Tengizchevroil Expansion: Benefitting Future Generations of Kazakhstan

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Agenda

- Fluor Overview
- Tengiz Project History
- Overview of the Future Growth Project & Wellhead Pressure Management
- Update on the Pipeline and Project Scope

Onshore Oil and Gas Projects - Pipeline Tie-In in Cold Climate
TCO Project History

- **Location:** Tengiz, Kazakhstan - 1998
- **Pipeline Details:**
  - Very sour field /H2S Content <=16%
  - 480km of pipeline (2 to 40")
  - Design Pressure (max): 650 Barg
  - Design Temperature (max): 110ºC
  - Fluids: Crude / Multiphase / Tech Water/Gas

- **Description:**
  - Designed to allow the Tengiz gathering system to provide a minimum of 12MMTPY (crude oil) at solution GOR during early well life or 10MMTPY (crude oil) at 120% GOR plus a 10% design margin for mature well life
  - Original Facility was stick built
  - Reinjection compressors were first of a kind with combination of Pressure and Sour Gas
  - Many lessons learned were incorporated into the new facility
  - TIC: Approximately $8 B
TCO FGP & WPMP Project Update

- Final Investment Decision was made in 2Q16 – TIC Approx $36 B
- Wellhead Pressure Management Project (WPMP)
  - Lower back-pressure on wells to maintain the existing plants at full capacity
- Future Growth Project (FGP)
  - Increasing capacity ~ 260 MBOED utilizing proven technology
  - Improves reservoir recovery
  - Extends the production plateau by increasing TCO gas handling capability

Source: Chevron Investor Relations Update – August 2016
TCO 3GP/3GI – Gas System Expansion

- Expanding the oil gathering network
  - New multi well pads
  - New manifolds and metering stations
  - New flow gathering and trunk lines

- Debottlenecking the existing gathering
  - Debottlenecking existing manifolds including the main manifold
  - Debottlenecking existing metering stations

- Expanding the gas reinjection
  - Expanding on SGI technology
  - High pressure sour gas re-injection

- Addition of associated infrastructure and utilities for all of the above
TCO FGP Facility – Kazakhstan

- **Plant Capacity:** 12 MMTPY Oil (260 MBOPD) 960 mmscfd Gas
- **3GI Capacity:** 2x 480 mmscfd (2x 75% trains)
- **H2S Content:** 16 mol%
- **Module Basis:** 1,800t / 300t
- **3GP Location:** NW Field (4km SW SGP)
- **Pressure Boost:** At 3GP
- **3GI Location:** Central Field (7km S 3GP)
- **Drives:** All Electric w/ Adj Speed Drives
- **Power Plant:** 4x Frame 9
Technical

- **3GI design parameters**
  - High reinjection pressure (600 bar)
  - Sour service
  - High temperature (110 °C)
  - Varying ground conditions

- **Reinjection pipelines**
  - ‘Gun barrel’ F22 & X60 - 14 " x 57.5mm wall

- **Gathering and trunk lines**
  - 450 km of pipeline (all dims)
  - 205 pig traps

- **Installation methods**
  - Open cut
  - Trenchless crossings

- **Well pad design**
  - One well pad, multiple cellars
  - Self contained utilities, etc
Summary of Pipelines

- **3GI Sour Gas Injection**
  - 5 Injection Pipelines, 30km in total, 14” OD, 57.5mm WT, 110°C, 600 Barg
  - 2 Sour FEED gas lines to 3GI injection island, 18km total, 26”, 70°C, 93 Barg

- **High Pressure Gathering System (Pre-WPMP)**
  - 16 Flowlines, 21km total, 8” and 16”, 95°C, 93 Barg
  - 21 Trunk lines, 120km total, 14” to 24”, 88°C, 93 Barg

- **Low Pressure Gathering System (Post-WPMP)**
  - 20 Flowlines, 22km total, 8” and 16”, 95°C, 40 Barg
  - 32 Trunk lines, 177km total, 18” to 24”, 88°C, 40 Barg

- **Utilities & Misc.**
  - 47 Fuel Gas Lines, 117km total, 4” and 6” and 24”, 80°C, 40 to 132 Barg
  - 35 HDPE Water lines, 46km total, 4” to 16”, 25°C, 14 Barg
  - 9 Misc. Lines: Diesel, Propane, Condensate, Drain, 52km total, Various Temps and Pressures
Current Status

- Project’s safety focus continues:
  - Over 8.7 MM man-hours worked since last recordable incident (3+ years)
- FEED completed
- Detailed engineering 9.9% complete
- Completed update of KC Plan following 4 engagements with KC Expert Group and Kazakhstani Suppliers Forum
- Contracts & Purchase Orders award is underway
- We have offices in Atyrau, Almaty, Aktau, Farnborough (UK), Houston (USA) and New Delhi (India)
- Workforce mobilization to Tengiz.
Current Status

- Start Dates – Prior to the end of the year
- Pipe Suppliers – In progress
- Coatings – In progress
- First Gas – Scheduled 2022 ???
Modular Construction - A lesson learned

FGP to use a modular strategy
- Moves work to a more controlled environment
- Provides access to a broader workforce
- Reduced infrastructure needs in Tengiz

Project requires ~ 253,000 tonnes of module fabrication
- About 88 modules and 75 pipe racks
- Weighing from 300 to 1800 tonnes
- Modules fabricated in and outside Kazakhstan
Thank You for Your Attendance

- Questions ???