specific standards or practices could create market entry barriers for foreign manufactured products.

Both the U.S. and the European Union (EU) have been working with the Brazilian Government to both influence its standards-setting procedures and promote U.S. and EU-compatible standards and regulations. Many EU standards differ from the market-driven standards developed by U.S. private sector institutions.

While it has traditionally been difficult for foreign companies to compete with domestic firms in terms of cost of basic energy transmission infrastructure, the smart-grid market remains relatively open to international companies because of their experience in this technically sophisticated field. In order to gain a foothold in the enormous Brazilian market, however, businesses will need to reevaluate how they plan to engage the smart grid/smart meter industry in Brazil.

Many foreign companies serious about participating in Brazil's smart grid/smart meter industry have already begun to invest in joint ventures with Brazilian companies. Firms such as Germany's Siemens, Korea's LS Industrial Systems Co. and the United States' General Electric (GE) have actively pursued partnerships with local companies as a way to establish a foothold in the Brazilian market.

5.2 Market Entry Issues

Changing business relationships and the difficulty in standards setting will present initial obstacles for foreign firms to enter the Brazilian market for smart grid and smart meter technologies. However, the trend of U.S. firms in gaining market shares in Brazil has been very positive and both CEMIG and LIGHT, the potential buyers of the technology and systems, have shown preference for U.S. products. They are also very familiar with U.S. technology and generally prefer U.S. technology to the competitors' products.

To date, some of the largest foreign companies in the Brazilian smart grid market include: GE (all goods and services), Hewlett-Packard (integrated communications, sensing and measurement), Cisco Systems (integrated communications), IBM (consulting services including

Foreign Competition and Market Entry Issues

systems integration), Itron (sensing and measuring), and Accenture (consulting services), ABB (UK-based, advanced components) and Siemens (Germany-based, integrated communications).

In general, U. S. companies remain competitive worldwide with advanced technologies and service capabilities. The largest challenge to U.S. companies remains gaining access to the Brazilian market and the initial market entry.

6 Development Impact

6.1 Primary Developmental Benefits from the Proposed Projects

Both the CEMIG and LIGHT are utilities that provide electricity services to a large number of customers. They also face similar challenges in terms of quality of service, energy efficiency, grid performance, and planning for the introduction of clean energy technologies into their respective systems. Therefore, they are very likely going to have similar development impacts from projects that are likely to be implemented based on the results of the proposed study.

The following types of development impacts are expected as a result of the implementation of smart grid projects by CEMIG and LIGHT if they are found to be feasible and adequate financing is engineered:

6.1.1 Macroeconomic Impacts

These types of impacts include overall economic impacts such as GDP growth, inflationary impacts, trade impacts, and other fiscal impacts.

6.1.2 Microeconomic Impacts

Employment, income, income distribution, new industries development, etc.

6.1.3 Social Development Impacts

Population movements, development of new communities, capacity building and skills improvement, greater social opportunities, etc.

6.1.4 Technology Transfer Impacts

Application of new technology in the country.

Exhibit 8 summarizes the anticipated development impacts of the smart grid and smart meter projects if they are implemented by CEMIG and LIGHT. These likely impacts are categorized in accordance with USTDA guidelines. The scope of work prepared for the proposed feasibility study includes a task on estimating development impacts in accordance with the specific guidelines provided by the USTDA.

6.2 Alternatives to Achieving Host Country Development Objectives

Given the size of the Brazilian market for smart grid and smart meter technologies, most foreign companies and governments are constantly cultivating major Brazilian government agencies, utilities, and private companies. The Brazilian Government is swamped with offers of assistance from most European governments as well as Scandinavian, Australian, and Japanese governments. All of these governments are

active in assisting their respective industries to gain access to the growing Brazilian market for various high-end technologies and products. Therefore, the Brazilian Government has many alternatives to achieve their development objectives.

Exhibit 8: Potential Development Impacts of the Proposed Projects

PROPOSED USTDA GRANT ACTIVITY	TYPE OF IMPACT	DESCRIPTION OF THE IMPACT
<p>1. Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil</p>	<p>Infrastructure Related Impact</p> <p>Market-Oriented Reform</p> <p>Human Capacity Building</p>	<p>Smart meter implementation is a key component in the modernization of Brazil's national electric grid with new standards for monitoring devices, transmission equipment, and software that will improve the reliability, security, and efficiency and the electrical network. Furthermore, this project will pave the way for interconnection to renewable energy sources such as wind and solar power as well as support new energy uses such as electric vehicle recharging. By reducing energy consumption, increasing efficiency and allowing greater renewable energy resources, substantial savings can be achieved in the economy and environmental impact of greenhouse gases and carbon footprint will be reduced.</p> <p>There will be considerable market reform impacts on the entire smart meter and smart grid industry throughout Brazil as the demand and competition for these products will significantly increase. Also, very likely, ANEEL, the national regulator will develop modern regulations and standards that would streamline the market rules and improve market performance and consumer service.</p> <p>This project will involve substantial interaction between Brazilian power and equipment industry experts and U.S. experts that will give both a better understanding of the wide variety of technical solutions provided by deploying products designed and manufactured to common standards and systems that achieved the desired efficiency improvements.</p> <p>There will be considerable human capacity building impact as a result of this project. U.S. contractor personnel will be working side by side with the experts from the Brazilian industry. In addition, this project has a strong</p>

PROPOSED USTDA GRANT ACTIVITY	TYPE OF IMPACT	DESCRIPTION OF THE IMPACT
	<p><i>Technology Transfer and Productivity Enhancement</i></p>	<p>replication potential for the construction of similar smart meter projects throughout Brazil that would lead for widespread human capacity building in the country.</p> <p>Since the U.S. electric transmission grid is owned and operated mainly by the private industry, its standards are market driven and reflect industry consensus. This project will encourage Brazil to pursue such goals as creating an environment conducive to innovation, the large-scale adoption of international standards, the creation of a system that ensures that standards are responsive to the market, and the promotion of legal reform. In addition, discussions with U.S. industry confirm that many U.S. firms are actively engaged in discussions with the Brazilian industry to establish joint venture facilities in Brazil for some of technology components. This would, therefore, lead to considerable technology transfer in the near term.</p>
	<p><i>Other</i></p>	<p>This project will introduce advanced technologies such as integrated communications equipment and software, sensing and measurement devices, advanced transmission components, and advanced monitoring and control systems to Brazil. These cutting edge technologies hold the promise of improved efficiency and increased productivity by anticipating and correcting operating problems automatically, and responding quickly to demand changes.</p>

6.3 Approaches to Tracking Development Impacts

Measuring development impacts of major infrastructure projects requires the collection of key economic and social data and information over a number of years after the projects are implemented. While some impacts such as number of jobs created, the increase in GDP, additional revenues generated, and other economic parameters can be measured with relative ease, other development impacts, especially social impacts are difficult to quantify. However, social development impacts can be measured through surveys of communities and population groups directly impacted by the project. The following options are available to USTDA to ensure that the development impacts of activities funded by USTDA are measured over time:

1. Ensuring that there is a specific clause in the USTDA grants that places the responsibility of tracking and reporting specific development impacts on the grantees.
2. Another option is for USTDA to require U.S. contractors to track and report any development impacts of USTDA grants for a specified period beyond the completion of their contract (Technical Assistance or feasibility study), say two years. All scopes of work developed by DM contractors for any USTDA grant could include a mandatory task on estimating development impacts from USTDA projects for a number of years after the feasibility study is completed. This could specifically be a very desirable option for all USTDA grants where the grantees request sole source awards to pre-selected contractors.
3. Another possible option for USTDA may be to have a separate instrument devoted entirely to tracking and reporting on development impacts of USTDA grants. While USTDA is engaged in the process through both internal staff and an outside contractor, this effort may need to be expanded. Given the total number of actions funded by USTDA on an annual basis, an exercise to measure development impacts from all actions may simply not be feasible. Accordingly, some type of grouping may be desirable to extract and document the most visible and important development impacts from a selected set of USTDA actions. Many Government agencies and utilities routinely publish success stories of major infrastructure projects. Therefore, some of the development impacts could be easily captured from public sources.

Brazilian entities have a well-established tradition of data and information collection. Therefore, tracking development impacts from published data sources should not be complex.

7 Impact on the Environment

This section discusses the likely environmental impacts of the smart grid and smart meter projects in accordance with the guidelines for estimating such impacts provided by USDA. The TORs for each of the two projects include a task for the Contractors to conduct an environmental assessment of the proposed project.

Smart grid and smart metering technologies enable the exploitation of clean technologies for energy efficiency, the rapid response to increases in consumer demand without additional infrastructure, the decentralization of power generation, and the seamless integration of renewable energy sources. Thus, the projects to be implemented by CEMIG and LIGHT will promote the efficient use of electric power and encourage the development of renewable energy sources such as wind and solar power. Increased efficiency and greater reliance on renewable energy will reduce the demand for electric power generation from traditional fossil fuel power plants and, consequently, the emission of harmful pollutants and the production of greenhouse gases.

Therefore, the environmental impacts from the smart grid and smart meter projects that would be implemented in Brazil will be positive in terms of reduced carbon and other pollutants. Furthermore, to the extent smart grid projects would displace any new generation or reduce demand for power, one would also expect to achieve carbon credits. To the extent the deployment of smart grid technologies can verifiably reduce or displace some of the fossil fuel based power, the projects implemented as a result of the proposed USDA grant could qualify for carbon credits.

