seanergy
26›28 June, 2024
Nantes, Pays de la Loire • France

Poster n°11

# An engineering method to assess extreme breaking wave loads in design of floating offshore wind turbines

Jean-François Filipot[1], Paul Renaud[1,3], Florian Hulin[1,2,3], Marc Batlle[1,4,8], Marc Prevosto[1], Alan Tassin[2], Jeffrey Harris[4], Nicolas Jacques[3], Christophe Peyrard[5], Maria Teles[5], Camil Matoug[1], Fabien Leckler[1], Arne Nestegård[6], Erik Asp[7]

1: France Energies Marines | 2: Ifremer | 3: ENSTA Bretagne | 4: Saint-Venant Hydraulics Laboratory, ENPC | 5: Saint-Venant Hydraulics Laboratory, EDF | 6: DNV Norway | 7: DNV Denmark | 8: Saitec Offshore Technologies

## Overall approach

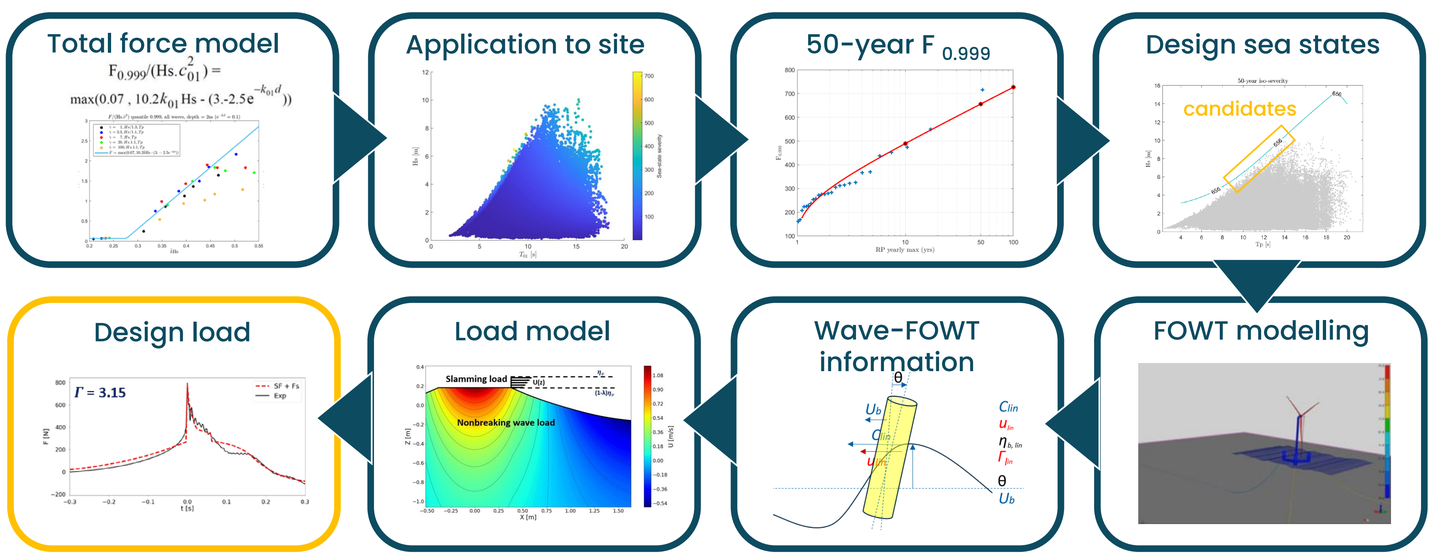
- DIMPACT's method first relies on a new definition of the design sea state by explicitly considering the contribution of slamming loads
- Sea states with the highest load potential are used as input of FOWT coupled-models, to capture the effect of FOWT motion & tilt on the loads
- Slamming loads are computed from the properties of linear waves solely
- Method validated with flume experiment

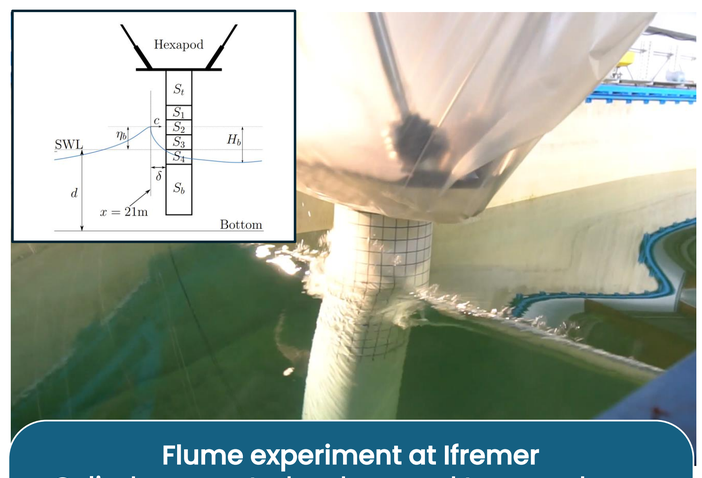
## Major breakthroughs

- Definition of a linear-equivalent breaking criterion and severity
- Relationship between breaking wave severity and slamming loads
- Slamming loads formula accounting for FOWT motion and tilt
- Flume exp. showed that FOWT tilt and motions tend to reduce slamming loads magnitude vs bottom-fixed OWT
- 14 scientific papers published and in progress

## Industry transfer

- DIMPACT's slamming method has been successfully implemented in OpenFAST (NREL's code) and DIEGO (EDF's code)
- The results will be referenced in DNV-RP-C205 recommended practice




**Flume experiment at Ifremer**

- Cylinder mounted on hexapod to reproduce FOWT tilt and surge motions
- Cylinder is equipped with 4 segments able to capture the vertical distribution of the wave loads

## Next steps

The DIMPACT+ follow up project is under definition. It will focus on:

- Confirming DIMPACT's results with a wider range of wave conditions
- Extending DIMPACT's breakthroughs to bottom fixed offshore wind turbine.

DIMPACT receives French State funding managed by the National Research Agency under the France 2030 investment plan.