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# Paving the way for offshore solar standards: results from Delta Flume testing

Oceans of Energy · Deltares · TNO · DNV

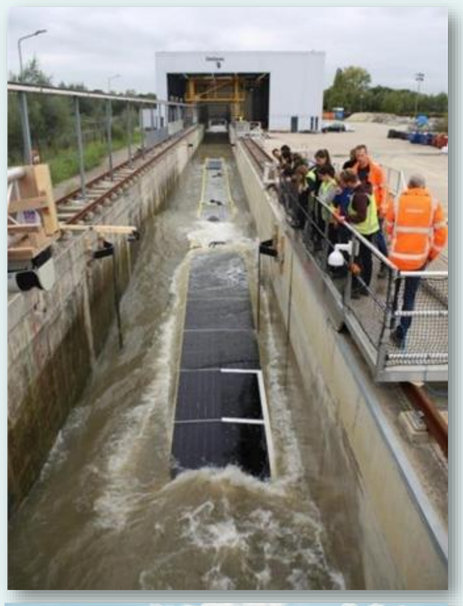
*Offshore Solar enables large scale solar energy generation, without the use of land space*

Offshore Solar is implemented in standalone applications and in combination with offshore wind. Amongst others, Shell, Eneco, RWE, TotalEnergies, Vattenfall, and Copenhagen Infrastructure Partners are investing to-date in offshore solar projects.

TNO, Deltares, DNV and Oceans of Energy collaborated to execute two key testing campaigns at the Deltares' Delta Flume -the World's largest flume- marking a meaningful step towards offshore solar certification.

## Full-scale hydrodynamic test of offshore solar array

Four full scale Oceans of Energy interconnected floaters were positioned inside the flume to measure the behavior and impacts of the breaking waves.



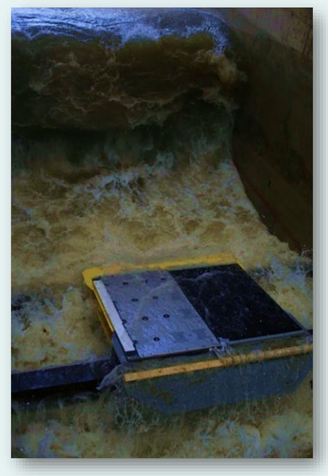
### Results

- Correlation was found between system response and wave characteristics.
- Different loading mechanisms were identified: direct wave impact, wave over wash, slamming loads, free span.
- Wave slamming impact are expected to be largest on the floaters at the outer edges of an offshore solar system.

After testing, platforms were demonstrated during 4-years in offshore conditions, 12km offshore The Hague.

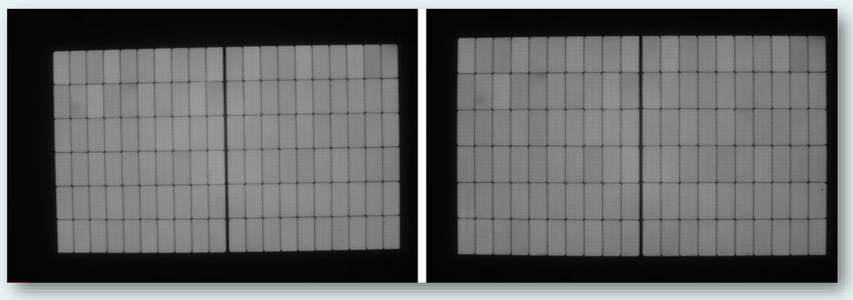
## Wave slamming testing of fixed PV-mounting and PV-modules

A glass-glass PV and dummy module were mounted on a fixed partial platform, which was positioned in different orientations with respect to the incoming waves to quantify mechanical stresses caused by direct wave impacts on the PV-module cells, glass and frames.



### Results

- Correlation was found between wave height (up to 2.5m) and pressure and force.
- Correlation was found between wave height and measured strain, suggesting that higher waves induce greater deformations. However, strain is also influenced by the PV mounting structure.
- Electro luminescence images of the PV modules taken before (left) and after (right) indicate that no microcracks are formed.



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## Lessons learned

This research offers valuable insights into the performance of offshore solar technology under real-world conditions. Each test method –like numerical modelling, small-scale and full-scale tests, offshore projects- has its own strengths and should be used together to get the best results. It highlights the need for further collaboration to build a solid scientific base in the path towards establishing standardized testing protocols and certification schemes.