Gulfstar One FPS

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Outline

> Williams’ Gulfstar strategy
> The first Gulfstar: Gulfstar One (‘GS1’)
  > Overview
  > Specifications
  > Fabrication
  > Installation
  > Challenges and lessons learned
> Questions
Williams’ Gulfstar strategy

> Deepwater development alternative
  – Bundled approach: combine Williams funded and owned:
    • Pre-designed Gulfstar FPS™ as a tie-back host facility; with
    • Oil and gas export pipelines, to downstream pipeline(s) selected by anchor producer(s)

> Maximize capital / risk allocation efficiency
  – Allow parties to focus their capital investment on their respective core business
    • Producers: Exploration, drilling, and production of oil and gas reserves
    • Williams: Infrastructure (Gulfstar FPS and export pipelines)

> Reduce cycle time, improve producer’s field development NPV
Gulfstar One FPS

> MC-724, 4,030’ WD

> Anchor tenant:
  – Hess’ Tubular Bells field (Chevron 43%)
  – First production: November 2014

> Tieback:
  – Noble’s Gunflint development (MC-948)
  – Expansion project ongoing
  – First production in 2016

> 17-mile oil & gas export pipelines
Specifications

- **Classic Spar Hull**
  - 584’ length (524’ draft)
  - 85’ diameter
- **Traditional 3-level deck**
  - Single lift weight: 6,600 st.
  - Max operating: 8,600 st.
- **Wet trees only**
- **Capacities:**
  - 60,000 bopd
  - 132,000 Mcfd
  - Produced water: 50,000 bwpd
  - Injected water: 60,000 bwpd
- **Base Export:**
  - Gas: 1,850# (boosting to 3,200#)
  - Oil: 2,310# (re-stage needed for 3,200#)
Specifications (cont.)

> Flowlines & injection lines:
  - Porches: (3) Tubular Bells risers
  - Pre-installed pull tubes: (4) future risers

> Umbilicals:
  - (6) from pull-tubes
    • (1) initial, (5) future

> Export risers:
  - (2) x 12" (porches)

> In-Hull bulk storage:
  - Dry Oil: 10,440 bbl
  - Methanol: 1,160 bbl
  - Diesel: 1,160 bbl
  - (20) S/S vessels for PW and chemicals
    • 10 x 100 bbl
    • 10 x 200 bbl

> Designed to API-MET – CGoM
Mooring configuration

> Arrangement
  - Nine line, 3 x 3 array
  - One chain jack per line

> Line make-up:
  - 8.75” polyester
  - 5” R4, studless chain at hull
  - 6” R4, studless chain at piles

> Anchor piles
  - Suction (GS1) or driven
Cellar Deck G/A

- PN
- Float Cell
- Glycol Regen.
- FWKO
- Oil Export Pumps
- Production Separator
- LACT Charge Pumps
- LACT (under)
- Production Manifold
- LACT (under)
- 3 Phase Test Separator
- BOT
- Topsides HPU
- Auxiliary Generator
- Flowline Launcher/Receiver
Production Deck G/A
Main Deck G/A

- Future BG Compressors
- FG Compressors
- SWI Pumps
- 1x 60,000 BWPD Sea Water Injection 2-Modules
- Turbine Generators
- 50-man Quarters & Helideck (not Shown)
Fabrication

Hull: GMF – Ingleside, TX
- Signal Int. - skirt tank sections
- First traditional Spar built in U.S.

Topsides: GIF – Houma, LA
- Construction began late 2011
- Deck sailed early March 2014

1. Dolphin Services: Spool piping
2. Intermoor: Suction piles
3. Allison Marine: TWD
4. Provided over 1,000 jobs in more than 20 states, ~90% domestic sourcing
Join Plates
Seam Weld
Square up Section
Fit Angles
Weld out Angles
Transport to Flipping Jigs
✓ Flip panel
✓ Back Gouge
✓ Weld Second Side
✓ Flip Panel

✓ Install in ¼ jig
✓ Fit and weld circumferential girders
30' centerwell
Water Tight Flat is fabricated in quadrants then flipped for backwelding.
Water tight flat is fit around the centerwell
Block “D” Assembly
Access shafts are installed on the flat, ¼ sections are installed
Block ‘I’ Assembly
Installing chain lockers - Block ‘F’
Block “G” Lift

JSA

Lift Off

Rolling

Swinging

Lowering

Touchdown
Block ‘F’ Lift
Temporary work-deck

> Robust, multipurpose design
  - Mooring line pull-ins
  - Hull pre-commissioning
  - Riser and umbilical pull-ins
    - Flow line
    - SWI
    - Export
  - Subsea pre-commissioning
Challenges

- Skilled labor availability

- Interface
  - Williams as FPS Owner, Hess as Field Operator and FPS Operator

- SIMOPS during offshore campaign

- Fabrication (to follow)
  - Lessons learned incorporated into Gulfstar standard design
Challenges - Hull complexities

- Large amounts of electrical and instrumentation cabling, block-to-block within hull
Chemical storage tanks

(-) 20 ft

PN

Pump Skid
In-hull chemical storage

- **Benefits:**
  - Flexibility with chemicals
  - Improves CG and global motions

- **Challenges:**
  - Transfer pumps
  - Piping
  - E&I
  - Fire and HVAC
  - Alloy (CuNi) welding (access, welders)
“Stop saying ‘That’s a good question’ and start answering them!”
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