**REQUEST FOR PROPOSALS**

**TECHNICAL ASSISTANCE FOR THE INTEGRATED WIND, SOLAR AND ENERGY STORAGE PROJECT**

Submission Deadline: **12:30 AM EDT**

**LOCAL TIME: 10:00 AM IST**

**July 13, 2015**

Submission Place:

Mr. Sameer Parikh
Vice President
IL & FS Energy Development Company Limited
1st Floor, Corporate Office Tower
Ambience Mall Complex,
Ambience Island , NH-8
Gurgaon – 122001, India
Phone: +91 124 471 6100
Fax: +91 124 471 6120

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$898,000 to IL & FS Energy Development Company Limited (IEDCL) (the "Grantee") in accordance with a grant agreement dated May 19, 2015 (the "Grant Agreement"). The Technical Assistance (TA) project would assess the technical, financial and commercial viability of renewable energy storage technologies for two planned renewable energy projects. IEDCL, the largest wind power producer in India, plans to construct 1,150 Megawatts (MW) of "Integrated Wind, Solar and Energy Storage" Project in the states of Andhra Pradesh and Gujarat over the next five years. Through the use of fully integrated energy storage infrastructure, the planned IEDCL integrated wind, solar and energy storage project would be developed as power generation parks that would supply dispatchable utility scale renewable energy to the power grid for the first time in India. 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 TA project.

Definitional Mission (DM) Contractor Emerging Markets Infrastructure (USTDA Activity No. 2014-31078A) strongly recommends the proposed TA, as it has the potential to create U.S. export opportunities, including the sale of U.S. energy storage equipment. U.S. firms produce some of the world's leading technologies for power grid energy storage, which have been commercially deployed in the U.S. and elsewhere. USTDA funding for this activity would advance procurement opportunities for U.S. firms such as Imergy Power Systems (Imergy) and GE, which have already gained a foothold in the Indian market but are seeking larger scale opportunities for their energy storage solutions. This TA project would directly support U.S. government policy priorities to promote commercial partnerships between our two countries while facilitating advanced technical cooperation that promotes the development of domestic clean energy production in India. These priorities have been elevated by the Administration in cooperation with the Indian government under Prime Minister Narendra Modi's leadership.

### 1.1 BACKGROUND SUMMARY

Portions of a background Definitional Mission is provided for reference in Annex 2.

The Government of India's (GOI) National Action Plan on Climate Change (NAPCC) suggests increasing the share of renewable energy in the total energy mix at-least up to 15 percent by 2020, from a current base of about 5-6 percent. Currently, India is generating over 30,000 MW of renewable energy at an annual growth rate of 19 percent. Indian states such as Tamil Nadu and Gujarat, which have high levels of renewable energy generation, are already suffering from transmission capacity constraints that prevent the evacuation of electricity during peak times and seasons. With significant wind and solar PV capacity additions expected in the coming years, India's power grid will continue to face severe transmission capacity constraints and stability issues. Energy storage technologies represent a potential solution for electricity systems that support injection of significant amounts of renewable energy power generation. These technologies are evolving into potentially crucial components of India's overall energy development strategy, as they provide utility companies with multiple power management benefits, including time shifting, grid stabilization, shaving of peak demand, improved generation efficiency, and improved utilization of transmission capacity.

IEDCL has close to 1500 MW of power generation projects in operation or about to be commissioned, and another 1500 MW under construction. These projects include conventional gas and coal thermal as well as wind, solar PV, and biomass generation. IEDCL is India's largest private developer of wind farms, and is also a private provider of power transmission services, placing the utility in a strong position to take advantage of storage opportunities from both generation and transmission operations. IEDCL is a subsidiary of the Indian company Infrastructure Leasing & Finance Services (IL&FS). Established in 1987, IL&FS is a pioneer of public-private partnerships (PPP) in India. The company has developed the largest number of lane kilometers of Build-Operate-Transfer road assets in India, the country's first private metrorail as well as waste-to-energy, real estate, and education PPPs. In the financial sector, IL&FS pioneered the first infrastructure private equity and debt funds in India and has acted as a syndicator for numerous projects, with $3.2 billion under its management.

As India's largest wind energy producer, IEDCL's aims to be an innovator in the development and application of energy storage technologies. Currently, the company is planning to construct two wind integrated Solar PV power systems with energy storage facilities: a 1000 MW integrated power system in the Ananthpur District of Andhra Pradesh and a similar but smaller scale 150 MW power system in the village of Nana Layja located in the Kutch District of Gujarat. Together these two sites, known as IEDCL's Integrated Wind, Solar and Energy Storage initiative, will be developed over the course of three phases in five years, from 2016 to the year 2020, as power generation parks with fully integrated energy storage facilities that will supply dispatchable utility scale renewable energy to India's power grid. The first phase would be an initial 27MW project in Andhra Pradesh (known as Phase 1A) at a site already owned by IEDCL. In fact, IEDCL is already generating 6.5 MW of wind power at the site and has basic power evacuation infrastructure already in place.

IEDCL has requested USTDA funding for this TA project to evaluate and recommend energy storage technologies for the project's initiative and recommend an integrated wind, solar and energy storage design applicable to both project sites. The energy storage component of the TA project will primarily focus on techno economic feasibility of the various types of battery technologies currently available and emerging in the Indian market. IEDCL is currently in discussions with U.S. companies, Imergy and GE, to explore the possibility of implementing U.S. battery powered energy storage systems for the project's initiative. The TA analysis will include a detailed economic and financial analysis, a regulatory analysis, and a specific feasibility study for Phase 1A. The TA will provide IEDCL with an overall plan for the entire 1,150 MW that will enable dispatchable wind and solar PV generation.

If successful, the project would ultimately serve as a model for the development of additional utility scale integrated renewable energy and energy storage projects in India. In particular the implementation of these technologies would help improve the overall reliability of the electric power grid; increase the delivery of power by eliminating the need for renewable energy producers to decrease production when the grid is overburdened; generate additional electricity during peak power periods; enable a scheduled dispatch of renewable energy; facilitate the establishment of interstate power purchase agreements; and reduce carbon emissions that mitigate the threat of climate change.

The TA will also include a study tour of the U.S. for up to eight (8) grantee and other stakeholder personnel for 10 business days. The study tour will cover best practices in integrated renewable energy and energy storage (advanced battery storage) project development covering technical, financing, business model and regulatory issues.

## 1.2 OBJECTIVE

The objective of this TA would be to recommend an integrated wind, solar and energy storage design applicable to both sites, with a particular focus on the optimal application of the energy storage technology options and the regulatory environment for these technologies. The Terms of Reference (TOR) for this Technical Assistance are attached as Annex 5.

## 1.3 PROPOSALS TO BE SUBMITTED

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

The amount for the contract has been established by a USTDA grant of US$898,000. **The USTDA grant of $US 898,000 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$898,000 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 the Integrated Wind, Solar and Energy Storage Project.

### 2.2 DEFINITIONS

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

The term "Request for Proposals" means this solicitation of a formal technical proposal, including qualifications statement.

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

### 2.3 DEFINITIONAL MISSION REPORT

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

### 2.4 EXAMINATION OF DOCUMENTS

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

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

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

## 2.5 PROJECT FUNDING SOURCE

The Technical Assistance will be funded under a grant from USTDA. The total amount of the grant is not to exceed US$898,000. The amount shall be paid to the Offeror directly by USTDA and the Grantee has no obligation for any payment to the Offeror.

## 2.6 RESPONSIBILITY FOR COSTS

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

## 2.7 TAXES

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

## 2.8 CONFIDENTIALITY

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

## 2.9 ECONOMY OF PROPOSALS

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

## 2.10 OFFEROR CERTIFICATIONS

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

## 2.11 CONDITIONS REQUIRED FOR PARTICIPATION

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

## 2.12 LANGUAGE OF PROPOSAL

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

## 2.13 PROPOSAL SUBMISSION REQUIREMENTS

Proposals are to be submitted both in hard copy as well as in the electronic form (e mail). Hard copies of the proposals are to be received before the dead line of receiving Proposal.

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

Mr. Sameer Parikh
Vice President
IL & FS Energy Development Company Limited
1st Floor, Corporate Office Tower
Ambience Mall Complex
Ambience Island , NH-8
Gurgaon – 122001, India
Phone: +91 124 471 6100
Fax: +91 124 471 6120

**An Original and three (3) copies of your proposal must be received at the above address no later than 10:00 AM IST, on July 13, 2015.**

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

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

## 2.14 PACKAGING

The original and each copy of the proposal must be sealed to ensure confidentiality of the information. The proposals should be individually wrapped and sealed, and labeled for content including the name of the project and designation of "original" or "copy number x." The original

and Three (3) copies should be collectively wrapped and sealed, and clearly labeled, including the contact name and the name of the project.

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

## 2.15 OFFEROR'S AUTHORIZED NEGOTIATOR

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

## 2.16 AUTHORIZED SIGNATURE

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

## 2.17 EFFECTIVE PERIOD OF PROPOSAL

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

## 2.18 EXCEPTIONS

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

## 2.19 OFFEROR QUALIFICATIONS

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

## 2.20 RIGHT TO REJECT PROPOSALS

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

## 2.21 PRIME CONTRACTOR RESPONSIBILITY

Offerors have the option of subcontracting parts of the services they propose. The Offeror's proposal must include a description of any anticipated subcontracting arrangements, including the name, address, and qualifications of any subcontractors. USTDA nationality provisions

apply to the use of subcontractors and are set forth in detail in Annex 3. The successful Offeror shall cause appropriate provisions of its contract, including all of the applicable USTDA Mandatory Contract Clauses, to be inserted in any subcontract funded or partially funded by USTDA grant funds.

## 2.22 AWARD

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

## 2.23 COMPLETE SERVICES

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

## 2.24 INVOICING AND PAYMENT

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

## Section 3: PROPOSAL FORMAT AND CONTENT

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

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

The proposal shall consist of a technical proposal only. A cost proposal is NOT required because the amount for the contract has been established by a USTDA grant of US$898,000, which is a fixed amount.

Offerors shall submit one (1) original and three (3) copies of the proposal. Proposals received by fax cannot be accepted.

Each proposal must include the following:

Transmittal Letter,
Cover/Title Page,
Table of Contents,
Executive Summary,
Firm Background Information,
Completed U.S. Firm Information Form,
Organizational Structure, Management Plan, and Key Personnel,
Technical Approach/Methodology, Work Plan and schedule, and
Experience and Qualifications.

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

### 3.1 EXECUTIVE SUMMARY

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

## 3.2 U.S. FIRM INFORMATION

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

## 3.3 ORGANIZATIONAL STRUCTURE, MANAGEMENT, AND KEY PERSONNEL

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

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

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

## 3.4 TECHNICAL APPROACH/METHODOLOGY, WORK PLAN AND SCHEDULE

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

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

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

## 3.5 EXPERIENCE AND QUALIFICATIONS

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

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

Project name, with details of technology adopted, capacity and power offtaker details
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
Present status of reference projects indicated and comments.

Offerors are strongly encouraged to include in their experience summary primarily those projects that are similar to the Technical Assistance as described in this RFP.

## Section 4: AWARD CRITERIA

Individual proposals will be initially evaluated by a Procurement Selection Committee of representatives from the Grantee. Further, the Offerer shall make a presentation on the Technical approach/methodology and Work Plan to the Committee either in person or through video conference at their cost. 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 Proposal (35)**

Overall understanding of the TOR and technical approach for performing the TA (15)

Technical approach for performing technical assessment, design and cost estimate for the Project (10)

Technical Approach for performing cost benefit analysis, financial analysis and financing plan for the Project (5)

Technical approach for performing regulatory analysis for the Project (5)

**Personnel and Management Plan (35)**

Overall personnel and management plan for successful completion of the TA (15)

Experience and expertise of the Project Manager and key personnel in developing, financing and/or managing integrated renewable energy with energy storage projects (10)

Experience and expertise of Team personnel in fulfilling the various functions of each component of the FS (10)

**Firm/Team Technical Capability and Past Performance (30)**

Firm's/Team's experience and years of performance in the area of integrated renewable energy with energy storage project development, design and/or construction (20)

Firm's/Team's experience working with financing and funding institutions, including government agencies, commercial banks, export credit agencies, and international financing institutions (5)

Firm's/Team's experience working in international and emerging markets, including experience in India (5)

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

Price will not be a factor in contractor selection.

# ANNEX 1

# FEDBIZOPPS ANNOUNCEMENT

Mr. Sameer Parikh
Vice President
IL & FS Energy Development Company Limited
1st Floor, Corporate Office Tower
Ambience Mall Complex
Ambience Island , NH-8
Gurgaon – 122001, India
Phone: +91 124 471 6100
Fax: +91 124 471 6120

Integrated Wind, Solar and Energy Storage Project (USTDA No. 2015-31004A)

POC: Jennifer Van Renterghem, USTDA, 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901, Tel: (703) 875-4357, Fax: (703) 875-4009, Email: RFPQuestions@ustda.gov

Integrated Wind, Solar and Energy Storage Project.The Grantee invites submission of qualifications and proposal data (collectively referred to as the "Proposal") from interested U.S. firms that are qualified on the basis of experience and capability to develop a technical assistance (TA) project for IL & FS Energy Development Company Limited (IEDCL) that would assess the technical, financial and commercial viability of grid interactive renewable energy storage technologies for two planned renewable energy projects. IEDCL, one of the largest wind power producer in India, plans to construct 1,150 Megawatts (MW) of solar photovoltaic (PV) and wind integrated projects in the states of Andhra Pradesh and Gujarat over the next five years. Through the use of fully integrated energy storage infrastructure, the planned project would be developed as power generation parks that would supply dispatchable utility scale renewable energy to the power grid for the first time in India. The objective of this TA would be to undertake techno economic feasibility of grid interactive Energy Storage technologies for integration with wind and Solar PV projects, and recommend appropriate technology options with an optimal configuration for the project highlighting the necessary regulatory framework to be introduced.

The Government of India (GOI) has mandated that 15 percent of the country's power consumption must be generated from renewable energy sources by 2020, from a current base of about 5-6 percent. Currently, India is generating over 30,000 MW of renewable energy at an annual growth rate of 19 percent. Indian states such as Tamil Nadu and Gujarat, which have high levels of renewable energy generation, are already suffering from transmission capacity constraints that prevent the evacuation of electricity during peak times and seasons. With significant wind and solar capacity additions expected in the coming years, India's power grid will continue to face severe transmission capacity constraints and stability issues. Energy storage technologies represent a potential solution for electricity systems that support significant amounts of renewable energy power generation. These technologies are evolving into potentially crucial components of India's overall energy development strategy, as they provide utility companies with multiple power management benefits, including time shifting, grid stabilization, shaving of peak demand, improved generation efficiency, and improved utilization of transmission capacity.

IEDCL has close to 1500 MW of power generation projects in operation or about to be commissioned, and another 1500 MW under construction. These projects include conventional gas and coal thermal as well as wind, solar, and biomass based power generation. IEDCL is India's one of the largest private developer of wind farms, and is also a private provider of power transmission services, placing the utility in a strong position to take advantage of storage opportunities from both generation and transmission operations. IEDCL is a subsidiary of the Indian company Infrastructure Leasing & Finance Services (IL&FS). Established in 1987, IL&FS is a pioneer of public-private partnerships (PPP) in India. The company has developed the largest number of lane kilometers of Build-Operate-Transfer road assets in India, the country's first private metrorail as well as waste-to-energy, real estate, and education PPPs. In the financial sector, IL&FS pioneered the first infrastructure private equity and debt funds in India and has acted as a syndicator for numerous projects, with $3.2 billion under its management.

As India's largest wind energy producer, IEDCL's aims to be an innovator in the development and application of energy storage technologies. Currently, the company is planning to construct two solar PV and wind integrated power systems with energy storage facilities: a 1000 MW integrated power system in the Ananthpur District of Andhra Pradesh and a similar but smaller scale 150 MW power system in the village of Nana Layja located in the Kutch District of Gujarat. Together these two sites, known as IEDCL's integrated wind, solar and energy storage initiative, will be developed over the course of three phases in five years, from 2015 to the year 2020, as power generation parks with fully integrated energy storage facilities that will supply dispatchable utility scale renewable energy to India's power grid. The first phase would be an initial 27MW project in Andhra Pradesh (known as Phase 1A) at a site already owned by IEDCL. In fact, IEDCL is already generating 6.5 MW of wind power at the site and has basic power evacuation infrastructure already in place.

IEDCL has requested USTDA funding for this TA project to evaluate and recommend energy storage technologies for the integrated wind, solar and energy storage project and recommend an integrated wind, solar and energy storage design applicable to both project sites. The energy storage component of the TA project will primarily focus on the various types of battery technologies currently available and emerging in the Indian market. IEDCL is currently in discussions with U.S. companies, Imergy and GE, to explore the possibility of implementing U.S. battery powered energy storage systems for the integrated wind, solar and energy storage project. The TA analysis will include a detailed economic and financial analysis, a regulatory analysis, and a specific feasibility study for Phase 1A. The TA will provide IEDCL with an overall plan for the entire 1,150 MW that will enable dispatchable wind and solar PV generation.

If successful, the integrated wind, solar and energy storage project would ultimately serve as a model for the development of additional utility scale integrated renewable energy and energy storage projects in India. In particular the implementation of these technologies would help improve the overall reliability of the electric power grid; increase the delivery of power by eliminating the need for renewable energy producers to decrease production when the grid is overburdened; generate additional electricity during peak power periods; enable a scheduled dispatch of renewable energy; facilitate the establishment of interstate power purchase agreements; and reduce carbon emissions that mitigate the threat of climate change.

The U.S. firm selected will be paid in U.S. dollars from a $898,000 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 portions of a background definitional mission/Definitional Mission report are available from USTDA, at 1000 Wilson Boulevard, Suite 1600, Arlington, VA 22209-3901.

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

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

Interested U.S. firms should submit their Proposal in English directly to the Grantee by 10:00 AM IST, on July 13, 2015 at the above address. Evaluation criteria for the Proposal are included in the RFP. Price will not be a factor in contractor selection, and therefore, cost proposals should NOT be submitted. The Grantee reserves the right to reject any and/or all Proposals. The Grantee also reserves the right to contract with the selected firm for subsequent work related to the project. The Grantee is not bound to pay for any costs associated with the preparation and submission of Proposals.

# ANNEX 2

# EXCERPTS FROM THE DEFINITIONAL MISSION REPORT

**Executive Summary**

India has over 30,000 MW of renewable energy, an annual growth rate of over 19 percent in renewable energy capacity over the last five years, and the Government of India has set a target for 15 percent of power consumption to be generated from renewable energy sources by 2022. Yet the transmission grid has severe capacity constraints which are negatively impacting generators, consumers, and the overall economy. Energy storage solutions can offer a range of benefits including: time shifting, grid stabilization, shaving of peak demand, improved generation efficiency, and improved utilization of transmission capacity

IL&FS Energy Development Company Limited (IEDCL), the largest wind power producer in India, plans to build 1,150 MW of solar PV and wind integrated projects (Project) with energy storage in Andhra Pradesh and Gujarat. The IEDCL "Integrated Wind, Solar and Energy Storage" project would be developed as power generation parks, implemented through the sale of development rights to investors and developers as well as through self-development. Through the use of fully integrated energy storage infrastructure, IEDCL plans to develop the Project in order to supply "dispatchable" utility scale renewable energy to the grid for the first time in India.

Based on IEDCL estimates, the Project has a total estimated capex of $1.9 billion for the full 1150 MW project. The energy storage component of the Project would cost $559 million. There is an estimated $798 million in potential U.S. exports, including $448 million for energy storage. U.S. suppliers have some of the leading technologies for grid energy storage and are actively pursuing foreign markets such as India; however, there is stiff competition in the global market. The Indian energy storage market is nascent and this Project will enable U.S. suppliers to obtain a foothold in this growing market. USTDA funding for this Project will advance procurement opportunities for U.S. energy storage power suppliers such as GE and Imergy, which have gained a foothold in the market but are seeking larger scale opportunities for their solutions.

IEDCL has considerable expertise in financing renewable energy infrastructure projects as a subsidiary of IL&FS, which is a financial services company. The Project would be funded with equity; debt, including concessionary debt financing from multilateral financing institutions such as the World Bank; OEM in-kind equipment and services; and grants from central and state

The Project has strong potential developmental impacts, overall positive environmental impacts, and fits well with the Government of India's plans to promote renewable energy and energy storage.

## Project Background and Description

### Overview

India has over 30,000 MW of renewable energy, an annual growth rate of over 19 percent in renewable energy capacity over the last five years (2007-2012), and the Government of India (GOI) has set a target for 15 percent of power consumption to be generated from renewable energy sources by 2022. States such as Tamil Nadu, which have a high level of renewable energy generation, are already suffering from transmission capacity constraints, which prevent evacuation of renewable energy during the peak season. With significant wind and solar capacity addition expected in coming years, the grid will continue to face severe transmission capacity constraints and stability issues. The Power Grid Corporation of India Ltd. (PGCIL), the national grid company, estimates that it would need 20,000 MW of flexible generation, including super critical thermal generators and energy storage solutions, to take care of peak load requirements by 2017. Energy storage solutions can offer a range of benefits including: time shifting, grid stabilization, shaving of peak demand, improved generation efficiency, and improved utilization of transmission capacity

IL&FS Energy Development Company Limited (IEDCL), the largest wind power producer in India, plans to build 1,150 MW of solar PV and wind integrated projects with energy storage in Andhra Pradesh and Gujarat. The IEDCL "Integrated Wind, Solar and Energy Storage" project would be developed as two independent power generation parks, implemented through the sale of development rights to investors and developers as well as through self-development. Through the use of fully integrated energy storage infrastructure, IEDCL plans to develop the Project through land acquisition, acquiring environmental clearance, negotiating off-take agreements, and providing for weather monitoring and power evacuation infrastructure. The Project will be then implemented through the sale of development rights to investors and developers as well as through self-development. The Project would supply "dispatchable" utility scale renewable energy to the grid for the first time in India.

### India Renewable Energy Background

India's energy system faces multiple challenges, including constrained transmission and distribution capacity, unmet energy demand and a continuing dependence on coal based generation. One of the key solutions to addressing these issues is the increased use of renewable energy sources, which are abundant in India. India has successfully deployed over 23,000 MW of wind and solar power and has huge potential for additional renewable energy. The renewable energy potential estimated and the installed capacity as of March 2014 is provided in the table below.

