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From	Arup / Foster Wheeler	Date
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Subject	Project: Compass Port - Decommissioning Strategy	

The following discusses the decommissioning strategy for the LNG Tanks and Marine Structures. This has been prepared for inclusion in section 46 of the permit application. Similar text will be included in the CGBS Conceptual Design Report.

1. DECOMMISSIONING

The terminal will be decommissioned at the end of its life. Decommissioning is to include the removal from the site of all structures from above the seabed. It has been assumed that structures would be returned to onshore for recycling or disposal.

1.1 General

This discussion on decommissioning is limited to activities directly related to the CGBS LNG tanks, re-gasification facilities and the marine structures.

Inclusions:

- Removal of CGBS units
- Removal of access bridges and pipe-racks
- Removal of all piled structures above seabed (including berthing jackets, intermediate jackets, process jacket, quarters jacket, flare tower jacket)
- Final removal of all dropped objects from sea-floor
- Decommissioning of terminal, including decommissioning of facility, warm-up and purging of LNG tanks, removal of In-Tank pumps.
- Purging of all process pipework
- Removal of process platform topsides, quarters platform topsides and flare tower

Exclusions:

- Decommissioning and removal of pipeline and riser
- Removal of any contaminated liquids or solids on the facilities or spilled into the surrounding environment

1.1.1 Facility Decommissioning

Decommissioning will occur after re-gasification of the last LNG shipment to the terminal.

The following activities will occur during decommissioning.

- Removal of LNG from tanks using process pumps. The LNG will be drawn down to the lowest operating level using the process pumps. The LNG will be re-gasified and exported through the existing pipeline system.
- Removal of LNG using stripping pumps. The remaining LNG will be removed using temporary stripping pumps. The pumps will be installed in the LNG tanks as required. The LNG will be re-gasified using the process equipment and exported through the existing pipeline system.
- Removal of remaining LNG by boil-off. The boil-off gases will be fed to the boil-off gas compressors and exported through the existing pipeline system.
- Purging of the LNG tanks. The LNG tanks will be purged using warm-dry nitrogen. Purged gas will be directed to atmospheric vents located in a safe area. Once the tanks are purged of gas, forced ventilation will be applied until the inner tank atmosphere is deemed acceptable. Continuous gas monitoring of the tanks will occur until the tanks are demolished.
- Purging of process equipment and pipework. Pipework and equipment will be purged, decommissioned and disassembled to ensure gas concentrations cannot occur.
- Pipeline and process equipment decommissioning. The pipeline and process facilities will be decommissioned, and then purged prior to its removal. The riser connection to the process jacket will be removed.
- All utility equipment will be drained, purged with air, dismantled and removed
- CGBS decommissioning and removal. The CGBS will be re-floated, towed to an onshore casting basin and demolished. The adjoining sections of the access bridges will be removed prior to CGBS removal. Refer to section 1.2 for further details.
- Access bridges and pipe-rack removal. Access bridges and pipe-racks will be lifted from their supports, placed on barges and shipped to onshore fabrication yards for demolition. Refer to section 1.3 for further discussion.
- Process platform, quarters platform and jacket platform decommissioning and removal. These items will be decommissioned and lifted off their jackets. The structures will be placed on barges and shipped to onshore fabrication yards for demolition.
- Substructure removal. All remaining substructures will cut from their piles at sea bed level and lifted onto barges. The substructures will be shipped to an onshore fabrication yard for demolition. Refer to section 1.3 for further discussion.
- Final clean-up of exposed obstructions and handover to owner. Refer to section 1.3 for further discussion.

1.1.2 Decommissioning Schedule

Decommissioning of a facility is generally not schedule driven. The following is an estimate of the offshore durations for removal of the terminal.

- Terminal Decommissioning (including pipeline decommissioning) – 4 Months
- CGBS removal – 1 Month per CGBS
- Marine Structures removal – 5 Months
- Final Clean-up – 1 Month

The total offshore decommissioning schedule is estimated to be 12 months.

Demolition of the CGBS structures is expected to take between 6-12 months depending of whether the CGBS can be demolished in a dry-dock or whether it must be partially demolished while still floating.

A level 1 schedule is provided with this memo.

1.2 CGBS Decommissioning

It is assumed that a contract will be awarded for removal of the CGBS units, and will include engineering, CGBS removal and CGBS demolition. This section discusses in detail the proposed CGBS Decommissioning activities:

- Engineering of the removal sequence will be carried out. The works would be carried out in accordance with prevailing regulatory standards, codes of practices and permitting requirements.
- A dock will be leased or constructed for the dry demolition of the structure. The depth of the dock will depend on the draft of the structure. It may be possible to carry out some demolition with the structure afloat if draft is critical. It is assumed that the demolition dock will be similar to the proposed CGBS construction docks.
- Vessel Mobilization. It is assumed that at least four large offshore tugs and one construction support vessel (CSV) will be mobilized for CGBS float-up.
- After LNG tank purging, all mechanical equipment on the CGBS will be disconnected. The construction support vessel will be used to remove the adjoining access bridge span. The structure will be placed on the deck of the CSV for return to shore.
- Solid ballast will be removed from CGBS using suction or airlift devices. Solid ballast will be placed on barges and shipped to an onshore disposal location.
- The skirt compartment pipework will be sealed and tested. During the deballasting operation, water will be pumped into the skirts until the skirts are freed from the seabed.
- The water contained in the CGBS lower ballast cells will be drained using submersible pumps. It is likely that the water will not be suitable for discharge to sea, and therefore should be transferred to a tanker for disposal onshore.
- The CGBS should be floating with a draft of approximately 18m. If significant weight of soil were to remain attached to the underside of the CGBS, it would be removed by water jetting.

- The CGBS draft will be reduced to approximately 12.5m by creating an air cushion in the skirts. Compressed air will be pumped into the skirt compartments using existing CGBS installation pipework.
- The CGBS will be towed into a dry dock and ballasted until grounded. The second CGBS would also be re-floated and towed into the same dry dock.
- A bund wall or similar will be installed across the front of the dock. The dock will be dewatered and hard standing material placed on the base of the dock.
- The CGBS will be demolished using hydraulic breakers and other conventional demolition equipment. The steel and concrete would be separated and recycled as appropriate. Material that cannot be recycled such as tank insulation would be disposed of at a certified disposal location.

1.3 Marine Structures Decommissioning

Decommissioning of the marine structures include:

- Process Deck and Jacket
- Quarters and Jacket
- Flare Tower Jacket
- 10 No. Access Bridges
- 11 No. Berthing structures
- 10 No. cat-walks for berthing structure
- 16 No. small piled jacket structures

A marine spread consisting of a construction support vessel (CSV) with a large crane will be mobilized to the terminal site. The CSV will also be installed with diving facilities for underwater cutting and seabed survey. Anchor handling vessels and transport barges will also be mobilized.

All offshore structures will be stripped and cut-up into manageable pieces. Underwater cutting techniques will be used if required to break larger jacket structures into smaller pieces. Lifting attachments will be attached to the structural pieces and tested if required. Prior to lifting jacket structures, they will be cut from the installed piles. Piles will be cut a short distance below the seabed to ensure that exposed obstructions do not remain on the seafloor.

All items will be lifted onto barges and shipped to an onshore fabrication yard, where they would be stripped of all non-recyclable material and cut into smaller pieces suitable for recycling.

Sonar and ROV sweeps of the terminal footprint will be made to ensure that no exposed obstructions remain on the seafloor.

Project: Compass Port - CGBS Decommissioning

LEVEL 1 Schedule for CGBS Decommissioning

