ENERGY

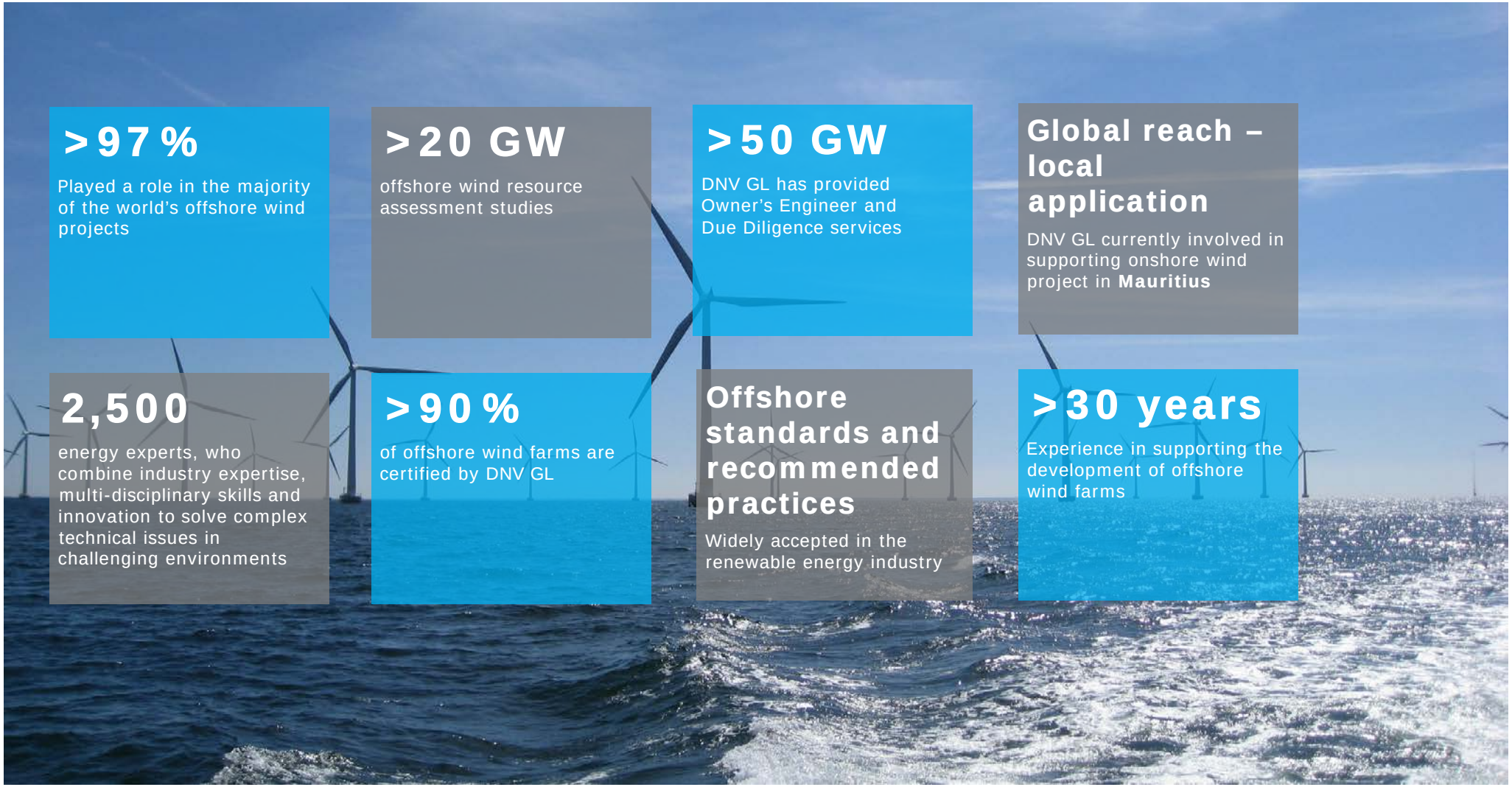
# The role of the third party

## Certification of floating wind farms

**Erik L. Walter**

31 May 2018

# Our involvement in offshore wind…



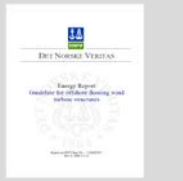
# DNV GL in floating wind development

## Key projects and innovation

2008 2010 2012 2014 2016 2018

*We continuously develop and maintain the **industry rules and standards***

*The second edition of our standard for floating wind turbines, **DNVGL-ST-0119**, will be issued in 2018*