**Wind & Solar Energy Potential in India**

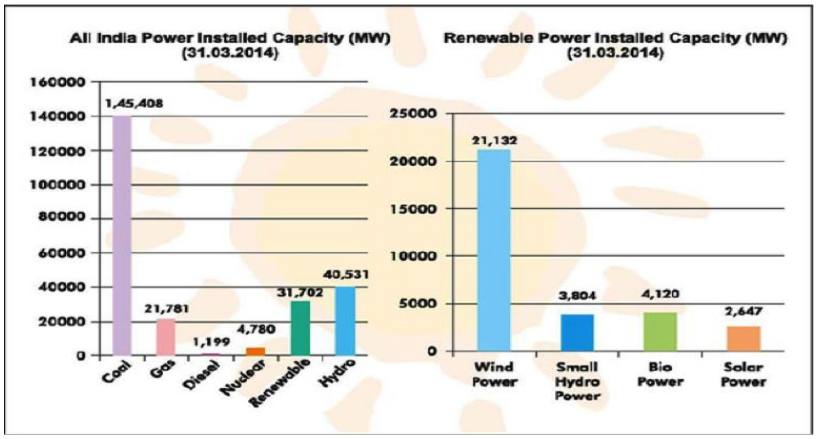
| Resource | Estimated potential (GW)[1] | Installed capacity (GW)[2] |
|---|---|---|
| Wind | 102.8 | 21.1 |
| Small hydro | 19.7 | 3.8 |
| Biomass power | 22.5 | 5.1 |
| Solar Power | 6 | 2.6 |

Over the past 10-15 years, both the central and the state governments have developed favorable policy frameworks to facilitate development of renewable energy (RE) projects in the country. These include mechanisms such as feed-in-tariffs, capital subsidies, and tax benefits. These mechanisms have been successful in attracting significant investments and adding RE capacity. New policy instruments such as Generation-Based Incentives (GBIs), Renewable Purchase Obligations (RPOs), RE certificates (RECs) and open access (wheeling and banking) have provided further stimulus to the sector in the last few years. This has led to an annual growth rate of over 19 percent in RE capacity over the last five years (2007-2012).

The Government of India (GOI) views renewable energy as critical to the country's sustainable growth and a key resource for the nation's energy security. The GOI has set a target for 15 percent of power consumption to be generated from RE sources by 2022, up from the current share of about five percent. To meet this target, the 12th Five-Year Plan of the Planning Commission includes an ambitious target to add 30 GW of RE between 2012 and 2017. In monetary terms, this means an additional capital requirement of $39 billion based on the prevailing market costs.

[1] "Mapping India's Renewable Energy growth potential: Status and outlook." Ernst and Young, 2013.http://www.ey.com/Publication/vwLUAssets/Mapping_Indias_Renewable_Energy_growth_potential/$FILE/EY-Mapping-Indias-Renewable-Energy-growth-potential.pdf

[2]http://mnre.gov.in/mission-and-vision-2/achievements/




## Energy Storage Background

Energy storage is a key solution for electricity systems with a high share of renewable energy as it allows electricity to be generated when renewable sources (i.e. wind, sunlight) are available and to be consumed on demand. It is expected that the increasing price of fossil fuels and peak-load electricity and the growing share of renewable energy will result in electricity storage growing rapidly and becoming more cost effective in India.

As noted in USAID's "Assessment of the Role of Energy Storage Technologies for Renewable Energy Deployment in India" report[3], the power sector in India is facing a number of challenges, among them power shortages of over nine percent of peak demand, transmission and distribution constraints, and stability issues caused by an increasing share of renewable energy in the grid. In its present scenario, the Indian energy market offers an appropriate environment for the use and scale up of energy storage solutions. Several states which have a high level of grid connected renewable energy capacity (such as Tamil Nadu with about 44 percent) suffer from transmission capacity constraints. This means that during peak generation, a significant portion of power (between 30 and 50 percent in many cases) may not get evacuated, resulting in loss to the system as well as the generators. While transmission capacity is being expanded to take care of evacuation needs, expansion has been slow. Moreover, an increase in the renewable energy mix is likely to put further pressure on the system. Energy storage can be used as an option for reducing 'back-down' of generation, and also reducing or postponing transmission capacity expansion.

Effective energy storage solutions have the ability to meet these challenges and enhance deployment of renewable energy technologies through:

- Time shift for use of generated energy

[3]"Technical Assistance Program Assessment of the Role of Energy Storage Technologies for Renewable Energy Deployment in India," Partnership to Advance Clean Energy - Deployment (PACE - D). March 2014.

- Scheduling of energy
- Grid stabilization
- Peak shaving of demand
- Sale of power during peak demand
- Interstate PPAs for renewable energy

Time Shift for generated energy - Renewable energy sources like wind, solar, hydro, etc. are inherently variable. The variable nature of renewable energy systems results in a mismatch between the time of generation and the time of consumption of energy.For example, most of the energy from solar is generated in daytime while the peak demand occurs in the evening time. The generated excess power can be stored during the day so that it is available to meet the consumer's need during the evening.

Scheduling of energy - Forecasting and Scheduling Requirements of the New Grid Code: India is implementing the Indian Electricity Grid Code, which mandates forecasting and scheduling for renewable energy generators. Although the current accuracy levels allowed are ± 30 percent of the forecast (and the generators are allowed to adjust the forecast up to three hours before the injection time), the bands are likely to be tightened in the future. This is leading to increased interest by generators in energy storage solutions, because storage enables renewable power generators to better meet the forecasting requirements and avoid payment of Unscheduled Interchange (UI) charges. The costs can be significantly reduced if generators were to come together and implement a forecasting system as a group, prior to connecting with an evacuation substation, as with IEDCL's power park model. This will give them the benefit of reduced variability at an aggregated level and consequently lead to better accuracy of forecasting and lower investment in storage.

Grid stabilization - The variability of renewable energy resources leads to a higher degree of frequency variations and harmonics in the transmission system, higher ramp rates and range, and higher uncertainty of meeting fast changing loads. As per the Western Wind and Solar Integration Study (WWSIS) by NREL[4]:

- The grid has very few issues with up to 10 percent renewable energy penetration.
- With 20 percent penetration, grid stability issues become more frequent.
- With penetration of 30 percent, the grid becomes unstable, affecting performance of other generating plants such as coal and nuclear power plants.

Transmission grids can integrate energy storage solutions to address grid stability issues due to higher renewable energy injection by:

[4] http://www.nrel.gov/docs/fy10osti/47781.pdf

- Bringing the demand-supply imbalance into a narrow range for power quality requirements; and
- Meeting the need for additional 'load-following' and 'reserve' capacity.

The Ministry of New and Renewable Energy (MNRE) of India has set the target of 15% of total energy consumption from renewable energy by 2020. With some states having little or no renewable energy potential, other states will reach levels of renewable energy that will have a major impact on grid stability; energy storage can play a critical role to stabilizethe grid and improve the quality of power.

Peak Shaving of demand - The Power Grid Corporation of India Ltd. (PGCIL), which is the national grid company, estimates that it would need 20 GW of flexible generation such as super critical thermal generators and energy storage solutions to take care of peak load requirements by 2017. Significant investments are planned for building dedicated green transmission corridors for large renewable energy zones.

The demand due to various loads being serviced by the grid varies routinely throughout the day, based on multiple factors such as varying energy use patterns by individuals, factories, commercial complexes, as well as utility tariffs, weather, etc. In the case of India, the peaks are experienced in the morning (between 8 and 10 a.m.) and then in the evening (between 6 and 10 p.m.). The major challenge before the utilities lies in managing peak demand. The conventional route adopted to address this issue is to have standby power available, which can be ramped up at the time of peak demand. Generally this is achieved by peaking plants using gas turbines, diesel generators, etc. In other cases, peak demand is managed by restricting supply to specific end users; load shedding across geographic areas; demand side management by pricing peak power[5] higher than off peak power, etc. Consumers with load restriction or load shedding during peak periods either procure power from open market sources or generate electricity using expensive captive diesel generator sets, or simply scale down operations to reduce power consumption.

With increasing renewable energy obligations and enhanced viability of renewable energy, the storage technologies can be used to shift the peak demand from the grid to locally generated and stored renewable energy. This allows smaller peak loads on the grid resulting in peak shaving.

Sale of power during peak time - Recently, in February 2014, Ministry of Power, Government of India has issued Guidelines for Procurement of Peaking Power for medium term from Power Stations set up on Finance, Own and Operate (FOO) basis, for procuring power during peak hours i.e. 8:00 hrs[6] to 10:00 hrs in the morning and 17:00 hrs to 21:00 hrs in the evening.

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[5] Government of India has also issued guidelines for procurement of peaking power

[6] http://powermin.nic.in/acts_notification/electricity_act2003/pdf/MBDs_procurement_peaking_power_Mar2014.pdf

Interstate PPAs for Renewable Energy - The expansion of renewable energy in India is constrained by certain characteristics, including; uncertainty in scheduling does not allow interstate and intrastate PPAs for wind power. Until now, wind was a small percentage of the overall mix and the wind capacity generated was able to be absorbed by the host state. However, as additional capacity is added, it may not be able to be absorbed by the host state and would need to be exported to other states. Here energy storage will play a critical role.

**Energy Storage Technologies**

Energy storage is evolving as a crucial component of India's energy strategy, and provides multiple benefits including time shifting, grid stabilization, shaving of peak demand, improved generation efficiency, and improved utilization of transmission capacity. At present the most cost effective technology for energy storage in India is pump storage. However, pump storage facilities are site specific and cannot be used for all locations where renewable energy is available. Further, the potential for pump storage, where it is available in India, is largely harnessed already. There are a wide range of commercial energy storage technologies globally as well as a number of technologies in the development stages. The table below lists the most prevalent technologies.

## Energy Storage Technologies[7]

| Technology | Primary Application | What we know currently | Challenges |
|---|---|---|---|
| **CAES** | • Energy management<br>• Backup and seasonal reserves<br>• Renewable integration | • Better ramp rates than gas turbine plants<br>• Established technology in operation since the 1970's | • Geographically limited<br>• Lower efficiency due to roundtrip conversion<br>• Slower response time than flywheels or batteries<br>• Environmental impact |
| **Pumped Hydro** | • Energy management<br>• Backup and seasonal reserves<br>• Regulation service also available through variable speed pumps | • Developed and mature technology<br>• Very high ramp rate<br>• Currently most cost effective form of storage | • Geographically limited<br>• Plant site<br>• Environmental impacts<br>• High overall project cost |
| **Fly wheels** | • Load leveling<br>• Frequency regulation<br>• Peak shaving and off peak storage<br>• Transient stability | • Modular technology<br>• Proven growth potential to utility scale<br>• Long cycle life<br>• High peak power without overheating concerns<br>• Rapid response<br>• High round trip energy efficiency | • Rotor tensile strength limitations<br>• Limited energy storage time due to high frictional losses |
| **Advanced Lead-Acid** | • Load leveling and regulation<br>• Grid stabilization | • Mature battery technology<br>• Low cost<br>• High recycled content<br>• Good battery life<br>• | • Limited depth of discharge<br>• Low energy density<br>• Large footprint<br>• Electrode corrosion limits useful life |
| **NaS** | • Power quality<br>• Congestion relief<br>• Renewable source integration | • High energy density<br>• Long discharge cycles<br>• Fast response<br>• Long life<br>• Good scaling potential | • Operating Temperature required between 250° and 300° C<br>• Liquid containment issues (corrosion and brittle glass seals) |
| **Li-ion** | • Power quality<br>• Frequency regulation | • High energy densities<br>• Good cycle life<br>• High charge/discharge efficiency | • High production cost - scalability<br>• Extremely sensitive to over temperature, overcharge and internal pressure buildup<br>• Intolerance to deep discharges |
| **Flow Batteries** | • Ramping<br>• Peak Shaving<br>• Time Shifting<br>• Frequency regulation<br>• Power quality<br>• | • Ability to perform high number of discharge cycles<br>• Lower charge/discharge efficiencies<br>• Very long life | • Developing technology, not mature for commercial scale development<br>• Complicated design<br>• Lower energy density |
| **SMES** | • Power quality<br>• Frequency regulation | • Highest round-trip efficiency from discharge | • Low energy density<br>• Material and manufacturing cost prohibitive |
| **Electrochemical Capacitors** | • Power quality<br>• Frequency regulation | • Very long life<br>• Highly reversible and fast discharge | • Currently cost prohibitive |
| **Thermochemical Energy Storage** | • Load leveling and regulation<br>• Grid stabilization | • Extremely high energy densities | • Currently cost prohibitive |

## Economics of Energy Storage

[7]"Grid Energy Storage."U.S. Department of Energy. December 2013. http://energy.gov/sites/prod/files/2013/12/f5/Grid%20Energy%20Storage%20December%202013.pdf

Energy storage options today are very expensive, though they have a significant potential for adding economic value to energy systems. An analysis undertaken by the U.S. National Renewable Energy Laboratory (NREL) estimated that energy storage added the following values to the power systems: energy arbitrage value (annual value between $37 and $240 per kW), frequency regulation (annual value between $236 and $429 per kW), and contingency reserve (annual value between $66 and $149 per kW). The net present value of gains from energy storage is estimated to be about $2,500 per kW. With these added values levels, many storage technologies are economically competitive.[8]

For energy storage technologies used on the grid, regulatory policies and rules provide the framework for the business case and economics of storage systems. As an example of the influence of policy structure on the adoption of storage, FERC Order 755 helps structure payments and set contracts for frequency regulation, and is changing the market for frequency-regulation applications.

The main hurdle for the implementation of energy storage technologies such as flow batteries and NAS batteries is their relatively high capital and operating costs. However, there are several renewable energy projects with battery storage facilities already developed across the world which offer promising results as seen in Appendix 1 of this report.

**International Energy Storage Trends**

At present, the U.S. has about 24.6GW (approx. 2.3% of total electric production capacity) of grid storage, 95% of which is pumped storage hydro. Europe and Japan have notably higher fractions of grid storage. California enacted a law in October 2010 requiring the California Public Utilities Commission (CPUC) to establish appropriate 2015 and 2020 energy storage procurement targets for California load serving entities, if cost effective and commercially viable solutions were available, by October 2013. In February 2013, the CPUC determined that Southern California Edison must procure 50 MW of energy storage capacity by 2021 in the Los Angeles area. Additionally, in June 2013, the CPUC proposed storage procurement targets and mechanisms totaling 1,325 MW of storage. Other states are looking to the example that California is setting and Congress has introduced two bills that establish incentives for storage deployment.

Growing renewable energy portfolios are spurring energy storage development efforts in Europe and Asia as well. The table below demonstrates some recent international energy storage developments.

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[8]"Technical Assistance Program Assessment of the Role of Energy Storage Technologies for Renewable Energy Deployment in India," Partnership to Advance Clean Energy - Deployment (PACE - D). March 2014. http://www.pace-d.com/wp-content/uploads/2014/04/RE-Storage-Report.pdf

| Country | Storage Targets[23] | Projects | Other Issues | Technology & Applications |
|---|---|---|---|---|
| Italy | 75 MW | • 51 MW of Storage Commissioned by 2015<br>• Additional 24 MW funded | • Italy has substantial renewables capacity relative to grid size, and the grid is currently struggling with reliability issues; additional renewables capacity will only exacerbate this problem | • 35 MW to be Sodium-Sulfur Batteries for long-duration discharge<br>• Additional capacity is focused on reliability issues and frequency regulation |
| Japan | 30 MW | • Approved 30 MW of Lithium-ion battery installations | • Potential decommissioning of nuclear fleet<br>• Large installation of intermittent sources - est. 9.4 GW of solar PV installed in 2013 alone<br>• Several isolated grids with insufficient transmission infrastructure during peak demand periods | • Primarily Lithium ion batteries<br>• Recently increased regulatory approved storage devices from 31 to 55 |
| South Korea | 154 MW | • 54 MW lithium-ion batteries<br>• 100 MW CAES | • Significant regulatory/performance issues with nuclear fleet | • Reliability & UPS |
| Germany | $260m for grid storage | • $172m already apportioned to announced projects | • Decommissioning entire nuclear fleet; Large (and expanding) intermittent renewable generation capabilities<br>• Over 160 energy storage pilot projects<br>• Awaiting information on energy storage mandates | • Hydrogen; CAES & Geological; Frequency Regulation |
| Canada | - | • Announced 1st frequency regulation plant | - | - |
| UK | - | • 6 MW multi-use battery | • Other small R&D and Demonstration projects | • Battery will perform both load shifting and frequency regulation applications |

Source: "Grid Energy Storage", Department of Energy[9]

## Energy Storage in the Indian Context

The cost optimization for battery storage is expected to be achieved through large scale implementation and corresponding economies of scale. According to USAID's PACE-D program financial analysis on energy storage, storage technologies that can be implemented at cost levels of less than $500 per kW and less than $0.10 per kWh/discharge cycle (electrical storage) have a huge potential for application in India.[10] The financial analysis also shows that average capital costs for energy storage would need to drop by 80% before many of the technologies would be viable. However, they also state that no comprehensive cost benefit analysis has been undertaken for energy storage technologies in India but that there is likely a strong economic case for energy storage in the country. Therefore any utility scale integrated renewable energy and battery storage project would be dependent on a range of subsidies and other financial incentives to capture the economic benefits of the Project. IEDCL believes that the financial viability of RE integration with battery storage will be possible due to the combined effect of reduction in energy storage costs, increases in tariffs for wind, and increases in fossil fuel prices.

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[9] "Grid Energy Storage", Department of Energy December 2013. http://energy.gov/sites/prod/files/2013/12/f5/Grid%20Energy%20Storage%20December%202013.pdf

[10] Technical Assistance Program Assessment of the Role of Energy Storage Technologies for Renewable Energy Deployment in India," Partnership to Advance Clean Energy - Deployment (PACE - D). March 2014

**Wind Solar Storage Integrated Project Description**

IEDCL plans to build a 1000 MW solar PV and wind integrated project with energy storage in in Ananthpur District, Andhra Pradesh and a 150 MW PV and wind integrated project with energy storage in Nana Layja Village, Gujarat. It plans to develop the Project through land acquisition, environmental clearance, off-take agreements, weather monitoring, and power evacuation infrastructure. The Project will be then be implemented through the sale of development rights to investors and developers as well as through self-development.

The first phase would consist of 100 MW of wind and solar PV projects with an appropriate amount of energy storage. Of this, the first 27 MW project, Phase 1A, has been secured at the Grantee's existing site at Ramagiri, Ananthapur district of Andhra Pradesh state. The Phase 1A project at Ramagiri is an existing wind project of 6.5 MW comprised of 26 wind turbines (250 kW each). The project is on 170 acre of land and would be repowered with new larger capacity wind turbines. The projection of capacity is estimated to be 27 MW (22MW wind, 5MW solar PV and 8 MW energy storage (with an estimated 6 hours storage) and would be planned as a demonstration project for the 1000 MW full scale Project. The Phase 1A site is available with historical wind mast data and solar PV mapping and grid interconnection so that it can be implemented rapidly. Phase II would include 300 MW and Phase III would be 600 MW, both sites within the same area as the Ramagiri project site at Ananthpur District. Phase II and Phase III would also have 50 MW and 100 MW in Nana Layja. Key features of the Project include:

- Wind and solar hybrid system with energy storage facility
- Large infrastructure for around 1150 MW capacity to achieve economies of scale.
- By combining the energy storage project with a large commercial wind and solar project, the economic incentives for all the stakeholders including developers can be aligned.
- Power park model with all permits, approvals, right of ways, wind and solar mapping, evacuation arrangement and land, PPA, energy storage infrastructure, and power evacuation infrastructure, readily available to the investor for execution of projects.
- Micro sited with 3-4 wind turbines models, which provide flexibility to the investor to choose the wind turbine.
- Shared infrastructure power park model reduces project costs and increases financial viability.
- Integrated weather stations with SCADA for enabling control and dispatch of power matching to weather and grid conditions.
- Optimum utilization of infrastructure facility with optimum wind and solar configuration as the peak time of solar generation is different than that of wind generation.
- Sale of stored power as peaking power at higher tariffs through interstate PPAs.

IEDCL's long term plan for renewable energy with energy storage is seen in the table below.

| 2015<br>Phase I- Study | 2015-2016<br>Phase II- Demonstration Projects | 2017-2018<br>Phase III- Commercial projects | 2019-2020<br>Phase IV- Large Commercial projects |
|---|---|---|---|
| – Duration 6 month<br>– Techno-commercial Study<br>– Identifying regulatory issues | – Couple of demonstration projects (≈**100MW**) with alternative energy storage technologies<br>– Grant support from bilateral or multilateral funding agencies such as World Bank and ADB including grants from energy storage technology providers<br>– Detailed monitoring and measurement campaign with active support from PGCIL and the CERC<br>– Undertaking Policy advocacy & formulation | – Projects (totaling to **350 MW**)<br>– Regulatory support with partial funding support<br>– Policy and techno-economic analysis for the kind of regulatory and policy support needed for commercial exploitation<br>– Partial funding from Central and State governments including National Clean Energy Fund (NCEF)<br>– Differential pricing in PPAs for peak power | – Larger scale commercial Projects (totaling to **700 MW**) |

IEDCL has evaluated multiple sites for the Project in Andhra Pradesh, Gujarat and Rajasthan. Based on various factor such as wind and solar potential, evacuation arrangement, quickness of executing demonstration project, the pace of implementation of PGCIL's green corridor, energy shortages and prospective fiscal benefits, 1150 MW of sites in Andhra Pradesh and Gujarat have been selected.

