



WITH YOU ALWAYS

# RE-Konnect

Risk Engineering Bulletin

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## Editor's Note

Energy from sun is abundant and the sun will continue to shine for billions of years to come. While the solar energy is inexhaustible and renewable, its irradiance is environment-friendly. The solar power system does not emit toxic gases, which are environmentally damaging. In addition, silicon, the raw material in making solar cells, is the second most abundant element in the earth's crust. Since the solar industry has been developing and the technology is maturing, the Photo Voltaic (PV) Power Systems are efficient for both commercial and residential use. The price of PV systems is also more affordable now due to recent price cuts. As a result the demand for insurance cover and reliable loss prevention advice has also increased.

In this issue of RE-Konnect, we provide you a brief overview, specifically focusing on photovoltaic, of various hazards faced by the industry and protection. The idea is to get you familiar with various aspects related to photovoltaic systems which can be further explored through the references provided.

## Did You Know?

- Solar energy has been used for over 2700 years. In 700 BC, glass lenses were used to make fire by magnifying the sun's rays.
- Solar energy is the most abundant energy resource on earth with 173,000 Terawatts of solar energy striking the Earth continuously. That amounts to more than 10,000 times the world's total energy use.
- The current largest solar power plant in the world is Longyangxia Dam Solar Park in China, with a capacity of 850 MW.
- The cost of solar panels has fallen approximately 100 times over since 1977. Today, solar panels are about half the price they were in 2008.



# Potential Damages

Insurance brokers and individual insurance companies consistently viewed insuring PV technologies as an emerging niche market. However, the technical aspects of PV Modules and the physical infrastructure necessary to support PV Modules on Rooftops or on Ground Configuration remains a new subject to be understood. As a result of their exposed location, PV Systems are subject to various set of hazards. In addition, the PV System itself can also become a hazard, both to the plant/building and surrounding area.

## Inadequate construction against environmental risks:

- Flood
- Storm
- Land slide
- Lightening
- Fire
- Snow load



## Engineering Errors:

- Poor infrastructure Design
- Poor lightening and over voltage protection design
- Poor static evaluation of mounting system
- Poor layout design

## Construction errors:

- PV module with transport/handling damage
- PV system with poor DC cabling
- Improper methods of storage for large quantity of modules
- Mounting systems with installation errors
- Inadequate Operation & Management
- Poor monitoring system installation



## Negligence in resolving issues in O&M:

- Broken Conduit
- Vegetation overgrowth
- Inverter breakdown
- Transformer oil leakage leading to fire
- Unclean Panels
- Soil erosion
- Vandalism damage
- Animal menace
- Racking erosion



# Flavour of the Month

## Kerala to have world's largest floating solar PV plant

National Hydro Power Corp. (NHPC) and the Renewable Energy College (REC) of Kolkata have partnered to develop a 50-MW floating solar photovoltaic (PV) plant in the Indian state of Kerala. The project would represent the largest floating solar PV plant in the world, dwarfing a 1.2-MW plant that came online in Japan last year. NHPC plans to deploy the plant on one of several large bodies of water in Kerala, which will provide technical and construction assistance with the project. The REC has developed floating solar PV technology over the past several years, and a 12-kW pilot project will begin operations later this year in Kolkata. The larger project is expected to cost around \$70 million.

Floating solar technology is simpler and offers greater yield than landed-based solar PV. The panels are mounted on floating platforms and are more resistant to overheating that can reduce solar PV output. The REC estimates that its technology can be deployed for about 15% less per megawatt than comparable land-based systems.

Floating solar PV has drawn interest in recent years because of the potential synergies, with some developers claiming such systems could be as much as 50% more efficient than land-based solar. One interesting element of floating solar PV, according to its proponents, is that unlike other power technologies that can significantly challenge local water resources, floating solar can actually help preserve them by reducing evaporation during hot days in the summer. Though the long-term maintenance requirements and durability of floating Solar PV is yet to be seen, initial results are promising: the system in Japan has thus far weathered three typhoons without significant damage.



