# **I**seas

COMPLEXITIES IN OFFSHORE JACKET STRUCTURE REMOVAL Evert van Herel - 16 August 2023 - SUT



## Agenda

- What is a jacket?
- Step 1: Topsides removal
- Step 2: How is the jacket left?
- Jacket removal legislation and impact on removal method
- Step 3: Jacket lift preparations: what type of lift points to use
- Step 4: Jacket lift preparations above water
- Step 5: Subsea preparation (cleaning and cutting)
- Jacket stability during / after cutting
- Step 6: Rigging connection
- Step 7: Lifting and tilting
- Final steps: Jacket transport and load-in

Mseas



# l'Iseas

Heavy Lift Vessel – Pioneering Spirit Lift systems onboard



5,000 ton crane







# **Step 1: Topsides removal**



# First step to freeing up a jacket is to remove the topsides





# **Allseas**

# **Step 2: How is the jacket left?**



#### After topsides removal, the jacket is left

- Jacket can be left for periods up to (a) year(s)
- When left behind a navigation aid will be installed for ship traffic
- Access platforms may be installed directly after topsides lift for future boarding or later by a CSV
- Providing access to jackets can be relatively easy or far more complex







# Jacket removal legislation and impact on removal method



## Jacket removal legislation

#### Europe

- In the past: 55m gap required between remaining structure and water level
- Since OSPAR (Oslo-Paris) agreement between North Sea countries (in effect since 1998):
  - Structure less than 10,000t? -> full removal
  - Structure more than 10,000t? -> partial removal allowed; most of the time footings / foundation can stay in place. Gap to be >55m (=derogation case)
  - Was based on vessel capabilities at the time

#### Australia

- In principle full removal of subsea assets
- Environmental Plan (EP) to be issued to NOPSEMA with proposed removal solution; derogation can be proposed but it has to be shown that this results is as-good or better for the environment compared to full removal
- 55m water gap is adopted for derogation requests
- Trailing liability to be agreed between government and tiltleholder in case of derogation acceptance

# **Allseas**

# **Policy impact on removal methods**

Derogation approved	<ul> <li>Foundation remains in place</li> <li>No sub soil cutting required</li> <li>Vertical lift and transport easier</li> <li>Vertical load in possible</li> </ul>	
Full removal	<ul> <li>Foundation pile cutting required</li> <li>Subsoil cutting</li> <li>May result in taller structures and horizontal transport &amp; transfer or multiple sections</li> </ul>	N. (0)

49925 HOUS TO C.O.G.

ORT THE



# Step 3: Jacket lift preparations: what type of lift points to use



# Lift points

- In most case there are no lift points present
- Lift points have to be constructed
- In general the simplest lift point is preferable
  - Least amount of access required for installing
  - Easiest to install
  - Easiest to connect to the heavy lift vessel

Every jacket and removal method has its own best lift point solution

• Key lift point drivers:

- Above water or below
- Required lift capacity
- Diameter and wall thickness of main leg
- Capacity of (horizontal) members
- Number of lift points required
- Presence of main piles in the legs
- Possible other obstructions in the legs
- Capacity and quality of existing welds



### **Types of lift points (simple to complex)**

1. Slings around braces



2. Internal lift tools inside jacket leg



3. Internal lift tools inside welded can





# Types of lift points (simple to complex)

4. Welded Trunnions onto jacket leg











#### **Step 4: Jacket lift preparations above water**



#### Preparation of access to top of jacket and installation of lift points

- The type of lift point dictates the access requirements
- Welding scopes require the largest amount of access (generators, welding and preheat equipment, rigging containers, air compressor, scaffolding, coffee room, ablutions, gangway landing)





# Preparation of access to top of jacket and installation of lift points

- The type of lift point dictates the access requirements
- Welding scopes require the largest amount of access (generators, welding and preheat equipment, rigging containers, air compressor, scaffolding, coffee room, ablutions, gangway landing)







# **Step 5: Subsea preparation**



#### Subsea scopes - Cleaning

- Cleaning marine growth from jacket members (legs, braces, skirts)
- ROV scope
  - At future support locations
  - At lift point locations
  - At exterior cutting locations
  - Reduction of weight
  - Reduction of onshore waste handling
- Brushes, rotating chain, high pressure water, scrapers can be depending on various types of marine growth











# **Allseas** Subsea scopes - Cutting

- Main methods: Internal Abrassive Water Jetting
  - Tool can be lowered by crane into a jacket leg or pile (above or below water)
  - Can cut through anything, up to 600mm thickness
  - Cut confirmation bit more complex than DWC
  - No external dredging required in case of cutting below seabed
  - Clean and straight cut surface





# Subsea scopes - Cutting

- Main methods: Internal Abrassive Water Jetting
  - Tool can be lowered by crane into a jacket leg or pile (above or below water)
  - Can cut through anything, up to 600mm thickness
  - Cut confirmation bit more complex than DWC
  - No dredging required in case of cutting below seabed
  - Clean cut surface
- Other methods: Hydraulic shears





#### Subsea scopes - Cutting

- Main methods: External Diamond Wire Cutting (DWC)
  - Tool can be made neutral buoyant for positioning with ROV
  - More suitable for braces and cuts above the seabed
  - Positive cut confirmation
  - Risk for uncompleted cuts due to wire breakage









#### Subsea scopes - Cutting

- Main methods: External Diamond Wire Cutting (DWC)
  - Substantial dredging required in case of cutting piles below seabed









# Jacket stability during / after cutting



### **Jacket Stability**

- Stability requirements are depending on time between cutting, final cuts and actual lift in combination with the expected environmental conditions
- Stability criteria: horizontal displacement and toppling
- Often green cuts, (yellow cuts) and red cuts philosophy is used:
  - Green cuts can be made well in advance of connecting rigging and lifting
  - Yellow cuts can be made shortly in advance of connecting rigging and lifting
  - Red cuts require the rigging to be connected and sometimes slight tension to ensure stability
- For full removal jackets red cuts may be omitted if analysis proves stability is sufficient for a specific period (e.g. month before lift it should be able to withstand a storm of the applicable season)
- For partial removal or removal in sections, the upper jacket parts very often have red cuts





# <u>|</u>||seas

# **Step 6: Rigging connection**

# **Rigging connection to Jacket Lift System (JLS)**

Pre-defined and agreed connection steps including safe positions for crew







# **Rigging connection to Jacket Lift System (Crane or JLS)**





# **Rigging connection to 5000t Crane**







# Step 7: Lifting and tilting



#### Jacket lift with Jacket Lift System











#### Final steps: Jacket transport and load-in



Inclined on JLS and on deck PS



#### Horizontal transfer from JLS to barge by skidding and subsequent load in



# **Allseas** Vertical jacket load-in



# Direct Load-in onto quayside



# COMPLEXITIES IN OFFSHORE JACKET STRUCTURE REMOVAL

Evert van Herel 16 August 2023 – SUT-Perth