**Project Locations**

*Ramagiri Site - Anantapur, Andrah Pradesh – 1000 MW*

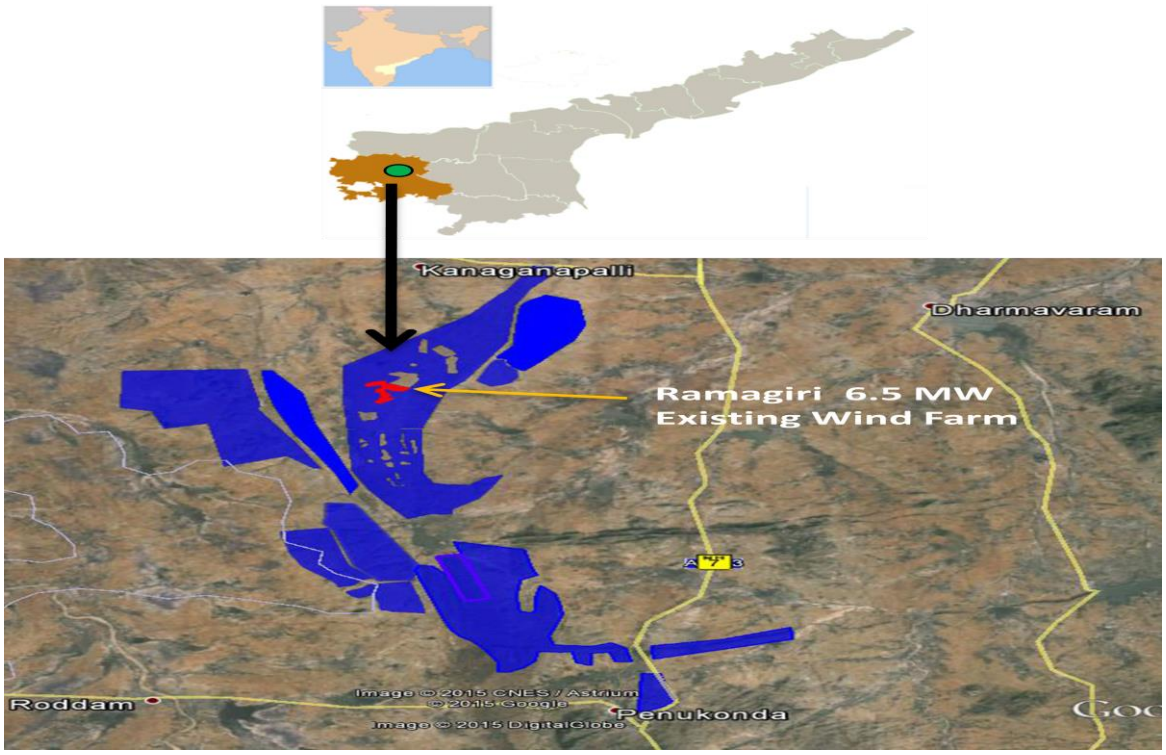
Anantapur has very good solar radiation and wind potential and is a hub for renewable energy projects with a number of operational wind and solar projects in the district.

| Resource | Existing (as on Mar'12) | Future (by 16-17) | Total |
|---|---|---|---|
| **Wind** | 392 | 5048 | 5440 |
| **Solar** | 92 | 285 | 377 |
| *Total* | *484* | *5333* | *5817* |

The average elevation is about 1000 feet above sea level and the average ambient temperature is 26 degrees Celsius. IEDCL has already developed a 6.5 MW wind power project in an area of around 170 acres land at the site. This wind farm was established with Nordex 250 kW wind turbines.The power is being evacuated at a 220KV/33KV sub-station established to evacuate the power from this and other wind farms situated at Ramagiri.The operation of all 26 turbines is well established. The availability of the grid is above 99% during the last six years. Considering the existing land availability for the wind farm, the same site can be utilized for development of Phase 1A of the Project by repowering the existing wind farm with higher capacity turbines. The estimated capacity of the project that can be installed is estimated at 27 MW, including 15 MW solar and 25MW.

There are 17 other wind farms with a total capacity of around 50.2 MW operating in Ramagiri. All these projects will be completing their operational life within three years. Around 500 acres of land area is covered by these projects. After successful completion of Phase 1A, these areas can be utilized for the remaining part of Phase I.

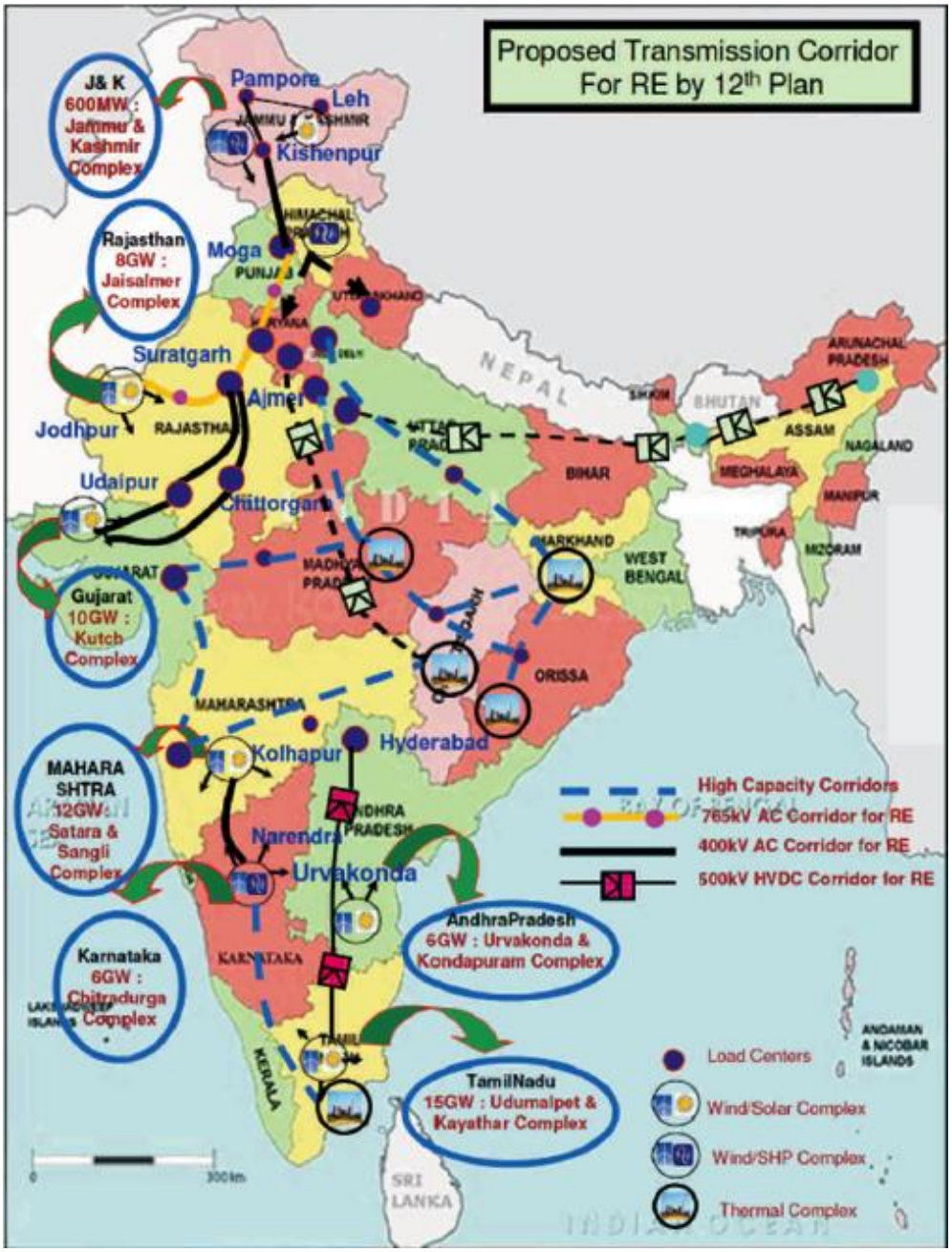
The proposed 1000 MW project area is located at 14.07° to 14.4° North latitude and 77.40° to 77.66° East longitude. The figure below shows the satellite map indicating the geographical boundaries of the site.




The integrated wind, solar and energy storage project site would cover a total area of about 2500 hectares (25 sq km). The red area depicts IEDCL's existing 6.5 MW operational wind farm on 89 hectares of land.

PGCIL has proposed the extra high voltage AC and HVDC corridor exclusively to evacuate the RE energy from the RE potential areas, called Green Corridor[11]. The network map of the green corridor until 2017 is shown in the map.

[11] "Transmission Plan for Envisaged Renewable Capacity - A Report, Vol-I. Power Grid Corporation of India Ltd. July, 2012.
http://www.powergridindia.com/_layouts/PowerGrid/WriteReadData/file/ourBusiness/SmartGrid/Vol_1.pdf




The power generated from the Project will be evacuated through a high voltage transmission corridor. There are two options available for power evacuation: (1) the power will be evacuated from Ramagiri 400 kV proposed pooling station to Hindupur 400 kV substation. From Hindupur Substation 400 kV double circuit line to Madhugiri 400/765kV substation (under construction); and (2) The power will be evacuated from Ramagiri 400 kV pooling substation to Urvakonda

400 kV substation, which is connected to 765 kV Kurnool substation (under construction and expected to be commissioned 4th quarter 2014[12]) via Kondapuram 400 kV substation.

The Project is located in close vicinity to PGICL's proposed 765 kV Green Corridor transmission project. The power transmitted through the green corridor will be managed by REMCs (Regional Energy Management Centers), operated by PGCIL in similar way to a State Load Dispatch Centre (SLDC). The green corridor in Andhra Pradesh will be operated by the REMC to be located in Hyderabad.

*Nana Lajya, Kutch District, Gujarat State – 150 MW*

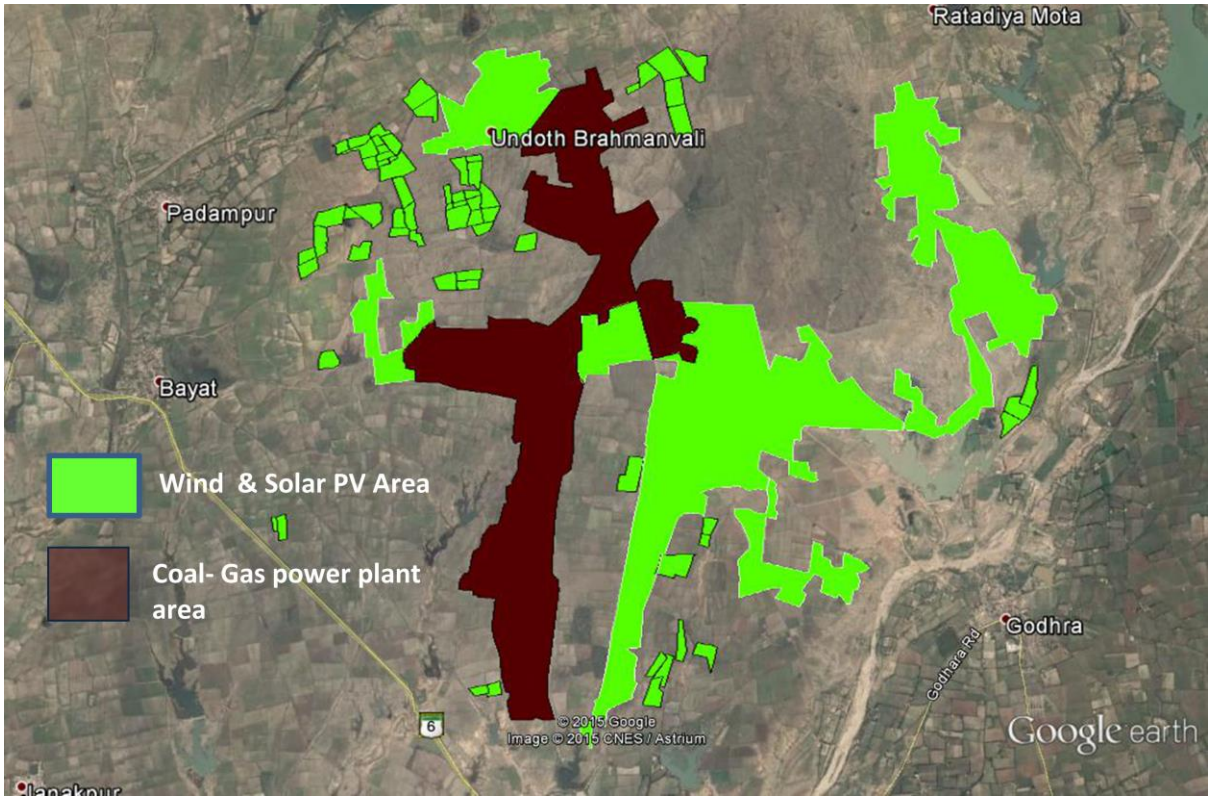
The Nana Lajya project site is located in Kutch district of Gujarat State lies between 22°.40' and 23°.50' Northern latitude and 68°.10' and 71°.30' Eastern longitude. Kutch has very good solar and wind potential and many wind and solar projects are already operation in the district.

| Resource | Existing (as on Mar'12) | Future (by 16-17) | Total |
|---|---|---|---|
| **Wind** | 2600 | 5083 | 7683 |
| **Solar** | 600 | 1400 | 2000 |
| *Total* | *3200* | *6483* | *9683* |

According to PGCIL, out of above 9700 MW renewable capacity for Gujarat, 2000 MW of solar plants are expected to be deployed with 500MW in the Kutch district; and 7700 MW of wind farms are expected to be deployed with 2800 MW in Kutch district.

The proposed 150 MW wind and solar PV site is located at 22.90° to 22.98° North Latitude and 69.19° to 69.27° East longitude. The average elevation is about 131 feet above sea level. The figure below shows the satellite map indicating the geographical boundaries of the site.

[12] http://www.srpc.kar.nic.in/website/2014/meetings/srpc/a23tcc-24srpc.pdf




The site is spread over the total area of about 1500 hectares (15 sq. km). The entire land area is owned by the IEDCL. The green area in the figure shows the site of the proposed wind-solar PV project. IEDCL has installed a 100 meter mast, commissioned on 12/23/2013 within the site boundary. Average wind speed since commissioning date is 7.78 m/s at 100m.

The site also has good solar potential. The average horizontal solar radiation at the sites is 5.51kWh/ $m^2$/d. The average capacity factor is estimated at 18.3%.

The following table shows the estimated Plant Load Factor (PLF) for wind and solar PV at the site:

| **Estimated Generation** | | | |
|---|---|---|---|
| | Model | Capacity (MW) | PLF-P75 (%) |
| Wind | G97 @ 104m | 150 | 29% |
| Solar | Multi Crystalline Silicon | 50 | 18.30% |

PGCIL has proposed the extra high voltage AC and HVDC corridor exclusively to evacuate the renewable energy from high RE potential areas such as Kutch. The Power generated evacuated through the green corridor will be managed by REMC (Regional Energy Management Centers) operated by PGCIL in similar way like (SLDC) State Load Dispatch Centre.

The power generated from the Project will be evacuated through to a high voltage transmission corridor. There are two options available for power evacuation:

Option 1: The power will be evacuated from Nana Lajya 220 kV proposed pooling station to 220 kV GETCO NaniKhakhar substation. The transmission length for the proposed evacuation plan is approximately 30 kms.

Option 2: The power will be evacuated from Nana Lajya 220 kV proposed pooling substation to 220 kV GETCO Vadala substation, which is connected to the 220 kV GETCO NaniKhakhar substation and 220 kV GETCO Bhachau substation. The transmission length for the proposed evacuation plan is approximately 60 kms.

**Implementation Financing**

IEDCL has considerable expertise in financing renewable energy infrastructure projects as a subsidiary of IL&FS, which is a financial services company. The Project would be funded with equity; debt, including concessionary debt financing from multilateral financing institutions such as the World Bank; OEM in-kind equipment and services; and grants from central and state government such as PGCIL and the National Clean Energy funds (NCEF).[13]

The Ministry of New and Renewable Energy recently issued an invitation for Expressions of Interest for Energy Storage Demonstration Projects for Supporting Renewable Generation. IEDCL plans to apply for this grant funding for Phase 1A of the Project. Similar grant funding is expected to be available to cover the cost of energy storage through the three phases of the Project. IEDCL's financial model assumes 100%, 40%, and 20% grant funding for energy storage capex costs for Phase 1, 2 and 3, respectively.

The Project is based on the business model of a power park and revenues from the Project would be the primarily from sale of development rights and lease rental or land and facilities. The Project company will have the MoU with Power Grid Corporation of India for development of external evacuation transmission and with the energy storage companies to provide energy storage solutions to the IPPs. The expenses would be incurred toward purchase of land, creation of infrastructure and other management expenses. Based on this, IEDCL estimates a Project IRR of between 12.6% and 13.8% for the three phases.

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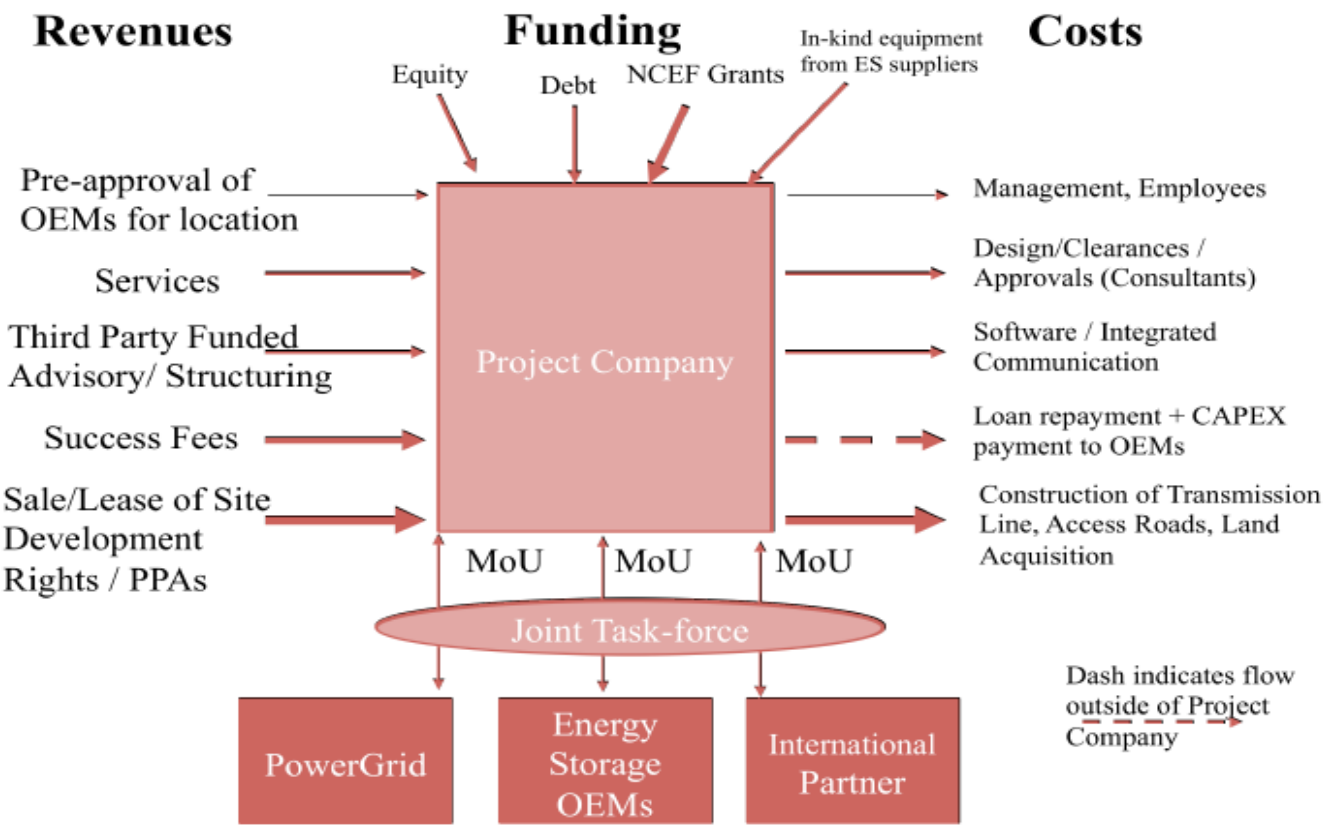
[13]**National Clean Energy Fund (NCEF) -** for funding research and innovative projects in clean energy technology. The Finance Minister said that in many areas of the country pollution level has reached alarming proportions. While it must be ensured that the principal of a "polluter pays" remains the basic guiding criteria for pollution management, there should also be a positive thrust for development of clean energy. And to build the purpose of the NCEF, the Minister has proposed to levy a clean energy cess on coal produced in India at a nominal rate of Rs.50 per tonne, which will also be applicable to imported coal. (source: http://pib.nic.in/newsite/erelease.aspx?relid=58419)




**Project Financing Structure**

One financing mechanism that may be explored for U.S. exports is the Loan Guarantee Program for Structured Project Financing of the Export-Import Bank of the United States (EXIM). The loans, while supported by EXIM, are funded through international commercial banks, which receive guarantees from the Bank to mitigate certain risks, including default. The mechanism of structured project financing requires establishing escrow accounts at an approved international bank for maintenance of special banking procedures, which are fundamental to the security agreement for the loan.

EXIM has funded a number of major projects in India. EXIM's financing in India includes projects in the transportation, petrochemicals and power sector. Currently, India has a portfolio of $8.1 billion, second only to Mexico, and is also growing very rapidly.

A second source of potential U.S. Government backed financing is the Overseas Private Investment Corporation's (OPIC) investment guaranty program. OPIC is open and active in India and has recently provided more than $6.9 million for clean energy and 3.5 million for water treatment projects in India. OPIC could finance renewable energy IPPs established in the IEDCL

power parks if they have 25% or greater U.S. equity participation.

**Development Impact**

The development of utility scale integrated renewable energy and energy storage project in India will enable the country to improve the overall reliability of the electric power grid; increase the delivery of power by eliminating the need for renewable energy producers to back down on production; add generation during peak power periods; and enable scheduled dispatch of renewable energy, enabling interstate power purchase agreements. The Project would also reduce carbon emissions as well as improve energy security and meet growing power demand.

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

**Infrastructure** – The Project will entail construction of 1150 MW of integrated renewable power generation (765 MW wind and 385 MW solar) with energy storage (173 MW). The Project would enable IEDCL to deliver dispatchable power to the grid; deliver peak power; improve grid reliability; and sell power through interstate PPAs. The Project would include the construction of high voltage transmission infrastructure for evacuation of power to the grid.

**Human Capacity Building** – Implementation of the Project would generate approximately 1500 new construction jobs and 100 full time positions to run the Project. Additionally, Project implementation will require considerable training in new technologies, especially energy storage construction, operation and maintenance and energy management systems for integrated renewable energy with energy storage projects. Training is typically provided as part of a procurement package for new systems but additional training will be required for IEDCL to become a leading developer of integrated renewable energy with energy storage projects.

**Technology Transfer and Productivity Improvement** – The Project will introduce a wide range of expertise and technologies for energy storage technology integration for renewable energy projects in India. Significant productivity improvements would take place at IEDCL's renewable energy plants that will be repowered with integrated energy storage. Productivity improvements would also take place.

**Environment:** The overall environmental impact is expected to be positive due to the fact that the Project, if fully implemented, would minimize the use fossil fuel fired generation. Renewable energy as an alternative to carbon-based energy is desirable for environmental sustainability, as it reduces the associated emissions and criteria pollutants of fossil fuel combustion. If the Project

were to displace coal fired plants in India, it would displace about 6.8 million tons of $CO_2$annually.[14]

**Other:** The Project would improve India's energy security by enhancing the delivery of indigenous renewable energy through integrated energy storage, which would improve delivery of future renewable energy production and allow for India to reach its goal of 15% renewable energy.