8 Impact on U. S. Labor

No U.S. jobs will be relocated as a result of USTDA providing any financial assistance to Brazil for the proposed project. In fact, as the project funded by USTDA comes to fruition, it will require potential imports of technology and equipment, most of which is manufactured by U.S. firms in facilities located in the U.S. Therefore, with this increase in demand for U.S. exports, these projects are expected to have a net positive impact on U.S. employment.

It should be noted, however, that while some jobs will be created in the U.S., additional jobs would likely be created in Brazil, as Brazil develops some of its own facilities to manufacture components and systems.

No relocation of U.S. jobs is expected as a result of USTDA providing funding for the proposed projects.

9 Qualifications

As part of this Desk Study, CORE International, Inc. has recommended the following project:

- Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil

CORE recommends the following selection criteria for Contractor selection for the proposed feasibility study:

- | | |
|---|-----|
| 1. Technical expertise of the proposed experts in smart grid projects, equipment and technologies | 25% |
| 2. Economic and financial expertise of the proposed experts in financing the complementation of smart grid projects | 15% |
| 3. Technical and economic/financial approach | 25% |
| 4. International experience of the proposed experts | 20% |
| 5. Portuguese language capabilities | 15% |

The relative weight among the various qualifications requirements is consistent with international best practices for procurement of contractors to carry out similar studies aimed at the development of smart grid implementation strategies.

10 Justification

This Desk Study Report has recommended a project that would support the smart grid implementation strategies of two major Brazilian utilities. The proposed feasibility study grant fully meets USTDA's criteria for funding feasibility studies and technical assistance activities. CORE International's justification for recommending the proposed grant to CEMIG is discussed below:

The basic objective of the project is to conduct a feasibility study of implementing a smart grid strategy and assistance with the deployment of pilot projects in the CEMIG and LIGHT service areas. The following provides the justification for USTDA funding:

1. Both CEMIG and LIGHT are operating on the basis of a national strategy in Brazil to accelerate the deployment of smart grid and smart meter technologies to improve the efficiency of the electricity sector in the country. The demonstration and application of smart meter and demand response technologies throughout Brazil is the top priority of the Brazilian Government. Therefore, the proposed assistance offers both the USTDA and U.S. companies a strategic opportunity to engage the Brazilian market in an important sector. The proposed study offers a systematic approach to CEMIG and LIGHT to accelerate the deployment of energy efficient smart grid, smart meter, and demand response technologies.
2. The project has not only the direct sponsorship of CEMIG and LIGHT, the two project sponsors, but also the support of the regulator ANEEL and the Brazilian Government.
3. This study does not duplicate any activities currently underway or planned in the near future by any of the key donor agencies and donors.
4. The proposed study will significantly add to the potential development of a major, largely untapped, industry in Brazil that will not only have economic and commercial benefits in Brazil but also result in substantial energy efficiency and environmental benefits.
5. Funding the proposed study will open a large energy efficient smart grid and smart meter technology market to the U.S. industry in a sector where the U.S. industry has a well-documented track record of success.
6. Even if a part of the overall project is implemented (only a few smart meter applications) it would lead to positive economic and developmental impacts in Brazil, as the project would lend itself to joint working with Brazilian engineers and planners. New investment projects will create employment in both Brazil and the U.S.
7. With increased opportunities for U.S. exports, the net impact on U.S. employment will be positive, as most of the high-end technology, software, and equipment required for the project to be implemented is manufactured in plants and facilities located within the United States.
8. The entire project focuses on the use of energy efficient clean technologies. Therefore, the environmental impacts of the proposed project will be positive.

11 Terms of Reference

Annex 2 includes detailed TORs for the proposed feasibility studies.

12 Study Budgets

Annex 3 includes detailed budgets and schedules for each of the recommended actions in the USTDA format.

13 Recommendations

Based on discussions that took place during this Desk Study and the evaluation of the needs in the sectors, CORE is pleased to recommend the project as shown in Exhibit 9.

The proposed project was discussed with the prospective grantees both in a working meeting and through various e-mail communications. Both CEMIG and LIGHT were provided with the Terms of Reference for the proposed project for comments. CORE has received full commitment from both of these utilities for the proposed project.

This activity meets all of the USTDA criteria for funding similar feasibility studies and technical assistance activities.

Exhibit 9: CORE International's Recommendations Summary

	PROPOSED ACTIVITY	PROPOSED GRANT AMOUNT	GRANTEE
1	Project: Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil	\$710,000.00	Grantee: Companhia Energetica de Minas Gerais (CEMIG), Brazil
	TOTAL		\$710,000.00

Note: Annex 2 provides detailed Terms of Reference (TORs) for the project. Annex 3 provides a detailed budget and schedule in accordance with USDA's formats and guidelines.

14 Annex 1: List of Contacts

The following are key contacts for the feasibility studies:

1. Rodrigo Mota
Country Representative, Brazil
U.S. Trade and Development Agency
Brazil
Phone: 55-11-5186-7335
Fax: 55-11-5186-7396
rmota@ustda.gov
2. Daniel Senna Guimarães
Cemig Distribuição S.A.
Superintendência de Desenvolvimento e Engenharia da Distribuição - TD
Phone: +55 (31) 3506-3301
Phone: +55 (31) 9667-9822
dsenna@cemig.com.br
3. Fabio Toledo
Chief Operating Officer Advisor
Energy Distributions Branch
Light SE SA
Phone: +55 21 9626 6191
Phone: +55 21 2211 4748
fabio.toledo@light.com.br
4. Mr. Surya Sethi
Former Senior Investment Officer, Latin America
International Finance Corporation
Principal Energy Advisor to the Prime Minister
Government of India
+91-98-112-306365

16 Annex 3: Detailed Budgets and Schedule for the Proposed Study

Annex 3 includes a detailed budgets and schedule for the proposed study in accordance with USTDA formats for preparing these documents.

Exhibits I through IV provide detailed budget, labor distribution, and schedule for Feasibility Study of a Smart Grid Implementation Strategy for CEMIG and LIGHT, Brazil.

Exhibit I: Budget Details in USTDA Format for Feasibility Study Budget

DIRECT LABOR COSTS

TASK

Task Name

TOR Task 1: Develop a Work Plan and Define Overall Parameters of the Study

		Person Days	Daily Rate	Total
Task 1 - Position A:	Project Manager	5	\$1,500.00	\$7,500.00
Task 1 - Position B:	Finance/Economic Specialists	0	\$1,500.00	\$0.00
Task 1 - Position C:	Smart Grid and IT Specialists	5	\$1,500.00	\$7,500.00
Task 1 - Position D:	Equipment/Systems Specialists	5	\$1,500.00	\$7,500.00
				\$22,500.00

TOR Task 2: Conduct an Analysis of Available Information and Develop AMI and Demand Response Benchmarks

		Total Person Days	Daily Rate	Total
Task 2 - Position A:	Project Manager	10	\$1,500.00	\$15,000.00
Task 2 - Position B:	Finance/Economic Specialists	10	\$1,500.00	\$15,000.00
Task 2 - Position C:	Smart Grid and IT Specialists	10	\$1,500.00	\$15,000.00
Task 2 - Position D:	Equipment/Systems Specialists	10	\$1,500.00	\$15,000.00
				\$60,000.00

TOR Task 3: Conduct an Analysis of Available Information and Develop Smart Grid Technology Platform to provide Real-Time Grid Management Technology

		Total Person Days	Daily Rate	Total
Task 3 - Position A:	Project Manager	15	\$1,500.00	\$22,500.00
Task 3 - Position B:	Finance/Economic Specialists	15	\$1,500.00	\$22,500.00
Task 3 - Position C:	Smart Grid and IT Specialists	20	\$1,500.00	\$30,000.00
Task 3 - Position D:	Equipment/Systems Specialists	20	\$1,500.00	\$30,000.00
				\$105,000.00

TOR Task 4: Conduct an Analysis of Available Information and Develop Distributed Storage & Renewable Source Integration and EV Charging Management Using Smart Grid Platform

		Total Person Days	Daily Rate	Total
Task 4 - Position A:	Project Manager	15	\$1,500.00	\$22,500.00
Task 4 - Position B:	Finance/Economic Specialists	20	\$1,500.00	\$30,000.00
Task 4 - Position C:	Smart Grid and IT Specialists	20	\$1,500.00	\$30,000.00
Task 4 - Position D:	Equipment/Systems Specialists	15	\$1,500.00	\$22,500.00
				\$ 105,000.00

TOR Task 5: Conduct Economic Analysis and Financing Mechanism Analysis

		Person	Daily Rate	Total
Task 5 - Position A:	Project Manager	5	\$1,500.00	\$7,500.00
Task 5 - Position B:	Finance/Economic Specialists	15	\$1,500.00	\$22,500.00
Task 5 - Position C:	Smart Grid and IT Specialists	5	\$1,500.00	\$7,500.00
Task 5 - Position D:	Equipment/Systems Specialists	5	\$1,500.00	\$7,500.00
				\$ 45,000.00

TOR Task 6: Assess CEMIG and Light Technical Architecture

		Person	Daily Rate	Total
Task 6 - Position A:	Project Manager	20	\$1,500.00	\$30,000.00
Task 6 - Position B:	Finance/Economic Specialists	20	\$1,500.00	\$30,000.00
Task 6 - Position C:	Smart Grid and IT Specialists	20	\$1,500.00	\$30,000.00

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Task 6 – Position D:	Equipment/Systems Specialists	20	\$1,500.00	\$30,000.00
				\$ 120,000.00