# Loss Prevention

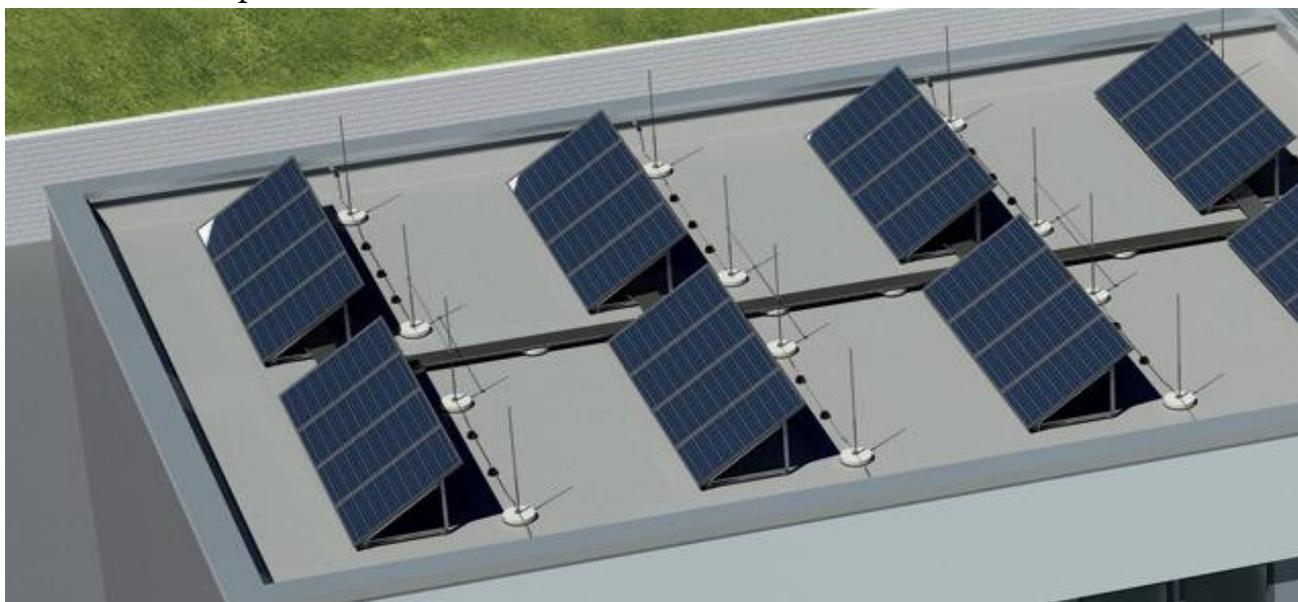
The overall property and liability risk for each photovoltaic system is unique, especially if systems are retrofitted on buildings. The level of protection needed should be based on an individual risk analysis. The following can be used to reduce the risk:

## Overall Quality of the Erection and Commissioning

- **Confirming to Codes and Standards:** Although still under development, basic codes and standards for performance, fire protection and installation of photovoltaic systems are available and should be closely followed.
- **Experience of EPC Contractors:** Photovoltaic systems should only be installed by qualified/certified installers.
- **Storage and Handling:** The modules must be carefully stacked. The internal transportation must be thoroughly monitored, especially when done with equipments such as forklifts and trucks.
- **Quality of Components:** Long-lasting, secure cable connections with low contact resistances are necessary to avoid defects and losses.
- **Maintenance and Inspection:** Photovoltaic systems should be maintained and inspected annually by qualified professionals. An AMC with OEMs would always update the operators with emerging trends in maintenance.
- **Reducing Power Losses:** Solar installations fail to realize their full potential, due to partial or temporary shading, even from small roof components such as antennas/trees in the perimeter of the plant. The result is also a loss of earnings.

## Lightning and Surge Protection

- **Lightning Protection:** If PV systems are ground mounted, lightning protection for the solar installation must be properly designed to cover the entire plant. If PV systems are mounted on buildings with no lightning protection, a risk analysis should be conducted to determine the susceptibility of the entire installation to damage from lightning.
- **Surge Protection:** Proper grounding and surge protection of the photovoltaic installation is important to avoid electrical faults.