**Environmental Impact**

The potential negative environmental impact of the Project is expected to be significantly outweighed by the environmental benefits. Benefits include replacement of thermal power with renewable power production, more efficient use of thermal power generation, and deferred investments in generation and transmission due to provision of peak power and balancing of load and generation within the grid. Potential negative impacts from the Project include:

Wind Power - The only potentially toxic or hazardous materials are relatively small amounts of lubricating oils and hydraulic and insulating fluids. Although wind power plants have relatively little impact on the environment compared to fossil fuel power plants, concerns have been raised over the sound produced by the rotor blades, visual impacts, and deaths of birds and bats that fly into the rotors (avian/bat mortality). In addition, construction of facilities such as new substations may lead to certain negative environmental impacts, which must be mitigated through the use of modern construction practices in accordance with applicable laws in India.

Solar Power – Solar PV projects have minimal impact on the environment, including clearing of land for PV array installation, transmission infrastructure and ancillary infrastructure (e.g. maintenance and warehouse buildings).

Energy Storage – The most likely storage solution for the Project is large scale batteries, either Flow Batteries, NAS and Molten Salt Batteries, and/or Li Ion Batteries. While there have been some issues with fires with both Li ion and NAS batteries, they are generally considered environmentally safe. The manufacture of these batteries requires processes which can have negative environmental impacts as with many manufacturing processes.

Vanadium Redox Flow Batteries from companies like Imergy are far greener than other batteries, as they lack potentially toxic metals as lead, cadmium, zinc, and nickel, which can contaminate the environment at all phases of the conventional battery life cycle. VRBs' most toxic component is the sulfuric acid of the electrolyte, which is only one-third as acidic as that in a

[14]Using 5913 tons $CO_2$ per annum as per estimates from Sourcewatch.
http://www.sourcewatch.org/index.php/Estimating_carbon_dioxide_emissions_for_proposed_coal_plants_in_India

lead-acid battery. But unlike lead-acid batteries, the electrolytes in a VRB function indefinitely, eliminating the disposal problem. Vanadium itself has very low toxicity, and the batteries are designed to contain electrolyte spills. Through an extensive R&D program, Imergy has recently developed a way to produce flow batteries with vanadium at a 98% purity level that can be harvested from environmental waste sites.

The TA will include an environmental impact assessment which will address these issues and recommend strategies to mitigate negative impacts.

**Contractor Qualifications**

This is a highly technical Project in the field of integrated renewable energy with energy storage. The key technical people are the Project Manager, Senior Electrical Engineer, Energy Storage Expert, Wind Resource Engineer, Solar Power Engineer, Senior Economic/Financial Analyst, and Regulatory Expert:

*Project Manager* - Experience should include significant work at the executive level with a renewable energy developer, an engineering consulting firm specializing in renewable energy, or both. He/she should have experience with energy storage projects as well as experience securing financing for renewable energy projects and managing the budget of renewable energy assets under development. He/she should have a track record in managing complex projects of similar content and size, preferably in emerging markets similar to India.

*Senior Electrical Engineer* - Experience should include significant work for a construction company, for a renewable independent power producer, for an engineering consulting firm specializing in power distribution, for a renewable project developer or some combination of all, including the design and construction of power distribution systems and wind farms. He/she should be an expert in the civil design for wind energy farms and solar power projects.

*Energy Storage Expert* - Experience should include significant work with a renewable energy developer, an engineering consulting firm specializing in renewable energy and energy storage, or both. He/she should be an expert in energy storage technologies and systems for renewable energy projects.

*Wind Resource Engineer* - Experience should include significant work with a renewable energy developer, an engineering consulting firm specializing in renewable energy, or both. He/she should be an expert in resource assessment and energy estimation of wind energy systems.

*Solar PV Power Engineer* - Experience should include significant work with a renewable energy developer, an engineering consulting firm specializing in renewable energy, or both. He/she should be an expert in resource assessment and energy estimation of solar power systems.

*Senior Economic/Financial Analyst* - Experience should include significant work in the design and use of financial modeling programs and economic analysis as applied to power projects, especially renewable energy projects. He/she will be responsible for the financial and economic analysis described in the terms of reference.

*Regulatory Expert* - Experience should include significant work in policy and regulation for renewable energy, including experience in consulting firms, with regulatory or policy making agencies. He/she should have experience working in international and/or emerging markets policy and regulatory environments.

The team should have experience with renewable energy projects in developing markets similar to India. It is expected that local Indian experts would help in wind and solar power resource assessment, power system analysis and policy/regulatory analysis.

## Appendix 1. Global Energy Storage Projects[15]

| Project | Description | Storage Technology | Storage Capacity (kW) | Location | Status |
|---|---|---|---|---|---|
| Shiura Wind Park | The first wind firm in Japan with an output fluctuation regulating system, operating since 2009 with total rated capacity of 15.4MW output from the wind turbines combined with a lead acid battery system for output stabilization with a capacity of 4.5MW: LL-W with a rated capacity of 10.5MWh. In the Tohoku-Area Japan, for the wind farm to be connected to the grid and sell the generated electricity to the utility, the output from the system must be kept within 10% of the rated output of the wind generation in a randomly selected 20 minute time range. The LL-W is a specially | Valve Regulated Lead Acid Battery (VRLA) | 4500 | Shiura, Aomori Prefecture, Japan | Operational |

[15] DOE Global Energy Storage Database. http://www.energystorageexchange.org/projects

| Project | Description | Storage Technology | Storage Capacity (kW) | Location | Status |
|---|---|---|---|---|---|
| | developed VRLA(Valve Regulated Lead Acid) battery to be used at PSOC (Partial State of Charge suited for stabilizing the output fluctuation from the wind generation, and with an expected lifetime of 17 years. | | | | |
| Kaheawa I Wind Project | Xtreme Power installed a 1.5MW Dynamic Power Resource (DPR) as a demonstration project to perform Ramp Control for 3MW of the 30MW Kaheawa Wind Farm in Hawaii. The project uses Xtreme's patented Dynamic Power Resource energy storage and power management system. | Advanced Lead Acid Battery | 1500 | Maui, Hawaii, United States | Operational |
| Zhangbei National Wind and Solar Energy Storage and Transmission Demonstration Project (I) | The project currently includes a total of 14MW of lithium-ion batteries and 2 MW vanadium redox flow battery. The Zhangbei National Wind and Solar Energy Storage and Transmission Demonstration Project will eventually grow to include 500 MW of installed wind capacity, 100 MW of installed solar PV capacity and 110 MW of energy storage with an overall investment of 12 billion RMB (1.89 billion USD). | Lithium Iron Phosphate Battery | 16000 | Zhangbei, Hebei, China | Operational |
| Laurel Mountain | AES installed a wind generation plant comprised of 98 MW of wind generation and 32 MW of integrated battery-based energy storage. The project is supplying emissions-free renewable energy | Lithium Ion Battery | 32000 | Elkins, West Virginia, United States | Operational |

| Project | Description | Storage Technology | Storage Capacity (kW) | Location | Status |
|---|---|---|---|---|---|
| | and clean, flexible, operating reserve capacity to the PJM Interconnection, the largest power market in the world. | | | | |
| Auwahi Wind Farm | This 11MW, 4.4MWh lithium ion battery system was provided by A123 Systems and performs wind ramp management for a 21MW wind farm located on the island of Maui. | Lithium Ion Battery | 11000 | Kula, Hawaii, United States | Operational |
| Fukuoka Wind Farm ESS Project | A 1.2MW NGK NAS battery is used at a wind farm in Fukuoka, Japan to firm output to the grid. | Sodium Sulfur Battery | 1200 | Fukuoka, Kyushu, Japan | Operational |
| Rokkasho Village Wind Farm | In May 2008, JWD completed construction of a wind farm near Rokkasho village in Aomori Prefecture, in northern Honshu. This smart grid wind farm is the first facility of its type to use sodium sulfur (NAS) batteries to store electricity for supply to the national power grid. These batteries are charged at night, when the demand for power is lower, and the stored electricity can be supplied to the grid together with the electricity generated by the windmills during the daylight hours. | Sodium Sulfur Battery | 34000 | Rokkasho, Aomori, Japan | Operational |

# ANNEX 3

# USTDA NATIONALITY REQUIREMENTS

**U.S. TRADE AND DEVELOPMENT AGENCY**
**Arlington, VA 22209-3901**

## NATIONALITY, SOURCE, AND ORIGIN REQUIREMENTS

The purpose of USTDA's nationality, source, and origin requirements is to ensure 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, the following provisions shall govern the delivery of goods and professional services funded by USTDA under the Grant Agreement:

(a) the Contractor must be a U.S. firm;

(b) the Contractor may use U.S. subcontractors without limitation;

(c) employees of U.S. Contractor or U.S. subcontractor firms shall be U.S. citizens, non-U.S. citizens lawfully admitted for permanent residence in the United States or non-U.S. citizens lawfully admitted to work in the United States, except as provided pursuant to subpart (d) below;

(d) up to twenty percent (20%) of the USTDA Grant amount may be used to pay for services performed by (i) Host Country subcontractors, and/or (ii) Host Country nationals who are employees of the Contractor;

(e) a Host Country subcontractor may only be used for specific services from the Terms of Reference identified in the subcontract;

(f) subcontractors from countries other than the United States or Host Country may not be used;

(g) goods purchased for performance of the Assistance and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and

(h) goods and services incidental to Assistance support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions.

**NATIONALITY:**

1) Application

A U.S. firm that submits a proposal must meet USTDA's nationality requirements as of the date of submission of the proposal and, if selected, must continue to meet such requirements throughout the duration of the USTDA-funded activity. These nationality provisions apply to all portions of the Terms of Reference that are funded with the USTDA grant.

2) Definitions

A "U.S. firm" is a privately owned firm that 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. citizens and/or non-U.S. citizens lawfully admitted for permanent residence in the United States, 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 that is organized in the U.S., has its principal place of business in the U.S., and is more than 50% owned by U.S. citizens and/or permanent residents, qualifies as a "U.S. firm".

A nonprofit organization, such as an educational institution, foundation, or association, also qualifies as a "U.S. firm" if it is incorporated in the U.S. and managed by a governing body, a majority of whose members are U.S. citizens and/or permanent residents.

**SOURCE AND ORIGIN:**

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.*

*Version 01.17.2014*

# ANNEX 4

# GRANT AGREEMENT AND GRANT AMENDMENT

IND 2015-31004A
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PF
U.S. TRADE AND DEVELOPMENT AGENCY
COS(CJ)
GC(EE)
EXEC ASST (SL)
RD(HS)
CM(JM)
OCFO(MB)
FINSPEC(EB)
GRANTS ADM (PD)
PIS(AA)

# 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 IL&FS Energy Development Company Limited ("Grantee"). USTDA agrees to provide the Grantee under the terms of this Grant Agreement US$798,000 ("USTDA Grant") to fund the cost of goods and services required for a technical assistance ("TA") on the proposed Integrated Wind, Solar and Energy Storage Project ("Project") in India ("Host Country").

## 1. USTDA Funding

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

## 2. Terms of Reference

The terms of reference for the TA ("Terms of Reference") are attached as Annex I and are hereby incorporated by reference into this Grant Agreement. The TA will examine the technical, financial, environmental, and other critical aspects of the proposed Project. The Terms of Reference for the TA shall also be included in the Contract.

## 3. Standards of Conduct

USTDA and the Grantee recognize the existence of standards of conduct for public officials and commercial entities in their respective countries. Therefore, USTDA, the Grantee, and the Contractor shall not directly or indirectly provide, offer or promise to provide money or anything of value to any public official in violation of any United States or Host Country laws relating to corruption or bribery.

## 4. Grantee Responsibilities

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

## 5. Contract Matters and USTDA's Rights as Financier

### (A) Grantee Competitive Selection Procedures

Selection of the U.S. Contractor shall be carried out by the Grantee according to its established procedures for the competitive selection of contractors with advance notice of the

procurement published online through *Federal Business Opportunities (www.fedbizopps.gov)*. Upon request, the Grantee will submit these contracting procedures and related documents to USTDA for information and/or approval.

**(B) USTDA's Right to Approve Contractor Selection**

The Grantee shall notify USTDA at the address of record set forth in Article 16 below upon selection of the Contractor to perform the TA. USTDA then shall notify the Grantee whether or not USTDA approves the Grantee's Contractor selection. Upon USTDA approval of the Grantee's Contractor selection, the Grantee shall notify in writing the U.S. firms that submitted unsuccessful proposals to perform the TA that they were not selected. The Grantee and the Contractor then shall enter into a Contract for performance of the TA.

**(C) USTDA's Right to Approve Contract Between Grantee and Contractor**

**(1) Contract**

The Grantee and the Contractor shall enter into a Contract for performance of the TA. The Grantee (or the Contractor on the Grantee's behalf) shall transmit to USTDA, at the address set forth in Article 16 below, a photocopy of an English language version of the signed Contract or a final negotiated draft version of the Contract. USTDA then shall notify the Grantee and the Contractor whether or not USTDA approves the Contract.

**(2) Amendments and Assignments**

The Grantee or the Contractor may submit any proposed amendment to the Contract, including any proposed amendment to any annex thereto, or any proposed assignment of the Contract, to USTDA at the address set forth in Article 16 below. USTDA then shall notify the Grantee and the Contractor whether or not USTDA approves the proposed amendment or assignment.

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

It is understood by the parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of the Contract and any amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any Contract funded under the Grant Agreement. The parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of U.S. Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval rights shall be made as a financier in the course of funding the TA and shall not be construed as making USTDA a party to the Contract. The parties hereto understand and agree that USTDA may, from time to time, exercise the foregoing approval rights, or discuss matters related to these rights and the Project with the parties to the

Contract or any subcontract, jointly or separately, without thereby incurring any responsibility or liability to such parties. Any approval or failure to approve by USTDA shall not bar the Grantee or USTDA from asserting any right they might have against the Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Grantee or USTDA.

**(E) Grant Agreement Controlling**

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

**6. Disbursement Procedures**

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

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

**(B) Contractor Invoice Requirements**

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

**7. Effective Date**

The effective date of this Grant Agreement ("Effective Date") shall be the date of signature by both parties or, if the parties sign on different dates, the date of the last signature. In the event that only one signature is dated, such date shall constitute the Effective Date.

**8. TA Schedule**

**(A) TA Completion Date**

The completion date for the TA, which is December 31, 2015, is the date by which the parties estimate that the TA will have been completed.

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

Except as USTDA may otherwise agree, (i) no USTDA funds may be disbursed under this Grant Agreement for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (ii) no USTDA funds may be disbursed more than four (4) years after the Effective Date of the Grant Agreement.

## 9. USTDA Mandatory Contract Clauses

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

## 10. Use of U.S. Carriers

### (A) Air

Transportation by air of persons or property funded under this 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 this 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 professional services funded by USTDA under the Grant Agreement:

(a) the Contractor must be a U.S. firm;

(b) the Contractor may use U.S. subcontractors without limitation;

(c) employees of U.S. Contractor or U.S. subcontractor firms shall be U.S. citizens, non-U.S. citizens lawfully admitted for permanent residence in the United States or non-U.S. citizens lawfully admitted to work in the United States, except as provided pursuant to subpart (d) below;

(d) up to twenty percent (20%) of the USTDA Grant amount may be used to pay for services performed by (i) Host Country subcontractors, and/or (ii) Host Country nationals who are employees of the Contractor;

(e) a Host Country subcontractor may only be used for specific services from the Terms of Reference identified in the subcontract;

(f) subcontractors from countries other than the United States or Host Country may not be used;

(g) goods purchased for performance of the TA and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and

(h) goods and services incidental to TA support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions.

USTDA will make available further details concerning these provisions upon request.

**12. Taxes**

USTDA funds provided under this Grant Agreement shall not be used to pay any taxes, tariffs, duties, fees or other levies imposed under laws in effect in Host Country, except for taxes of a de minimis nature imposed on local lodging, food, transportation, or airport arrivals or departures. Neither the Grantee nor the Contractor will seek reimbursement from USTDA for taxes, tariffs, duties, fees or other levies, except for taxes of a de minimis nature referenced above.

**13. USTDA Project Evaluation**

The parties will cooperate to assure that the purposes of the Grant Agreement are accomplished. For five (5) years following receipt by USTDA of the Final Report, the Grantee agrees to respond to any reasonable inquiries from USTDA about the status of the Project. Inquiries will include, but not be limited to, whether the Final Report recommendations have been or will be used to implement the Project, anticipated Project implementation timeline, and likely source of financing. In addition, the Grantee agrees to notify USTDA any time the Grantee selects a new primary contact person for this Project during the five-year period referenced above.

**14. Recordkeeping and Audit**

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

**15. 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 itsHead-Wind Business & CTO-Renewable Investments. The parties hereto may, by written notice, designate additional representatives for all purposes under this Grant Agreement.

## 16. 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 an electronic medium that produces a tangible record of the transmission, such as a facsimile or e-mail message, and will be deemed duly given or sent when delivered to such party at the following:

To: IL&FS Energy Development Company Limited
Address: 1st Floor, Corporate Office Tower, Ambience Mail Complex, Ambience Island, NH- 8, Gurgaon 122001. India
Phone: +91 124 4716100
Fax: +91 124 4716120
E-Mail: Sameer.Parikh@ilfsindia.com

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

Phone: (703) 875-4357
Fax: (703) 875-4009
E-Mail: south_southeast_asia@ustda.gov

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

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

Appropriation No.: 11 15/16 1001
Activity No.: 2015-31004A
Reservation No.: 2015042
Grant No.: GH201531042

## 17. Implementation Letters

To assist the Grantee in the implementation of the TA, USTDA may, from time to time, issue implementation letters that will provide additional information about matters covered by this Grant Agreement. USTDA may also issue implementation letters to (i) extend the estimated completion date set forth in Article 8(A) above, or (ii) change the fiscal data set forth in Article 16 above. The parties may also use jointly agreed upon implementation letters to confirm and record their mutual understanding of matters covered by this Grant Agreement.

## 18. Grant Agreement Amendments

Either party may submit to the other party at any time a proposed amendment to the Grant Agreement. A Grant Agreement amendment shall be effective only if it has been signed by both parties.

## 19. Termination Clause

Either party may terminate this Grant Agreement by giving the other party written notice thereof. The termination of the Grant Agreement will end any obligations of the parties to provide financial or other resources for the TA, except for payments that may be made pursuant to Clause H of the USTDA Mandatory Contract Clauses set forth in Annex II to this Grant Agreement. This article and Articles 5, 12, 13, 14, and 21 of the Grant Agreement shall survive termination of the Grant Agreement.

## 20. Non-waiver of Rights and Remedies

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

## 21. U.S. Technology and Equipment

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

## 22. Governing Law

This Grant Agreement shall be governed by, and construed in accordance with, the applicable laws of the United States of America. In the absence of federal law, the laws of the State of New York shall apply.

## 23. Counterparts

This Grant Agreement may be executed in counterparts, each of which shall be deemed an original, but all of which together shall constitute one and the same agreement. Counterparts may be delivered via electronic mail or other transmission method and any counterpart so delivered shall be deemed to be valid and effective for all purposes.

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

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

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

By: _____

Date: January 25, 2015

Witnessed:

By: _____

**For IL&FS Energy Development Company Limited**

By: _____

Date: 25 Jan 2015

Witnessed:

By: _____

**Annex I -- Terms of Reference**

**Annex II -- USTDA Mandatory Contract Clauses**

## Annex I

### Terms of Reference

IL & FS Energy Development Company Limited (Grantee) plans to build an Integrated Wind, Solar, and Energy Storage Project (Project). The Project consists of: 1000 MW solar PV and wind integrated project with energy storage in Ananthpur District, Andhra Pradesh; and a 150 MW solar PV and wind integrated project with energy storage in Kutch District, Gujarat.

Phase 1 would consist of 100 MW of wind and solar PV projects with an appropriate amount of energy storage. Of this, the first 27 MW project, Phase 1A, has been secured at the Grantee's existing site at Ramagiri, Ananthapur district of Andhra Pradesh State. The Phase 1A project at the Ramagiri site is an existing wind project of 6.5 MW comprised of 26 wind turbines (250 kW each). The projection of capacity is estimated to be 27 MW (22 MW wind, 5 MW solar PV) with 8 MW of energy storage (with an estimated 6 hours storage capacity) and would be planned as a demonstration project for the 1150 MW full scale Project. Phase 1B would be an additional 73 MW located at a contiguous site to Phase 1A. Phase II would include 300 MW and Phase III would be 600 MW within the same area as the Ramagiri project site at Ananthpur District, Andhra Pradesh State. Phase II and Phase III would also include 50 MW and 100 MW at a separate site in Nana Layja in Kutch District, Gujarat State.

Grantee's estimated timeframe for the phases is as follows:
Phase 1A: 27MW Construction Begins Aug 2015
Phase 1B: 73MW Construction Begins May 2016
Phase II: 300MW at Ananthpur and 50 MW at Kutch 2017-2018
Phase III: 600MW at Ananthpur and 100 MW at Kutch 2019-2020

The objectives of these Technical Assistance (TA) Terms of Reference are to:

- Evaluate and recommend grid interactive energy storage technologies for the Project;
- Evaluate and recommend energy storage technologies and an integrated wind, solar PV and energy storage design for the Project that:
    - improves efficient dispatch of renewable power within the State of Andhra Pradesh and Gujarat and to other Indian states (e.g. through Power Grid Corporation of India Limited's proposed Green Corridor); and
    - maximizes the financial benefits of delivery of renewable energy for the project developers under various business models over multiple phases of the Project.
- Conduct a feasibility study for the 27 MW Phase 1A site, the technical assumptions from which will then be used as the basis for other phases of the Project;
- Perform an economic and financial analysis for the Project to determine the need for:

- o gap funding (i.e. grants or subsidies) and/or concessional financing from the Government of India, State Governments, international and bilateral financing institutions, and/or other sources under various business models for various phases of the Project.
- o policy and/or regulatory incentives (i.e. quotas, tariffs, charges, penalties) to capture the economic benefits of energy storage.

- Develop a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India;
- Develop a master plan for the entire 1,150 MW Project for enabling dispatchable wind and solar PV generation through a combination of smoothening the intermittent generation and shifting the generation to match the grid load curve; and
- Forecast the cost-performance parameters of various competing energy storage technologies under various stages of development and demonstration and revising the master plan and financial models to help calibrate the right technology selection for Phase 2 and Phase 3.

