PMC-EF2a
(20402)

U.S. DEPARTMENT OF ENERGY
EERE PROJECT MANAGEMENT CENTER
NEPA DETERMINATION

RECIPIENT: NREL **STATE:** WY

PROJECT TITLE : Development of Low-Cost Suspension Heliostat - Solaflect Inc.; NREL Tracking No. 12-004

Funding Opportunity Announcement Number	Procurement Instrument Number	NEPA Control Number	CID Number
		NREL-12-004	GO10337

Based on my review of the information concerning the proposed action, as NEPA Compliance Officer (authorized under DOE Order 451.1A), I have made the following determination:

CX, EA, EIS APPENDIX AND NUMBER:
Description:

B5.15 Small-scale renewable energy research and development and pilot projects
Small-scale renewable energy research and development projects and small-scale pilot projects, provided that the projects are located within a previously disturbed or developed area. Covered actions would be in accordance with applicable requirements (such as local land use and zoning requirements) in the proposed project area and would incorporate appropriate control technologies and best management practices.

B3.6 Small-scale research and development, laboratory operations, and pilot projects
Siting, construction, modification, operation, and decommissioning of facilities for smallscale research and development projects; conventional laboratory operations (such as preparation of chemical standards and sample analysis); and small-scale pilot projects (generally less than 2 years) frequently conducted to verify a concept before demonstration actions, provided that construction or modification would be within or contiguous to a previously disturbed or developed area (where active utilities and currently used roads are readily accessible). Not included in this category are demonstration actions, meaning actions that are undertaken at a scale to show whether a technology would be viable on a larger scale and suitable for commercial deployment.

A9 Information gathering, analysis, and dissemination
Information gathering (including, but not limited to, literature surveys, inventories, site visits, and audits), data analysis (including, but not limited to, computer modeling), document preparation (including, but not limited to, conceptual design, feasibility studies, and analytical energy supply and demand studies), and information dissemination (including, but not limited to, document publication and distribution, and classroom training and informational programs), but not including site characterization or environmental monitoring. (See also B3.1 of appendix B to this subpart.)

A11 Technical advice and assistance to organizations
Technical advice and planning assistance to international, national, state, and local organizations.

B3.11 Outdoor tests and experiments on materials and equipment components
Outdoor tests and experiments for the development, quality assurance, or reliability of materials and equipment (including, but not limited to, weapon system components) under controlled conditions. Covered actions include, but are not limited to, burn tests (such as tests of electric cable fire resistance or the combustion characteristics of fuels), impact tests (such as pneumatic ejector tests using earthen embankments or concrete slabs designated and routinely used for that purpose), or drop, puncture, water-immersion, or thermal tests. Covered actions would not involve source, special nuclear, or byproduct materials, except encapsulated sources manufactured to applicable standards that contain source, special nuclear, or byproduct materials may be used for nondestructive actions such as detector/sensor development and testing and first responder field training.

Rational for determination:

BACKGROUND
The SunShot Incubator project represents a significant component of the U.S. Department of Energy (DOE) business strategy of partnering with U.S. industry to accelerate the commercialization of solar energy system research and development (R&D) to meet aggressive cost and installed capacity goals. This specific partnership leverages technical capabilities and resources within the National Renewable Energy Laboratory (NREL) and other DOE laboratories/facilities to enhance and support areas of expertise within a small business in order to accelerate the development of the small business's technology. This early-stage assistance in crossing the technological barriers to commercialization also provides a better level of understanding and development for the investment community to base decisions on.

PROPOSED ACTION
Project objectives include the development and demonstration of an improved heliostat with reduced costs, improved manufacturability, and well documented performance characteristics. Work would be done by a Subcontractor, Solaflect Energy, Inc. (Solaflect) of Norwich, VT. To achieve project objectives, work would be done in seven tasks over a period of 12-months, as discussed below:

• Task 1 – Baseline Heliostat. The Subcontractor would provide performance documentation on their most recent heliostat design as the baseline deliverable, including documentation of all major components. This would involve demonstrating the current Suspension Heliostat already installed in the Cheyenne, WY wind-testing site (see attached Solaflect Energy Locations). This would be used to identify modifications that would need to be made over the course of the project.

• Task 2 – Redesign Elevation Assembly. The Subcontractor would thoroughly investigate viable materials, manufacturing, and coating options to ensure that all design choices are considered. This information would be provided to NREL in a report. Once a thorough understanding of all design options is established, the Subcontractor would develop a redesigned elevation assembly in CAD software. The Subcontractor would then build an initial elevation assembly prototype to test whether the new solution with the reduced weight would be capable of safely operating in 30 mph wind speeds, successfully stowing to a safe position when wind speed first exceeds 30 mph, and have a survival wind speed of at least 85 mph without material failure. This would involve having components machined, welded, and galvanized by outside vendors. Finally, The Subcontractor would complete the final elevation assembly prototype, and it would be installed on a new or previously-installed heliostat as part of Task 3.

