# MCEDD

## DEEPWATER DEVELOPMENT

**28 - 30 March 2023 | Millennium Gloucester Hotel | London, UK**

ORGANIZED BY

GULF QUEST

Quest Offshore

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# Cross Industry Opportunities for Marine Asset Development

# The fixed/floating industry matrix

Time and different requirements for floating structures drove the development of different technology and marine assets to install and maintain in oil and gas.

Will we see similar step changes in offshore floating wind and increased cross-utilization?


## Oil & Gas Fixed

- Heavy Lifting Offshore
- Pipelay
- Diving

## Offshore Wind Fixed

- Heavy Lifting Offshore
- Static Cables
- Diving / ROV

Bespoke

Multiplicity

## Oil & Gas Floating

- Heavy Lifting nearshore/in port
- Anchor Handlers
- Flexible Pipes (Dynamic Risers)
- ROV

## Offshore Wind Floating

- Heavy Lifting nearshore/in port
- Anchor Handlers
- Dynamic Cables
- ROV / AUV

# Vessel Development & Evolution – Tugs and AHTS

Anchor Handling Vessels (AHTS) evolved from tugs and small OSV's.

From small 100 tonne bollard pull tugs, AHTS have evolved to have Dynamic Positioning, 300t+ BP, 500–700t winches, Work Class ROV's and state-of-the-art deck equipment.

With the provision of 150 – 250 tonnes cranes onboard selected vessels, the lines begin to blur between AHTS and Offshore Construction Vessels.

Will the AHTS evolution continue on an ever larger hull/capacity trajectory or split off into different types of AHTS or 'sub-groups'?

**1970 / 80's**
**16 – 18m beam,**
**50 – 70m long**


**1980 / 90's**
**17 - 20m beam,**
**65 – 80m long**


**2000 – 2010**
**18 – 25m beam,**
**70 – 100m long**


**2010 – 2020**
**20 – 25m beam,**
**75 – 100m long**

# Vessel Development & Evolution – Diving Support

Diving Support vessels started small, focused on the core task of diving. Much of the development of the DSV's was on the inside, within the diving equipment and support infrastructure onboard.

As more subsea equipment began to be deployed, so did the demand for deck space and larger cranes to carry equipment. Too large a deck space increased the cost of the vessel, and so a 'sweet-spot' had to be found in functionality and efficiency.

Some DSV's evolved to focus more on back deck utilization, losing the diving spread to focus on Offshore Construction.

Do we see evolution of the traditional DSV or is the current fleet of DSV's in an optimal size, configuration and capacity.


https://fromthesouthsea.wordpress.com/2017/12/27/free-money-in-offshore-and-hoyles-fallacy/


https://skipshistorie.net/Oslo/414Awilco/Tekster/OSL41419840100000Wilchief.htm



Courtesy TechnipFMC

# Vessel Development & Evolution – Heavy Lifting

Heavy lifting vessels evolved from the early 'barge' with a stern crane with 1,000 – 5,000 tonnes lifting capacity. Many of the lifts were jackets, topsides and/or laying large rigid pipelines. With a large beam for stability, these vessels were the classic 'heavy lift vessels' in the offshore industry.

Some DSV designs increased the deck space and positioned the main crane on the side of the vessel. Subsea deployments were the target, ROV's replaced divers and crane capacity jumped from 150t – 250t – 400t to 600t+. Beam increased from 18m up to 32m.

These vessels were then used to also deploy flexible pipe from underdeck carousels over towers and hence with the cross-over into flexlay they became the 'Offshore Construction Vessels'.

Are these vessels the most likely to evolve into different specialities in years to come?