**Task 1: Develop Work Plan and Define Overall Study Parameters**

Sub-task 1.1: Document and Data Review

The Contractor shall conduct a document and data review to begin the project. To facilitate this review, the Grantee shall provide all relevant and necessary Project information and available documentation to the Contractor. In particular, the Grantee shall provide, at a minimum, the following:

- Wind and solar PV power data and planning documentation for the Project, including:
  - o Historical wind mast and wind power production data for the Project;
  - o Solar irradiation data for the Project;
  - o Baseline capital costs for the wind and solar PV components of the Project;
  - o Baseline transmission interconnection costs for the Project; and
  - o A timeline for Project development.

The Contractor shall review and analyze all of the information collected or provided by the Grantee and stakeholders identified by the Grantee in order to understand current planning for all three proposed phases of the Project.

Sub-task 1.2: Kickoff Meeting, Stakeholder Consultations, and Work Plan

The Contractor shall conduct a kickoff meeting with the Grantee and other stakeholders identified by the Grantee at the Grantee's facilities, or at another appropriate venue agreed upon by the Contractor and the Grantee. The Grantee shall identify appropriate personnel and other relevant stakeholders to participate in the kickoff meeting. The Contractor shall review the tasks to be performed under these Terms of Reference, and

review the Contractor's existing work plan to perform the tasks under these Terms of Reference. The Contractor shall obtain Grantee approval for the Contractor's work plan for the TA.

The Contractor shall produce a report with the overall parameters for the Project based on available data, project planning documents, and stakeholder meetings conducted in Task 1.

Task 1 Deliverable(s) - The Contractor shall provide the Grantee with areport based on the review and analysis of documents and data provided by the Grantee. The Contractor shall provide the Grantee with a copy of the work plan for the TA, as approved by the Grantee.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 2: Technical Assessment of the Project**

The Contractor shall conduct site visits to the Ramagiri and Nana Layja sites, and assess the sites for the Project in terms of wind and solar resources and grid connectivity for all the 3 phases of the Project (Phase 1A, Phase 1B, Phase 2 and Phase 3).

Task 2.a: Wind Resource Assessment and Energy Estimates

Based on the data collected in Task 1 and other available data the Contractor finds appropriate, the Contractor shall conduct a full wind resource assessment of the sites for all 3 phases including, but not limited to:

1. Data cleaning and Quality Assurance/Quality Control;
2. Extrapolation of the data over the expected life of the Project;
3. Vertical extrapolation to hub-height(s);
4. Flow-modeling to extrapolate the wind resource over the Project area;
5. Setback and buffer review;
6. Micro-siting of the site for optimum layout and generation maximization;
7. Layout optimization for not less than four turbines and/or turbine configurations;
8. Shadow flicker and sound calculation for each configuration/layout;
9. Estimation of energy output for each configuration/layout;
10. Monthly and diurnal production estimates (12x24);
11. Annual hourly energy estimates (8760 hours per year);
12. Uncertainty analysis; and
13. Recommendations for additional data acquisition and studies.

The Grantee shall provide wind turbine models to be used in the Contractor's wind resource assessment.

Task 2.b: Solar Resource Estimate and Energy Estimates

The Contractor shall assess the solar resource for the Ramagiri and Nana Layia sites for all 3 Phases of the Project using GeoModel Solar Time series 18-year hourly data (Direct Normal Irradiation, Temperature, Relative Humidity, Atmospheric Temperature, Wind Speed, etc.) or other satellite-derived data, and data adapted from on-site or neighboring weather stations' measurements, collected by the Contractor. The data shall be analyzed to create a typical meteorological year for the performance modelling of the PV power plant.

Task 2.c: Develop Energy Estimates

The Contractor shall model plant performance at the sites and develop combined energy production estimates for the sites and an energy production profile which estimates hourly energy production for different seasons.

Task 2.d: Transmission Grid Interconnection Analysis

The Contractor shall analyze the grid in the region of interconnection sufficient to model the impact to the system by the addition of the Project for all 3 phases. This analysis shall model congestion expected with the additional wind and solar power generation and determine any necessary system upgrades that would be necessary in order to accommodate the additional power generation, as well as their estimated costs based on baseline cost data provided by the Grantee.

The analysis shall include a transmission network study which considers plans for future transmission networks, including the Green Corridors being planned by Power Grid Corporation of India Limited. The Contractor's analysis shall include load flow analysis and transient stability studies.

The Contractor shall perform simulation modeling based on wind speed and solar PV irradiation data in order to assess the stochastic nature of the renewable energy supply.

The Contractor shall analyze demand variations in the region, including:

- Inability of the grid to accept power based on historical data;
- Load curve analysis to identify peak power periods; and
- Tariff analysis to identify current and planned time of day tariffs and power purchase pricing. The Grantee shall work with the Contractor to identify this information.

The Contractor shall evaluate options for scheduling the delivery of produced electricity from the Ramagiri Phase 1A project and all the remaining phases of the Project to the grid in accordance with the Indian electricity grid code.

Task 2.e: Energy Storage Technology Assessment

The Contractor shall perform a technology assessment for energy storage technologies available for deployment within the Project timeline, including the following:

- Research and identify energy storage technologies that would meet the requirements of the Project, including commercial availability (ready for commercial utility deployment) during the 3 phases of the Project timeline;
- Evaluate energy storage technologies based on key performance metrics (i.e. Energy Density; Discharge Time; Power Rating; Energy Rating; Depth of Discharge; Life Discharge Cycles; Rapidity of Charge/Discharge Cycle; and Loss of Energy in One Discharge Cycle or Cycle Efficiency);
- Conduct discussions with suppliers of energy storage technologies to gather information on current operations and production, as well as other technical details;
- Evaluate the capital and operational costs of the technologies over the timeline for implementation of all 3 Phases of the Project;
- Perform a risk analysis for the technologies, including, but not limited to, supply risk, price changes, and technical performance risk, and prepare a risk mitigation matrix; and
- Estimate the levelized cost of energy storage per kWh of delivered energy over the life of the storage technology for all 3 Phases of the Project, taking into consideration (a) the life-cycle cost of the various competing technology options and (b) the SCADA and control system required for operation.

The Contractor shall recommend suitable energy storage technologies for the Ramagiri Phase 1A project and for all the remaining phases of the Project, taking into consideration different business models as detailed in Task 3.

The Contractor shall perform an assessment of available technologies for monitoring and operation of the Project including SCADA systems, energy management systems, and other technologies and software for the efficient operation of the Project. The assessment shall consider factors such as cost and maturity of various technologies and will serve as the basis for the Task 3 technical design.

Task 2 Deliverable(s): The Contractor shall deliver to the Grantee:
- A wind and solar resource and energy assessment report for the Project sites. Within this report will be clear net energy estimates and uncertainty results for use as inputs to the financial model, financing plan and other purposes. Results shall be presented in the report as well as an editable electronic format (Microsoft Excel or similar) which can be modified by the Grantee;
- A transmission grid interconnection analysis;
- An energy storage technology assessment which clearly specifies the technology to be implemented during the 3 Phases of the Project for various business models with their cost and performance parameters; and
- A risk mitigation matrix.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 3: Technical Design and Cost Assessment**

The Grantee shall provide to the Contractor information on the price of solar PV and wind power project pricing in India for the multiple phases of the project.

Based on the work performed in Task 2 and the price information provided by the Grantee, the Contractor shall develop a baseline technical design (sizing and specification of the system) and cost estimate (plus or minus 25%) for the Ramagiri Phase IA project.

Based on the Ramagiri Phase 1A design and cost estimate, the Contractor shall develop a baseline master plan for all 3 Phases of the Project for optimum configuration of wind, solar PV and energy storage capacity. The master plan shall include conceptual designs and cost estimates for all phases of the Project.

The Contractor shall provide conceptual plans for technical and commercial options for all 3 phases of the Project for, at a minimum, the following business models:

- Business Model 1: Provide schedule certainty for wind projects for interstate and intrastate sales: Minimum storage for wind farm only required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting. This analysis will apply to the cost benefit analysis (Task 6) and to the regulatory strategy (Task 8).
- Business Model 2: Provide schedule certainty for wind plus solar PV projects for interstate and intrastate sales: Minimum storage for a wind and solar PV combined project required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting;
- Business Model 3: Provide a portion of the total power (10%, 20% and 30%) stored and injected in the grid during peak hours;
- Business Model 4: Provide grid ancillary services; and
- Business Model 5: Optimal storage required for wind and wind plus solar PV for a time shift of 2-3 hrs, 4-6 hrs, and 5-8 hrs.

The Grantee shall provide revenue assumptions for various business models, with the exception of Model 4 (ancillary services). The Contractor shall establish an estimate of revenues for ancillary services based on data from other countries. The Grantee shall also provide Indian financing assumptions for the Contractor to use in the modeling.

Based on this analysis, the Contractor shall develop a conceptual design and cost estimates for the 3 Phases of the Project for each of the above business models.

Based on the evaluation of business model scenarios, the Grantee shall select a model and the Contractor shall prepare a detailed technical design for the Ramagiri Phase 1A project. The Contractor's design shall include a schematic layout with single line electrical drawings for the wind and solar PV project with energy storage and grid interconnection. The Contractor shall prepare a schematic design of a SCADA system for effective weather monitoring, forecasting and energy dispatch including the control

methodology with identification of vendors for energy storage and for implementing the control/SCADA system.

The Contractor shall develop the total capital and operating cost estimates (+/- 25%) for wind, solar PV and energy storage installation, grid interconnection and SCADA for the Ramagiri Phase IA project.

Task 3 Deliverable(s): The Contractor shall deliver technical design and cost estimates for the Ramagiri Phase 1A project and conceptual design and cost estimates for the 3 Phases of the Project for all the business models.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 4: U.S. Sources of Supply**

The Contractor shall conduct an assessment of the availability of potential U.S. sources of supply for the hardware, software, and services needed for the implementation of the Project. The Contractor shall provide a list of potential U.S. suppliers including business name, point of contact, address, telephone number, e-mail, and fax numbers.

Deliverable: The Contractor shall deliver a report on Task 4 that shall include a list of U.S. sources of supply by type of hardware, software, and services.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 5: Developmental Impact Assessment**

The Contractor shall report on the potential developmental impact of the implementation of the Project at both sites. While specific focus shall be paid to the immediate impact of the Project, the Contractor shall include, where appropriate, any additional developmental benefits, including spin-off and demonstration projects and/or impacts. The analysis of potential benefits of the Project shall be as concrete and detailed as possible. The Contractor shall provide estimates of the Project's potential benefits in the following areas:

Infrastructure: The Contractor shall provide a description of the infrastructure impact of the implementation of the 1150 MW wind/solar PV/energy storage Project, including transmission grid upgrades at both sites.

Human Capacity Building: For both sites, the Contractor shall assess the number and type of positions that would be needed to construct and operate the Project as well as the

number of people who will require training and a brief description of the training programs.

Technology Transfer and Productivity Enhancement: The Contractor shall provide a description of any advanced technologies that will be implemented as a result of the Project, particularly the energy storage technologies and the energy management systems for integrating the renewable power and energy storage that will be dispatched to the grid. The Contractor shall estimate the productivity enhancement from the improved delivery of renewable power to the grid at both sites.

Environmental Benefits: The Contractor shall provide a description and quantify any environmental benefits from the implementation of the Project at either site.

Other: The Contractor shall identify any other developmental benefits of the Project, including any spin-off or demonstration projects and/or impacts.

Task 5 Deliverable(s): The Contractor shall prepare a developmental impact assessment report based on the work conducted in Task 5.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 6: Economic and Cost Benefit Analysis**

The Contractor shall perform a cost benefit analysis of the Project with the objective of developing an economic planning document that will assist the Grantee, in collaboration with other stakeholders, in creating a roadmap and implementing a framework for energy storage. The document will also be used to establish the basis for requesting grants, subsidies and other incentives for energy storage.

The Contractor shall quantify the quality of power improvement (frequency, flicker, harmonics) from the energy storage system as part of the grid ancillary services provided by the Project.

The Contractor shall perform an economic analysis of the proposed Project which shall include a comparison to the Project without the energy storage component. The analysis shall take into account the requirements of regulatory agencies for approval of tariffs and cost recovery grants, subsidies and other incentives that will support the Project. The Contractor's analysis shall address the potential of the Project to increase the availability of power during peak demand periods.

Task 6 Deliverable(s): The Contractor shall deliver a cost benefit analysis and economic analysis for the Project based on the work performed in Task 6.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 7: Financial Analysis and Financing Plan**

7.a: Financial Analysis

The Contractor shall develop a financial model for the Project, broken down by the 3 Phases. The financial analysis shall be shown in pro-forma cash flow spreadsheets over a 20-year operating period for the Project. The financial analysis shall cover the following areas:

- Income Statement: The Contractor shall provide a forecast of operating revenues, operating costs, depreciation, and profits before and after taxes;

- Cash Flow Statement: The Contractor shall provide a forecast of net operating income after deduction of depreciation from after-tax profits, and allowance for inflows of bank loans and equity capital contributions. The Contractor shall estimate annual cash outflows by deducting loan payments and construction costs paid to contractors. The Contractor shall provide a forecast of annual net cash balances;

- Financing Ratios: The Contractor shall establish debt/equity ratios and debt service ratios;

- Financial Performance Indicators: The Contractor shall calculate the financial internal rate of return (FIRR) and return on equity (ROE); and

- Sensitivity Analyses: The Contractor shall evaluate the impact on FIRR and ROE for key variables (i.e. CAPEX, OPEX, tariffs, energy production, interest rates, inflation rates, subsidies, taxes) as agreed with the Grantee.

7.b: Financing Plan

Based on the financial analysis, the Contractor shall estimate the viability gap funding (VGF) and/or policy support and incentives (i.e. upfront capital subsidy, accelerated depreciation, generation based incentives) required from regional utilities and/or state and central government for each phase of the Project in order for the Project's produced power to remain competitive in the market.

The Contractor shall assess the availability of financing and/or grant funding from national, bilateral and multilateral financing institutions such as Power Grid Corporation of India Limited, other Government of India institutions, the World Bank, IFC, Asian Development Bank, the Export-Import Bank of the United States and the Overseas Private Investment Corporation for the Project. The Contractor shall hold discussions

with these institutions to solicit their interest in providing financing and/or other types of funding for the Project.

The Contractor shall develop a financing plan for the Project based on the analysis and discussions with prospective financing and gap funding institutions.

Task 7 Deliverable(s): The Contractor shall deliver a financial analysis for the Project and a financing plan for the Project.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 8: Analysis of Regulatory Issues**

The Contractor shall conduct a review of policies and regulations related to energy storage in place or being developed in at least three other countries (including the United States and one other high income country and one low or middle income country) such as technical specifications for grid connectivity; financial incentives in term of tariffs or subsidies; and other programs for the promotion for energy storage.

The Contractor shall review the regulatory framework under which the Project will be deployed, including state and central government regulations. The Contractor shall review the existing grid code for connecting different sources of power generation and assess limits of penetration, interconnection barriers, and norms and quality issues.

The Contractor shall meet with state and central Indian government regulatory agencies and other relevant stakeholders to gather information on current and planned policies and regulations related to energy storage and renewable energy applicable to the Project.

Based on the energy storage technologies assessment performed, the Contractor shall estimate how the prices of the selected energy storage technologies are expected to change over time. This will include an estimate of how energy storage prices will change as the technologies are localized in the Indian economy.

The Contractor shall work with the Grantee to develop a strategy document to be used by the Grantee to approach Indian regulatory and policymaking institutions. The strategy document shall include and detailed recommendations for regulatory and policy support for energy storage including tariffs, subsidies and other incentives necessary to support the Project .

Task 8 Deliverable(s): The Contractor shall deliver a report on all work conducted in Task 8 including an analysis of regulatory requirements.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 9: Preliminary Environmental Impact Assessment**

The Contractor shall conduct a preliminary review of the Project's anticipated impact, both positive and negative, on the environment with reference to local requirements and those of multilateral lending agencies, such as the World Bank. The primary focus shall be on the environmental impact of recommended energy storage technologies on the environment. This review shall identify potential negative impacts, discuss the extent to which they can be mitigated, and develop plans for a full environmental impact assessment, as applicable, if and when the Project moves forward to the implementation stage. This includes the identification of steps that will need to be undertaken by the Grantee subsequent to the TA's completion and prior to Project implementation, and an outline for a full environmental impact assessment, as applicable, if and when the Project moves forward.

Task 9 Deliverable(s): The Contractor shall prepare a preliminary environmental impact assessment report based on the work conducted in Task 9. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 10: Implementation Plan**

Based on the previous tasks, the Contractor, in conjunction with the Grantee, shall develop an implementation plan that clearly outlines the anticipated next steps necessary to implement the Project. The plan shall include but not be limited to: (1) phasing of the Project; (2) plans for adopting new technologies, including training programs; (3) plans to facilitate regulatory and policy development; (4) a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India; and (5) plans for securing gap funding for deployment of the Project. The Contractor shall develop a tentative schedule in which milestones could be ideally achieved. The Contractor shall present a draft implementation plan to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

Task 10 Deliverable(s): The Contractor shall prepare and deliver an Implementation Plan. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 11: Final Report**

The Contractor shall present the Final Report in person to the Grantee, and in consultation and agreement with the Grantee, to other stakeholders, including regulatory agencies.

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

- Adobe Acrobat readable copies of all documents;
- Source files for all drawings in AutoCAD or Visio format; and
- Source files for all documents in MS Office 2000 or later formats.

## Annex II

## USTDA Mandatory Contract Clauses

### A. USTDA Mandatory Clauses Controlling

The parties to this Contract acknowledge that this Contract is funded in whole or in part by the U.S. Trade and Development Agency ("USTDA") under the Grant Agreement between the Government of the United States of America acting through USTDA and IL&FS Energy Development Company Limited ("Client"), dated _____ ("Grant Agreement"). The Client has selected _____ ("Contractor") to perform the technical assistance ("TA") for the Integrated Wind, Solar and Energy Storage project ("Project") in India ("Host Country"). The Client and the Contractor are the parties to this Contract, and they hereinafter are referred to collectively as the "Contract Parties." Notwithstanding any other provisions of this Contract, the following USTDA Mandatory Contract Clauses shall govern. All subcontracts entered into by Contractor funded or partially funded with USTDA Grant funds shall include these USTDA Mandatory Contract Clauses, except for Clauses B(1), G, H, I, and S. In addition, in the event of any inconsistency between the Grant Agreement and the Contract or any subcontract thereunder, the Grant Agreement shall be controlling.

### B. USTDA as Financier

#### (1) USTDA Approval of Contract

This Contract, and any amendment thereto, including any amendment to any annex thereto, and any proposed assignment of this Contract, must be approved by USTDA in writing in order to be effective with respect to the expenditure of USTDA Grant funds. USTDA will not authorize the disbursement of USTDA Grant funds until the Contract conforms to modifications required by USTDA during the Contract review process and the Contract has been formally approved by USTDA. To make this review in a timely fashion, USTDA must receive from either the Client or the Contractor an English language version of a final negotiated draft Contract or a signed Contract to the attention of the General Counsel's office at USTDA's address listed in Clause M below.

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

It is understood by the Contract Parties that USTDA has reserved certain rights such as, but not limited to, the right to approve the terms of this Contract and amendments thereto, including assignments, the selection of all contractors, the Terms of Reference, the Final Report, and any and all documents related to any contract funded under the Grant Agreement. The Contract Parties hereto further understand and agree that USTDA, in reserving any or all of the foregoing approval rights, has acted solely as a financing entity to assure the proper use of United States Government funds, and that any decision by USTDA to exercise or refrain from exercising these approval

rights shall be made as a financier in the course of financing the TA and shall not be construed as making USTDA a party to the Contract. The Contract 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 Contract Parties or the parties to any subcontract, jointly or separately; and in consideration of USTDA's role as financier, the Contract Parties further agree that USTDA's rights may be exercised without thereby incurring any responsibility or liability, in contract, tort, or otherwise, to the Contract Parties or the parties to any subcontract. Any approval or failure to approve by USTDA shall not bar the Client or USTDA from asserting any right they might have against the Contractor, or relieve the Contractor of any liability which the Contractor might otherwise have to the Client or USTDA.

**C. Nationality, Source and Origin**

Except as USTDA may otherwise agree, the following provisions shall govern the delivery of goods and professional services funded by USTDA under the Grant Agreement:

(a) the Contractor must be a U.S. firm;

(b) the Contractor may use U.S. subcontractors without limitation;

(c) employees of U.S. Contractor or U.S. subcontractor firms shall be U.S. citizens, non-U.S. citizens lawfully admitted for permanent residence in the United States or non-U.S. citizens lawfully admitted to work in the United States, except as provided pursuant to subpart (d) below;

(d) up to twenty percent (20%) of the USTDA Grant amount may be used to pay for services performed by (i) Host Country subcontractors, and/or (ii) Host Country nationals who are employees of the Contractor;

(e) a Host Country subcontractor may only be used for specific services from the Terms of Reference identified in the subcontract;

(f) subcontractors from countries other than the United States or Host Country may not be used;

(g) goods purchased for performance of the TA and associated delivery services (e.g., international transportation and insurance) must have their nationality, source and origin in the United States; and

(h) goods and services incidental to TA support (e.g., local lodging, food, and transportation) in Host Country are not subject to the above restrictions.

USTDA will make available further details concerning these provisions upon request.

## D. Recordkeeping and Audit

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

## E. U.S. Carriers

### (1) Air

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

### (2) Marine

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

## F. Workman's Compensation Insurance

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

## G. Disbursement Procedures

### (1) USTDA Approval of Contract

Disbursement of Grant funds will be made only after USTDA approval of this Contract.

**(2) Payment Schedule Requirements**

A payment schedule for disbursement of Grant funds to the Contractor shall be included in this Contract. Such payment schedule must conform to the following USTDA requirements: (1) up to twenty percent (20%) of the total USTDA Grant amount may be used as a mobilization payment; (2) all other payments, with the exception of the final payment, shall be based upon Contract performance milestones; and (3) the final payment may be no less than fifteen percent (15%) of the total USTDA Grant amount, payable upon approval by USTDA of a Final Report that has been (i) prepared and submitted in accordance with the requirements set forth in Clause I below, and (ii) approved in writing by the Client in the manner provided for by Clause G(3)(b)(iii) below. Invoicing procedures for all payments are described below.