TOR Task 7: Conduct an Environmental and Development Impact Assessment

		Person	Daily Rate	Total
Task 7 - Position A:	Project Manager	10	\$1,500.00	\$15,000.00
Task 7 - Position B:	Finance/Economic Specialists		\$1,500.00	\$0.00
Task 7 – Position C:	Smart Grid and IT Specialists	5	\$1,500.00	\$7,500.00
Task 7 – Position D:	Equipment/Systems Specialists	5	\$1,500.00	\$7,500.00
				\$ 30,000.00

TOR Task 8: Conduct an Assessment of U.S. Sources of Supply

		Total Person Days	Daily Rate	Total
Task 8 - Position A:	Project Manager	0	\$1,500.00	\$0.00
Task 8 - Position B:	Finance/Economic Specialists	0	\$1,500.00	\$0.00
Task 8 – Position C:	Smart Grid and IT Specialists	3	\$1,500.00	\$4,500.00
Task 8 – Position D:	Equipment/Systems Specialists (Reference Note 1)	3	\$1,500.00	\$4,500.00
				\$ 9,000.00

TOR Task 9: Prepare and Submit Draft Final Report

		Total Person Days	Daily Rate	Total
Task 9 - Position A:	Project Manager	5	\$1,500.00	\$7,500.00
Task 9 - Position B:	Finance/Economic Specialists	5	\$1,500.00	\$7,500.00
Task 9 – Position C:	Smart Grid and IT Specialists	5	\$1,500.00	\$7,500.00
Task 9 – Position D:	Equipment/Systems Specialists	5	\$1,500.00	\$7,500.00
				\$ 30,000.00

TOR Task 10: Prepare and Submit the Final Report

		Total Person Days	Daily Rate	Total
Task 10 - Position A:	Project Manager	5	\$1,500.00	\$7,500.00
Task 10 - Position B:	Finance/Economic Specialists	5	\$1,500.00	\$7,500.00
Task 10 - Position C:	Smart Grid and IT Specialists	5	\$1,500.00	\$7,500.00
Task 10 - Position D:	Equipment/Systems Specialists	5	\$1,500.00	\$7,500.00
				\$30,000.00

TOTAL LABOR FOR EXPAT EXPERTS \$556,500.00

LOCAL EXPERTISE BUDGET

		Total Person Days	Daily Rate	Total
Task 1	Local Expert	0	\$500.00	\$0.00
Task 2	Local Expert	20	\$500.00	\$10,000.00
Task 3	Local Expert	30	\$500.00	\$15,000.00
Task 4	Local Expert	30	\$500.00	\$15,000.00
Task 5	Local Expert	5	\$500.00	\$2,500.00
Task 6	Local Expert	0	\$500.00	\$0.00
Task 7	Local Expert	10	\$500.00	\$5,000.00
Task 8	Local Expert	5	\$500.00	\$2,500.00
Task 9	Local Expert	0	\$500.00	\$0.00
Task 10	Local Expert	0	\$500.00	\$0.00

TOTAL LABOR FOR LOCAL EXPERTS \$50,000.00

TOTAL LABOR FOR EXPAT AND LOCAL EXPERTS \$ 606,500.00

NOTE 1: THE CATEGORY OF EQUIPMENT / SYSTEMS SPECIALIST INCLUDES ENVIRONMENTAL EXPERTS AND PROJECT COSTING EXPERTS

OTHER DIRECT COSTS

	Trips	Trip Cost	Total
International Air Travel	10	\$1,600.00	\$16,000.00
In-Country Travel and Ground Transportation including travel to LIGHT	20	\$400.00	\$8,000.00
Per Diem in Various Cities in Brazil	Trip Days 160	Per Diem Rate \$400.00	\$64,000.00

Reproduction and Binding

10 separate deliverables, 50 pages average, and 20 copies each including several power point presentations	10,000	\$0.25	\$2,500.00
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Translation Services

400 pages @ \$25 per page	400	\$25.00	\$10,000.00
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Courier Services

10 large courier packages of draft and final bound reports	10	\$160.00	\$1,600.00
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Visa Services

5	\$100	\$500.00
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Communication

9 months @ \$100 p/month	9	\$100.00	\$900.00
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TOTAL OTHER DIRECT COSTS	\$103,500.00
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TOTAL COSTS (DIRECT LABOR COSTS + OTHER DIRECT COSTS):	\$710,000.00
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TOTAL PROPOSED BUDGET FOR PROJECT

\$710,000.00

**EXHIBIT II: DISTRIBUTION OF TOTAL LABOR BUDGET AMONG VARIOUS TASKS
 FEASIBILITY STUDY OF A SMART GRID IMPLEMENTATION STRATEGY FOR CEMIG AND LIGHT, BRAZIL**

TOTAL U.S. LABOR PART OF THE BUDGET FOR THE FEASIBILITY STUDY	100%	\$556,500.00
Task	Percent of U. S. Labor Budget	Amount
Task 1: Develop a Work Plan and Define Overall Parameters of the Study	4.04%	\$22,500.00
Task 2: Conduct an Analysis of Available Information and Develop AMI and Demand Response Benchmarks	10.78%	\$60,000.00
Task 3: Conduct an Analysis of Available Information and Develop Smart Grid Technology Platform to provide Real-Time Grid Management Technology	18.87%	\$105,000.00
Task 4: Conduct an Analysis of Available Information and Develop Distributed Storage & Renewable Source Integration and EV Charging Management Using Smart Grid Platform	18.87%	\$105,500.00
Task 5: Conduct and Economic Analysis and Financing Mechanism Analysis	8.08%	\$45,000.00
Task 6: Analyze LIGHT and CEMIG Technical Architecture	21.56%	\$120,000.00
Task 7: Conduct an Environmental and Development Impact Assessment	5.39%	\$30,000.00
Task 8: Conduct an Assessment of U.S. Sources of Supply	1.62%	\$9,000.00
Task 9: Prepare and Submit Draft Final Report	5.39%	\$30,000.00
Task 10: Prepare and Submit the Final Report	5.39%	\$30,000.00
TOTAL	100%	\$556,500.00

EXHIBIT III: DISTRIBUTION OF TOTAL LABOR PERSON HOURS AMONG VARIOUS TASKS AND EXPERTS
FEASIBILITY STUDY OF A SMART GRID IMPLEMENTATION STRATEGY FOR CEMIG AND LIGHT, BRAZIL

PROPOSED EXPERTS	TASK 1	TASK 2	TASK 3	TASK 4	TASK 5	TASK 6	TASK 7	TASK 8	TASK 9	TASK 10	TOTAL DAYS
1. Project Manager	5	10	15	15	5	20	10	0	5	5	90
2. Finance/Economic Specialists	0	10	15	20	15	20	5	0	5	5	95
3. Smart Grid and IT Specialists	5	10	20	20	5	20	5	3	5	5	98
4. Equipment/Systems Specialists	5	10	20	15	5	20	5	3	5	5	98
5. Local Experts	0	20	30	30	5	0	10	5	0	0	100
TOTAL DAYS	15	60	100	100	35	80	35	11	20	20	476

**EXHIBIT IV: PROPOSED SCHEDULE FOR THE STUDY
 FEASIBILITY STUDY OF A SMART GRID IMPLEMENTATION STRATEGY FOR CEMIG AND LIGHT, BRAZIL**

NO.	TASKS	MONTHS AFTER CONTRACT AWARD												
		1	2	3	4	5	6	7	8	9				
1.	Task 1: Develop a Work Plan and Define Overall Parameters of the Study	█												
2.	Task 2: Conduct an Analysis of Available Information and Develop AMI and Demand Response Benchmarks	█	█											
3.	Task 3: Conduct an Analysis of Available Information and Develop Smart Grid Technology Platform to provide Real-Time Grid Management Technology	█	█	█										
4.	Task 4: Conduct an Analysis of Available Information and Develop Distributed Storage & Renewable Source Integration and EV Charging Management Using Smart Grid Platform	█	█	█	█									
5.	Task 5: Conduct Economic Analysis and Financing Mechanism Analysis				█	█								
6.	Task 6: Analyze LIGHT and CEMIG Technical Architecture			█	█	█	█							
7.	Task 7: Conduct an Environmental and Development Impact Assessment				█	█	█	█						
8.	Task 8: Conduct an Assessment of U.S. Sources of Supply					█	█	█						
9.	Task 9: Prepare and Submit Draft Final Report								█	█				
10.	Task 10: Prepare and Submit the Final Report											█	█	



**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.

Brazil 2011-51003A
RECEIVED
MAR 16 2011
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U.S. TRADE AND DEVELOPMENT AGENCY

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 Cemig Distribuição S.A. ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Grant Agreement US\$710,000 ("USTDA Grant") to fund the cost of goods and services required for the preparation of a feasibility study ("Study") on the proposed Smart Grid Pilot Implementation Strategy Project ("Project") in Brazil ("Host Country").

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DC AY
SF

1. USTDA Funding

The funding to be provided under this Grant Agreement shall be used to fund the costs of an Agreement of Understanding to Perform the Feasibility Study ("Agreement of Understanding") between the Grantee and the U.S. firm selected by the Grantee ("U.S. Firm") under which the U.S. Firm will perform the Study. Payment to the U.S. Firm 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 shall also be included in the Agreement of Understanding.

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 U.S. Firm 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 U.S. Firm, such as local transportation, office space and secretarial support.