• Task 3 – Optical Testing. The Subcontractor would test the optical performance of the heliostat structure at the Cheyenne, WY wind testing site. This would involve mounting pointing lasers on various components of the heliostat, and measuring the movement of the laser beam on a nearby target. Finally, the Subcontractor would analyze focal images to estimate the canting errors and obtain a specified accuracy by the end of the project.

• Task 4 –Design improved heliostat controller. The Subcontractor would develop an on-board networked controller, which would decentralize control to each heliostat with significantly less input from the central computer. The deliverable would be a newly developed commercially viable controller that is capable of daily tracking operation on the selected network, as demonstrated by visual documentation. The redesigned controller would be integrated with the Subcontractor's heliostat and tested for field performance. The Subcontractor would also develop a printed circuit board (PCB) or a combination of commercial equipment that is designed and manufactured for high reliability which can be manufactured in high volumes. Controller cost reduction documentation would be provided to NREL.

• Task 5 – Evaluate reliability and redesign unreliable components. This task would include accelerated operation testing, accelerated wind testing, and survival wind testing. Accelerated operation testing would include pulsing the heliostat at a rate approximately ten times faster than normal to evaluate wear rates of bearing surfaces and relay and motor failure. Accelerated wind testing would involve the installation or retrofitting of a heliostat with the new elevation assembly built in Task 2 in Cheyenne, Wyoming, and exposing it to wind speeds of most concern to heliostat design and survival, 30 – 60 mph. Observations would be made using cameras and other sensor equipment. Testing would occur for at least six months.

The Subcontractor would then utilize the facilities of a company in California (see attached Solaflect Energy Locations) that is equipped for high wind testing by using a jet engine to create extreme wind events on demand, anywhere from 50-300 mph. A heliostat with the elevation assembly developed in Task 2 would be built on this test site and a series of tests to failure would be conducted in order to document the performance of the heliostat in extreme wind events. The special effect jet engine would be run by the operator of Bolan Jet Air.

• Task 6 – Refine and validated alternative cable drive system for heliostat. The Subcontractor would conduct tests to measure backlash on the motor in a laboratory system at the Solaflect workshop in White River Junction, VT (see attached Solaflect Energy Locations), and on the heliostat in a field setting in Norwich, VT. This would include measuring of backlash on five motors by weighting the cable in alternate directions and measuring the angular movement of the motor drum. Backlash on the azimuth heliostat motor would be measured ten times. The backlash in the motors would be measured over a two month period, and these tests would be repeated until scientifically valid results have been produced. The Subcontractor would then conduct an accelerated testing program with ten motors to ensure longevity of the winch since the heliostat duty cycle is significantly different than that for which the winches were designed. The test motors would simulate an accelerated heliostat duty cycle in the Solaflect Energy workshop in White River Junction, VT., and would approximate at least three years of heliostat movements per motor. The Subcontractor would then combine the results of the subtasks to identify an improved cable drive design that would reduce costs.

• Task 7 – Final prototype deliverable. The Subcontractor would fabricate a completed heliostat and provide performance data to verify that the heliostat meets key performance targets.

AFFECTED ENVIRONMENT
There are five locations where work would be conducted. See the aerial photos showing all locations have been uploaded to this database for more information about these locations:

(a) The Solaflect office is located in a shared office space in the center of Norwich, VT. Office work, CAD design, report and document generation in Tasks 1, 2, 4, and 7 would occur here.

(b) The Solaflect Workshop is located in a small interior space within a large industrial complex in White River Junction, VT. Component assembly and fabrication in Tasks 2, 4, and 7 would occur here. Laboratory-based cable drive train testing in Task 6 would also occur here.

(c) The Norwich, VT test site is located at the private residence of Solaflect President, Bill Bender. There is a thick tree stand blocking the installation from the road. Field-based cable drive train testing in Task 6 would occur here on an existing heliostat pad.

(d) The Cheyenne test site is located on a privately owned ranch outside of Cheyenne, WY. The installation is not visible from the road due to a dip in the terrain. Outdoor testing in Tasks 1, 3, and 5 would occur here.

(e) The survival wind testing in Task 5 at Brown Field Municipal Airport in San Diego, CA would be set-up near the E88 Experimental Hangar and on nearby abandoned runways. It is an active airport with frequent air traffic.

IMPACTS OF PROPOSED ACTION

In Task 5, it is proposed that a heliostat with the elevation assembly developed in Task 2 would be built on the test site. It is currently intended that an existing foundation would be used for this activity. If a new foundation was to be built, the maximum excavation would be 8 feet by 8 feet in size, and six inches maximum in depth in a previously disturbed area. This would be excavated by hand. All excavated material would be deposited within three feet of the excavated site. Any trenching would be a maximum of one foot in depth and 6-8 inches in width, with a length of approximately 50 feet or less. All soil would be replaced in the same location. A concrete foundation would include a maximum of 2.5 cubic yards of concrete. No other potential environmental effects would be expected. The installation of a 10 ft deep helical or driven pile may occur if it is determined that a new foundation concept should be tested.