**(3) Contractor Invoice Requirements**

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

**(a) Contractor's Invoice**

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

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

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

(ii) For Contract performance milestone payments:

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

(iii) For final payment:

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

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

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

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

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

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

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

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

Requests for disbursement shall be submitted to the attention of the Finance Department at USTDA's address listed in Clause M below, or by e-mail to invoices@ustda.gov.

## H. Termination

### (1) Method of Termination

Either Contract Party may terminate this Contract upon giving written notice to the other party and USTDA. This notice shall be effective after either 30 days, or any other period set forth elsewhere in this Contract. Furthermore, this Contract shall terminate immediately upon notification of USTDA's termination of the Grant Agreement or the term of availability of any funds thereunder.

**(2) Ramifications of Termination**

In the event that this Contract is terminated prior to completion, the Contractor will be eligible, subject to USTDA approval, for payment for the value of the work performed pursuant to the terms of this Contract. Likewise, in the event of such termination, USTDA is entitled to receive from the Contractor all USTDA Grant funds previously disbursed to the Contractor (including but not limited to mobilization payments) which exceed the value of the work performed pursuant to the terms of this Contract.

**(3) Survivability**

Clauses B, D, G, H, N and S of the USTDA Mandatory Contract Clauses shall survive the termination of this Contract.

## I. USTDA Final Report

**(1) Definition**

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

**(2) Final Report Submission Requirements**

The Contractor shall provide the following to USTDA:

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

and

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

and

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

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

**(3) Final Report Presentation**

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

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

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

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

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

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

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

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

**(g)** The Client, USTDA, and the Commercial and/or Economic Section(s) of the U.S. Embassy in Host Country shall have irrevocable, worldwide, royalty-free, non-exclusive rights to use and distribute the Final Report.

## J. Modifications

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

## K. TA Schedule

### (1) TA Completion Date

The completion date for the TA, which is December 31, 2015, is the date by which the Contract Parties estimate that the TA will have been completed.

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

Except as USTDA may otherwise agree, (a) no USTDA funds may be disbursed under this Contract for goods and services which are provided prior to the Effective Date of the Grant Agreement; and (b) no USTDA funds may be disbursed more than four (4) years after the Effective Date of the Grant Agreement.

## L. Business Practices

The Contract Parties recognize the existence of standards of conduct for public officials and commercial entities in their respective countries. Therefore, the Contract Parties shall fully comply with all United States and Host Country laws relating to corruption or bribery. For example, the Contractor and its subcontractors shall fully comply with the

requirements of the Foreign Corrupt Practices Act, as amended (15 U.S.C. §§ 78dd-1 et seq.). Each Contract Party agrees that it shall require that any agent or representative hired to represent it in connection with the TA will comply with this paragraph and all laws which apply to activities and obligations of that Contract Party, including, but not limited to, those laws and obligations referenced above.

**M. USTDA Address and Fiscal Data**

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

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

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

Fiscal Data:

| | | | |
|---|---|---|---|
| Appropriation No.: | 11 15/16 1001 | Activity No.: | 2015-31004A |
| Reservation No.: | 2015042 | | |
| Grant No.: | GH201531042 | | |

**N. 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, except for taxes of a de minimis nature imposed on local lodging, food, transportation, or airport arrivals or departures. Neither the Client nor the Contractor will seek reimbursement from USTDA for taxes, tariffs, duties, fees or other levies, except for taxes of a de minimis nature referenced above.

**O. Export Licensing**

The Contractor and all subcontractors are responsible for compliance with U.S. export licensing requirements, if applicable, in the performance of the Terms of Reference.

**P. Contact Persons**

The Client designates the following person as the contact person for matters concerning this Contract:

Name: Sameer Parikh
Title: Vice President
Phone: 91 124 471 6100
Fax: 91 124 471 6120
E-Mail:Sameer.parikh@ilfsindia.com

The Contractor designates the following person as the contact person for matters concerning this Contract:

Name:
Title:
Phone:
Fax:
E-Mail:

If anyone designated by a Contract Party as a contact person ceases service as a contact person at any point during the ten-year period following the date of signing of this Contract, the Contract Party that had designated that contact person shall provide USTDA and the other Contract Party with the name and contact information of a replacement contact person.

**Q. Liability**

This Contract may include a clause that limits the liability of the Contract Parties, provided that such a clause does not (i) disclaim liability for damages that are natural, probable, and reasonably foreseeable as a result of a breach of this Contract, or (ii) limit the total amount of damages recoverable to an amount less than the total amount disbursed to the Contractor pursuant to this Contract. If any clause included by the Contract Parties is inconsistent with either or both of these limitations, it shall be invalid and unenforceable to the extent of the inconsistency.

**R. Arbitration**

If the Contract Parties submit any dispute arising under this Contract for arbitration, the scope of any such arbitration shall be limited to the Contract Parties' rights and/or obligations under this Contract and may not extend to any right or obligation of USTDA. The arbitrator(s) shall not arbitrate issues directly affecting the rights or obligations of USTDA.

**S. Reporting Requirements**

The Contractor shall advise USTDA by letter as to the status of the Project on March 1st annually for a period of two (2) years after completion of the TA. In addition, if at any time the Contractor receives follow-on work from the Client, the Contractor shall so notify USTDA and designate the Contractor's contact point including name, telephone, fax number, and e-mail address. Since this information may be made publicly available

by USTDA, any information which is confidential shall be designated as such by the Contractor and provided separately to USTDA. USTDA will maintain the confidentiality of such information in accordance with applicable law.

**AMENDMENT NO. 1**

**TO**

**GRANT AGREEMENT**
**BETWEEN**
**THE U.S. TRADE AND DEVELOPMENT AGENCY**
**AND**
**IL&FS ENERGY DEVELOPMENT COMPANY LIMITED**

Re: Integrated Wind, Solar and Energy Storage Project
Appropriation No.: 11 15/16 1001
Activity No.: 2015-31004A
Reservation No.: 2015042
Grant No.: GH201531042

The Grant Agreement, dated January 25, 2015, between the Government of the United States of America, acting through the U.S. Trade and Development Agency ("USTDA"), and IL&FS Energy Development Company Limited "Grantee") for a technical assistance ("TA") on the Integrated Wind, Solar and Energy Storage Project is hereby amended as follows:

## 1. Terms of Reference

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

## 2. USTDA Funding

Under the existing Grant Agreement, USTDA agreed to provide a US$798,000 grant for the TA. USTDA hereby agrees to provide the Grantee an additional US$100,000 to fund the cost of goods and services required to perform the TA as amended. The total USTDA funding available to the Grantee for the full TA is now US$898,000.

## 3. Fiscal Data

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

Appropriation No: 11 15/16 1001
Activity No.: 2015-31004A

Reservation No.: 2015087
Grant No.: GH201531042

Please note that there are two sets of fiscal data under the Grant Agreement as amended. The US$798,000 in USTDA Grant funds under the existing Grant Agreement must be disbursed (using the fiscal data in Article 16 and Mandatory Clause M of the Grant Agreement) before disbursing the US$100,000 of USTDA Grant funds under this Amendment No. 1 (using the above fiscal data).

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

**IN WITNESS WHEREOF, the U.S. Trade and Development Agency and IL&FS Energy Development Company Limited**, each acting through its duly authorized representative, have caused this Agreement to be signed in the English language in their names and delivered as of the day and year written below.

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

By: _____

Date: May 19, 2015

**For IL&FS Energy Development Company Limited**

By: _____

Date: 15/05/2015

## ANNEX I

AMENDMENT NO. 1 TERMS OF REFERENCE

IL&FS Energy Development Company Limited (IEDCL) (Grantee) plans to build the Integrated Wind, Solar PV, and Energy Storage Project (Project). The Project consists of: a 1000 MW integrated wind, solar PV and energy storage project in Ananthpur District, Andhra Pradesh; and a 150 MW integrated wind, solar PV and energy storage project in Kutch District, Gujarat.

Phase 1 would consist of 100 MW of wind and solar PV projects with an appropriate amount of energy storage. Of this, the first 27 MW project, Phase 1A, has been secured at the Grantee's existing site at Ramagiri, Ananthapur district of Andhra Pradesh State. The Phase 1A project at the Ramagiri site is an existing (19 year old) wind project of 6.5 MW comprised of 26 wind turbines (250 kW each). The project is on 170 acres of land and would be repowered with new larger capacity wind turbines. The projection of capacity is roughly estimated to be 27 MW (22 MW wind, 5 MW solar PV) with 8 MW of energy storage (with an estimated 6 hours storage capacity) and would be planned as a demonstration project for the 1150 MW full scale Project. The Phase 1A site has historical wind mast data and existing grid interconnection so that it can be implemented rapidly. Phase 1B would be an additional 73 MW located at a contiguous site to Phase 1A. Phase II would include 300 MW and Phase III would be 600 MW within the same area as the Ramagiri project site at Ananthpur District, Andhra Pradesh State. Phase II and Phase III would also include 50 MW and 100 MW at a separate site in Nana Layja in Kutch District, Gujarat State.

IEDCL's estimated timeframe for the phases is as follows:

Phase 1A: 27MW Construction Begins Jan 2016

Phase 1B: 73MW Construction Begins Oct 2016

Phase 2: 300MW at Ananthpur and 50 MW at Kutch 2017-2018

Phase 3: 600MW at Ananthpur and 100 MW at Kutch 2019-2020

The objectives of these Technical Assistance (TA) Terms of Reference are to:

- Evaluate and recommend grid interactive energy storage technologies for the Project;
- Evaluate and recommend energy storage technologies and an integrated wind, solar PV and energy storage design for the Project that:

- improves efficient dispatch of renewable power within the State of Andhra Pradesh and Gujarat and to other Indian states (e.g. through Power Grid Corporation of India Limited's proposed Green Corridor); and
- maximizes the financial benefits of delivery of renewable energy for the project developers under various business models over multiple phases of the Project.

- Conduct a feasibility study for the 27 MW Phase 1A site, the technical assumptions from which will then be used as the basis for other phases of the Project;
- Perform an economic and financial analysis for the Project to determine the need for:
  - gap funding (i.e. grants or subsidies) and/or concessional financing from the Government of India, State Governments, international and bilateral financing institutions, and/or other sources under various business models for various phases of the Project.
  - policy and/or regulatory incentives (i.e. quotas, tariffs, charges, penalties) to capture the economic benefits of energy storage through evaluation of monetizable benefits of energy storage systems to the grid (e.g. energy time shift, ancillary services, spinning reserve and deferment of additional T&D network investments).

- A Study Tour for IEDCL and Indian regulators and/or utilities to the United Sates to gain exposure to viable business models for integrated renewable energy and energy storage projects.
- Develop a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India.
- Develop a master plan for the entire 1,150 MW Project for enabling dispatchable wind and solar PV generation through a combination of smoothening the intermittent generation and shifting the generation to match the grid load curve; and
- Forecast the cost-performance parameters of various competing energy storage technologies under various stages of development and demonstration and revising the master plan and financial models to help calibrate the right technology selection for Phase 2 and Phase 3.

**Task 1: Develop Work Plan and Define Overall Study Parameters**

Sub-task 1.1: Document and Data Review

The Contractor shall conduct and document and data review to begin the project. To facilitate this review, the Grantee shall provide all relevant and necessary Project information and available documentation to the Contractor. In particular, the Grantee shall provide, at a minimum, the following:

- Wind and solar PV power data and planning documentation for the Project, including:
    - Historical wind mast and wind power production data for the Project;
    - Solar irradiation data for the Project;
    - Baseline capital costs for the wind and solar PV components of the Project;
    - Baseline transmission interconnection costs for the Project; and
    - A timeline for Project development.

The Contractor shall review and analyze all of the information collected or provided by the Grantee and stakeholders identified by the Grantee in order to understand current planning for all three proposed phases of the Project.

Sub-task 1.2: Kickoff Meeting, Stakeholder Consultations, and Work Plan

The Contractor shall conduct a kickoff meeting with the Grantee and other stakeholders identified by the Grantee at the Grantee's facilities, or at another appropriate venue agreed upon by the Contractor and the Grantee. The Grantee shall identify appropriate personnel and other relevant stakeholders to participate in the kickoff meeting. The Contractor shall review the tasks to be performed under these Terms of Reference, and review the Contractor's existing work plan to perform the tasks under these Terms of Reference. The Contractor shall obtain Grantee approval for the Contractor's work plan for the TA.

The Contractor shall produce a high level report with the overall parameters for the Project based on available data, project planning documents, and stakeholder meetings conducted in Task 1.

Task 1 Deliverable(s) - The Contractor shall provide the Grantee with a summary report based on the review and analysis of documents and data provided by the Grantee. The Contractor shall provide the Grantee with a copy of the work plan for the TA, as approved by the Grantee.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 2. Technical Assessment of the Project**

The Contractor shall conduct site visits to the Ramagiri and Nana Layja sites, and assess the sites for the Project in terms of wind and solar resources and grid connectivity for all the 3 phases of the Project (Phase 1A, Phase 1B, Phase 2 and Phase 3).

Task 2.a Wind Resource Assessment and Energy Estimates

Based on the data collected in Task 1 and other available data the Contractor finds appropriate, the Contractor shall conduct a full wind resource assessment of the sites for all 3 phases including, but not limited to:

1. Data cleaning and Quality Assurance/Quality Control;
2. Extrapolation of the data over the expected life of the Project;
3. Vertical extrapolation to hub-height(s);
4. Flow-modeling to extrapolate the wind resource over the Project area;
5. Setback and buffer review;
6. Micro-siting of the site for optimum layout and generation maximization;
7. Layout optimization for not less than four turbines and/or turbine configurations;
8. Shadow flicker and sound calculation for each configuration/layout;
9. Estimation of energy output for each configuration/layout;
10. Monthly and diurnal production estimates (12x24);
11. Annual hourly energy estimates (8760 hours per year);
12. Uncertainty analysis; and
13. Recommendations for additional data acquisition and studies.

The Grantee shall provide wind turbine models to be used in the Contractor's wind resource assessment.

Task 2.b Solar PV Resource Estimate and Energy Estimates

The Contractor shall assess the solar PV resource for the Ramagiri and Nana Layia sites for all 3 Phases of the Project using GeoModel Solar Time series 18-year hourly data (Direct Normal Irradiation, Temperature, Relative Humidity, Atmospheric Temperature, Wind Speed, etc.) or other satellite-derived data, and data adapted from in-situ or neighboring weather stations' measurements, collected by the Contractor. The data shall be analyzed to create a typical meteorological year for the performance modeling of the PV power plant.

Task 2.c Develop Energy Estimates

The Contractor shall model plant performance at the sites and develop combined energy production estimates for the sites and an energy production profile which estimates hourly energy production for different seasons.

Task 2.d Transmission Grid Interconnection Analysis

The Contractor shall analyze the grid in the region of interconnection sufficient to model the impact to the system by the addition of the Project for all 3 phases. This analysis shall model congestion expected and determine any likely necessary system upgrades and estimate their costs based on baseline cost data provided by the Grantee. The Contactor shall analyze the monetizable benefits of deferment of transmission system augmentation (or abating its congestion) achievable through the integration of energy storage.

The analysis shall include a transmission network study which considers plans for future transmission networks, including the Green Corridors being planned by Power Grid Corporation of India Limited. The Contractor's analysis shall include load flow analysis and transient stability studies.

The Contractor shall perform simulation modeling based on wind speed and solar PV irradiation data in order to assess the stochastic nature of the renewable energy supply.

The Contractor shall analyze demand variations in the region, including:

- Inability of the grid to accept power based on historical data;
- Load curve analysis to identify peak power periods; and
- Tariff analysis to identify current and planned time of day tariffs and power purchase pricing. The Grantee shall work with the Contractor to identify this information.

The Contractor shall evaluate options for scheduling the delivery of produced electricity from the Ramagiri Phase 1A project and all the remaining phases of the Project to the grid in accordance with the Indian electricity grid code.

Task 2.e Energy Storage Technology Assessment

The Contractor shall perform a technology assessment for energy storage technologies available for deployment within the Project timeline, including the following:

- Research and identify energy storage technologies that would meet the requirements of the Project, including commercial availability (ready for commercial utility deployment) during the 3 phases of the Project timeline;

- Evaluate energy storage technologies based on key performance metrics (i.e. Energy Density; Discharge Time; Power Rating; Energy Rating; Depth of Discharge; Life Discharge Cycles; Rapidity of Charge/Discharge Cycle; and Loss of Energy in One Discharge Cycle or Cycle Efficiency) and its suitability for various integration applications (e.g., energy time shift, frequency regulation, voltage support, deferment of T&D network addition);
- Conduct discussions with suppliers of energy storage technologies to gather information on current operations and production, as well as other technical details;
- Evaluate the capital and operational costs of the technologies over the timeline for implementation of all 3 Phases of the Project;
- Perform a risk analysis for the technologies, including, but not limited to, supply risk, price changes, and technical performance risk, and prepare a risk mitigation matrix; and
- Estimate the levelized cost of energy storage per kWh of delivered energy over the life of the storage technology for all 3 Phases of the Project, taking into consideration (a) the life-cycle of the various competing technology options and (b) the SCADA and control system required for operation.

The Contractor shall recommend suitable energy storage technologies for the Ramagiri Phase 1A project and for all the remaining phases of the Project, taking into consideration different business models as detailed in Task 3.

The Contractor shall perform an assessment of available technologies for monitoring and operation of the Project including SCADA systems, energy management systems, and other technologies and software for the efficient operation of the Project. The assessment shall consider factors such as cost and maturity of various technologies and will serve as the basis for the Task 3 technical design.

Task 2 Deliverable(s): The Contractor shall deliver to the Grantee:

- A wind and solar PV resource and energy assessment report for the Project site. Within this report will be clear net energy estimates and uncertainty results for use as inputs to the financial model, financing plan and other purposes. Results shall be presented in the report as well as an editable electronic format (Microsoft Excel or similar) which can be modified by the Grantee;
- A transmission grid interconnection analysis;

- An energy storage technology assessment which clearly specifies the technology to be implemented during the 3 Phases of the Project for various business models with their cost and performance parameters; and
- A risk mitigation matrix .

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 3. Plan, Organize, and Conduct Study Tour**

The Contractor shall plan, organize, and conduct a Study Tour of U.S. for up to eight (8) Grantee and other stakeholder personnel for 10 business days. However, the Contractor shall only cover the costs of up to five (5) personnel; the Grantee shall have the option to nominate up to three (3) additional personnel at its own cost for a total of eight (8) personnel.

The Study Tour shall cover best practices in integrated renewable energy and energy storage (advanced battery storage) project development covering technical, financing, business model and regulatory issues. The objective of the Study Tour is to promote cooperation between stakeholders of India and United States on energy storage issues. The Indian delegation shall include representatives from Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commission (SERC), Govt. of Andhra Pradesh (GOAP) and the Grantee. Visit and knowledge exchange program is to facilitate Indian policy makers' efforts towards appropriate policy design, minimize the technology learning curve and support evolution of appropriate business models for energy storage in India.

The Study Tour shall include, at a minimum:

- Visits with active energy storage facilities
- Meetings and visits with state and federal regulators
- Meetings with U.S. technology suppliers and service providers
- Meetings and visits with investor owned companies or utilities actively engaged in energy storage project implementation
- Meetings and discussions with prospective developers of energy storage facilities

The Contractor, taking into account the Grantee's needs, shall determine the most appropriate facilities to visit. The Contractor shall develop a preliminary travel itinerary

including site visits and rationale for visiting each site and obtain the Grantee approval at least two weeks prior to the Grantee personnel departure from India. The Contractor shall provide for international economy class travel, U.S. domestic economy class travel, appropriate travel insurance, lodging and meals for at least the five (5) Study Tour participants whose expenses the Contractor is responsible for.

Prior to the trip, the Contractor shall also prepare a report (Pre-trip Report) consisting of two parts. Part one should introduce the Project and visitors to the U.S. participants in the Study Tour. It should provide background information on the Project (e.g. goal and objective of the Study Tour and the scope of the Project) and professional biographical sketches of each one of the visitors. Part two of the report should provide background information on each site to be visited. The objective of part two of the Pre-Trip Report is to familiarize the participants to attributes of each site before they arrive at the site.

Upon completion of the visit, the Contractor shall also prepare a brief report (Post-trip Report) summarizing the outcome of each visit and technology areas of interest to the visitors, a list of attendees and contact information from each site visit/meeting.

Task 3 Deliverable(s): The Contractor shall prepare and deliver to the Grantee a report that contains all information collected, work performed and analysis provided under Task 3. This shall include: a Final approved itinerary, Pre-trip Report, Post-trip Report, and a report on best practices in advanced battery energy storage; regulation for integration of energy storage; operational and business models; and financing mechanisms.

**Task 4. Technical Design and Cost Assessment**

The Grantee shall provide to the Contractor information on the price of solar PV and wind power project pricing in India for the multiple phases of the project.

Based on the work performed in Task 2 and the price information provided by the Grantee, the Contractor shall develop a baseline technical design (sizing and specification of the system) and cost estimate (plus or minus 25%) for the Ramagiri Phase IA project.

Based on the Ramagiri Phase 1A design and cost estimate, the Contractor shall develop a baseline master plan for all 3 Phases of the Project for optimum configuration of wind, solar PV and energy storage capacity. The master plan shall include conceptual designs and cost estimates for all phases of the Project.

The Contractor shall provide conceptual plans for technical and commercial options for the all 3 phases of the Project for, at a minimum, the following business models:

- Business Model 1: Provide schedule certainty for wind projects for interstate and intrastate sales: Minimum storage for wind farm only required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting. This analysis will apply to the cost benefit analysis (Task 6) and to the regulatory strategy (Task 8).

- Business Model 2: Provide schedule certainty for wind plus solar PV projects for interstate and intrastate sales: Minimum storage for a wind and solar PV combined project required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting;

- Business Model 3: Provide a portion of the total power (10%, 20% and 30%) stored and injected in the grid during peak hours;

- Business Model 4: Provide grid ancillary services;

- Business Model 5: Optimal storage required for wind and wind plus solar PV for a time shift of 2-3 hrs, 4-6 hrs, and 5-8 hrs; and

- Business Model 6: Optimal storage required for deferral of transmission network capacity of 10%, 20% and 30% of the total transmission capacity

The Grantee shall provide revenue assumptions for various business models, with the exception of Model 4 (ancillary services) and Model 6. The Contractor shall establish an estimate of revenues for ancillary services based on data from other countries. The Grantee shall also provide Indian financing assumptions for the Contractor to use in the modeling.

Based on this analysis, the Contractor shall develop a conceptual design and cost estimates for the 3 Phases of the Project for each of the above business models.