## Natural Hazards

- **Storm:** When designing the panel fixings, maximum wind speeds in the local area must be considered to avoid potential damage to the fixings, panels or ultimately the roof.
- **Inundation:** The plant must be provided with proper drains systems and the same should have regular monsoon checks.
- **Flood:** For solar parks located in flood-prone areas the foundations and supporting framework should be designed to withstand this risk.

## Fire Protection (Includes Roof Top and Ground Mounted)

- **Isolating the solar rooftop from the building:** Direct contact between PV System components and combustible building components must be avoided. Inverters should be located in a separate non-combustible structure, supervised by a fire detection system. DC cables from modules to the inverter should not be routed through the interior of a building. If this cannot be avoided, DC cables should be enclosed in fire resistant ducts, chutes or similar.
- **Roof fire load:** To avoid increasing the combustible load of the building roof use non-combustible modules and non-combustible mounting systems.
- **Vegetation:** Avoid exposure from fire to ground-mounted systems by regularly cutting vegetation.
- **Disconnecting PV Systems:** Although the DC current cannot be switched-off completely on PV Systems the means to safely de-energize major DC conduits can be provided through the installation of a fireman's switch. This switch should be installed where possible and located in an area that is easily accessible in the event of a fire. Non installation of this switch may delay efforts to fight the fire.
- **Pre-emergency plans:** Clearly label all important components of the PV system and supplement pre-emergency plans with the additional fire hazards and emergency contacts to qualified electricians.

## Other

- **Theft/Vandalism:** Ground-mounted solar farms/parks – especially in rural locations - require additional security measures (e.g. security module fasteners, fences, intrusion detection, video supervision).
- **Rodent Bites:** In order to avoid bites from rodents, cable at ground level should have appropriate protection.

# Guidelines

In Indian market, Central Electricity Authority (CEA) of India and Ministry of New and Renewable Energy (MNRE) guidelines are referred with respect to cost, use of land, layout considerations. The Bureau of Indian Standards (BIS) is followed by experienced EPC contractors with respect to the design requirements.

Globally, every country has respective guidelines which have been reviewed and amended considering solar to be a new and emerging technology. All the guidelines prepared are in line with the International Electro-technical Commission, IEC (Safety: 61730, Design Qualification: 61215, Efficiency Performance: 61683, Installation practices: 60364, 61727).

# Engage

Answer the following questions to win Amazon coupons worth Rs 500 each. Send the answers to [editor.bulletin@tata-aig.com](mailto:editor.bulletin@tata-aig.com). 5 winners of this quiz will be announced in next issue.

- Q. Which type of solar power plant is relatively cheaper? : a) Floating b) Ground mounted
- Q. Which country has the current largest solar power plant?
- Q. What is the main raw material in making solar PV cells?

## Winners of the previous issue are as follows:

- **Partha Pathak**, Marsh India Insurance Brokers – Bangalore
- **Asha NC**, Marsh India Insurance Brokers – Bangalore
- **Mrugesh Datar**, Tata AIG – Ahmedabad
- **Anant Kulkarni**, Petronet LNG – Kochi
- **Suparas Singhi**, Aon Global Insurance Brokers – Bangalore
- **Lathisia Aruna**, J B Boda Insurance Brokers – Bangalore

Answers to previous questions: 1. Lightning rod with taut wires 2. Single is enough 3. (b) Inside a car with windows rolled up

For further information please contact:

**Abhimanyu Mannepalli**

Loss Control Engineer

Energy (Power & Construction)

+91 40 6657 5067

[abhimanyu.mannepalli@tata-aig.com](mailto:abhimanyu.mannepalli@tata-aig.com)

For any feedback or comment related to the bulletin  
please contact: [editor.bulletin@tata-aig.com](mailto:editor.bulletin@tata-aig.com)

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Company Limited,  
Peninsula Business Park,  
Tower A, 15th Floor,  
G. K. Marg, Lower Parel,  
Mumbai 400013  
[www.tataaiginsurance.in](http://www.tataaiginsurance.in)



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