

## FLOATING SOLAR PLANTS

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“Accidents are errors  
where the persons involved were perfectly capable of not making them,  
but made them anyway.”

“Two things are universal: hydrogen and stupidity.”  
Frank Zappa

## INTRODUCTION

A floating solar plant is sited on the the Madhya Pradesh’s Omkareshwar dam. The floating photo-voltaic flat panels are positioned on top of floating boat-like structures on the water surface and were situated in the backwater of the dam. Placing the photovoltaic arrays on piers was apparently too costly. It is the largest of its kind in the world among other such plants positioned on fresh as well as saltwater locations.



Figure 1. Floating Photovoltaic PV solar panels plant.

It was developed as a joint venture between the Madhya Pradesh Government and the National Hydroelectric Power Corporation (NHPC). The Omkareshwar Dam is a gravity dam on the Narmada River just upstream of Mandhata in the Khandwa district of Madhya Pradesh in India.

The part of the project near the village of Kelwa Khurd aims at generating 100 MWe of electricity, with additional capacities of 88 MWe at Indawadi and 90 MWE at the Ekhand villages.

## **UNIQUE ENVIRONMENT**

It is common knowledge that water is a harsh environment and structures on its surface need special maintenance compared with structures on land. A large boat which is left in the water can be affected by storms and require reliable mooring.

Plastics tend to disintegrate under intense tropical ultra-violet sunlight, especially when in contact with water or water spray. Ultraviolet from the sun drives exotic chemical reactions, which leads to chemical breakdown.

Metallic structures sitting in salty and to a lesser extent fresh water are difficult to manage, even stainless steel is not immune to corrosion. Metal structures in contact with water need to be protected with frequent repainting. They also require the use of sacrificial anodes or comparable protective measures if electrical currents are present. Electricity and metals are a unique combination since any electrical fault which causes a current to run through metal in contact with water can cause corrosion to occur at a higher rate than normal.

Dams are one of the largest producers of methane gas  $\text{CH}_4$  at about 30 times more than  $\text{CO}_2$ . Blocking the sunlight from the water surface results in killing off animal and plant life and creates a decaying methane generation environment. The project was initially opposed as affecting local fishing rights.

## **BAD WEATHER EFFECT ON FLOATING PLANT**

On May 7, 2024, summer storms with the wind speed of 50 km/hr, 14 m / second, or 31 mph hit the project and threw the floating solar panels all around the place. Such a wind speed occurrence is so common that the designers should have considered its possibility. This occurrence also happened in the previous summer. No person was reported injured.

That was a storm, not a sustained hurricane or tornado. Every time a storm blows in the right direction those panels are expected to stack up against the dam.

In the USA's Great Lakes, sheets of floating ice pack, that weigh thousands of times more than solar panels do form. When a sustained wind blows, wave action stacks up the ice sheets of ice along the shoreline.

Even on a freshwater lake rather than salty ocean water, a floating solar array presents additional problems concerning electronics and metal in water. An outdrive that is not properly protected with anodes will be consumed by electrolysis within a year. Anodes will be consumed way faster on such units if electrical current that finds its way to the structure is exposed to the water. Just replacing the anodes that would be required would be a huge task. They are sacrificial, so must be replaced regularly. The more electrolysis occurs, the faster they are consumed, so they would not all erode at the same pace. They need to be inspected on a regular basis. Impressed current cathodic protection and not sacrificial anodes could be used instead.

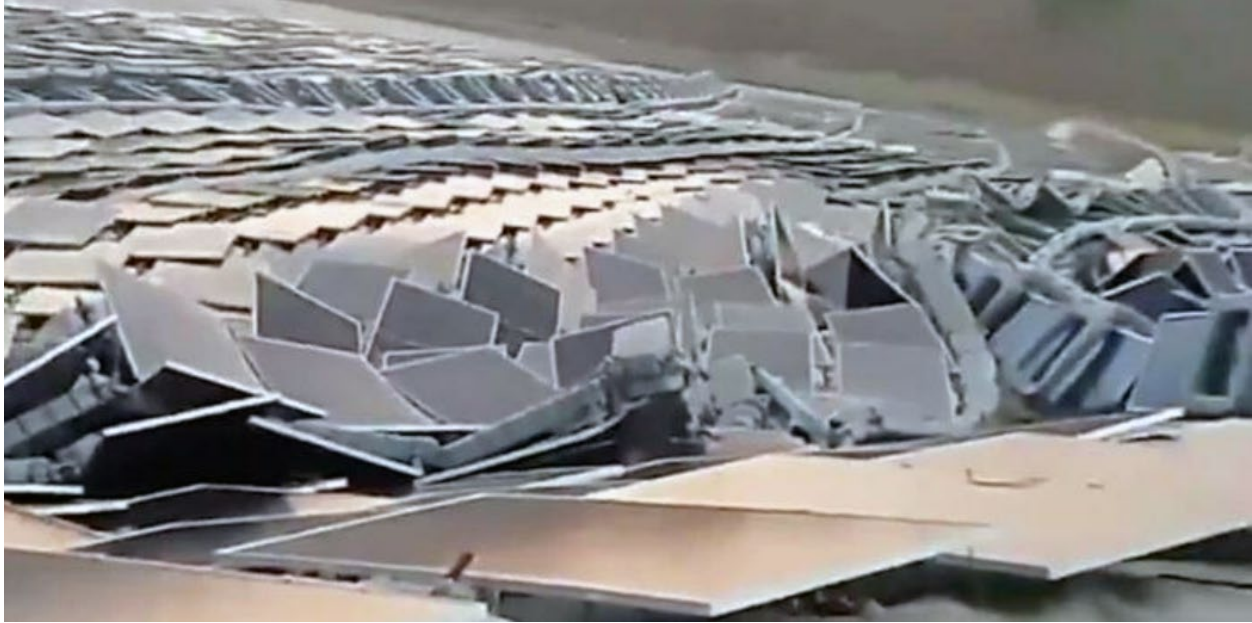


Figure 2. Effect of storm on floating solar panels. Those dislodged panels slugging the dam holding them is a serious unforeseen loading condition unlikely considered in the original stability analysis of the dam.

## DISCUSSION

Solar photovoltaics is ideally applicable to small scale applications. No so much for large projects that require a large land mass or water surface. One panel for each home, a tiny panel for each outdoor light are optimal and reliable applications.

Major issues for solar panels applications include ultraviolet solar radiation of plastic degradation, windstorms, tornadoes, hurricanes, as well as rain, sleet, and hail.

The dislodged solar panels slugging the dam holding them is a serious loading condition unlikely considered in the stability analysis of the dam.

“Who could have predicted acres of fragile floating structures would be vulnerable to bad weather?” It is inevitable that insurance companies will have second thoughts about covering such projects in the future.

## REFERENCES

1. <https://www.zerohedge.com/energy/worlds-largest-floating-solar-farm-wrecked-storm-just-launch>