

# Tullow Ghana T.E.N.

subsea 7



The T.E.N. (Tweneboa, Enyenra, Ntomme) Development Project is comprised of three fields producing to single FPSO through 36km of pipe-in-pipe (PiP) production flowlines, and augmented by water and gas injection. A gas export pipeline transfers the gas production 30km to the Jubilee field and to shore.

The T.E.N. Project includes detailed design and installation engineering, procurement, fabrication, construction, surveys, installation and pre-commissioning of subsea facilities connected to a turret moored FPSO.

# Tullow Ghana T.E.N. (Tweneboa, Enyenra, Ntomme)

## Project

T.E.N. Project

## Client

Tullow Ghana Limited

## Location

Approximately  
100 miles offshore  
Takoradi Ghana

## Water depth

1,000m - 2,000m

## Project Type

SURF

## Date Awarded

August 2013

## Date Completed

Ongoing

## Vessels Utilised/ Spoolbases

*Seven Borealis*  
*Simar Esperança*  
Takoradi Fabrication  
Yard

## Overview

Subsea 7 EPCI Scope of Work included the following:

- Pipe and structures fabrication and installation (6"/ 9" PiP, 8" / 10" PiP and 16 PLETs/PLEMs + 1 SSV);
- Pipe-walking mitigations and anchor chains connections (19 pipe-walking piles), lateral buckling mitigations (18 sleepers);
- Installation of:
  - 4 x Manifolds and Piles
  - 2 x Riser Bases and Piles
  - 84 Electrical Flying Leads, 6 Umbilical Termination Assembly Jumpers and 25 Steel Flying Leads
- Pre-lay and as-built inspection
- Pre-commissioning of production and gas export flowlines

The Subsea 7 Global Projects office in London managed and engineered the Project with the support of the Paris-based *Seven Borealis* Vessel Support Team, responsible for pipelay engineering, and the Vessel Chartering Group providing 15 support vessels. Subsea 7 established a fabrication yard in Takoradi Port, Ghana, to support fabrication activities and offshore operations. Good communication between the teams on the Project ensured its safe and efficient delivery.

The *Seven Borealis* successfully completed the pipeline campaign and heavy structures installation ahead of schedule. The Light Construction Vessel *Simar Esperança* completed the survey, jumper metrology, pre-commissioning and as-built inspection as well as the installation of flying leads, pipe-walking chains and the LBL array. Offshore operations were performed in ten months with 17 Vessels and over 600 personnel.

The Takoradi Fabrication Yard manufactured 25 suction piles, 18 sleepers and one Gas Export manifold, delivering these critical structures on schedule whilst exceeding local content requirements.

Subsea 7's new fabrication facility at Takoradi Port offers multiple new capabilities to Ghana's developing oil and gas sector, boosting the West African nation's growing profile as a regional hub for offshore petroleum operations. Specific capabilities include medium to high specification fabrication, which involves the manufacture of complex subsea structures, heavy fabrication and marine loading. The Takoradi facility, which spans an area of 10,000m<sup>2</sup>, has fabricated more than 2,000 tonnes of steel structures to be used as permanent equipment on the seafloor and loaded them onto cargo barges with the yard's new Manitowoc 16000 crawler crane. Safety training was delivered to 100 employees in the fabrication yard as well as selected trainers from the Ghana Port and Harbour Authorities (GPHA).

Technology transfer to Ghana includes the following:

- Heavy plate rolling
- Computerised plate cutting
- Heavy lifting operations
- Super duplex and carbon steel pipe welding
- Working at height and confined space training
- Seafastening

Key achievements of the TEN Project are:

- Direct pipe transfer from Europe to the pipelay vessel offshore Ghana
- A solution for lateral buckling and pipe-walking to reduce required anchoring loads
- The first subsea manifold fabrication in Ghana
- The largest crawler crane capacity in Ghana
- Pipelay and heavy structure installation ahead of schedule
- Design, construction and management of the Takoradi Fabrication Facility



*Seven Borealis offshore Ghana*



*300ft cargo barge approaching Seven Borealis offshore Ghana*



*Pipe-walking chain installation by Simar Esperança*