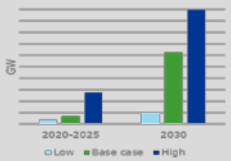
*We have supported Customers with **concept design support** for several floater concepts*



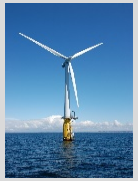
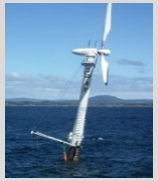
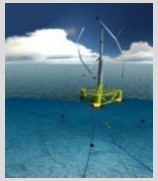


*We have delivered multiple floating wind **market studies** and **technical due diligence** projects*

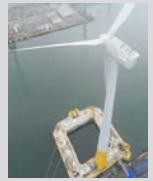




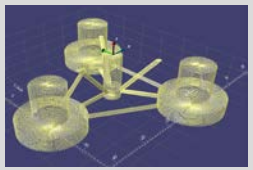

*We have done **verification** and **independent analysis** of several floaters and wind farms*





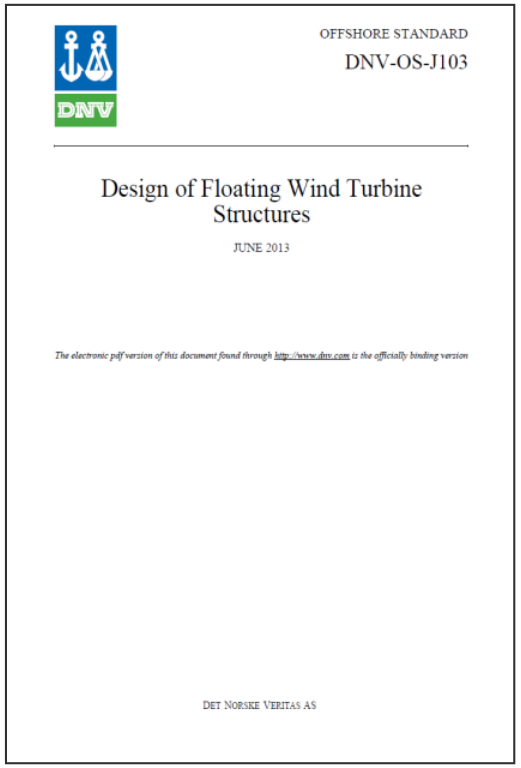
*__BLADED__ is developed, validated and maintained by DNV GL*


Bladed used in over 20 different floating wind projects in the last 10 years

# Standard development - DNV-OS-J103 to be revised to become DNVGL-ST-0119

- DNV-OS-J103 published June 2013
- Being revised during 2016 – 2018 to become DNVGL-ST-0119
- Work performed internally in DNV GL, but with input from industry
- Reflect industry experience since the first issue
- Consideration of new international standards e.g. IEC TS 61400-3-2
- Harmonize with new and revised DNV GL standards


OFFSHORE STANDARD

DNV-OS-J103

Design of Floating Wind Turbine Structures

JUNE 2013

*The electronic pdf version of this document found through http://www.dnv.com is the officially binding version*

DET NORSKE VERITAS AS


DNV·GL

STANDARD

DNVGL-ST-0119 Edition xxxx 2017

**Design of floating wind turbines**

The electronic pdf version of this document found through http://www.dnvgl.com is the officially binding version. The documents are available free of charge in PDF format.

DNV GL AS

# Main revisions

- Reference to new DNV GL standards (e.g. DNVGL-ST-0126, DNVGL-ST-0437)
- Formulation of floater-specific load cases
- Requirements for investigations to be performed to support the exemption from designing unmanned floaters against damage stability
- Fatigue factors for substructure on similar level as for bottom-fixed structures
- Fatigue factors for steel mooring lines and tendons
- Recommendations for shared anchor points
- Floater motion control system and its integration with the control and protection system for the turbine

