

MOU Number: _____

MEMORANDUM OF UNDERSTANDING

For the Collaboration on Solar Energy Research and Development

Between

The Solar Energy Centre,
Ministry of New and Renewable Energy
Republic of India

and

The National Renewable Energy Laboratory,
United States Department of Energy

SUBJECT COOPERATION IN THE AREA OF SOLAR ENERGY

INTRODUCTION

The Solar Energy Centre (SEC), a technical institute within the Ministry of New and Renewable Energy (MNRE), Republic of India and the National Renewable Energy Laboratory (NREL), a United States Department of Energy national laboratory managed and operated by the Alliance for Sustainable Energy, LLC (hereafter "Participants") have collaborated for several years on advancing solar energy in India through assessing India's solar energy resources using well-established satellite-based techniques validated with ground measurements, and through informal exchange of researchers. The Participants' goals have historically overlapped in advancing the development and deployment of solar technologies.

Among other activities, NREL conducts research and analysis on photovoltaics (PV), concentrating solar power (CSP), integration with the electric power grid, and market transformation in support of the U.S. Department of Energy's Solar Energy Technologies Program (SETP). Understanding that the objective of the SETP is to develop cost-competitive solar systems and facilitate the technologies' acceptance in the marketplace, this collaboration intends to advance SETP goals.

The SEC also conducts research and analysis aimed at developing solar energy technologies and promoting their application through product development. The SEC is part of India's Ministry of New and Renewable Energy, the nodal ministry for all matters relating to new and renewable energy in India. This collaboration of SEC and NREL, and other entities as may be mutually determined by the Ministry of New and Renewable Energy and the U.S. Department of Energy, is designed to support the development and application of solar technologies in India.

It is the intent of the Participants to collaborate in activities that will further the assessment of solar resources across all of India, the evaluation of sites with the best technical and economic solar power producing potential, the development of project design and finance tools and promote the sharing of experiences in the Solar America Cities program and the Indian Solar Cities Programme and building of capacity across the spectrum of solar technologies. Also, the collaborative activities may include technical information exchanges related to development of a CSP plant and solar thermal and PV reliability. Collaborative activities in all these areas are of mutual interest to the Participants.

This Memorandum of Understanding (MOU) memorializes the Participants' intent to cooperate to maximize the benefit of their respective institutional interests.

Section I: Authority, Organization and Mission

1. Authority

- a. NREL is a Federally Funded Research and Development Center (FFRDC) managed and operated by the Alliance for Sustainable Energy, LLC for the United States Department of Energy under Contract No. DE-AC36-08GO28308. NREL's participation in the collaborative activities under this MOU is in accordance with the terms of the DOE contract and the DOE FFRDC sponsoring agreement.

The SEC is a specialized centre within MNRE and the SEC serves as MNRE's technical focal point for solar energy development in India.

2. Organization and Mission

- a. NREL's mission is to enhance energy efficiency and the production of renewable energy to bring clean, reliable and affordable energy technologies to the marketplace. NREL has active programs in solar energy, wind energy, ocean energy, biomass, geothermal energy, utility integration, transportation systems, energy efficiency, and energy analysis and applications.
- b. The mission of SEC is to serve as an effective interface between the Government of India and institutions, industry and user organizations for development, promotion and widespread utilization of solar energy in the country.

Section II: Scope of Cooperation and Objectives

The scope of this MOU is intended to focus on advancing solar energy in India. The objectives of the collaboration are to:

- Facilitate the development of accurate data on Indian solar energy resources as a basis for expanded solar applications.
- Transform market acceptance and implementation of solar applications in India
- Support PV and solar thermal component reliability.
- Support Indian efforts to develop a CSP pilot plant.
- Facilitate exchange of technical and market experts to advance solar energy in India.

Desired outcomes from this collaboration include:

- Facilitate the assessment of the solar resource throughout India.
- Cooperate to enhance MNRE's Solar Cities Programme.
- Facilitate the development of tools to support investment decisions on solar applications in India.
- Cooperate to identify and recommend solutions to PV and solar thermal component reliability issues.

- Increase the understanding of the scope and design of CSP plant in India.
- Enhance the capacity among Indian solar energy experts and stakeholders on technical, market and related aspects of expanded solar technologies in India.

Section III: Collaborative Activities

Collaborative activities under this MOU may include, but are not limited to, activities in the scientific and technical areas of mutual interest as described in Section II. The initial areas of focus should be to:

- **Expand the understanding of Indian solar energy resources** as the basis for development of solar energy in India. Through previous collaborative efforts between NREL, the SEC and other Indian partners (such as the Indian Meteorological Department), the solar resource in the northwestern part of India has been mapped. A main objective of the collaboration is to facilitate the extension of that assessment to the remainder of the country.
- **Identify optimal sites for large-scale solar in India** by facilitating the validation of existing solar data (high resolution, for both flat plate and concentrating collectors) for northwestern India collected over six years. Once the data are validated, the most economically viable sites in this region are to be identified based on GIS (geographic information systems) data and guided by MNRE, the SEC, and industry representatives.
- **Develop Solar Project Design and Finance Tools** that will allow industrial entities to investigate project economics for various solar project designs and financing options while drawing on incentive and resource information for that specific region.
- **Promote Bilateral Solar Cities** by drawing upon the experiences of the Solar America Cities program. NREL intends to facilitate the sharing of U.S. program structure, lessons learned and best practices with India as India implements its recently established Solar Cities Programme, and may facilitate the pairing of Indian and U.S. cities.