5. USTDA as Financier

(A) USTDA Approval of Competitive Selection Procedures

Selection of the U.S. Firm 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 U.S. Firm Selection

The Grantee shall notify USTDA at the address of record set forth in Article 17 below upon selection of the U.S. Firm to perform the Study. Upon approval of this selection by USTDA, the Grantee and the U.S. Firm shall then enter into an Agreement of Understanding. 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 the Agreement of Understanding

The Grantee and the U.S. Firm shall enter into the Agreement of Understanding. The Agreement of Understanding, 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 U.S. Firm 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 Agreement of Understanding or a final negotiated draft version of the Agreement of Understanding.

(D) USTDA Not a Party to the Agreement of Understanding

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 Agreement of Understanding and any amendments thereto, including assignments, the selection of all U.S. Firms, the Terms of Reference, the Final Report (as defined in Clause I of Annex II), and any and all documents related to any Agreement of Understanding 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 Agreement of Understanding. 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 Agreement of Understanding or any sub-agreement, 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 U.S. Firm, or relieve the U.S. Firm of any liability which the U.S. Firm 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 Agreement of Understanding or any sub-agreement thereunder must be consistent with this Grant Agreement. In the event of any inconsistency between the Grant Agreement and the Agreement of Understanding or any sub-agreement funded by the Grant Agreement, the Grant Agreement shall be controlling.

6. Disbursement Procedures

(A) USTDA Approval of Agreement of Understanding Required

USTDA will make disbursements of USTDA Grant funds directly to the U.S. Firm only after USTDA approves the Agreement of Understanding.

(B) Contractor Invoice Requirements

The Grantee should request disbursement of USTDA Grant funds by USTDA to the U.S. Firm for performance of the Study by submitting invoices in accordance with the procedures set forth in the USTDA Mandatory Clauses in Annex II. The Grantee shall not be responsible for any payment to the U.S. Firm under this Grant Agreement.

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 October 31, 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; and (b) all funds made available under the Grant Agreement must be disbursed within four (4) years from the Effective Date.

9. USTDA Mandatory Clauses

The Agreement of Understanding and any other agreement funded under this Grant Agreement shall include the USTDA mandatory clauses set forth in Annex II. All sub-agreements 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 U.S. Firm must be either a U.S. firm or U.S. individual; (b) the U.S. Firm 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 sub-agreement; (c) employees of the U.S. Firm or U.S. subcontractors 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 U.S. Firm 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 this Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report, 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 U.S. Firms, receipt and approval of the Agreement of Understanding deliverables, and approval or disapproval of U.S. firm invoices for payment by USTDA. Such books, records, and other documents shall be separately maintained for three (3) years after the date of the final disbursement by USTDA. The Grantee shall afford USTDA or its authorized representatives the opportunity at reasonable times to review books, records and other documents relating to the Study and the Grant Agreement.



16. Representation of Parties

For all purposes relevant to this 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 its President. The parties hereto may, by written notice, designate additional representatives for all purposes under this 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: Cemig Distribuição S.A.
Avenida Barbacena, 1200, 5th floor; 30190-131
Belo Horizonte, Minas Gerais
Brazil

Phone: 011 55 (31) 3506-4900
Fax: 011 55 (31) 3506-5026
Email: dsenna@cemig.com.br

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.: 1111/121001
Activity No.: 2011-51003A
Reservation No.: 2011090
Grant No.: GH201151090



18. Termination

Either party may terminate this Grant Agreement by giving the other party thirty (30) days advance written notice. The termination of this 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 this Grant Agreement shall be construed as a waiver of such right or remedy.

20. U.S. Technology and Equipment

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

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

For the Government of the
United States of America

For Cemig Distribuição S.A.

By: Gabrielle Mandel
Gabrielle Mandel
Country Manager
US Trade and Development Agency

Date: 3/15/11

By: Djalma Bastos de Moraes
Djalma Bastos de Moraes
President Director
Cemig Distribuição S.A.

Date: 3/15/11

José Carlos de Mattos
José Carlos de Mattos
Diretor de Distribuição e
Comercialização

Witnessed:

By: [Signature]

Witnessed:

By: [Signature]

Annex I -- Terms of Reference

Annex II -- USTDA Mandatory Clauses



Annex I

Terms of Reference

Objective

The Smart Grid Pilot Implementation Strategy Study ("Study") shall analyze various factors related to the implementation of Smart Grid technologies for Cemig Distribuição, S.A. ("Cemig") and its affiliate, Light Serviços de Eletricidade S.A. ("Light"), including the following:

- Integrated Smart Grid Platform;
- Automatic Metering Infrastructure (AMI) Smart Metering System Planning & Implementation;
- Demand Response;
- Real-Time Distribution Grid Management, including substation automation; and
- Integration of Renewable, Distributed Storage and EV in Distribution Grid Management.

The Study tasks are as follows:

Task 1 – Develop a Work Plan and Define Overall Parameters of the Study

Immediately upon the start of the Study, the U.S. firm selected by Cemig ("U.S. Firm") shall hold discussions with Cemig and Light officials to develop a detailed smart meter implementation project plan. The project plan shall include, at a minimum, items such as methodology and timeline to prepare technology review of functionality desired under the various tasks including system parameters, potential rules and regulations affecting the project plan and other factors identified by the Grantee that would ensure a sound project design and an effective implementation program. Through these discussions, the U.S. Firm shall define all of the project parameters before proceeding to developing the project design and implementation plan.

In addition, given the need for capacity building and training of Cemig and Light engineers in the Smart Grid technology, the U.S. Firm shall develop specific topics for the workshops during the course of the feasibility study as discussed under individual tasks.

The U.S. Firm shall develop a detailed work plan including a schedule for completing the feasibility study and demonstration project. The work plan shall also include a detailed list of data and information requirements for completing the Study. The U.S. Firm shall present this analysis and the conclusions to Cemig and Light officials and receive concurrence before proceeding further.



Deliverable #1: As part of Task 1, the U.S. Firm shall develop a detailed work plan including a manpower allocation plan, a list of specific data requirements and a detailed task-by-task schedule for the completion of the feasibility study.

Task 2: Develop AMI and Demand Response Benchmarks

As part of Task 2, the U.S. Firm shall conduct a number of subtasks as follows:

Subtask 2.1: Review AMI Information and Demand Response Technology and Standards: As part of Subtask 2.1, the U.S. Firm shall conduct a number of reviews related to the AMI technology. Specifically, the U.S. Firm's activities shall include the following:

- Review of AMI and Smart Metering technology and standards;
- Review of AMI and Smart Metering technology providers who comply with the technical recommendations and recommend the technology suitable for Cemig and Light;
- Review of laws, policies and regulations related to AMI and Smart Metering projects investments;
- Review of Demand Response technology and standards and recommend Demand Response program strategy suitable for Cemig and Light;
- Review of financing mechanisms available to customers. Cemig and Light;
- Review of other available studies and information as needed (to be provided by Grantee);
- A key benefits qualification and quantification;
- A non-traditional benefits evaluation that includes cross-sectoral and environmental benefits; and
- Evaluate Cemig's and Light's customer profile (energy consumption, average salary, market needs, etc.) and purpose new business to be implemented together with smart grid.

Subtask 2.2: Evaluate the Status of the AMI Technology in the U. S. and Assess Implications for Brazil: As part of Subtask 2.2, the U.S. Firm shall evaluate the U.S. experience of deploying the AMI using an Integrated Smart Grid platform. The U.S. Firm shall conduct the following specific activities:

- Conduct benchmarking and performance evaluation of the AMI deployment in Brazil and North America;
- Conduct benchmarking and performance evaluation of the Demand Response program in Brazil and North America including time-of-the-use rate mechanism;
- Conduct risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include, technical risk, regulatory issues and financial, legal and operational issues;
- Analyze AMI/Smart Grid legislation in the U.S. and compare it with the current legislative status in Brazil to provide the gap analysis and recommendation on desired legislative changes in the context of regulatory and standardization issues;



- Analyze criteria used by U.S. utilities to evaluate benefits of the AMI/Smart Grid program and compare it to the criteria used by Cemig and Light;
- Analyze the contribution of Demand Response and energy efficiency programs to deploy the AMI technology in the U.S. and how Cemig and Light could develop similar programs;
- Analyze approaches taken by U.S. utilities to engage customers using various methods, tools and technology to educate them about Smart Grid programs and provide recommendations to Cemig and Light considering its infrastructure, market and customer profile; and
- Develop AMI installation regulatory incentives.

Task 2 Deliverables:

The U.S. Firm shall deliver a composite report that shall include clearly labeled sections for the reports on each subtask. The individual subtask reports shall include the following:

- Subtask 2.1 Report
 - A detailed report in English on items listed in Subtask 2.1, which shall provide available AMI technology and demand response mechanisms.
- Subtask 2.2 Report
 - A detailed report in English that shall summarize best practices available for AMI and Smart Metering infrastructure deployment in the U.S.

In addition, the U.S. Firm shall prepare a Power Point presentation in English and Portuguese and conduct a one-day workshop for Cemig and Light officials and stakeholders, to be chosen by Cemig and Light, on the findings and recommendations from Task 2.

Task 3: Develop Smart Grid Technology Platform

Cemig and Light plan to develop an integrated grid management system using Smart Grid platform architecture and communication technology. The Real-Time Grid management system will support operation and maintenance of the interconnected overhead and underground distribution network through real-time supervision, diagnostics, prognostic health management applications and network reconfiguration to provide following major functionality. The detailed tasks of the Smart Grid Technology platform and real-time grid management technology are discussed under Subtasks 3.1 and 3.2.