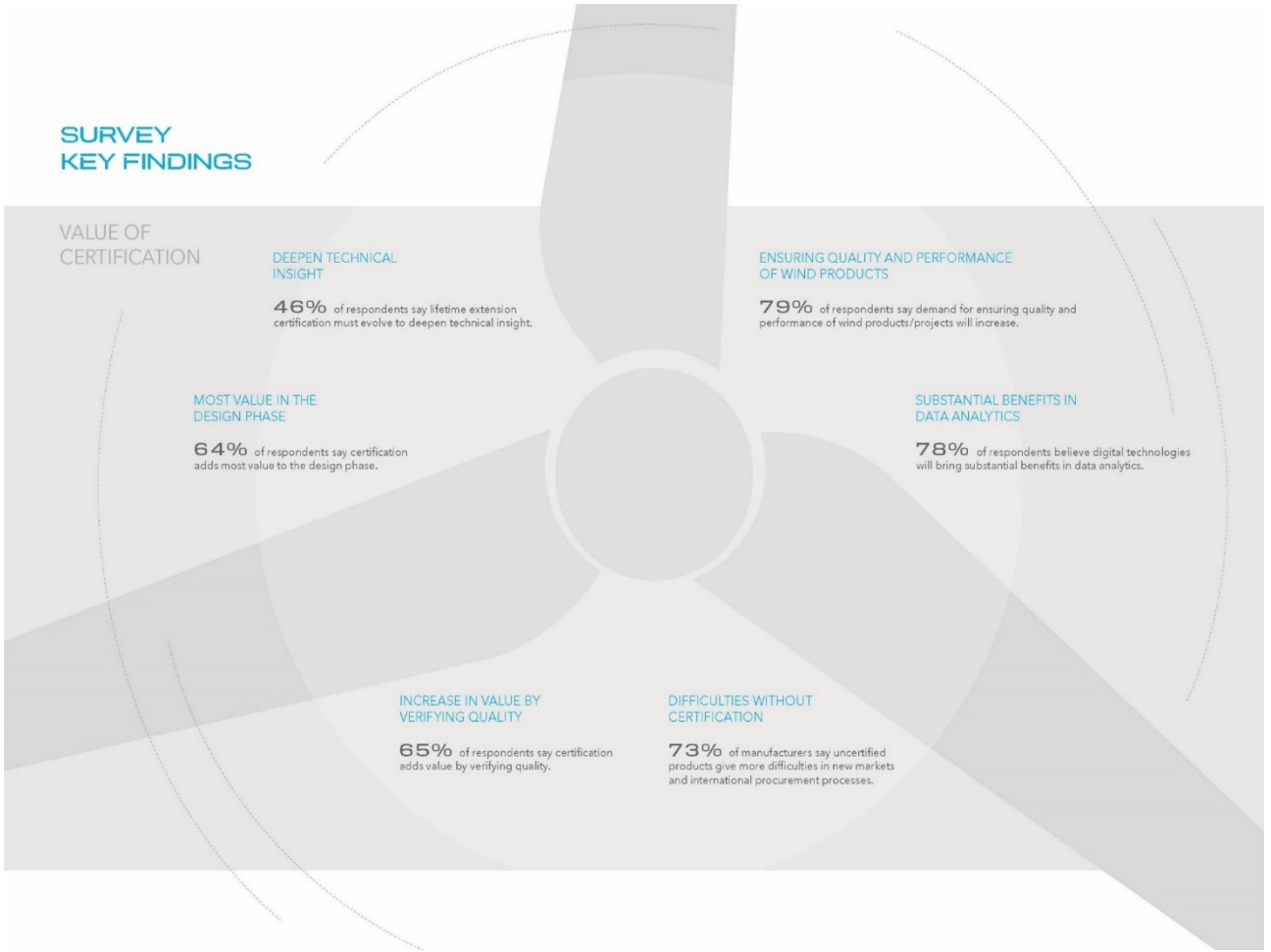
Hywind
Photo: Knut Ronold DNVGL

# Way forward

- External industry hearing during fall 2017
- Comments received during the hearing have been considered
- Update of the manuscript is ongoing
- The revised standard is expected to be published by mid 2018

# Why Certification? We asked the industry

- Industry focus on reducing costs by adopting new technologies and business models
- Anything new brings potential risk
- **Certification is one of the key tools in managing risk**
- **Certification needs to evolve with the industry to support growth and innovation**
- Certification could add more value if continued to deepen technical insight
- **Traditional on-offshore: 65% say certification adds value by verifying quality***
- **Floating: 82% say certification adds value by verifying quality****

