



BUREAU
VERITAS

OPTIFOWT JIP

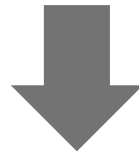
28 JUNE

2023

COMPUTATIONS COMPLEXITY...

IEC standards ~ 17 DLC

- | **For each DLC category (X.Y): Environmental cases combination**
 - | MUL: ~12 environmental directions
 - | MIS: misaligned wind, wave, current ~ $12 \times 12 = 144$
 - | Wind speed range: ~10 different wind speeds (step 2m/s)
 - | Wave period range: Associated wave conditions contours ~3 Hs-Tp?
 - | System combinations parameters (e.g. Nacelle yaw misalignment) ~ 3
 - | ~1 or 2 Water depth

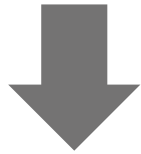


About 20 times more environmental cases in total than for a FPSO

COMPUTATIONS COMPLEXITY...

Aero-Hydro-Elasto-Servo coupled model:

- | Wind turbulence,
- | Tower & blade flexibility,
- | Dynamic mooring line response, Seabed friction,
- | Hydrodynamic formulation, fullQTF....



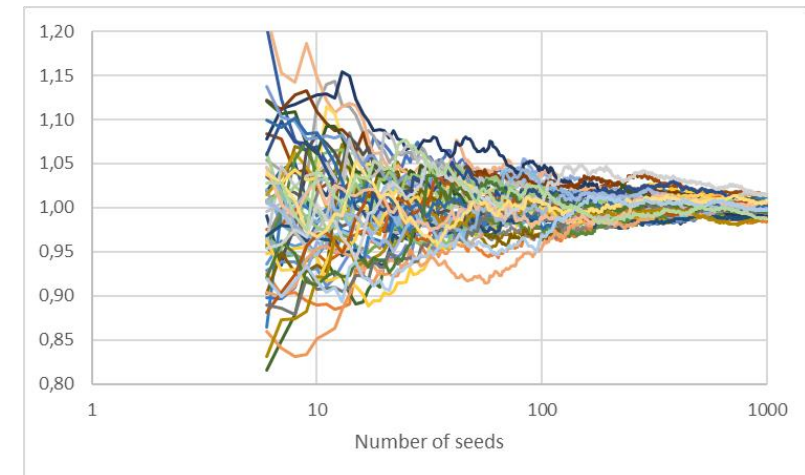
Simulation about 1 to 100 times slower than for a FPSO

With always tighter project schedules

... FOR WHAT DESIGN ROBUSTNESS?

For each simulation case:

- | **6 seeds** (for appropriate maximum combinations)
(was ~30 for offshore units moorings)
- | **Durations:**
 - | Analysis time: between 10 min and 3 hours each
 - | Transient at the beginning



BV PROPOSAL

JIP OBJECTIVES

Identify acceptable model simplifications and critical Design Load cases to reduce CPU time without increasing the risk level

Confirm number of seeds required for statistical convergence

Develop FOWT design guidelines

BV PROPOSAL

STUDY BREAKDOWN

WP1

Collect input data
build the model (validation with partners)
Identify target outputs

WP2

Run critical DLCs
simplify the model on a
sequential basis

WP3

Run on-site and intact hull
DLC with simplified model
Confirm critical DLCs

WP4

Run high number of critical load cases
Identify number of seeds required to
reach statistical convergence

WP5

Build guidelines on FOWT
design methodology based on
conclusion of previous WP

GUIDANCE NOTE

FOR DESIGN METHODOLOGY OF FOWT



Section 1 - General

Section 2 - Numerical Modeling of FOWT

Section 3 - Load cases set-up and FOWT analysis

No justification required by BV to designer on model simplifications or DLC selection if based on this guideline

PLANNING

	Start time	Duration	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36						
WP I: Collection	1	18																																										
WP II: Model simplification	6	18																																										
WP III: Critical DLC	17	15																																										
WP IV: Statistical convergence	24	6																																										
WP V: Guidance note	7	30																																										

Planned beginning by end of 2023 / beginning of 2024

CONTACT

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INTERESTED?

Meet us Thursday 29th june from 9.00 to 12.30 in Novotel



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