Subtask 3.1: Review U.S. Experience in Deploying the Integrated Smart Grid Platform: As part of Subtask 3.1, the U.S. Firm shall evaluate the experience of deploying the Integrated Smart Grid Platform to provide real-time Overhead and Underground Grid in the U.S. The U.S. Firm shall also investigate local and regional success stories in the US. The U.S. Firm's activities shall include the following:



- Conduct a benchmarking and performance evaluation of the Real-Time Grid Management in Brazil and North America;
- Conduct risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include: technical risk, regulatory, financial, legal and operational issues;
- Analyze criteria used by U.S. utilities to evaluate benefits of the Real-Time Grid Management program and compare it to the criteria used by Cemig and Light;
- Analyze contribution of micro-grid management, fault analysis, loss reduction, and energy efficiency programs to deploy the Real-Time Grid Management solution and recommend the approach for Cemig and Light to develop similar programs; and
- Assess regulatory incentives to deploy Real-Time Grid Management.

Subtask 3.2: Assess the Impact of Real-Time Grid Management on Cemig's and Light's Business Processes and IT Systems (Geographic Information System, Customer Relationship Management, Enterprise Resource Planning, Smart Grid Demonstration Program, Meter Data Management, Outage Management System, etc.): As part of Subtask 3.2, the U.S. Firm shall assess the impact of Real-Time Grid Management on Cemig's and Light's business processes, particularly in the area of operation, planning and maintenance. As a part of this task, the U.S. Firm shall analyze Cemig's and Light's "as is" processes and procedures that will be impacted by the implementation of AMI and Smart Metering. The analysis shall also include an assessment of the benefits of the AMI technology to Cemig, Light and other stakeholders including regulators and consumers. The U.S. Firm's specific activities shall include the following:

- Analyze and provide recommendations on the business transformations that Cemig and Light would need to make in order to deploy the new integrated Smart Grid platform, and Real-Time Grid Management technology. The U.S. Firm shall carry out this assessment by providing an example of U.S. utility experience. The business transformation impact shall analyze "as is" and "to be" business processes, procedures, governance, and management structure;
- Analyze the impact of real-time grid management on Cemig's and Light's IT systems and recommend remediation strategies for any potential adverse impacts;
- Define scenarios strategies and timeframes for mass implementation of Real-time Grid Management in Cemig's and Light's distribution territory;
- Based on the above analyses, scenarios, strategies and timeframes, prepare a detailed business case with technical and financial analysis for the implementation of Real-Time Grid Management in Cemig's and Light's distribution territory; and
- Provide post implementation planning which shall include targeted workforce training.

Task 3 Deliverables:

As part of Task 3, the U.S. Firm shall deliver a composite Task 3 report that shall clearly label various subtask reports. The subtask reports shall include the following:



- Subtask 3.1 Report
 - A detailed report in English that shall summarize best practices available for Integrated Smart Grid platform and Real-Time Grid Management application deployment in the U.S.
- Subtask 3.2 Report
 - A detailed report in English that shall summarize Cemig's and Light's Integrated Smart Grid platform and Real-Time Grid Management plan, business process transformation and post-implementation planning. The U.S. Firm shall also include best practices available for Integrated Smart Grid platform and Real-Time Grid Management introduction and sustainability.
- A Power Point presentation in English and Portuguese on the findings of Task 3.

Task 4: Develop Distributed Storage and Renewable Source Integration and Electric Vehicle (EV) Charging Management

Cemig and Light envision that a variety of renewable generation sources, electric vehicle and distributed storage facilities and possibly micro-grids will be connected to the distribution grid in the coming years. As part of Task 4 the U.S. Firm shall review and assess technology and standards to manage integration and management of these resources using the Smart Grid platform. This task shall analyze the impact of micro-generation and micro-grid on distribution. The U.S. Firm shall conduct the following specific subtasks:

Subtask 4.1: Evaluate U.S. Experience: As part of Subtask 4.1, the U.S. Firm shall evaluate the experience of integrating and managing renewable resources, distributed storage and EV in the U.S. The U.S. Firm shall also investigate local and regional success stories as applicable. Specifically, the U.S. Firm shall conduct the following activities:

- Analyze the impact of distributed generation and storage in the U.S. utilities and for the Brazilian market;
- Analyze the impact of Plug-in Hybrid EV (PHEV) and EV in the U.S. utilities and provide recommendations for the Brazilian market;
- Conduct a benchmarking and performance evaluation of the deployment of these technologies in Brazil and North America;
- Conduct a risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include: technical risk, regulatory, financial, legal and operational issues;
- Analyze approaches taken by the U.S. utilities to engage customers using various methods, tools and technology to educate them about renewable resources and PHEV/EV integration; and



- Assess regulatory incentives needed to integrate renewable resources, distributed storage and EV.

Subtask 4.2: Impact of Technology Integration on the Grid: As part of Subtask 4.2, the U.S. Firm shall assess the impact of integration and management of renewable, distributed storage, and EV on the distribution grid. As a part of this task, the U.S. Firm shall analyze Cemig's and Light's "as is" processes and procedures that will be impacted. The U.S. Firm shall conduct the following activities as part of this Subtask:

- Analyze and provide recommendations on the business transformations that Cemig and Light would need to make in order to integrate with various renewable generation sources, distributed storage and managing new PHEV/EV load. This shall be carried out by providing an example of U.S. utility experience. The business transformation impact shall analyze "as is" and "to be" business processes, procedures, governance and management structure;
- Define scenarios strategies and timeframes for mass implementation of distributed storage, renewable resources and EV in Cemig's and Light's distribution territory;
- Based on the above analyses, scenarios, strategies and timeframes, prepare a detailed business case with technical and financial analysis for the implementation of integration and management of renewable, distributed storage and EV management in Cemig's and Light's distribution territory; and
- Provide post implementation planning which shall include:
 - Internal and external communication strategy and;
 - Workforce training and capacity building.

Task 4 Deliverables:

As part of Task 4, the U.S. Firm shall deliver the following:

- Subtask 4.1 Report
 - A detailed report in English that shall summarize best practices available in the U.S.
- Subtask 4.2 Report
 - A detailed report in English that shall summarize Cemig's and Light's AMI deployment plan, AMI initiated business process transformation and post-implementation planning.

The U.S. Firm shall also submit an interim report in English with an executive summary in both English and Portuguese that shall include all work completed and all prior reports submitted under Tasks 1 through 4.

Task 5: Conduct Economic Analysis and Financing Mechanism Analysis

The U.S. Firm shall conduct an economic analysis for the implementation strategy developed in Tasks 2, 3 and 4. Both the broad cost estimate and the plan may need to be revised based on the conclusions of the economic analysis conducted under this Task.



The analysis shall result in a set of profitability indicators, such as Net Profit Value, Initial Rate of Return, payback period and others as applicable. The U.S. Firm shall conduct an economic sensitivity analysis of each major plan component reflecting variations in interest rates, electricity tariffs, volumes and equipment costs. The U.S. Firm shall provide a pro-forma assessment of tariffs increase required (if any) for sustainability of the Project.

As part 2 of this task, the U.S. Firm shall provide an analysis of various financing mechanisms that can be applied to the smart meter installation program. These mechanisms shall include at a minimum full customer expense, partially subsidized installation, concessionary financing through international banks, special purpose funds designed to ease the burden of this expenditure and others. Although the program shall be designed considering full economic viability and the capacity of the local market to provide the necessary finance for the program, the U.S. Firm shall discuss this project with a minimum of 5 banks and agencies to understand their interest in financing such projects.

In addition to financing mechanisms, the U.S. Firm shall calculate the expected cost to the consumer for the implementation strategy.

Task 5 Deliverables:

As part of Task 5, the U.S. Firm shall prepare and deliver the following reports:

- A report in English summarizing the economic analysis of the project with sensitivities for all major elements of the implementation plan. Sensitivity analysis shall include key factors such as international oil price, tax rates, interest rates, currency fluctuation and depreciation rates; and
- A report in English summarizing at least 3 potential financing options and the estimated potential costs to the consumer of each option.

Task 6: Analyze Light and Cemig Technical Architecture

Under Task 6, the U.S. Firm shall conduct an evaluation of the technical architecture developed by Light and Cemig in their Smart Grid program. The task shall include:

- Benchmarking of international projects related to Smart Metering/Smart Grid and areas investigated;
- Analysis of Cemig and Light technical architecture (data security, telecom, processing, devices, protocols, etc.) in relation to the above item and provide recommendations;
- Benchmarking of international studies related to impacts of communications technologies considered in Cemig's and Light's Smart Grid technical architecture and telecommunications master plan on human health and provide recommendations;



- Ranking of Cemig's and Light's program in relation to other programs worldwide and a gap analysis in relation to the U.S. and other international markets;
- Analyzing Cemig's and Light's operations center restructuring plan and providing recommendations;
- Analyzing the current project metrics and providing recommendations;
- Analyzing project requirements, assumptions and risks and providing recommendations;
- Analyzing the current tasks for customer engagement and providing recommendations; and
- Analyzing project scope, overall tasks, functionalities and pilots, and providing recommendations for current and future actions.

Task 6 Deliverables:

The U.S. Firm shall deliver an evaluation report on Light's and Cemig's Smart Grid program with recommendations.

Task 7: Conduct an Environmental and Development Impact Assessment

The U.S. Firm shall conduct an environmental and social impact assessment(s) of the proposed project. The assessments shall carefully consider the benefits of the overall "smart" system, rather than the benefits of an individual component.

