WORK PLAN

DOE FOA - DE-FOA-0001195 Control Number: 1195-1507

ELECTRICAL CONSULTANT/PHOTOVOLTAIC CODE OFFICIAL

FIELD WORK.

Primary Location Of work. 16 forest Irvine ca 92612

TEAM:

PROJECT SPONSOR: Wasif Ali Qureshi.BE {electrical &mechanical),

BSc{Physics &Math}.

DUTIES{ Preparation of specification, PV Firms survey, Limited tender document for issue to three firms, grant of work to eligible firm. Execution of work, performance testing and trial.

ASSISTANT : Azzam Ahmad Qureshi: BE(Electronic),Post graduate student{electronic}, SANTA CRUZ University

Duties: Supervision PV grid connected installation, performance monitoring

ARCHITECT: SALEHA WASIF QURESHI. Master Architecture. University of Cambridge UK.

DUTIES:

SITE survey, design and supervision of Solar Lab construction.

Financial Advisor: LCOE priced at which electricity must be generated from a specific source to breakeven over the life time of the project.

Computer Operator:

DUTIES: Record keeping.

The architect SALEHA WASIF QURESHI shall be deputed for most suitable Site selection survey in both cities i.e. SANJOSE and IRVINE to set up an exclusive SF6 photovoltaic module Research Lab. She will design and supervise construction of a simple one hall room for roof mounted grid connected PV system.

Limited tender enquiry shall be used to three US photovoltaic module companies to redesign crystalline silicon module by filling SF6 gas, laminate it with a perforated laminate instead of plan laminate sheet as per detail specification given in the tender enquiry. The supplier shall set up Lab testing facilities and supply all instruments on turnkey basis . The supplier shall be responsible for three years for repair and maintenance on turnkey basis from the commissioning date.

PERFORMANCE TESTING:
The several companies have began embedding electronics to PV junction boxes. This enables performing maximum power point tracking (MPPT) for each module individually and measurement of performance data for monitoring and fault detection at module level.
Temperature coefficient for module shall be measured indoor with a solar simulator. For indoor tests the module shall be illuminated using the solar

module and then heated from the rear surface in order to achieve a range of temperature and measuring the module current voltage (I-V) curve over a range of module temperature and then calculating the rate of change of the desired parameters with temperature.
For outdoor tests, the module shall be shaded to lower its temperature to near its ambient temperature then unshaded with (I-V) curves measured as its heats up to operating temperature.
SF6 gas in both cases i.e. indoor and outdoor tests shall act as thermal insulation.
PV MODULE RELIABILITY MODEL BASED ON DEGRADATION STUDIES:
Field data of modules shall be used to produce system level estimate of reliability and availability based on PV modules degradation rates and time dependent power availability.

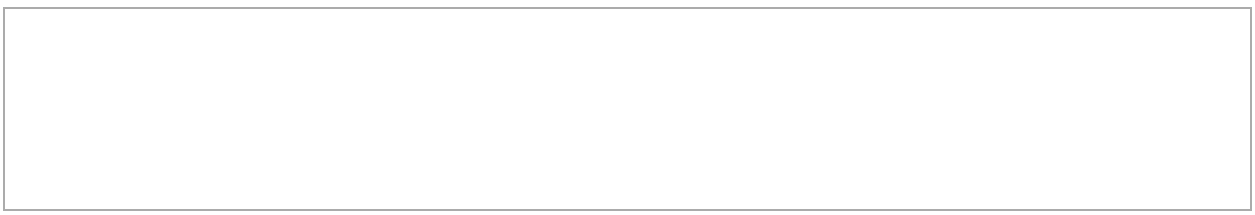
The short-circuit current (ISC), the open-circuit voltage (VOC), the fill factor (FF) and the efficiency parameters shall be determined from the IV curve. solar panels in controlled temperature shall ensure its consistent performance without any power degradation normally experienced in the conventional modules.

DESIGN OF SF 6 GAS FILLED PV MODULE TO IMPROVE EFFICIENCY, RELIABILITY AND

Design Details.,
For efficient, economical and safe operation of any Electricity generator, it would need prescribed Pure fuel and efficient exhaust and cooling system during its normal operation.

The standard PV module being an electricity generators does not fulfill above cited requirements. As indicated above 527 W/M2 Infrared radiance and 32 w/M2 ultraviolet radiation received by PV module shall be converted in to heat and only 445 W/M2 visible light shall be converted in to electricity during its normal operation.
In view of above, PV module solar cell laminated with plan lamination sheet shall suffer from elevated temperature during its normal operation. In view of this, use of perforated lamination shall facilitate heat transfer for effective module cooling through convection during its normal operation.
The following Thermodynamics rule regarding Radiation in gases has been adopted to filter Infrared radiation falling on PV module solar cells.
"RADIATION IN GASES: Elementary gases such as oxygen, nitrogen, hydrogen, and helium are essentially transparent to thermal radiation. Their absorption and emission bands are confined mainly to ultraviolet region of the spectrum. The gaseous vapors of most compounds, however, have absorption bands in the infrared region. Carbon dioxide, SF6 absorbs and emits significant amounts of energy.
In view of this, SF6 gas filled PV module would absorb and emit significant amounts of energy in the infrared region of solar spectrum; however it would be transparent in the visible region of solar spectrum.
Design Details.
The PV module will be filled with adequate quantity of SF6 gas in space between support board and encapsulating covering in the factory, sealed, so that there will be no gas leakage and no periodic filling will be required throughout its life. Not only has the gas a good dielectric strength, the gas has also very good heat transfer property. Due to its low gaseous viscosity (because of less molecular mobility) SF6 gas can efficiently transfer heat by convection. So due to its high dielectric strength and high cooling effect and excellent electric arc quenching property , it is considered a wonderful choice for PV module to improve its efficiency, durability, reliability and consistent power output performance.

The SF 6 being a very good insulation material and having excellent property to extinguish electric fire will ensure safety of inhabitants in houses fitted with roof mounted solar panels. It shall also minimize damage to solar cells from hot spot which could occur any time on roof mounted PV panels being beyond human control.
The SF6 gas is identified as a greenhouse gas; hence safety regulations will have to be introduced in order to prevent its release into the atmosphere.
The obsolete and mechanically damaged SF6 modules would be delivered back to manufacturers for its recycling so as to avoid its leakage to the atmosphere.
Module will be laminated with a perforated sheet instead of plain sheet. Perforations in lamination sheet will improve thermal conductivity of the module assembly and will allow flow of heat transfer out of the solar panel. The perforation in lamination sheet will allow SF 6 gas to be in touch with solar cells for their protection against sparking, hot spot and insulation failure.



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The monthly generated output as recorded by the system KWH Meter shall determine field performance of the solar panels. Power output verses 12 months, i.e.
January –December graphs shall be made to determine module performance. Operation of
solar panels in controlled temperature shall ensure its consistent performance
without any power degradation normally experienced in the conventional modules.