https://gcaptain.com/dynamic-positioning-jobs-part-five/


https://www.waves-group.co.uk/blog/history-of-heavy-lifts-in-the-marine-context/


Courtesy Huismann

# Heavy Lifting - Fixed Wind Cross-over

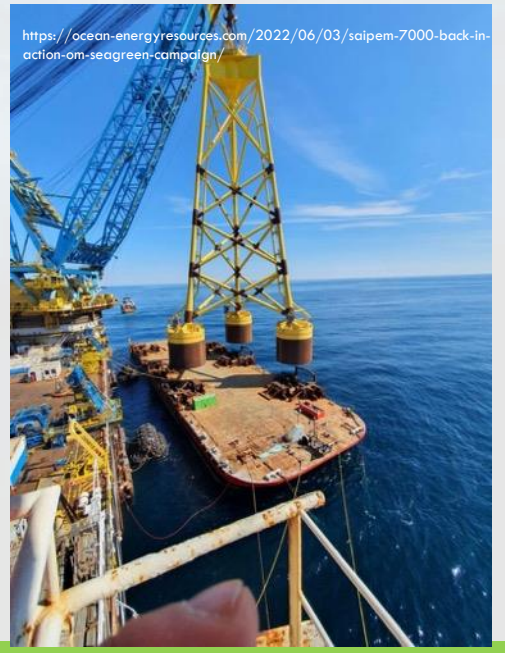
In oil & gas, jackups were predominately used for drilling operations.

The first fixed wind offshore lifting involved near-shore jackups.

These evolved quickly to self-propelled jackups, then the industry started using monohull and semi-submersible crane barges as used in the oil & gas industry.

The asset cost in offshore wind eventually reached a point where the large more expensive marine assets provide economic and hence shared across industries.



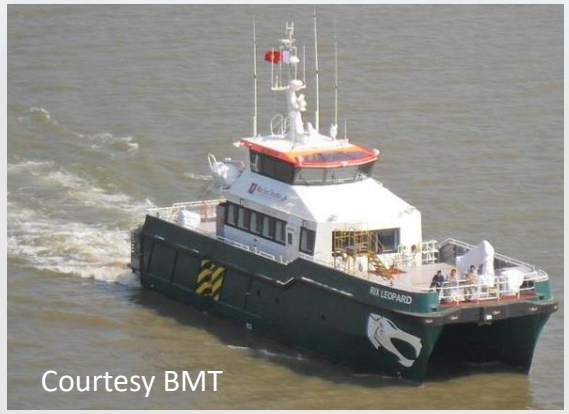
# Service Operations Vessels -

The early wind farms were close to shore and hence day trip vs Crew Transfer Vessels were the norm. Although still used extensively, the larger wind farms further out to see use Service Operations Vessels with typically 2-week rotations and daughter-craft onboard.

Early SOV's were converted/re-purposed from ERRV's in Oil & Gas,

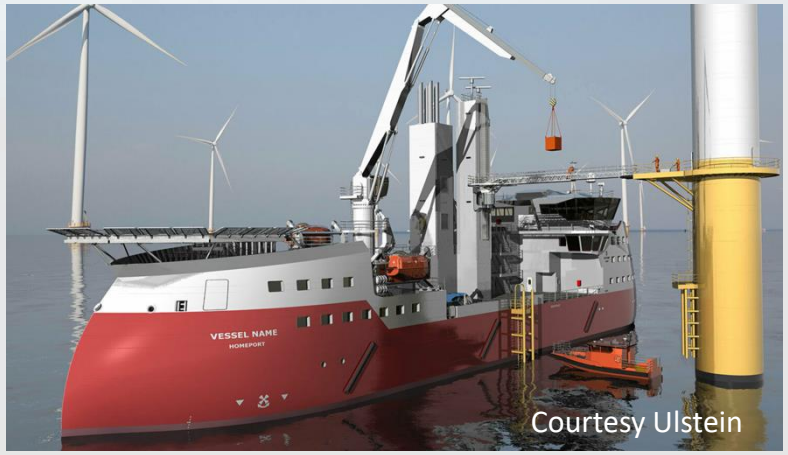
The size and capability of SOV's has increased to become a unique class of vessels themselves, focusing on walk-to-work, concentrated and efficient field support, together with high welfare standards.

Will SOV's support oil & gas also? How will their support for floating wind differ from fixed?



Courtesy BMT

Courtesy Esvagt



Courtesy Ulstein

# Specialist or Multi-Purpose – Case Study

In 1998 the "Seaway Eagle" (now Subsea Eagle) loaded out the entire Triton FPSO mooring system in one mobilisation;

- 4.5km of 120mm chain into underdeck chain lockers (1200m$^3$)
- 7km of spiral strand wire into an underdeck carousel.
- 9 x Drag anchors on deck

The Eagle, unique for an OCV then, had a stern roller and sharks jaws for chain handling. At the time, estimates of 3 - 4 trips by large AHTS were required vs 1 for the Eagle.

By being able to transport, install and tension an entire mooring system this was a classic example of multi-functionality in one asset.

As we move to 7, 30, 50, 100 FOWT's in a farm, which is best?