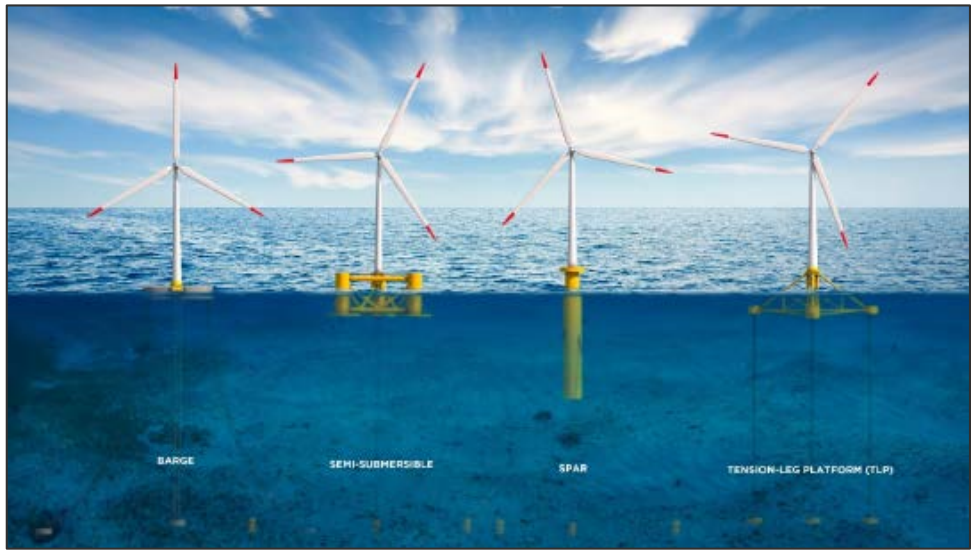


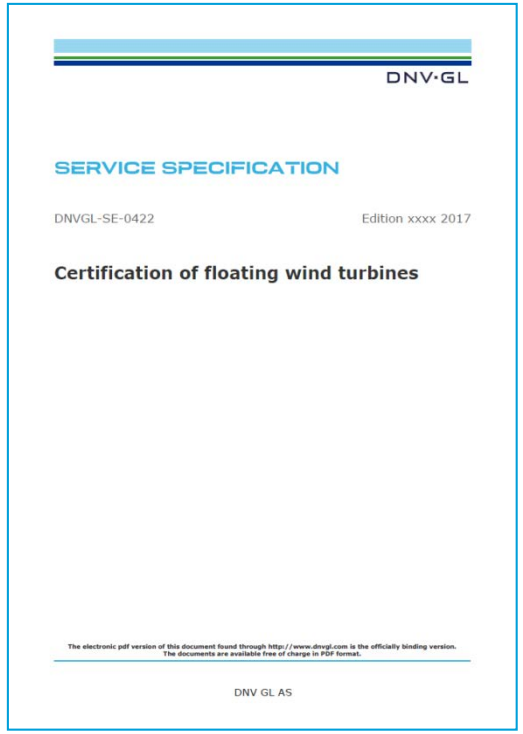

*2017: Certification for the wind energy of tomorrow.
**2015: DNV GL Floating wind customer survey

# DNV GL-SE-0422 Certification of floating wind turbines

- Service description specific for floating installations - includes all development phases (replaces DNVGL-SE-0190):


- Applicable for components and complete systems
- Risk based approach





DNV·GL

SERVICE SPECIFICATION

DNVGL-SE-0422 Edition xxxx 2017

Certification of floating wind turbines

The electronic pdf version of this document found through http://www.dnvgl.com is the officially binding version. The documents are available free of charge in PDF format.

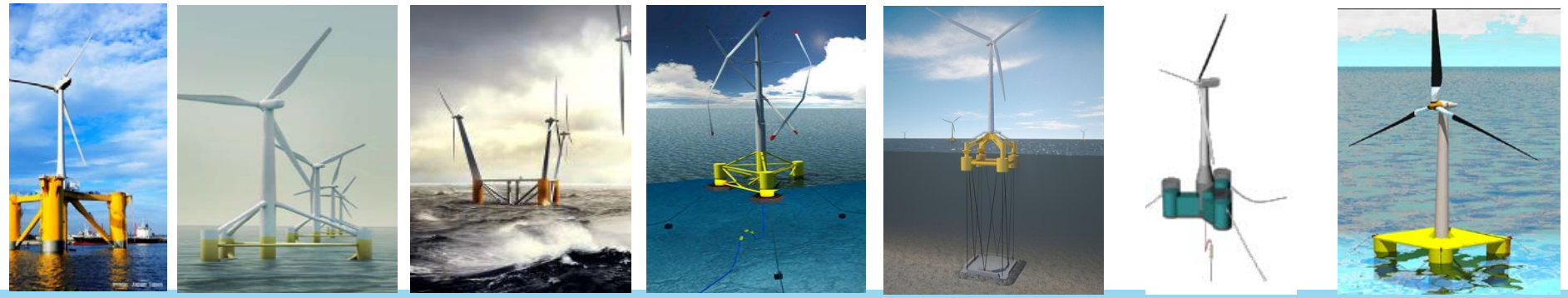
DNV GL AS

# Concept feasibility phase


- **Objectives**
  - Identify show stoppers, and issue recommendations
  - Identify possible novelties, requiring **technology qualification**
  - Integrated part of the certification process
  - Add confidence towards stakeholders