The proposed project is not expected to have any environmental impact because it is focused on replacing the existing systems and installing new ones. Nevertheless, the environmental review shall include, but not be limited to the following:

- Existing meter disposition and recycling;
- New meter disposition and control;
- Impact of EV and PHEV on the environment;
- Impact of distributed storage and renewable source integration on carbon emission;
- Impact of distribution automation provided loss reduction and efficient delivery on carbon emission and demand;
- Air quality and noise;
- Environmental risk assessment;
- Overall benefits of implementing a comprehensive energy management system; and
- Occupational health and safety.

The U.S. Firm shall also conduct an analysis of the potential social and developmental impact of the project. The U.S. Firm's analysis shall focus on what development impact is likely if the project is implemented according to the Study recommendations. While specific focus shall be paid to the immediate impact of the project, analysis shall include any additional development benefits that may result from the project's implementation, including spin-off and demonstration effects.



Accordingly, the analysis shall be an assessment of each of the following categories with respect to the project's potential development impact:

- *Infrastructure*: A statement on the infrastructure impact of the project, giving a brief synopsis;
- *Market-Oriented Reform*: A description of any regulations, laws or institutional changes that are recommended and the effect they would have if implemented;
- *Human Capacity Building*: A description of the number and type of positions in Brazil that would be needed to construct and operate the Project, the number of people that will be needed to process construction materials, as well as the number of people who will receive training, and a brief description of the training program;
- *Technology Transfer and Productivity Enhancement*: A description of any advanced technologies that will be implemented as well as any efficiency that would be gained as a result of the implementation of the project; and
- *Other*: Any other developmental impacts or benefits that would result from the project, for example, follow-on or replication projects, safer work place, increased good governance or improved financial revenue flows to Brazil.

Task 7 Deliverables:

The U.S. Firm shall prepare and submit a report in English on the environmental and developmental impacts of the project in accordance with USTDA's requirements for this report.

Task 8: Draft Final Report and Presentation

The U.S. Firm shall prepare a draft final report and present its findings to Cemig. In addition, the U.S. Firm shall conduct a full-day workshop under the leadership of Cemig to make a detailed presentation on the report. Cemig will be responsible for sending invitations to the participants and all logistics including venue and audio/visual equipment.

The draft final report shall be organized according to the above tasks and shall include all deliverables and documents that have been provided to Cemig. Cemig shall provide comments to the U.S. Firm on the draft final report within four weeks from the date of submission. Based on these comments, the U.S. Firm shall prepare a Power Point presentation to be used during a workshop for the stakeholders under the leadership of Cemig.

Task 8 Deliverable:

The U.S. Firm shall deliver the following as part of this task:



- A draft final report in English and Portuguese;
- An Executive Summary of the report in both English and Portuguese; and
- A Power Point presentation of the findings and recommendations of the feasibility study in both the English and Portuguese languages.

Task 9: Final Report

Once Cemig and Light have provided comments and revisions to the draft final report, the U.S. Firm shall prepare and provide a comprehensive Final Report to Cemig and Light, which shall contain the key findings, recommendations and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 8 above.

The U.S. Firm shall ensure that the Final Report is submitted in accordance with Clause I of Annex II of the Grant Agreement. The Final Report shall be a substantive and comprehensive report of work performed to carry out all of the tasks set forth in these Terms of Reference and shall include, among other things, an Executive Summary and all deliverables. Each task of these Terms of Reference shall form a separate chapter of the Final Report.

The Final Report shall also include a comprehensive list of suppliers, including potential sources of U.S. equipment and services, relevant to the implementation of each component of the Project as outlined in the Study. The U.S. Suppliers list shall identify the capabilities, addresses and principal points of contact for each of the suppliers. The Final Report shall be provided no later than 2 weeks after the receipt of comments from Cemig and Light.

Task 9 Deliverable:

The U.S. Firm shall produce a Final Report and prepare a Power Point Presentation of all the project findings. The Final Report shall be in the English and Portuguese languages. The Executive Summary and the Power Point Presentation shall also be submitted in the Portuguese language.

Notes:

- (1) The U.S. Firm is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of these Terms of Reference.
- (2) The U.S. Firm and Cemig shall be careful to ensure that the public version of the Final Report contains no security or confidential information.



(3) Cemig 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 Agreement of Understanding Clauses

A. USTDA Mandatory Clauses Controlling

The parties to this Agreement of Understanding to Perform the Feasibility Study ("Agreement of Understanding") acknowledge that this Agreement of Understanding 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 Cemig Distribuição S.A. ("Client"), dated _____ ("Grant Agreement"). The Client has selected _____ ("U.S. Firm") to perform the Feasibility Study ("Study") for the Smart Grid Pilot Implementation Strategy ("Project") in Brazil ("Host Country"). Notwithstanding any other provisions of this Agreement of Understanding, the following USTDA mandatory Agreement of Understanding clauses shall govern. All sub-agreements entered into by the U.S. Firm funded or partially funded with USTDA Grant funds shall include these USTDA mandatory Agreement of Understanding clauses, except for clauses B(1), G, H, I and J. In addition, in the event of any inconsistency between the Grant Agreement and the Agreement of Understanding or sub-agreement thereunder, the Grant Agreement shall be controlling.

B. USTDA as Financier

(1) USTDA Approval of Agreement of Understanding

All agreements of understanding 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 Agreement of Understanding has been formally approved by USTDA or until the Agreement of Understanding conforms to modifications required by USTDA during the Agreement of Understanding review process.

(2) USTDA Not a Party to the Agreement of Understanding

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 Agreement of Understanding and amendments thereto, including assignments, the selection of all U.S. Firms, the Terms of Reference, the Final Report, and any and all documents related to any Agreement of Understanding 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 Agreement of Understanding. 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 Agreement of Understanding or any sub-agreement, 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 U.S. Firm, or relieve the U.S. Firm of any liability which the U.S. Firm 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 U.S. Firm must be either a U.S. firm or U.S. individual; (b) the U.S. Firm 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 sub-agreement; (c) employees of the U.S. Firm or U.S. subcontractors 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 U.S. Firm 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 Agreement of Understanding. 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 Agreement of Understanding term and for a period of three (3) years after final disbursement by USTDA. The U.S. Firm and subcontractors shall afford USTDA, or its authorized representatives, the opportunity at reasonable times for inspection and audit of such books, records and other documentation.



E. U.S. Carriers

(1) Air

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

(2) Marine

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

F. Workman's Compensation Insurance

The U.S. Firm shall provide adequate Workman's Compensation Insurance coverage for work performed under this Agreement of Understanding.

G. Reporting Requirements

The U.S. Firm 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 U.S. Firm receives follow-on work from the Client, the U.S. Firm shall so notify USTDA and designate the U.S. Firm'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 U.S. Firm 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 Agreement of Understanding

Disbursement of Grant funds will be made only after USTDA approval of this Agreement of Understanding. To make this review in a timely fashion, USTDA must receive from either the Client or the U.S. Firm a photocopy of an English language version of a signed Agreement of Understanding 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 U.S. Firm shall be included in this Agreement of Understanding. 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 Agreement of Understanding 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) U.S. Firm Invoice Requirements

USTDA will make all disbursements of USTDA Grant funds directly to the U.S. Firm. The U.S. Firm 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 U.S. Firm for performance of the contract by submitting the following to USTDA:

(a) U.S. Firm's Invoice

The U.S. Firm's invoice shall include reference to an item listed in the Agreement of Understanding payment schedule, the requested payment amount, and an appropriate certification by the U.S. Firm, as follows:

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

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

(ii) For Agreement of Understanding performance milestone payments:

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



(iii) For final payment:

"The U.S. Firm has performed the work described in this invoice in accordance with the terms of its Agreement of Understanding with the Client and is entitled to payment thereunder. Specifically, the U.S. Firm has submitted the Final Report to the Client, as required by the Agreement of Understanding, and received the Client's approval of the Final Report. To the extent the U.S. Firm has not complied with the terms and conditions of the Agreement of Understanding, 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 U.S. Firm's Invoice

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

(ii) For Agreement of Understanding 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 U.S. Firm have been performed satisfactorily, in accordance with applicable Agreement of Understanding 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 U.S. Firm have been performed satisfactorily, in accordance with applicable Agreement of Understanding provisions and terms and conditions of the USTDA Grant Agreement. The Final Report submitted by the U.S. Firm 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 Agreement of Understanding is terminated prior to completion, the U.S. Firm 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 U.S. Firm all USTDA Grant funds previously disbursed to the U.S. Firm (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 U.S. Firm 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 U.S. Firm 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 U.S. Firm to ensure that no confidential information is contained on the CD-ROMs.



The U.S. Firm 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 U.S. Firm 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 U.S. Firm shall be responsible for labeling the front cover of that version of the Final Report with the term "Confidential Version." The U.S. Firm 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 U.S. Firm 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 U.S. Firm who prepared the report, a report title and the following language:

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

(d) The U.S. Firm 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 U.S. Firm 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 Agreement of Understanding, 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 October 31, 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 Agreement of Understanding 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 U.S. Firm 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 U.S. Firm 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 Agreement of Understanding, 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 Agreement of Understanding 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.: 1111/121001
Activity No.: 2011-51003A
Reservation No.: 2011090
Grant No.: GH201151090

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 U.S. Firm will seek reimbursement from USTDA for such taxes, tariffs, duties, fees or other levies.



Annex I

Terms of Reference

Objective

The Smart Grid Pilot Implementation Strategy Study ("Study") shall analyze various factors related to the implementation of Smart Grid technologies for Cemig Distribuição, S.A. ("Cemig") and its affiliate, Light Serviços de Eletricidade S.A. ("Light"), including the following:

- Integrated Smart Grid Platform;
- Automatic Metering Infrastructure (AMI) Smart Metering System Planning & Implementation;
- Demand Response;
- Real-Time Distribution Grid Management, including substation automation; and
- Integration of Renewable, Distributed Storage and EV in Distribution Grid Management.