– One vessel type doing a whole mooring system

– Multiple vessels each doing parts of the mooring

– Hybridisation of the above to minimize double handling.


# Market Utilisation Demographics

| Marine Asset | Fixed O&G | Fixed Wind | Floating O&G | Floating Wind | Interconnectors |
|---|---|---|---|---|---|
| Jackup Crane Barge | Potential | | Rare | Nearshore WTG assembly | |
| Semi-submersible Crane Barge | Common | | | | |
| Monohull Crane Vessel | | | | | |
| AHTS | | | | | |
| Ocean Going Tug | | | | | |
| Cable Lay Vessel | | | | (1) | |
| Flexible Lay Vessel | | | | | Size limitation |
| Pipelay Vessel | | | | (2) | |
| Large Offshore Construction Vessel | | | | | |
| Small Offshore Construction Vessel | | | | | Supporting works |
| Service Operations Vessels | | | | | |
| Crew Transfer Vessels | | | | Limited by distance | |
| Non-Propelled Barges | | | | | |

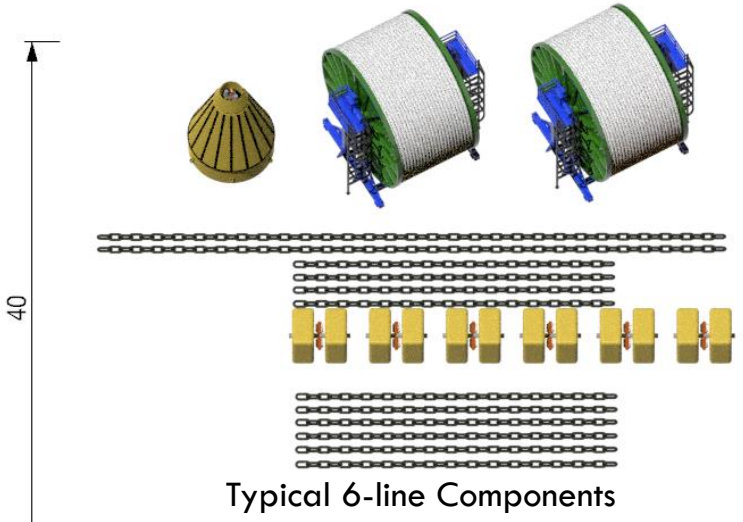
1. Heavy lift assets may be used more inshore/nearshore/alongside in port for floating wind turbine assembly.
2. CLV demand may negate need to enter floating wind space due to upgrades required / Pipelay vessels maybe needed to fill demand for FOW.
3. Jack-up cranes vessels are relatively rare in oil & gas which tended to semi-sub / barge crane – fixed wind creates opportunity.

# Floating Wind – Mooring Systems

The space and volume required for Floating Wind moorings varies, but below is a typical 6-line mooring system. The anchor selection is subject to a variety of considerations and multiple types may be used on a single mooring system.

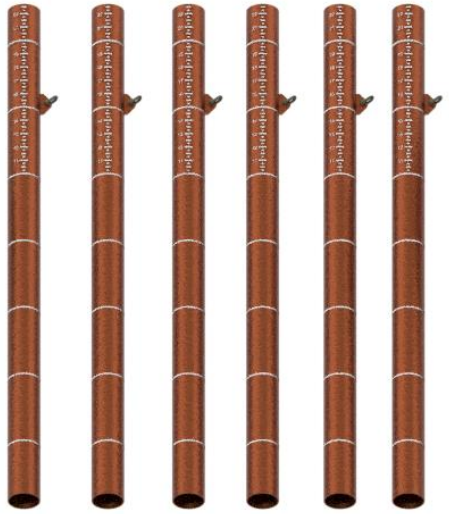
Despite the long lengths, fibre ropes are light and reel efficiently. There are 3 ropes on each reel shown.

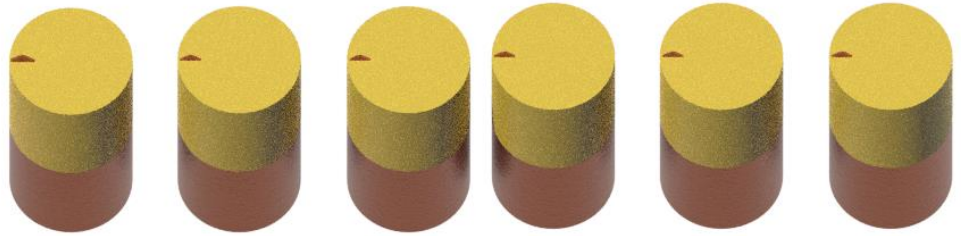
The volume of 2 dynamics risers is similar to that below.