Also, the following additional areas of mutual collaboration may include:

- **CSP Pilot Plant.** This may include technical information exchanges in support of design and sourcing the plant, and may build on analysis conducted to identify optimal sites for a facility.
- **Solar Thermal and PV Component Reliability.** This may include the facilitation of testing of technology and devices at Indian institutions, and training on procedures and standards.

Collaboration may occur through several means, including joint technical projects, workshops, and researcher exchange.

Section IV: Source of Funding

1. The conduct of any collaborative activities mutually determined is subject to the availability of funds and staff available to the Participants. In the event that special funding is available for selected activities, the Participants may develop a separate written understanding for such activities. In such cases, the terms of funding should be mutually determined by both Participants before the commencement of activities and should be described in a separate written understanding pursuant to Section VIII below.
2. Each Participant is responsible for its own expenses for collaborative activities under this MOU, including all administrative costs, overhead expenses, labor costs, insurance costs, travel expenses and similar costs, unless a separate written understanding between the Participants provides otherwise. No exchange of funds is permitted under this MOU.

Section V: Reports, Documents and Release of Information

1. Each Participant intends to collaborate in a manner that facilitates exchanges of non-proprietary information. Subject to applicable laws and regulations, the Participants intend that information, data and reports of collaborative activities carried out under this MOU may be released by either Participant with the written concurrence of the other Participant.
2. Activities that may involve sharing of proprietary information and transfer of rights and interest in intellectual property are excluded from the purview of this MOU. In the event it becomes necessary to share proprietary information, separate written non-disclosure understandings should be put in place.

Section VI: Review of Activities

The Participants intend to review collaborative activities conducted under this MOU as a means to ascertain their effectiveness, document achievements and lessons, recognize technical personnel, and identify and plan areas for future collaboration. This review should take the form of annual, mutually determined meetings of key technical contacts and management from each Participant to discuss ongoing and future cooperation. Specific commitments developed pursuant to this MOU should be reflected in separate written understandings in accordance with Section VIII below.

Section VII: Disclaimer

Information transmitted by one Participant to the other under this MOU should be accurate to the best knowledge and belief of the transmitting Participant. Neither Participant makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, nor usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe upon privately owned rights.

Section VIII: Separate Written Understandings

Select activities derived from the collaborative activities under this MOU, including, as appropriate, details concerning financial arrangements and the allocation and protection of property rights, including intellectual property rights, should be confirmed in a separate written understanding between Participants. Such separate written understanding should include, as appropriate, a work plan, staffing requirements, cost estimates, funding sources, a plan for the adequate and effective protection of intellectual property rights and other arrangements or conditions that are not within the purview of this MOU.

Section IX: Status of the Memorandum of Understanding

This MOU does not create any legally binding obligations between the Participants. This MOU: (1) is not a contract; (2) may not be used to obligate or commit funds; and (3) may not be used as a basis for the transfer of funds.

Section X: Contacts and Changes

1. All notices, communications and coordination should involve, at a minimum, the following individuals, their successors and/or designees as follows:
 - a) For the Solar Energy Centre
Dr. Bibek Bandyopadhyay, Advisor and Head
19th Milestone, Institutional Area,
Gurgaon-Faridabad Road,
Gwalpahari, Gurgaon
Tel: 0124-2579207
 - b) For the National Renewable Energy Laboratory:
Dr. Dan Arvizi, Laboratory Director
Alliance for Sustainable Energy, LLC
1617 Cole Boulevard
Golden, CO 80401
Tel: 1 303 275 3016
2. The Participants recognize that implementation of the MOU may require an ongoing dialogue between the Participants and, accordingly, intend to make future changes to the MOU as technologies, policies and program goals change over time. All such changes are to be made in writing by the Participants' mutual consent.

Section XI: Commencement Date, Changes, and Discontinuation

The Participants intend to commence cooperation under this MOU upon signature. Such cooperation may continue for a period of five (5) years or until it is discontinued in writing by the Participants' mutual consent. A Participant that wishes to discontinue its participation in this MOU should endeavor to provide at least 90 days advance written notice to the other Participant.

Section XII: Miscellaneous

1. This MOU is not intended to restrict either of the Participants from participating in any activity with any other public or private organization.
2. This MOU is neither a fiscal nor a funds obligation document. Nothing in this MOU authorizes or is intended to obligate the Participants to expend, exchange, or reimburse funds, services, or supplies or transfer or receive anything of value.
3. This MOU is strictly for internal management purposes for each of the Participants. It is not legally enforceable and may not be construed to create any legal obligation on the part of either party. This MOU may not be construed to provide a private right or cause of action for or by any person or entity.
4. Each Participant should conduct the activities contemplated by this MOU in accordance with the applicable laws of its respective country, including, without limitation, export control laws.

Signed in duplicate.

Signatures

The Parties hereby initiate this MEMORANDUM OF UNDERSTANDING and acknowledge their understanding by the following signatures.

For: Solar Energy Centre:



Signature

Dr. Bibek Bandyopadhyay

Advisor and Head

Date:

Place:

For: National Renewable Energy Laboratory:



Signature

Dr. Dan Arvizu

Laboratory Director

Nov. 23, 2009

Date:

Golden, Colorado USA

Place