The Study tasks are as follows:

Task 1 – Develop a Work Plan and Define Overall Parameters of the Study

Immediately upon the start of the Study, the U.S. firm selected by Cemig ("U.S. Firm") shall hold discussions with Cemig and Light officials to develop a detailed smart meter implementation project plan. The project plan shall include, at a minimum, items such as methodology and timeline to prepare technology review of functionality desired under the various tasks including system parameters, potential rules and regulations affecting the project plan and other factors identified by the Grantee that would ensure a sound project design and an effective implementation program. Through these discussions, the U.S. Firm shall define all of the project parameters before proceeding to developing the project design and implementation plan.

In addition, given the need for capacity building and training of Cemig and Light engineers in the Smart Grid technology, the U.S. Firm shall develop specific topics for the workshops during the course of the feasibility study as discussed under individual tasks.

The U.S. Firm shall develop a detailed work plan including a schedule for completing the feasibility study and demonstration project. The work plan shall also include a detailed list of data and information requirements for completing the Study. The U.S. Firm shall present this analysis and the conclusions to Cemig and Light officials and receive concurrence before proceeding further.



Deliverable #1: As part of Task 1, the U.S. Firm shall develop a detailed work plan including a manpower allocation plan, a list of specific data requirements and a detailed task-by-task schedule for the completion of the feasibility study.

Task 2: Develop AMI and Demand Response Benchmarks

As part of Task 2, the U.S. Firm shall conduct a number of subtasks as follows:

Subtask 2.1: Review AMI Information and Demand Response Technology and Standards: As part of Subtask 2.1, the U.S. Firm shall conduct a number of reviews related to the AMI technology. Specifically, the U.S. Firm's activities shall include the following:

- Review of AMI and Smart Metering technology and standards;
- Review of AMI and Smart Metering technology providers who comply with the technical recommendations and recommend the technology suitable for Cemig and Light;
- Review of laws, policies and regulations related to AMI and Smart Metering projects investments;
- Review of Demand Response technology and standards and recommend Demand Response program strategy suitable for Cemig and Light;
- Review of financing mechanisms available to customers, Cemig and Light;
- Review of other available studies and information as needed (to be provided by Grantee);
- A key benefits qualification and quantification;
- A non-traditional benefits evaluation that includes cross-sectoral and environmental benefits; and
- Evaluate Cemig's and Light's customer profile (energy consumption, average salary, market needs, etc.) and purpose new business to be implemented together with smart grid.

Subtask 2.2: Evaluate the Status of the AMI Technology in the U. S. and Assess Implications for Brazil: As part of Subtask 2.2, the U.S. Firm shall evaluate the U.S. experience of deploying the AMI using an Integrated Smart Grid platform. The U.S. Firm shall conduct the following specific activities:

- Conduct benchmarking and performance evaluation of the AMI deployment in Brazil and North America;
- Conduct benchmarking and performance evaluation of the Demand Response program in Brazil and North America including time-of-the-use rate mechanism;
- Conduct risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include, technical risk, regulatory issues and financial, legal and operational issues;
- Analyze AMI/Smart Grid legislation in the U.S. and compare it with the current legislative status in Brazil to provide the gap analysis and recommendation on desired legislative changes in the context of regulatory and standardization issues;



- Analyze criteria used by U.S. utilities to evaluate benefits of the AMI/Smart Grid program and compare it to the criteria used by Cemig and Light;
- Analyze the contribution of Demand Response and energy efficiency programs to deploy the AMI technology in the U.S. and how Cemig and Light could develop similar programs;
- Analyze approaches taken by U.S. utilities to engage customers using various methods, tools and technology to educate them about Smart Grid programs and provide recommendations to Cemig and Light considering its infrastructure, market and customer profile; and
- Develop AMI installation regulatory incentives.

Task 2 Deliverables:

The U.S. Firm shall deliver a composite report that shall include clearly labeled sections for the reports on each subtask. The individual subtask reports shall include the following:

- Subtask 2.1 Report
 - A detailed report in English on items listed in Subtask 2.1, which shall provide available AMI technology and demand response mechanisms.
- Subtask 2.2 Report
 - A detailed report in English that shall summarize best practices available for AMI and Smart Metering infrastructure deployment in the U.S.

In addition, the U.S. Firm shall prepare a Power Point presentation in English and Portuguese and conduct a one-day workshop for Cemig and Light officials and stakeholders, to be chosen by Cemig and Light, on the findings and recommendations from Task 2.

Task 3: Develop Smart Grid Technology Platform

Cemig and Light plan to develop an integrated grid management system using Smart Grid platform architecture and communication technology. The Real-Time Grid management system will support operation and maintenance of the interconnected overhead and underground distribution network through real-time supervision, diagnostics, prognostic health management applications and network reconfiguration to provide following major functionality. The detailed tasks of the Smart Grid Technology platform and real-time grid management technology are discussed under Subtasks 3.1 and 3.2.

Subtask 3.1: Review U.S. Experience in Deploying the Integrated Smart Grid Platform: As part of Subtask 3.1, the U.S. Firm shall evaluate the experience of deploying the Integrated Smart Grid Platform to provide real-time Overhead and Underground Grid in the U.S. The U.S. Firm shall also investigate local and regional success stories in the US. The U.S. Firm's activities shall include the following:



- Conduct a benchmarking and performance evaluation of the Real-Time Grid Management in Brazil and North America;
- Conduct risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include: technical risk, regulatory, financial, legal and operational issues;
- Analyze criteria used by U.S. utilities to evaluate benefits of the Real-Time Grid Management program and compare it to the criteria used by Cemig and Light;
- Analyze contribution of micro-grid management, fault analysis, loss reduction, and energy efficiency programs to deploy the Real-Time Grid Management solution and recommend the approach for Cemig and Light to develop similar programs; and
- Assess regulatory incentives to deploy Real-Time Grid Management.

Subtask 3.2: Assess the Impact of Real-Time Grid Management on Cemig's and Light's Business Processes and IT Systems (Geographic Information System, Customer Relationship Management, Enterprise Resource Planning, Smart Grid Demonstration Program, Meter Data Management, Outage Management System, etc.): As part of Subtask 3.2, the U.S. Firm shall assess the impact of Real-Time Grid Management on Cemig's and Light's business processes, particularly in the area of operation, planning and maintenance. As a part of this task, the U.S. Firm shall analyze Cemig's and Light's "as is" processes and procedures that will be impacted by the implementation of AMI and Smart Metering. The analysis shall also include an assessment of the benefits of the AMI technology to Cemig, Light and other stakeholders including regulators and consumers. The U.S. Firm's specific activities shall include the following:

- Analyze and provide recommendations on the business transformations that Cemig and Light would need to make in order to deploy the new integrated Smart Grid platform, and Real-Time Grid Management technology. The U.S. Firm shall carry out this assessment by providing an example of U.S. utility experience. The business transformation impact shall analyze "as is" and "to be" business processes, procedures, governance, and management structure;
- Analyze the impact of real-time grid management on Cemig's and Light's IT systems and recommend remediation strategies for any potential adverse impacts;
- Define scenarios strategies and timeframes for mass implementation of Real-time Grid Management in Cemig's and Light's distribution territory;
- Based on the above analyses, scenarios, strategies and timeframes, prepare a detailed business case with technical and financial analysis for the implementation of Real-Time Grid Management in Cemig's and Light's distribution territory; and
- Provide post implementation planning which shall include targeted workforce training.

Task 3 Deliverables:

As part of Task 3, the U.S. Firm shall deliver a composite Task 3 report that shall clearly label various subtask reports. The subtask reports shall include the following:



- Subtask 3.1 Report
 - A detailed report in English that shall summarize best practices available for Integrated Smart Grid platform and Real-Time Grid Management application deployment in the U.S.

- Subtask 3.2 Report
 - A detailed report in English that shall summarize Cemig's and Light's Integrated Smart Grid platform and Real-Time Grid Management plan, business process transformation and post-implementation planning. The U.S. Firm shall also include best practices available for Integrated Smart Grid platform and Real-Time Grid Management introduction and sustainability.

- A Power Point presentation in English and Portuguese on the findings of Task 3.

Task 4: Develop Distributed Storage and Renewable Source Integration and Electric Vehicle (EV) Charging Management

Cemig and Light envision that a variety of renewable generation sources, electric vehicle and distributed storage facilities and possibly micro-grids will be connected to the distribution grid in the coming years. As part of Task 4 the U.S. Firm shall review and assess technology and standards to manage integration and management of these resources using the Smart Grid platform. This task shall analyze the impact of micro-generation and micro-grid on distribution. The U.S. Firm shall conduct the following specific subtasks:

Subtask 4.1: Evaluate U.S. Experience: As part of Subtask 4.1, the U.S. Firm shall evaluate the experience of integrating and managing renewable resources, distributed storage and EV in the U.S. The U.S. Firm shall also investigate local and regional success stories as applicable. Specifically, the U.S. Firm shall conduct the following activities:

- Analyze the impact of distributed generation and storage in the U.S. utilities and for the Brazilian market;
- Analyze the impact of Plug-in Hybrid EV (PHEV) and EV in the U.S. utilities and provide recommendations for the Brazilian market;
- Conduct a benchmarking and performance evaluation of the deployment of these technologies in Brazil and North America;
- Conduct a risk analysis and make recommendations to mitigate risks based on the lessons learned in the U.S. The risk analysis shall include: technical risk, regulatory, financial, legal and operational issues;
- Analyze approaches taken by the U.S. utilities to engage customers using various methods, tools and technology to educate them about renewable resources and PHEV/EV integration; and



- Assess regulatory incentives needed to integrate renewable resources, distributed storage and EV.