Typical 6-line Components

Pile Anchor Option





Suction Anchor Option

Drag Anchor Option

# Floating Wind Anchors – Driving Vessel Selection

The early floating wind projects used drag anchors and AHTS's.

As floating turbines increase in size so does the drag anchor embedment loads and we are now seeing embedment forces close to and in excess of 1,000 tonnes.

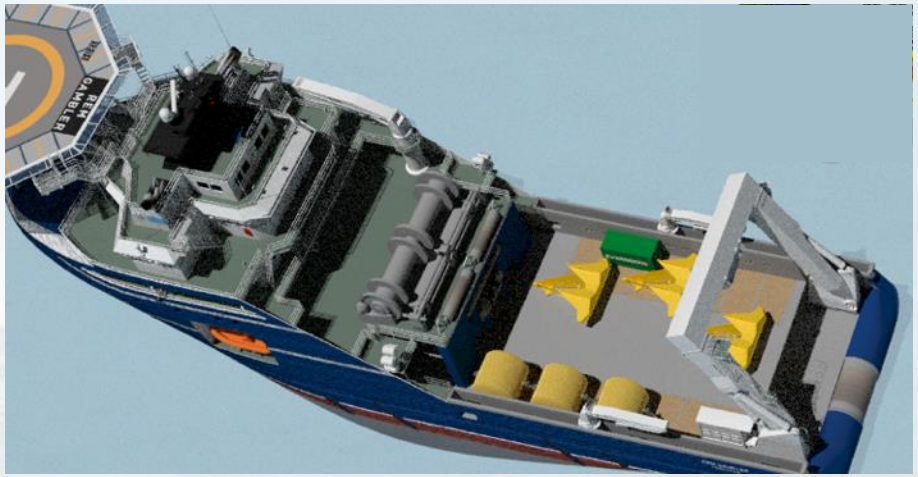
This creates technical-economic risk and places pressure on the vessel market for high bollard pull capacity AHTS.

The option of suction anchor, driven/vibro piles or drilled piles are established options and base case for shared anchors.

For the same beam an OCV has a much larger deck space and a crane to deploy over the side instead of the stern.

Is the GW scale deployment of anchors for Floating Wind better served by a large OCV loadout or multiple trips with AHTS?

Do we see the AHTS becoming a supporting role to very large deck offshore construction vessels?



25m beam AHTS and OCV which has larger deck space, crane and underdeck storage.

# Floating Wind Mooring Components –Vessel Selection

A recent ORE Catapult report [1] identified that steel chain has high carbon emissions compared to fibre rope. Given the limitations within the supply chain the floating wind industry looks to move to fibre rope and alternative materials.

This trend will have significant impacts on the marine assets projections as rope is easily reeled or spooled into carousels, maximizing the use of deck space, plus lower transported weight instead of chain in lockers.

Will we see a shift to ultra large open deck vessels transporting ropes en-mass with AHTS of small OCV's supporting the offshore installation?

https://breakbulk.news/tag/biglift-barentsz/


https://www.heavyliftnews.com/jumbo-sal-alliance-achieve-faster-project-schedule-transporting-29-offshore-reels/

1. https://ore.catapult.org.uk/wp-content/uploads/2023/01/CSC-RPT-CFAR-OC-031-11012023-WP4-Task-4-Anchoring-and-Mooring.pdf

# Specialisation driving market

The market for Anchor Handling Vessels for floating wind is seen as a major bottleneck in the supply chain.

With such a large demand for towing as a core function (especially for tow-to-port), does this reduce the demand for AHTS's with large deck space, ROV's, large chain lockers and multiple sharks jaws? Or do some move to an emergency response role?

Will we see an expansion of the traditional towing vessels focusing on seakeeping, minimal environmental footprint, efficiency and cost optimization - a return to a more traditional ocean-going tug role?

