

SOLARIF

RISK MANAGEMENT

Solarif Risk Management

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Making solar park Roodehaan (Groningen, 11.4MWp) financeable

Introduction

The 22-hectare park “Zonneweide Roodehaan” in the municipality of Groningen with a capacity of 11.4 MW has 81.429 Solibro ‘SL2 CIGS’ thin film panels installed and provides more than 3.500 households with local green energy. The park was developed in collaboration by Hanergy, SolarEnergyWorks as well as Sun Projects and acquired by Sunrock Investments.

The Rabobank has been asked to finance the park. The requirement of the Rabobank to finance the project was subject to Solarif being able to arrange the inherent defect coverage in addition to the Operational all risk insurance. To provide the inherent defect coverage the purchased solar panels needed to undergo and pass Solarif’s panel certification program, performed by Solarif Risk Management. The panels needed to be Solarif-certified as a condition for the inherent defect coverage, which was also a desire of Sunrock Investments.

The inherent defect coverage insures damages caused by the nature of or a defect in the panel itself. In other words, it is a weakness which has not been caused by an external event. Examples of Inherent defect are delamination of the panels, bad soldering and short circuit of the junction box. The Inherent defect coverage supports and backs up the manufacturer’s warranty at system level in case of damage as result of an inherent defect, even in the case of the manufacturer being bankrupt (insolvency cover).

Certification process

Factory Risk Assessment:

First of all, Solarif Risk Management performed over two days a technical / quality risk assessment of the Solibro factory in Germany where the panels were to be produced. The purpose of the technical risk assessment was to carry out verification of the factory whether the manufacturing process conforms to required standards.

The factory inspection considered the following checks:

- Collection of general information about the factory;
- Audit factory process & quality inspection;
- In-line product inspection;
- ISO 9001/14001, OHSAS 18001 documentation inspection / verification / implementation;
- EHS (Environment, Health, Safety) implementation inspection.

Note: During the technical Factory inspection, a total of 4 minor and 4 major non-conformities have been identified and communicated to Solibro, after which Solibro solved these non-conformities to our satisfaction.

Pre-shipment inspection:

Furthermore, Solarif Risk Management performed a Pre-Shipment inspection in order to verify consistency of production - divided into two visits to the Solibro Factory in Germany.

During the **1st Factory visit** (in May 2018) the Solarif inspectors focused on:

- A cross-check of primary materials assemblies on-site against applicable CDF / BOM;
- A review of product / workshop certifications;
- A quality and conformity check of (primary & secondary) reference modules on-site;
- A sample inspection on a limited number of panels (Visual inspection, EL test & IV measurement).

Note: The results of the first factory visit were a pass with no modules being rejected. However, a second on-site inspection had still to be performed.

The **2nd Factory visit** (in August 2018) comprised of:

- A brief check of quality management setup (IQC / IPQC / OQC);
- Additional tests on a limited number of modules (Visual inspection, EL test & IV measurement).

Note: The results of the second factory visit were a pass and only 5 modules have been rejected (3 modules through Visual inspection; 2 modules through EL imaging) during the inspection with minor non-conformities.

Lab tests:

In addition to the factory visits, a specific number of Solibro thin film module samples were randomly taken out of the inspected batches and provided to the KIWA Laboratory Facility in Milan (Italy) for environmental stress testing.

The performed Lab tests on the specified module samples were:

- **Low irradiance test (Result = Pass)**

The purpose of the test was to determine how the electrical performance of the module varies with load at 25 °C and an irradiance of 200 W/m². The test results correspond to an average relative efficiency of 96%.

- **Materials Creep test (Result = Pass)**

The purpose of the material creep test was to validate that the materials used in the PV module will not show creep or lose adhesion when highest temperatures that PV modules normally experience in the field. Solibro thin film modules were mounted according to the installation manual and the approved clamps in vertical position inside a climate chamber. The modules were subjected to a stress test of 200h in 105°C and did not show any sign of creep or lose adhesion between the front and the back glass. (Note: The modules were supported only from the clamps)

- **EVA Gel content test (Result = Pass)**

The purpose of the test was to determine the gel content of the EVA (measure of crosslinking of the polymer) because the gel content provides a means of both controlling the process and rating finished product quality. The results laid above the industry standards ($\geq 70\%$) which provides the modules the desired mechanical integrity needed to withstand harsh outdoor environments.

➤ **PID test (Result = Pass)**

The purpose of the PID Test was to evaluate the durability of thin-film photovoltaic (PV) modules to the effects of high-voltage stress in a damp heat environment including potential-induced degradation (PID). The test results for the Solibro modules was a Pass with minor power degradations of -2.34% and -2.12% when the modules connected to the correct and according to the installation manual polarity (Positive Polarity).

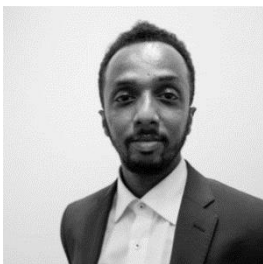
Inspection Results:

Based on the aforementioned findings, the inspection results were a PASS, the panels became Solarif-certified and hence fulfilled the requirements of the financier as well as the Insurer.

Through this process, the Solibro thin film panels were made financeable / bankable due to:

1. The quality assurance of the purchased panels performed by Solarif Risk Management; and
2. The additional assurance for the investor and the bank due to the inherent defect coverage in addition to the Operational all risk insurance arranged and placed by Solarif Insurance.

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