The Task 5 survival wind testing would occur at Brown Field Municipal Airport in San Diego, CA. Noise that would be created by the special effects jet engine used for the testing would be similar to that of planes taxiing and taking off at the active airport. The noise created during the testing would be at permissible levels at the airport and conducted at times to minimize impacts to potential sensitive receptors. Noise dosimetry data of the jet engine is provided in the CTL Environmental Services report uploaded to the PMC database.

Only the outdoor testing part of Task 5 survival wind testing at Brown Field Municipal Airport would result in the emission of air pollutants. Emission testing of the jet engine is provided in the CTL Environmental Services report uploaded to the PMC database. The testing would comply with applicable federal, state, and local air regulations and would not require an air permit with the regional air quality board. None of the outdoor testing proposed at the Cheyenne, WY or Norwich, VT test sites would result in the generation of air pollutants.

The Solaflect office facility is in a commercially zoned region allowing office activities. The workshop is located in an industrially zoned region allowing the activities performed at this facility. Solar facilities are allowed by zoning ordinances in the residential locations and they would not visible from off the properties due to terrain. The maximum size of a heliostat is an 8 foot by 8 foot footprint, and the maximum size of mirrors is approximately 13 feet by 13 feet. No additional permits would be required.

Parts of the industrial yard where Solaflect has their Workshop at 9 Harrison Ave, White River Junction, VT, 05001 are located in a 100-year floodplain, which has greater than a 1% chance of flooding in a given year. The Solaflect facility was not flooded during Hurricane Irene despite extensive damage elsewhere in the floodplain of the Connecticut River. All activities of this proposed project at this location would not increase the property's susceptibility to flooding or impede the floodway or floodplain. No modification to the FEMA FIRM would be required. Survival wind testing in Task 5 would be done in a Coastal Zone state, but the activities to be conducted would not require a Coastal Zone Consistency Determination.

Based on aerial photos, the U.S. Fish & Wildlife Service National Wetland Inventory (NWI) database and 7.5-minute quadrangle topographic maps, no designated wetlands are located within the Cheyenne, WY or Norwich, WY testing sites. Per Prime Farmland soil data from the USDA NRCS Web Soil Survey, there are no prime farmlands or other important agricultural soil types at the Cheyenne, WY or Norwich, VT test sites. Given the types of outdoor testing proposed, their locations, and the relatively small size of the heliostats and mirrors to be utilized (169 SQFT or less), no impacts to endangered or threatened species, critical habitat, or other protected species are anticipated by this proposed project. Additionally, no impacts to historical or cultural resources are anticipated by this proposed action. All of the proposed tasks would occur at existing developed facilities utilizing existing infrastructure, therefore no direct effect to historical or cultural resources is possible. Given the small size and height of the heliostat components involved in outdoor testing and the existing topography, no indirect visual impact to cultural resources is anticipated by this proposed action.

Oil paints and epoxies would be used for heliostat coating, motor oil would be used for machining, and rubbing alcohol would be used for cleaning. Flammable substances would be kept in a flammables cabinet. Safety equipment includes

fire extinguishers and smoke detectors. Solaflect Energy follows OSHA standards and the written Solaflect Energy safety policies.

NEPA DETERMINATION
Based upon the information provided above, this proposed action would qualify for Categorical Exclusions (CXs) A9, A11, B3.6, B3.11, and B5.15.

NEPA PROVISION
DOE has made a final NEPA determination for this award

Insert the following language in the award:

If you intend to make changes to the scope or objective of your project you are required to contact the Project Officer identified in Block 11 of the Notice of Financial Assistance Award before proceeding. You must receive notification of approval from the DOE Contracting Officer prior to commencing with work beyond that currently approved.

Note to Specialist :

EF2a created by Rob Smith on 11/28/2011.

SIGNATURE OF THIS MEMORANDUM CONSTITUTES A RECORD OF THIS DECISION.

NEPA Compliance Officer Signature: Lori Gray Lori Gray Date: 11/28/2011
NEPA Compliance Officer

FIELD OFFICE MANAGER DETERMINATION

☐ Field Office Manager review required

NCO REQUESTS THE FIELD OFFICE MANAGER REVIEW FOR THE FOLLOWING REASON:

☐ Proposed action fits within a categorical exclusion but involves a high profile or controversial issue that warrants Field Office Manager's attention.
☐ Proposed action falls within an EA or EIS category and therefore requires Field Office Manager's review and determination.

BASED ON MY REVIEW I CONCUR WITH THE DETERMINATION OF THE NCO :

Field Office Manager's Signature: _____ Date: _____
Field Office Manager