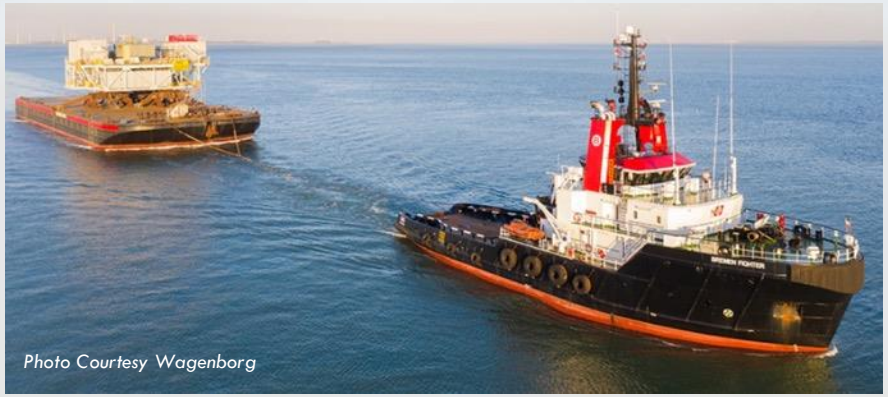


Photo Courtesy Wagenborg

https://www.energyvoice.com/renewables-energy-transition/329482/worlds-largest-floating-wind-farm-kincardine-aberdeen-complete-next-month/

# What will the market want, get and need?

Damen Shipyard announced the FLOW-SV design based on a 32m beam AHTS. Is this the vessel for floating wind if the trend moves to different anchor types and long length fibre rope?

Could the AHTS's and the SOV's merge some capabilities together with the emergency towing requirements for floating wind?

Will SOV's be home to AUV's for inspections?

Will SOV's be built to support the construction phase of floating wind as part of cost efficiency and 'learning curve'

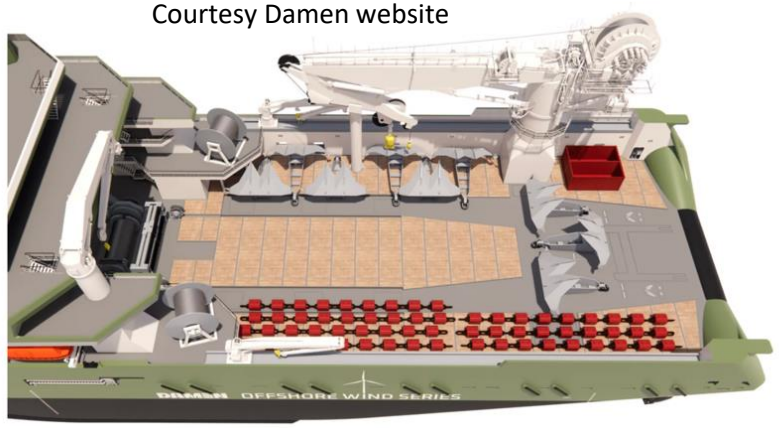
Do we build more smaller assets?

Do we build bigger, less high specification assets?

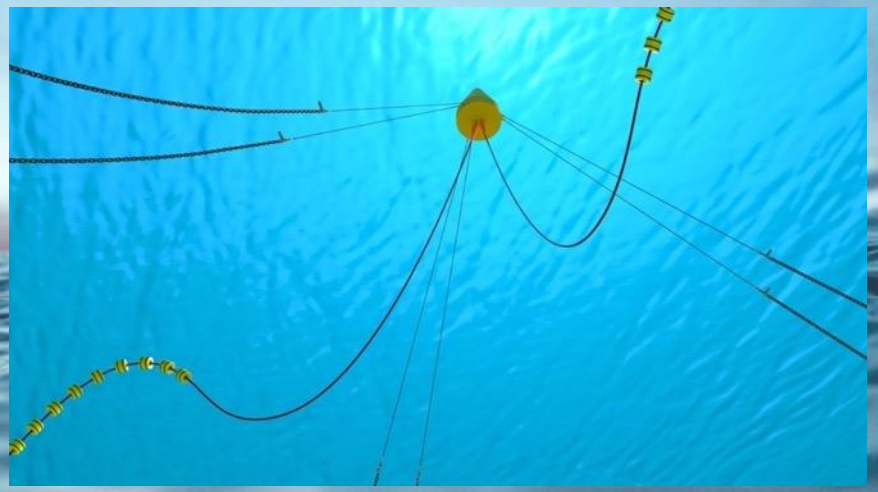
How big a crane do we need?

Are we volume or weight constrained for load-out

Courtesy Damen website



**Multiple questions, many opinions and many answers in a rapidly evolving market…**



*Enabling Floating Wind*

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