Subtask 4.2: Impact of Technology Integration on the Grid: As part of Subtask 4.2, the U.S. Firm shall assess the impact of integration and management of renewable, distributed storage, and EV on the distribution grid. As a part of this task, the U.S. Firm shall analyze Cemig's and Light's "as is" processes and procedures that will be impacted. The U.S. Firm shall conduct the following activities as part of this Subtask:

- Analyze and provide recommendations on the business transformations that Cemig and Light would need to make in order to integrate with various renewable generation sources, distributed storage and managing new PHEV/EV load. This shall be carried out by providing an example of U.S. utility experience. The business transformation impact shall analyze "as is" and "to be" business processes, procedures, governance and management structure;
- Define scenarios strategies and timeframes for mass implementation of distributed storage, renewable resources and EV in Cemig's and Light's distribution territory;
- Based on the above analyses, scenarios, strategies and timeframes, prepare a detailed business case with technical and financial analysis for the implementation of integration and management of renewable, distributed storage and EV management in Cemig's and Light's distribution territory; and
- Provide post implementation planning which shall include:
 - Internal and external communication strategy and;
 - Workforce training and capacity building.

Task 4 Deliverables:

As part of Task 4, the U.S. Firm shall deliver the following:

- Subtask 4.1 Report
 - A detailed report in English that shall summarize best practices available in the U.S.
- Subtask 4.2 Report
 - A detailed report in English that shall summarize Cemig's and Light's AMI deployment plan, AMI initiated business process transformation and post-implementation planning.

The U.S. Firm shall also submit an interim report in English with an executive summary in both English and Portuguese that shall include all work completed and all prior reports submitted under Tasks 1 through 4.

Task 5: Conduct Economic Analysis and Financing Mechanism Analysis

The U.S. Firm shall conduct an economic analysis for the implementation strategy developed in Tasks 2, 3 and 4. Both the broad cost estimate and the plan may need to be revised based on the conclusions of the economic analysis conducted under this Task.



The analysis shall result in a set of profitability indicators, such as Net Profit Value, Initial Rate of Return, payback period and others as applicable. The U.S. Firm shall conduct an economic sensitivity analysis of each major plan component reflecting variations in interest rates, electricity tariffs, volumes and equipment costs. The U.S. Firm shall provide a pro-forma assessment of tariffs increase required (if any) for sustainability of the Project.

As part 2 of this task, the U.S. Firm shall provide an analysis of various financing mechanisms that can be applied to the smart meter installation program. These mechanisms shall include at a minimum full customer expense, partially subsidized installation, concessionary financing through international banks, special purpose funds designed to ease the burden of this expenditure and others. Although the program shall be designed considering full economic viability and the capacity of the local market to provide the necessary finance for the program, the U.S. Firm shall discuss this project with a minimum of 5 banks and agencies to understand their interest in financing such projects.

In addition to financing mechanisms, the U.S. Firm shall calculate the expected cost to the consumer for the implementation strategy.

Task 5 Deliverables:

As part of Task 5, the U.S. Firm shall prepare and deliver the following reports:

- A report in English summarizing the economic analysis of the project with sensitivities for all major elements of the implementation plan. Sensitivity analysis shall include key factors such as international oil price, tax rates, interest rates, currency fluctuation and depreciation rates; and
- A report in English summarizing at least 3 potential financing options and the estimated potential costs to the consumer of each option.

Task 6: Analyze Light and Cemig Technical Architecture

Under Task 6, the U.S. Firm shall conduct an evaluation of the technical architecture developed by Light and Cemig in their Smart Grid program. The task shall include:

- Benchmarking of international projects related to Smart Metering/Smart Grid and areas investigated;
- Analysis of Cemig and Light technical architecture (data security, telecom, processing, devices, protocols, etc.) in relation to the above item and provide recommendations;
- Benchmarking of international studies related to impacts of communications technologies considered in Cemig's and Light's Smart Grid technical architecture and telecommunications master plan on human health and provide recommendations;



- Ranking of Cemig's and Light's program in relation to other programs worldwide and a gap analysis in relation to the U.S. and other international markets;
- Analyzing Cemig's and Light's operations center restructuring plan and providing recommendations;
- Analyzing the current project metrics and providing recommendations;
- Analyzing project requirements, assumptions and risks and providing recommendations;
- Analyzing the current tasks for customer engagement and providing recommendations; and
- Analyzing project scope, overall tasks, functionalities and pilots, and providing recommendations for current and future actions.

Task 6 Deliverables:

The U.S. Firm shall deliver an evaluation report on Light's and Cemig's Smart Grid program with recommendations.

Task 7: Conduct an Environmental and Development Impact Assessment

The U.S. Firm shall conduct an environmental and social impact assessment(s) of the proposed project. The assessments shall carefully consider the benefits of the overall "smart" system, rather than the benefits of an individual component.

The proposed project is not expected to have any environmental impact because it is focused on replacing the existing systems and installing new ones. Nevertheless, the environmental review shall include, but not be limited to the following:

- Existing meter disposition and recycling;
- New meter disposition and control;
- Impact of EV and PHEV on the environment;
- Impact of distributed storage and renewable source integration on carbon emission;
- Impact of distribution automation provided loss reduction and efficient delivery on carbon emission and demand;
- Air quality and noise;
- Environmental risk assessment;
- Overall benefits of implementing a comprehensive energy management system; and
- Occupational health and safety.

The U.S. Firm shall also conduct an analysis of the potential social and developmental impact of the project. The U.S. Firm's analysis shall focus on what development impact is likely if the project is implemented according to the Study recommendations. While specific focus shall be paid to the immediate impact of the project, analysis shall include any additional development benefits that may result from the project's implementation, including spin-off and demonstration effects.



Accordingly, the analysis shall be an assessment of each of the following categories with respect to the project's potential development impact:

- *Infrastructure*: A statement on the infrastructure impact of the project, giving a brief synopsis;
- *Market-Oriented Reform*: A description of any regulations, laws or institutional changes that are recommended and the effect they would have if implemented;
- *Human Capacity Building*: A description of the number and type of positions in Brazil that would be needed to construct and operate the Project, the number of people that will be needed to process construction materials, as well as the number of people who will receive training, and a brief description of the training program;
- *Technology Transfer and Productivity Enhancement*: A description of any advanced technologies that will be implemented as well as any efficiency that would be gained as a result of the implementation of the project; and
- *Other*: Any other developmental impacts or benefits that would result from the project, for example, follow-on or replication projects, safer work place, increased good governance or improved financial revenue flows to Brazil.

Task 7 Deliverables:

The U.S. Firm shall prepare and submit a report in English on the environmental and developmental impacts of the project in accordance with USTDA's requirements for this report.

Task 8: Draft Final Report and Presentation

The U.S. Firm shall prepare a draft final report and present its findings to Cemig. In addition, the U.S. Firm shall conduct a full-day workshop under the leadership of Cemig to make a detailed presentation on the report. Cemig will be responsible for sending invitations to the participants and all logistics including venue and audio/visual equipment.

The draft final report shall be organized according to the above tasks and shall include all deliverables and documents that have been provided to Cemig. Cemig shall provide comments to the U.S. Firm on the draft final report within four weeks from the date of submission. Based on these comments, the U.S. Firm shall prepare a Power Point presentation to be used during a workshop for the stakeholders under the leadership of Cemig.

Task 8 Deliverable:

The U.S. Firm shall deliver the following as part of this task:



- A draft final report in English and Portuguese;
- An Executive Summary of the report in both English and Portuguese; and
- A Power Point presentation of the findings and recommendations of the feasibility study in both the English and Portuguese languages.

Task 9: Final Report

Once Cemig and Light have provided comments and revisions to the draft final report, the U.S. Firm shall prepare and provide a comprehensive Final Report to Cemig and Light, which shall contain the key findings, recommendations and conclusions of the Study, and shall incorporate all other documents and/or reports provided pursuant to Tasks 1 through 8 above.

The U.S. Firm shall ensure that the Final Report is submitted in accordance with Clause I of Annex II of the Grant Agreement. The Final Report shall be a substantive and comprehensive report of work performed to carry out all of the tasks set forth in these Terms of Reference and shall include, among other things, an Executive Summary and all deliverables. Each task of these Terms of Reference shall form a separate chapter of the Final Report.

The Final Report shall also include a comprehensive list of suppliers, including potential sources of U.S. equipment and services, relevant to the implementation of each component of the Project as outlined in the Study. The U.S. Suppliers list shall identify the capabilities, addresses and principal points of contact for each of the suppliers. The Final Report shall be provided no later than 2 weeks after the receipt of comments from Cemig and Light.

Task 9 Deliverable:

The U.S. Firm shall produce a Final Report and prepare a Power Point Presentation of all the project findings. The Final Report shall be in the English and Portuguese languages. The Executive Summary and the Power Point Presentation shall also be submitted in the Portuguese language.

Notes:

- (1) The U.S. Firm is responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of these Terms of Reference.
- (2) The U.S. Firm and Cemig shall be careful to ensure that the public version of the Final Report contains no security or confidential information.



(3) Cemig 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.



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: _____