- **Scope of Work focuses on**
  - design methodologies and assumptions
  - standards for the floating system and consistency

Example: Review of site conditions and standards for a floating wind project in Taiwan (EOLFI/Cobra)



# Project certification phase

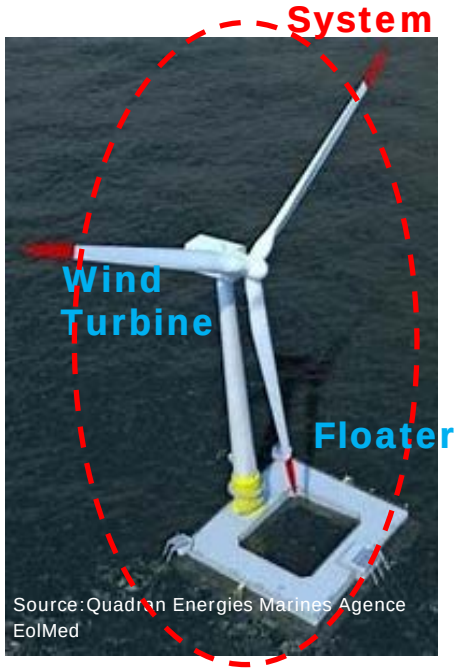

- **Objectives**

| | | | |
|---|---|---|---|
| **Ensure safety and integrity** | **Provide independent analysis** | **Cover critical technical interfaces** | **Assure documentation is in order and complete** |

- **Scope of Work**
  - Site Conditions
  - Design Basis
  - ILA
  - Design
  - Manufacturing
  - Transportation & installation
  - Commissioning

**Example: Certification of EolMed-Gruissan Floating Windfarm for the Design Basis, Design Evaluation incl. Integrated Load Analysis**

**Example 2: Verification of Hywind Scotland, including independent load and response analyses**



Source:Quadran Energies Marines Agence EolMed

# DNV GL standards – Assisting the industry to develop safely


*3 scheduled releases in 2018:*

**DNVGL-ST-0119** Design of floating wind turbine structures (replaces DNV-OS-J103)
External hearing completed. Internal final approval in May.

**DNVGL-RP-0286** Coupled analysis of floating wind turbines (JIP - new)
Draft ready in April, publication expected in end of 2018

**DNVGL-SE-0422** Certification of floating wind turbines (service specification – new)
External hearing mid February 2018

# Wind-powered water injection

## The innovation

- Wind-powered water injection is a new concept integrating floating wind with O&G operations
- Wind-powered water injection will take place in a harsh offshore environment
- A microgrid, including energy storage, enables controlled start-up and shut-down of the system and ensure that critical systems are accounted for in periods with no wind.
- A key to understand the stability of the microgrid is to understand the power consumption in the different operational phases, how vulnerable the system is for sudden changes in power output. Lab tests will be conducted to validate the stability of the microgrid.

## The challenge

- Stability of the microgrid
- Optimal system configuration
- Redundancy level

## The benefit

- ‘Green innovation’ that is positive for the O&G industry
- Increased technical and market related understanding of the integration of renewable energy with O&G operations
- Increased level of maturity, enabling demonstration in its real offshore environment

# Reducing risk via certification – a 10 years journey

Hywind demo 2.3MW (2008)

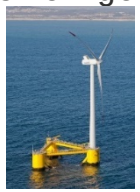
Pelastar FEED (2013)

VolturnUS – concept (2014)

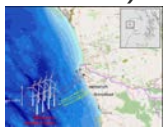
Aerodyn SCD nezzy – Concept (2014)


ACS - Concept (2014-2015)

WindFloat Atlantic (2015- on-going)



Hywind Scotland 24MW(2015-2017)



Nautilus – concept

EolMed-Gruissan Floating Windfarm(ongoing)

1st JIP: DNV-OS-J103 Standard (2011-2013)

2016-2017 JIP: Coupled analysis

New 2018: DNVGL-SE-0422 DNVGL-ST-0119 DNVGL-RP-0286

*Selected references*

# Thank you for your attention

**Contact**

Erik.Lokken.Walter@dnvgl.com

**www.dnvgl.com**

**SAFER, SMARTER, GREENER**