Based on the evaluation of business model scenarios, the Grantee shall select a model and the Contractor shall prepare a detailed technical design for the Ramagiri Phase IA project. The Contractor's design shall include a schematic layout with single line electrical drawings for the wind and solar PV project with energy storage and grid interconnection. The Contractor shall prepare a schematic design of a SCADA system for effective weather monitoring, forecasting and energy dispatch including the control methodology with identification of vendors for energy storage and for implementing the control/SCADA system.

The Contractor, considering the sizing and technical specification of the Project shall design a comprehensive control system for seamless operation of energy storage system in compliance with the Indian electricity grid code. The design of the control system for energy storage shall address the following, at a minimum:

- Battery Management System which monitors, balances and protects battery cells
- Power Management which controls power input and output on demand, both real power and reactive power.
- Energy Management which supports grid applications such as peak shaving, renewable integration and load leveling.
- Remote Communication which supports remote control interfaces such as Web Services.

The Contractor shall develop the total capital and operating cost estimates (plus minus 25%) for wind, solar PV and energy storage installation, grid interconnection and SCADA for the Ramagiri Phase IA project.

Task 4 Deliverable(s): The Contractor shall deliver technical design and cost estimates for the Ramagiri Phase IA project and conceptual design and cost estimates for the 3 Phases of the Project for all the business models.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 5: U.S. Sources of Supply**

The Contractor shall conduct an assessment of the availability of potential U.S. sources of supply for the hardware, software, and services needed for the implementation of the Project. The Contractor shall provide a list of potential U.S. suppliers including business name, point of contact, address, telephone number, e-mail, and fax numbers.

Deliverable: The Contractor shall deliver a report on Task 5 that shall include a list of U.S. sources of supply by type of hardware, software, and services.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 6: Developmental Impact Assessment**

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

Infrastructure: The Contractor shall provide a description of the infrastructure impact of the implementation of the 1150 MW wind/solar PV/energy storage Project, including transmission upgrades.

Human Capacity Building: The Contractor shall assess the number and type of positions that would be needed to construct and operate the Project as well as the number of people who will require training and a brief description of the training programs.

Technology Transfer and Productivity Enhancement: The Contractor shall provide a description of any advanced technologies that will be implemented as a result of the Project, particularly the energy storage technologies and the energy management systems for integrating the renewable power and energy storage and dispatching that power to the grid. The Contractor shall estimate the productivity enhancement from the improved delivery of renewable power to the grid.

Environmental Benefits: The Contractor shall provide a description and quantify any environmental benefits from the implementation of the Project in terms of the quantity of Co2 emission reduction

Other: The Contractor shall identify any other developmental benefits of the Project, including any spin-off or demonstration projects and/or impacts.

Task 6 Deliverable(s): The Contractor shall prepare a developmental impact assessment report based on the work conducted in Task 6.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 7. Economic and Cost Benefit Analysis**

The Contractor shall perform a cost benefit analysis of the Project with the objective of developing an economic planning document that will assist the Grantee, in collaboration with other stakeholders, in creating a roadmap and implementing framework for energy storage. The document will also be used to establish the basis for requesting grants, subsidies and other incentives for energy storage.

The Contractor shall quantify the quality of power improvement (frequency, flicker, harmonics) from the energy storage system as part of the grid ancillary services provided by the Project.

Based on the energy storage technologies assessment performed, the Contractor shall estimate how the prices of the selected energy storage technologies are expected to change over time. This will include an estimate of how energy storage prices will change as the technologies are localized in the Indian economy over time.

The Contractor shall perform an economic analysis of the proposed Project and a comparison to the Project without the energy storage component. The analysis shall take into account the requirements of regulatory agencies for approval of tariffs and cost recovery grants, subsidies and other incentives that will support the Project. The Contractor's analysis shall address the potential of the Project to increase the availability of power during peak demand periods.

Task 7 Deliverable(s): The Contractor shall deliver a cost benefit analysis and economic analysis for the Project based on the work performed in Task 7.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 8. Financial Analysis and Financing Plan**

8.a Financial Analysis

The Contractor shall develop a financial model for the Project, broken down by the 3 Phases. The financial analysis shall be shown in pro-forma cash flow spreadsheets over a 20-year operating period for the Project. The financial analysis shall cover the following areas:

- Income Statement: The Contractor shall provide a forecast of operating revenues, operating costs, depreciation, and profits before and after taxes;
- Cash Flow Statement: The Contractor shall provide a forecast of net operating income after deduction of depreciation from after-tax profits, and allowance for inflows of bank loans and equity capital contributions. The Contractor shall estimate annual cash outflows by deducting loan payments and construction costs paid to contractors. The Contractor shall provide a forecast of annual net cash balances;
- Financing Ratios: The Contractor shall establish debt/equity ratios and debt service ratios;
- Financial Performance Indicators: The Contractor shall calculate the financial internal rate of return (FIRR) and return on equity (ROE); and
- Sensitivity Analyses: The Contractor shall evaluate the impact on FIRR and ROE for key variables (i.e. CAPEX, OPEX, tariffs, energy production, interest rates, inflation rates, subsidies, taxes) as agreed with the Grantee.

8.b Financing Plan

Based on the financial analysis, the Contractor shall estimate the viability gap funding (VGF) and/or policy support and incentives (i.e. upfront capital subsidy, accelerated depreciation, generation based incentives) required from regional utilities and/or state and central government for each phase of the Project in order for the Project's produced power to remain competitive in the market.

The Contractor shall assess the availability of financing and/or grant funding from national, bilateral and multilateral financing institutions such as Power Grid Corporation of India Limited, other Government of India institutions, the World Bank, IFC, USAID, Asian Development Bank, the Export-Import Bank of the United States and the Overseas Private Investment Corporation for the Project. The Contractor shall hold discussions with these institutions to solicit their interest in providing financing and/or other types of funding for the Project.

The Contractor shall develop a financing plan for the Project based on the analysis and discussions with prospective financing and gap funding institutions.

Task 8 Deliverable(s): The Contractor shall deliver a financial analysis for the Project and a financing plan for the Project.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 9: Analysis of Regulatory Issues and Development of Strategy Document**

The Contractor shall conduct a review of policies and regulations related to energy storage in place or being developed in at least three other countries (including the United States (specifically in the state of California and/or Texas and/or New York) and one other high income country and one low or middle income country) such as technical specifications for grid connectivity; financial incentives in term of tariffs or subsidies mechanisms existing and proposed; and other programs for the promotion for energy storage.

The Contractor shall review existing business models for operational projects (with minimum energy storage capacity of 20 MWh) for at least five energy storage integrated applications (e.g., frequency regulation, energy time shift to meet peak demand, T&D upgrade deferral, spinning reserves, ancillary services). The analysis of the business models should cover: technology adopted, sizing of energy storage, regulatory framework, funding/financing mechanism, statutory approvals, infrastructure requirement, implementation model, gestation period, testing and stabilization, performance assessment, and tariff mechanism.

The Contractor shall evaluate and quantify in monetary terms the benefits of the energy storage system in the proposed Project, for the abovementioned integrated applications and recommend a conducive regulatory framework for promotion and development of energy storage in India, including the tariff mechanism and technical standards.

The Contractor shall review the regulatory framework under which the Project will be deployed (including state and central government regulations). The Contractor shall review the existing grid code for connecting different sources of power generation and assess: limits of penetration; interconnection barriers; and norms and quality issues.

The Contractor shall meet with state and central Indian government regulatory agencies and other relevant stakeholders to gather information on current and planned policies and regulations related to energy storage and renewable energy applicable to the Project. The Contractor shall work with the Grantee to develop a strategy document to be used by the Grantee to approach Indian regulatory and policymaking institutions. The strategy document shall include and detailed recommendations for regulatory and policy support for energy storage including tariffs, subsidies and other incentives necessary to support the Project .

Task 9 Deliverable(s): The Contractor shall deliver a report on all work conducted in Task 9 including an analysis of regulatory requirements.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 10. Preliminary Environmental Impact Assessment**

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

Task 10 Deliverable(s): The Contractor shall prepare a preliminary environmental impact assessment report based on the work conducted in Task 10. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 11. Implementation Plan**

Based on the previous tasks, the Contractor, in conjunction with the Grantee, shall develop an implementation plan that clearly outlines the anticipated next steps necessary to implement the Project. The plan shall include but not be limited to: phasing of the Project; plans for adopting new technologies, including training programs; plans to facilitate regulatory and policy development; a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India; and plans for securing gap funding for deployment of the Project. The Contractor shall develop a tentative schedule in which milestones could be ideally achieved. The Contractor shall present a draft implementation plan to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

Task 11 Deliverable(s): The Contractor shall prepare and deliver an Implementation Plan. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 12. Final Report**

The Contractor shall present the Final Report in person to the Grantee and in consultation and agreement with Grantee to all other stakeholders, including regulatory agencies.

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

- Adobe Acrobat readable copies of all documents;
- Source files for all drawings in AutoCAD or Visio format; and
- Source files for all documents in MS Office 2000 or later formats.

# ANNEX 5
# TERMS OF REFERENCE (FROM USTDA GRANT AGREEMENTAMENDMENT)

## ANNEX I

AMENDMENT NO. 1 TERMS OF REFERENCE

IL&FS Energy Development Company Limited (IEDCL) (Grantee) plans to build the Integrated Wind, Solar PV, and Energy Storage Project (Project). The Project consists of: a 1000 MW integrated wind, solar PV and energy storage project in Ananthpur District, Andhra Pradesh; and a 150 MW integrated wind, solar PV and energy storage project in Kutch District, Gujarat.

Phase 1 would consist of 100 MW of wind and solar PV projects with an appropriate amount of energy storage. Of this, the first 27 MW project, Phase 1A, has been secured at the Grantee's existing site at Ramagiri, Ananthapur district of Andhra Pradesh State. The Phase 1A project at the Ramagiri site is an existing (19 year old) wind project of 6.5 MW comprised of 26 wind turbines (250 kW each). The project is on 170 acres of land and would be repowered with new larger capacity wind turbines. The projection of capacity is roughly estimated to be 27 MW (22 MW wind, 5 MW solar PV) with 8 MW of energy storage (with an estimated 6 hours storage capacity) and would be planned as a demonstration project for the 1150 MW full scale Project. The Phase 1A site has historical wind mast data and existing grid interconnection so that it can be implemented rapidly. Phase 1B would be an additional 73 MW located at a contiguous site to Phase 1A. Phase II would include 300 MW and Phase III would be 600 MW within the same area as the Ramagiri project site at Ananthpur District, Andhra Pradesh State. Phase II and Phase III would also include 50 MW and 100 MW at a separate site in Nana Layja in Kutch District, Gujarat State.

IEDCL's estimated timeframe for the phases is as follows:

Phase 1A: 27MW Construction Begins Jan 2016

Phase 1B: 73MW Construction Begins Oct 2016

Phase 2: 300MW at Ananthpur and 50 MW at Kutch 2017-2018

Phase 3: 600MW at Ananthpur and 100 MW at Kutch 2019-2020

The objectives of these Technical Assistance (TA) Terms of Reference are to:

- Evaluate and recommend grid interactive energy storage technologies for the Project;
- Evaluate and recommend energy storage technologies and an integrated wind, solar PV and energy storage design for the Project that:

- improves efficient dispatch of renewable power within the State of Andhra Pradesh and Gujarat and to other Indian states (e.g. through Power Grid Corporation of India Limited's proposed Green Corridor); and
- maximizes the financial benefits of delivery of renewable energy for the project developers under various business models over multiple phases of the Project.

- Conduct a feasibility study for the 27 MW Phase 1A site, the technical assumptions from which will then be used as the basis for other phases of the Project;
- Perform an economic and financial analysis for the Project to determine the need for:
  - gap funding (i.e. grants or subsidies) and/or concessional financing from the Government of India, State Governments, international and bilateral financing institutions, and/or other sources under various business models for various phases of the Project.
  - policy and/or regulatory incentives (i.e. quotas, tariffs, charges, penalties) to capture the economic benefits of energy storage through evaluation of monetizable benefits of energy storage systems to the grid (e.g. energy time shift, ancillary services, spinning reserve and deferment of additional T&D network investments).

- A Study Tour for IEDCL and Indian regulators and/or utilities to the United Sates to gain exposure to viable business models for integrated renewable energy and energy storage projects.
- Develop a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India.
- Develop a master plan for the entire 1,150 MW Project for enabling dispatchable wind and solar PV generation through a combination of smoothening the intermittent generation and shifting the generation to match the grid load curve; and
- Forecast the cost-performance parameters of various competing energy storage technologies under various stages of development and demonstration and revising the master plan and financial models to help calibrate the right technology selection for Phase 2 and Phase 3.

**Task 1: Develop Work Plan and Define Overall Study Parameters**

Sub-task 1.1: Document and Data Review

The Contractor shall conduct and document and data review to begin the project. To facilitate this review, the Grantee shall provide all relevant and necessary Project information and available documentation to the Contractor. In particular, the Grantee shall provide, at a minimum, the following:

- Wind and solar PV power data and planning documentation for the Project, including:
    - Historical wind mast and wind power production data for the Project;
    - Solar irradiation data for the Project;
    - Baseline capital costs for the wind and solar PV components of the Project;
    - Baseline transmission interconnection costs for the Project; and
    - A timeline for Project development.

The Contractor shall review and analyze all of the information collected or provided by the Grantee and stakeholders identified by the Grantee in order to understand current planning for all three proposed phases of the Project.

Sub-task 1.2: Kickoff Meeting, Stakeholder Consultations, and Work Plan

The Contractor shall conduct a kickoff meeting with the Grantee and other stakeholders identified by the Grantee at the Grantee's facilities, or at another appropriate venue agreed upon by the Contractor and the Grantee. The Grantee shall identify appropriate personnel and other relevant stakeholders to participate in the kickoff meeting. The Contractor shall review the tasks to be performed under these Terms of Reference, and review the Contractor's existing work plan to perform the tasks under these Terms of Reference. The Contractor shall obtain Grantee approval for the Contractor's work plan for the TA.

The Contractor shall produce a high level report with the overall parameters for the Project based on available data, project planning documents, and stakeholder meetings conducted in Task 1.

Task 1 Deliverable(s) - The Contractor shall provide the Grantee with a summary report based on the review and analysis of documents and data provided by the Grantee. The Contractor shall provide the Grantee with a copy of the work plan for the TA, as approved by the Grantee.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 2. Technical Assessment of the Project**

The Contractor shall conduct site visits to the Ramagiri and Nana Layja sites, and assess the sites for the Project in terms of wind and solar resources and grid connectivity for all the 3 phases of the Project (Phase 1A, Phase 1B, Phase 2 and Phase 3).

Task 2.a Wind Resource Assessment and Energy Estimates

Based on the data collected in Task 1 and other available data the Contractor finds appropriate, the Contractor shall conduct a full wind resource assessment of the sites for all 3 phases including, but not limited to:

1. Data cleaning and Quality Assurance/Quality Control;
2. Extrapolation of the data over the expected life of the Project;
3. Vertical extrapolation to hub-height(s);
4. Flow-modeling to extrapolate the wind resource over the Project area;
5. Setback and buffer review;
6. Micro-siting of the site for optimum layout and generation maximization;
7. Layout optimization for not less than four turbines and/or turbine configurations;
8. Shadow flicker and sound calculation for each configuration/layout;
9. Estimation of energy output for each configuration/layout;
10. Monthly and diurnal production estimates (12x24);
11. Annual hourly energy estimates (8760 hours per year);
12. Uncertainty analysis; and
13. Recommendations for additional data acquisition and studies.

The Grantee shall provide wind turbine models to be used in the Contractor's wind resource assessment.

Task 2.b Solar PV Resource Estimate and Energy Estimates

The Contractor shall assess the solar PV resource for the Ramagiri and Nana Layia sites for all 3 Phases of the Project using GeoModel Solar Time series 18-year hourly data (Direct Normal Irradiation, Temperature, Relative Humidity, Atmospheric Temperature, Wind Speed, etc.) or other satellite-derived data, and data adapted from in-situ or neighboring weather stations' measurements, collected by the Contractor. The data shall be analyzed to create a typical meteorological year for the performance modeling of the PV power plant.

Task 2.c Develop Energy Estimates

The Contractor shall model plant performance at the sites and develop combined energy production estimates for the sites and an energy production profile which estimates hourly energy production for different seasons.

Task 2.d Transmission Grid Interconnection Analysis

The Contractor shall analyze the grid in the region of interconnection sufficient to model the impact to the system by the addition of the Project for all 3 phases. This analysis shall model congestion expected and determine any likely necessary system upgrades and estimate their costs based on baseline cost data provided by the Grantee. The Contactor shall analyze the monetizable benefits of deferment of transmission system augmentation (or abating its congestion) achievable through the integration of energy storage.

The analysis shall include a transmission network study which considers plans for future transmission networks, including the Green Corridors being planned by Power Grid Corporation of India Limited. The Contractor's analysis shall include load flow analysis and transient stability studies.

The Contractor shall perform simulation modeling based on wind speed and solar PV irradiation data in order to assess the stochastic nature of the renewable energy supply.

The Contractor shall analyze demand variations in the region, including:

- Inability of the grid to accept power based on historical data;
- Load curve analysis to identify peak power periods; and
- Tariff analysis to identify current and planned time of day tariffs and power purchase pricing. The Grantee shall work with the Contractor to identify this information.

The Contractor shall evaluate options for scheduling the delivery of produced electricity from the Ramagiri Phase 1A project and all the remaining phases of the Project to the grid in accordance with the Indian electricity grid code.

Task 2.e Energy Storage Technology Assessment

The Contractor shall perform a technology assessment for energy storage technologies available for deployment within the Project timeline, including the following:

- Research and identify energy storage technologies that would meet the requirements of the Project, including commercial availability (ready for commercial utility deployment) during the 3 phases of the Project timeline;

- Evaluate energy storage technologies based on key performance metrics (i.e. Energy Density; Discharge Time; Power Rating; Energy Rating; Depth of Discharge; Life Discharge Cycles; Rapidity of Charge/Discharge Cycle; and Loss of Energy in One Discharge Cycle or Cycle Efficiency) and its suitability for various integration applications (e.g., energy time shift, frequency regulation, voltage support, deferment of T&D network addition);
- Conduct discussions with suppliers of energy storage technologies to gather information on current operations and production, as well as other technical details;
- Evaluate the capital and operational costs of the technologies over the timeline for implementation of all 3 Phases of the Project;
- Perform a risk analysis for the technologies, including, but not limited to, supply risk, price changes, and technical performance risk, and prepare a risk mitigation matrix; and
- Estimate the levelized cost of energy storage per kWh of delivered energy over the life of the storage technology for all 3 Phases of the Project, taking into consideration (a) the life-cycle of the various competing technology options and (b) the SCADA and control system required for operation.

The Contractor shall recommend suitable energy storage technologies for the Ramagiri Phase 1A project and for all the remaining phases of the Project, taking into consideration different business models as detailed in Task 3.

The Contractor shall perform an assessment of available technologies for monitoring and operation of the Project including SCADA systems, energy management systems, and other technologies and software for the efficient operation of the Project. The assessment shall consider factors such as cost and maturity of various technologies and will serve as the basis for the Task 3 technical design.

Task 2 Deliverable(s): The Contractor shall deliver to the Grantee:

- A wind and solar PV resource and energy assessment report for the Project site. Within this report will be clear net energy estimates and uncertainty results for use as inputs to the financial model, financing plan and other purposes. Results shall be presented in the report as well as an editable electronic format (Microsoft Excel or similar) which can be modified by the Grantee;
- A transmission grid interconnection analysis;

- An energy storage technology assessment which clearly specifies the technology to be implemented during the 3 Phases of the Project for various business models with their cost and performance parameters; and
- A risk mitigation matrix .

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 3. Plan, Organize, and Conduct Study Tour**

The Contractor shall plan, organize, and conduct a Study Tour of U.S. for up to eight (8) Grantee and other stakeholder personnel for 10 business days. However, the Contractor shall only cover the costs of up to five (5) personnel; the Grantee shall have the option to nominate up to three (3) additional personnel at its own cost for a total of eight (8) personnel.

The Study Tour shall cover best practices in integrated renewable energy and energy storage (advanced battery storage) project development covering technical, financing, business model and regulatory issues. The objective of the Study Tour is to promote cooperation between stakeholders of India and United States on energy storage issues. The Indian delegation shall include representatives from Central Electricity Regulatory Commission (CERC), State Electricity Regulatory Commission (SERC), Govt. of Andhra Pradesh (GOAP) and the Grantee. Visit and knowledge exchange program is to facilitate Indian policy makers' efforts towards appropriate policy design, minimize the technology learning curve and support evolution of appropriate business models for energy storage in India.

The Study Tour shall include, at a minimum:

- Visits with active energy storage facilities
- Meetings and visits with state and federal regulators
- Meetings with U.S. technology suppliers and service providers
- Meetings and visits with investor owned companies or utilities actively engaged in energy storage project implementation
- Meetings and discussions with prospective developers of energy storage facilities

The Contractor, taking into account the Grantee's needs, shall determine the most appropriate facilities to visit. The Contractor shall develop a preliminary travel itinerary

including site visits and rationale for visiting each site and obtain the Grantee approval at least two weeks prior to the Grantee personnel departure from India. The Contractor shall provide for international economy class travel, U.S. domestic economy class travel, appropriate travel insurance, lodging and meals for at least the five (5) Study Tour participants whose expenses the Contractor is responsible for.

Prior to the trip, the Contractor shall also prepare a report (Pre-trip Report) consisting of two parts. Part one should introduce the Project and visitors to the U.S. participants in the Study Tour. It should provide background information on the Project (e.g. goal and objective of the Study Tour and the scope of the Project) and professional biographical sketches of each one of the visitors. Part two of the report should provide background information on each site to be visited. The objective of part two of the Pre-Trip Report is to familiarize the participants to attributes of each site before they arrive at the site.

Upon completion of the visit, the Contractor shall also prepare a brief report (Post-trip Report) summarizing the outcome of each visit and technology areas of interest to the visitors, a list of attendees and contact information from each site visit/meeting.

Task 3 Deliverable(s): The Contractor shall prepare and deliver to the Grantee a report that contains all information collected, work performed and analysis provided under Task 3. This shall include: a Final approved itinerary, Pre-trip Report, Post-trip Report, and a report on best practices in advanced battery energy storage; regulation for integration of energy storage; operational and business models; and financing mechanisms.

**Task 4. Technical Design and Cost Assessment**

The Grantee shall provide to the Contractor information on the price of solar PV and wind power project pricing in India for the multiple phases of the project.

Based on the work performed in Task 2 and the price information provided by the Grantee, the Contractor shall develop a baseline technical design (sizing and specification of the system) and cost estimate (plus or minus 25%) for the Ramagiri Phase IA project.

Based on the Ramagiri Phase 1A design and cost estimate, the Contractor shall develop a baseline master plan for all 3 Phases of the Project for optimum configuration of wind, solar PV and energy storage capacity. The master plan shall include conceptual designs and cost estimates for all phases of the Project.

The Contractor shall provide conceptual plans for technical and commercial options for the all 3 phases of the Project for, at a minimum, the following business models:

- Business Model 1: Provide schedule certainty for wind projects for interstate and intrastate sales: Minimum storage for wind farm only required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting. This analysis will apply to the cost benefit analysis (Task 6) and to the regulatory strategy (Task 8).

- Business Model 2: Provide schedule certainty for wind plus solar PV projects for interstate and intrastate sales: Minimum storage for a wind and solar PV combined project required to provide scheduling certainty of +/- 30%, +/-20%, and +/-10% in day ahead forecasting;

- Business Model 3: Provide a portion of the total power (10%, 20% and 30%) stored and injected in the grid during peak hours;

- Business Model 4: Provide grid ancillary services;

- Business Model 5: Optimal storage required for wind and wind plus solar PV for a time shift of 2-3 hrs, 4-6 hrs, and 5-8 hrs; and

- Business Model 6: Optimal storage required for deferral of transmission network capacity of 10%, 20% and 30% of the total transmission capacity

The Grantee shall provide revenue assumptions for various business models, with the exception of Model 4 (ancillary services) and Model 6. The Contractor shall establish an estimate of revenues for ancillary services based on data from other countries. The Grantee shall also provide Indian financing assumptions for the Contractor to use in the modeling.

Based on this analysis, the Contractor shall develop a conceptual design and cost estimates for the 3 Phases of the Project for each of the above business models.

Based on the evaluation of business model scenarios, the Grantee shall select a model and the Contractor shall prepare a detailed technical design for the Ramagiri Phase IA project. The Contractor's design shall include a schematic layout with single line electrical drawings for the wind and solar PV project with energy storage and grid interconnection. The Contractor shall prepare a schematic design of a SCADA system for effective weather monitoring, forecasting and energy dispatch including the control methodology with identification of vendors for energy storage and for implementing the control/SCADA system.

The Contractor, considering the sizing and technical specification of the Project shall design a comprehensive control system for seamless operation of energy storage system in compliance with the Indian electricity grid code. The design of the control system for energy storage shall address the following, at a minimum:

- Battery Management System which monitors, balances and protects battery cells
- Power Management which controls power input and output on demand, both real power and reactive power.
- Energy Management which supports grid applications such as peak shaving, renewable integration and load leveling.
- Remote Communication which supports remote control interfaces such as Web Services.

The Contractor shall develop the total capital and operating cost estimates (plus minus 25%) for wind, solar PV and energy storage installation, grid interconnection and SCADA for the Ramagiri Phase IA project.

Task 4 Deliverable(s): The Contractor shall deliver technical design and cost estimates for the Ramagiri Phase IA project and conceptual design and cost estimates for the 3 Phases of the Project for all the business models.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 5: U.S. Sources of Supply**

The Contractor shall conduct an assessment of the availability of potential U.S. sources of supply for the hardware, software, and services needed for the implementation of the Project. The Contractor shall provide a list of potential U.S. suppliers including business name, point of contact, address, telephone number, e-mail, and fax numbers.

Deliverable: The Contractor shall deliver a report on Task 5 that shall include a list of U.S. sources of supply by type of hardware, software, and services.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 6: Developmental Impact Assessment**

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

Infrastructure: The Contractor shall provide a description of the infrastructure impact of the implementation of the 1150 MW wind/solar PV/energy storage Project, including transmission upgrades.

Human Capacity Building: The Contractor shall assess the number and type of positions that would be needed to construct and operate the Project as well as the number of people who will require training and a brief description of the training programs.

Technology Transfer and Productivity Enhancement: The Contractor shall provide a description of any advanced technologies that will be implemented as a result of the Project, particularly the energy storage technologies and the energy management systems for integrating the renewable power and energy storage and dispatching that power to the grid. The Contractor shall estimate the productivity enhancement from the improved delivery of renewable power to the grid.

Environmental Benefits: The Contractor shall provide a description and quantify any environmental benefits from the implementation of the Project in terms of the quantity of Co2 emission reduction

Other: The Contractor shall identify any other developmental benefits of the Project, including any spin-off or demonstration projects and/or impacts.

Task 6 Deliverable(s): The Contractor shall prepare a developmental impact assessment report based on the work conducted in Task 6.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 7. Economic and Cost Benefit Analysis**

The Contractor shall perform a cost benefit analysis of the Project with the objective of developing an economic planning document that will assist the Grantee, in collaboration with other stakeholders, in creating a roadmap and implementing framework for energy storage. The document will also be used to establish the basis for requesting grants, subsidies and other incentives for energy storage.

The Contractor shall quantify the quality of power improvement (frequency, flicker, harmonics) from the energy storage system as part of the grid ancillary services provided by the Project.

Based on the energy storage technologies assessment performed, the Contractor shall estimate how the prices of the selected energy storage technologies are expected to change over time. This will include an estimate of how energy storage prices will change as the technologies are localized in the Indian economy over time.

The Contractor shall perform an economic analysis of the proposed Project and a comparison to the Project without the energy storage component. The analysis shall take into account the requirements of regulatory agencies for approval of tariffs and cost recovery grants, subsidies and other incentives that will support the Project. The Contractor's analysis shall address the potential of the Project to increase the availability of power during peak demand periods.

Task 7 Deliverable(s): The Contractor shall deliver a cost benefit analysis and economic analysis for the Project based on the work performed in Task 7.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 8. Financial Analysis and Financing Plan**

8.a Financial Analysis

The Contractor shall develop a financial model for the Project, broken down by the 3 Phases. The financial analysis shall be shown in pro-forma cash flow spreadsheets over a 20-year operating period for the Project. The financial analysis shall cover the following areas:

- Income Statement: The Contractor shall provide a forecast of operating revenues, operating costs, depreciation, and profits before and after taxes;
- Cash Flow Statement: The Contractor shall provide a forecast of net operating income after deduction of depreciation from after-tax profits, and allowance for inflows of bank loans and equity capital contributions. The Contractor shall estimate annual cash outflows by deducting loan payments and construction costs paid to contractors. The Contractor shall provide a forecast of annual net cash balances;
- Financing Ratios: The Contractor shall establish debt/equity ratios and debt service ratios;
- Financial Performance Indicators: The Contractor shall calculate the financial internal rate of return (FIRR) and return on equity (ROE); and
- Sensitivity Analyses: The Contractor shall evaluate the impact on FIRR and ROE for key variables (i.e. CAPEX, OPEX, tariffs, energy production, interest rates, inflation rates, subsidies, taxes) as agreed with the Grantee.

8.b Financing Plan

Based on the financial analysis, the Contractor shall estimate the viability gap funding (VGF) and/or policy support and incentives (i.e. upfront capital subsidy, accelerated depreciation, generation based incentives) required from regional utilities and/or state and central government for each phase of the Project in order for the Project's produced power to remain competitive in the market.

The Contractor shall assess the availability of financing and/or grant funding from national, bilateral and multilateral financing institutions such as Power Grid Corporation of India Limited, other Government of India institutions, the World Bank, IFC, USAID, Asian Development Bank, the Export-Import Bank of the United States and the Overseas Private Investment Corporation for the Project. The Contractor shall hold discussions with these institutions to solicit their interest in providing financing and/or other types of funding for the Project.

The Contractor shall develop a financing plan for the Project based on the analysis and discussions with prospective financing and gap funding institutions.

Task 8 Deliverable(s): The Contractor shall deliver a financial analysis for the Project and a financing plan for the Project.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 9: Analysis of Regulatory Issues and Development of Strategy Document**

The Contractor shall conduct a review of policies and regulations related to energy storage in place or being developed in at least three other countries (including the United States (specifically in the state of California and/or Texas and/or New York) and one other high income country and one low or middle income country) such as technical specifications for grid connectivity; financial incentives in term of tariffs or subsidies mechanisms existing and proposed; and other programs for the promotion for energy storage.

The Contractor shall review existing business models for operational projects (with minimum energy storage capacity of 20 MWh) for at least five energy storage integrated applications (e.g., frequency regulation, energy time shift to meet peak demand, T&D upgrade deferral, spinning reserves, ancillary services). The analysis of the business models should cover: technology adopted, sizing of energy storage, regulatory framework, funding/financing mechanism, statutory approvals, infrastructure requirement, implementation model, gestation period, testing and stabilization, performance assessment, and tariff mechanism.

The Contractor shall evaluate and quantify in monetary terms the benefits of the energy storage system in the proposed Project, for the abovementioned integrated applications and recommend a conducive regulatory framework for promotion and development of energy storage in India, including the tariff mechanism and technical standards.

The Contractor shall review the regulatory framework under which the Project will be deployed (including state and central government regulations). The Contractor shall review the existing grid code for connecting different sources of power generation and assess: limits of penetration; interconnection barriers; and norms and quality issues.

The Contractor shall meet with state and central Indian government regulatory agencies and other relevant stakeholders to gather information on current and planned policies and regulations related to energy storage and renewable energy applicable to the Project. The Contractor shall work with the Grantee to develop a strategy document to be used by the Grantee to approach Indian regulatory and policymaking institutions. The strategy document shall include and detailed recommendations for regulatory and policy support for energy storage including tariffs, subsidies and other incentives necessary to support the Project .

Task 9 Deliverable(s): The Contractor shall deliver a report on all work conducted in Task 9 including an analysis of regulatory requirements.

The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 10. Preliminary Environmental Impact Assessment**

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

Task 10 Deliverable(s): The Contractor shall prepare a preliminary environmental impact assessment report based on the work conducted in Task 10. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 11. Implementation Plan**

Based on the previous tasks, the Contractor, in conjunction with the Grantee, shall develop an implementation plan that clearly outlines the anticipated next steps necessary to implement the Project. The plan shall include but not be limited to: phasing of the Project; plans for adopting new technologies, including training programs; plans to facilitate regulatory and policy development; a strategy for the Grantee's operations within the evolving policy and regulatory framework for energy storage technology applications in India; and plans for securing gap funding for deployment of the Project. The Contractor shall develop a tentative schedule in which milestones could be ideally achieved. The Contractor shall present a draft implementation plan to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

Task 11 Deliverable(s): The Contractor shall prepare and deliver an Implementation Plan. The Contractor shall present a draft report to the Grantee for review and comment, and incorporate any appropriate feedback into the final version.

**Task 12. Final Report**

The Contractor shall present the Final Report in person to the Grantee and in consultation and agreement with Grantee to all other stakeholders, including regulatory agencies.

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

- Adobe Acrobat readable copies of all documents;
- Source files for all drawings in AutoCAD or Visio format; and
- Source files for all documents in MS Office 2000 or later formats.

# ANNEX 6

# U.S. FIRM FORM

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

### U.S. Firm Information Form

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

| | | | | | | |
|---|---|---|---|---|---|---|
| USTDA Activity Number [*To be completed by USTDA*] | 2015-31004A | | | | | |
| Activity Type [*To be completed by USTDA*] | ☐ | Feasibility Study | ✔ | Technical Assistance | ☐ | Other (specify) |
| Activity Title [*To be completed by USTDA*] | Integrated Wind, Solar and Energy Storage Project | | | | | |
| Full Legal Name of U.S. Firm | | | | | | |
| Business Address (street address only) | | | | | | |
| Telephone | | Fax | | Website | | |
| Year Established (include any predecessor company(s) and year(s) established, if appropriate). Please attach additional pages as necessary. | | | | | | |
| Type of Ownership | ☐ | Publicly Traded Company | | | | |
| | ☐ | Private Company | | | | |
| | ☐ | Other (please specify) | | | | |
| Please provide a list of directors and principal officers as detailed in Attachment A. Attached? (Not Applicable for U.S. Publicly Traded Company) | ☐ | Yes | | | | |
| If Private Company or Other (if applicable), provide a list of shareholders and the percentage of their ownership. In addition, for each shareholder that owns 15% or more shares in U.S. Firm, please complete Attachment B. | | | | | | |
| Is the U.S. Firm a wholly-owned or partially owned subsidiary? | ☐ | Yes | | | | |
| | ☐ | No | | | | |
| If so, please provide the name of the U.S. Firm's parent company(ies). In addition, for any parent identified, please complete Attachment B. | | | | | | |
| Is the U.S. Firm proposing to subcontract some of the proposed work to another firm? | ☐ | Yes | | | | |
| | ☐ | No | | | | |
| If yes, U.S. Firm shall complete Attachment C for each subcontractor. Attached? | ☐ | Yes | | | | |
| | ☐ | Not applicable | | | | |
| **Project Manager** | | | | | | |
| Name | Surname | | | | | |
| | Given Name | | | | | |
| Address | | | | | | |
| Telephone | | | | | | |
| Fax | | | | | | |
| Email | | | | | | |
| **Negotiation Prerequisites** | | | | | | |
| Discuss any current or anticipated commitments which may impact the ability of the U.S. Firm or its subcontractors to complete the Activity as proposed and reflect such impact within the project schedule. | | | | | | |
| Identify any specific information which is needed from the Grantee before commencing negotiations. | | | | | | |

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

| U.S. Firm's Representations |
|---|
| U.S. Firm shall certify to the following (or provide an explanation as to why any representation cannot be made): |
| 1. U.S. Firm is a *[check one]* ☐ Corporation ☐ LLC ☐ Partnership ☐ Sole Proprietor ☐ Other: duly organized, validly existing and in good standing under the laws of the State of: *[insert state]* . The U.S. Firm has all the requisite corporate power and authority to conduct its business as presently conducted, to submit this proposal, and if selected, to execute and deliver a contract to the Grantee for the performance of the USTDA Activity. The U.S. Firm is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority. |
| 2. The U.S. Firm has included herewith, a copy of its Articles of Incorporation (or equivalent charter or document issued by a designated authority in accordance with applicable laws that provides information and authentication regarding the legal status of an entity) and a Certificate of Good Standing (or equivalent document) issued within 1 month of the date of signature below by the State of: *[insert state]* . The U.S. Firm commits to notify USTDA and the Grantee if it becomes aware of any change in its status in the state in which it is incorporated. USTDA retains the right to request an updated certificate of good standing. **(U.S. publicly traded companies need not include Articles of Incorporation or Good Standing Certificate)** |
| 3. Neither the U.S. Firm nor any of its directors and principal officers have, within the ten-year period preceding the submission of this proposal, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property. |
| 4. Neither the U.S. Firm, nor any of its directors and principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 3 above. |
| 5. There are no federal or state tax liens pending against the assets, property or business of the U.S. Firm. The U.S. Firm, has not, within the three-year period preceding the submission of this proposal, been notified of any delinquent federal or state taxes in an amount that exceeds US$3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required. |
| 6. The U.S. Firm has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself of its debts under any bankruptcy, insolvency or other similar law. The U.S. Firm has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law. |
| 7. The U.S. Firm certifies that it complies with USTDA Nationality, Source, and Origin Requirements and shall continue to comply with such requirements throughout the duration of the USTDA-funded activity. The U.S. Firm commits to notify USTDA and the Grantee if it becomes aware of any change which might affect U.S. Firm's ability to meet the USTDA Nationality, Source, and Origin Requirements. |
| *The U.S. Firm shall notify USTDA if any of the representations are no longer true and correct.* |
| U.S. Firm certifies that the information provided in this form is true and correct. U.S. Firm understands and agrees that the U.S. Government may rely on the accuracy of this information in processing a request to participate in a USTDA-funded activity. If at any time USTDA has reason to believe that any person or entity has willfully and knowingly provided incorrect information or made false statements, USTDA may take action under applicable law. The undersigned represents and warrants that he/she has the requisite power and authority to sign on behalf of the U.S. Firm. |

| | | | |
|---|---|---|---|
| Name | | Signature | |
| Title | | | |
| Full Legal Name of U.S. Firm | | Date | |

**ATTACHMENT A**

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

### U.S. Firm Information Form – Directors and Principal Officers

**(Not Applicable for U.S. Publicly Traded Company)**

**Provide a list of all directors and principal officers (e.g., President, Chief Executive Officer, Vice-President(s), Secretary and Treasurer). Please provide full names including surname and given name.**

| | |
|---|---|
| USTDA Activity Number [*To be completed by USTDA*] | 2015-31004A |
| Activity Title [*To be completed by USTDA*] | Integrated Wind, Solar and Energy Storage Project |
| Full Legal Name of Entity | |

| Title | Name | | |
|---|---|---|---|
| **(e.g., Director, President, Chief Executive Officer, Vice-President(s), Secretary, Treasurer)** **** Please place an asterisk (*) next to the names of those principal officers who will be involved in the USTDA-funded activity*** | **Surname** | **Given Name** | **Middle Name** |
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**ATTACHMENT B**

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

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

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

| | |
|---|---|
| USTDA Activity Number [*To be completed by USTDA*] | 2015-31004A |
| Activity Title [*To be completed by USTDA*] | Integrated Wind, Solar and Energy Storage Project |
| Full Legal Name of U.S. Firm | |

| | | | |
|---|---|---|---|
| Full Legal Name of Shareholder | | | |
| Business Address of Shareholder (street address only) | | | |
| Telephone number | | Fax Number | |
| Year Established (include any predecessor company(s) and year(s) established, if appropriate). Please attach additional pages as necessary. | | | |
| Country of Shareholder's Principal Place of Business | | | |
| Please provide a list of directors and principal officers as detailed in Attachment A. Attached? | | ☐ Yes | |
| Type of Ownership | ☐ Publicly Traded Company<br>☐ Private Company<br>☐ Other | | |
| If applicable, provide a list of shareholders and the percentage of their ownership. In addition, for each shareholder that owns 15% or more shares in Shareholder, please complete Attachment B. | | | |
| Is the Shareholder a wholly-owned or partially owned subsidiary? | ☐ Yes<br>☐ No | | |
| If so, please provide the name of the Shareholder's parent(s). In addition, for any parent identified, please complete Attachment B. | | | |

*Shareholder may attach additional sheets, as necessary.*

**ATTACHMENT C**

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

## Subcontractor Information Form

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

| | |
|---|---|
| USTDA Activity Number [*To be completed by USTDA*] | 2015-31004A |
| Activity Title [*To be completed by USTDA*] | Integrated Wind, Solar and Energy Storage Project |
| Full Legal Name of Prime Contractor U.S. Firm ("U.S. Firm") | |
| Full Legal Name of Subcontractor | |
| Business Address of Subcontractor (street address only) | |
| Telephone Number | |
| Fax Number | |
| Year Established (include any predecessor company(s) and year(s) established, if appropriate). Please attach additional pages as necessary. | |

| **Subcontractor Point of Contact** | | |
|---|---|---|
| Name | Surname | |
| | Given Name | |
| Address | | |
| Telephone | | |
| Fax | | |
| Email | | |

| Subcontractor's Representations | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Subcontractor shall provide the following (or any explanation as to why any representation cannot be made), made as of the date of the proposal: | | | | | | | | | | | |
| 1. | Subcontractor is a *[check one]* | ☐ | Corporation | ☐ | LLC | ☐ | Partnership | ☐ | Sole Proprietor | ☐ | Other |
| | duly organized, validly existing and in good standing under the laws of: | *[insert state (if U.S.) or country]* | | | | | | | | | . |
| | The subcontractor has all the requisite corporate power and authority to conduct its business as presently conducted, to participate in this proposal, and if the U.S. Firm is selected, to execute and deliver a subcontract to the U.S. Firm for the performance of the USTDA Activity and to perform the USTDA Activity. The subcontractor is not debarred, suspended, or to the best of its knowledge or belief, proposed for debarment or ineligible for the award of contracts by any federal or state governmental agency or authority. | | | | | | | | | | |
| 2. | Neither the subcontractor nor any of its directors and principal officers have, within the ten-year period preceding the submission of the Offeror's proposal, been convicted of or had a civil judgment rendered against them for: commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a federal, state or local government contract or subcontract; violation of federal or state antitrust statutes relating to the submission of offers; or commission of embezzlement, theft, forgery, bribery, falsification or destruction of records, making false statements, tax evasion, violating federal or state criminal tax laws, or receiving stolen property. | | | | | | | | | | |
| 3. | Neither the subcontractor, nor any of its directors and principal officers, is presently indicted for, or otherwise criminally or civilly charged with, commission of any of the offenses enumerated in paragraph 2 above. | | | | | | | | | | |
| 4. | There are no federal or state tax liens pending against the assets, property or business of the subcontractor. The subcontractor, has not, within the three-year period preceding this RFP, been notified of any delinquent federal or state taxes in an amount that exceeds $3,000 for which the liability remains unsatisfied. Taxes are considered delinquent if (a) the tax liability has been fully determined, with no pending administrative or judicial appeals; and (b) a taxpayer has failed to pay the tax liability when full payment is due and required. | | | | | | | | | | |
| 5. | The subcontractor has not commenced a voluntary case or other proceeding seeking liquidation, reorganization or other relief with respect to itself or its debts under any bankruptcy, insolvency or other similar law. The subcontractor has not had filed against it an involuntary petition under any bankruptcy, insolvency or similar law. | | | | | | | | | | |
| 6. | The Subcontractor certifies that it complies with the USTDA Nationality, Source, and Origin Requirements and shall continue to comply with such requirements throughout the duration of the USTDA-funded activity. The Subcontractor commits to notify USTDA, the Contractor, and the Grantee if it becomes aware of any change which might affect U.S. Firm's ability to meet the USTDA Nationality, Source, and Origin Requirements. | | | | | | | | | | |
| *The selected Subcontractor shall notify the U.S. Firm, Grantee and USTDA if any of the representations included in its proposal are no longer true and correct.* | | | | | | | | | | | |
| Subcontractor certifies that the information provided in this form is true and correct. Subcontractor understands and agrees that the U.S. Government may rely on the accuracy of this information in processing a request to participate in a USTDA-funded activity. If at any time USTDA has reason to believe that any person or entity has willfully and knowingly provided incorrect information or made false statements, USTDA may take action under applicable law. The undersigned represents and warrants that he/she has the requisite power and authority to sign on behalf of the Subcontractor. | | | | | | | | | | | |

| | | | |
|---|---|---|---|
| Name | | Signature | |
| Title | | | |
| Full Legal Name of Subcontractor | | Date | |