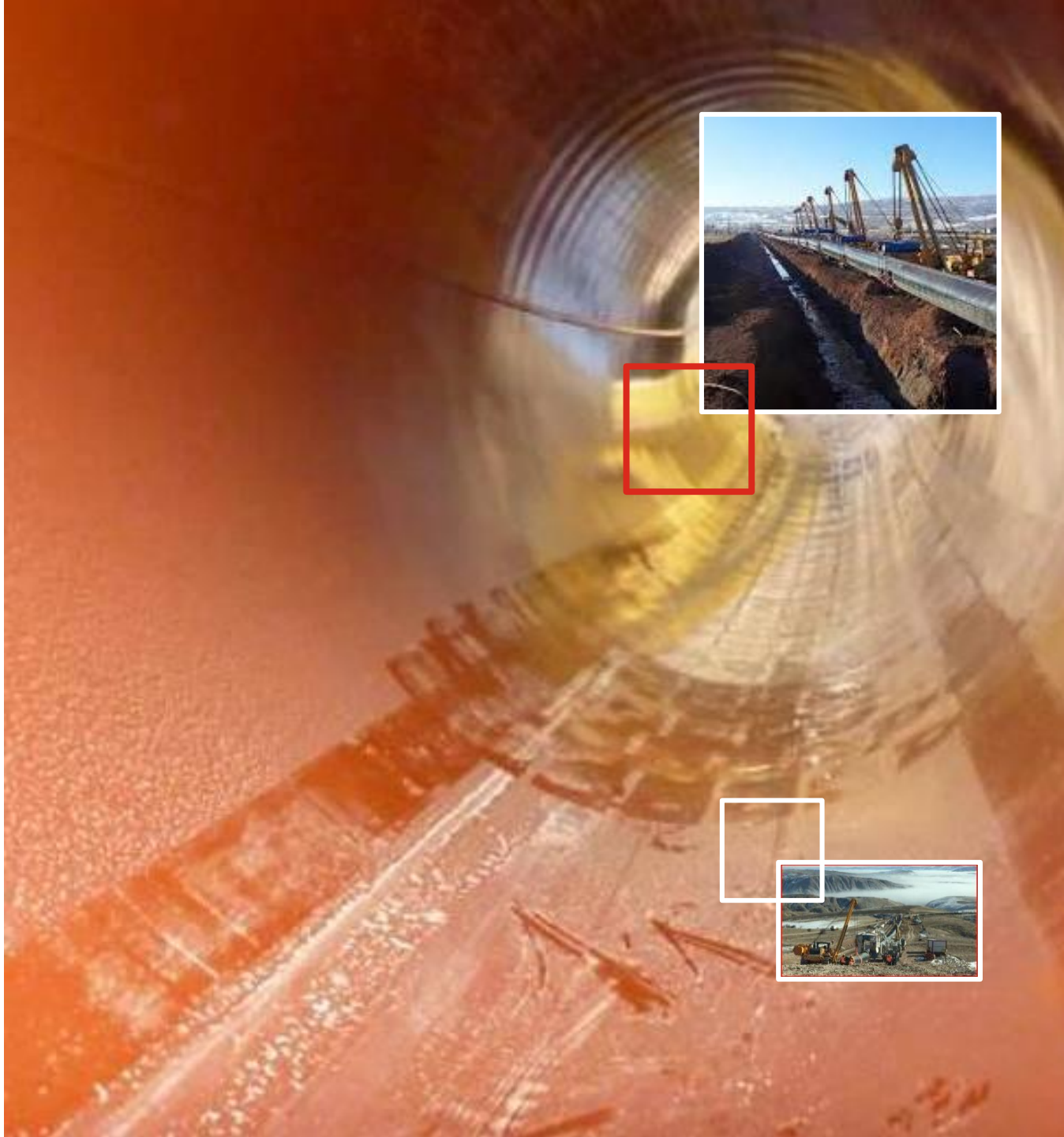
WorleyParsons
resources & energy

EcoNomics

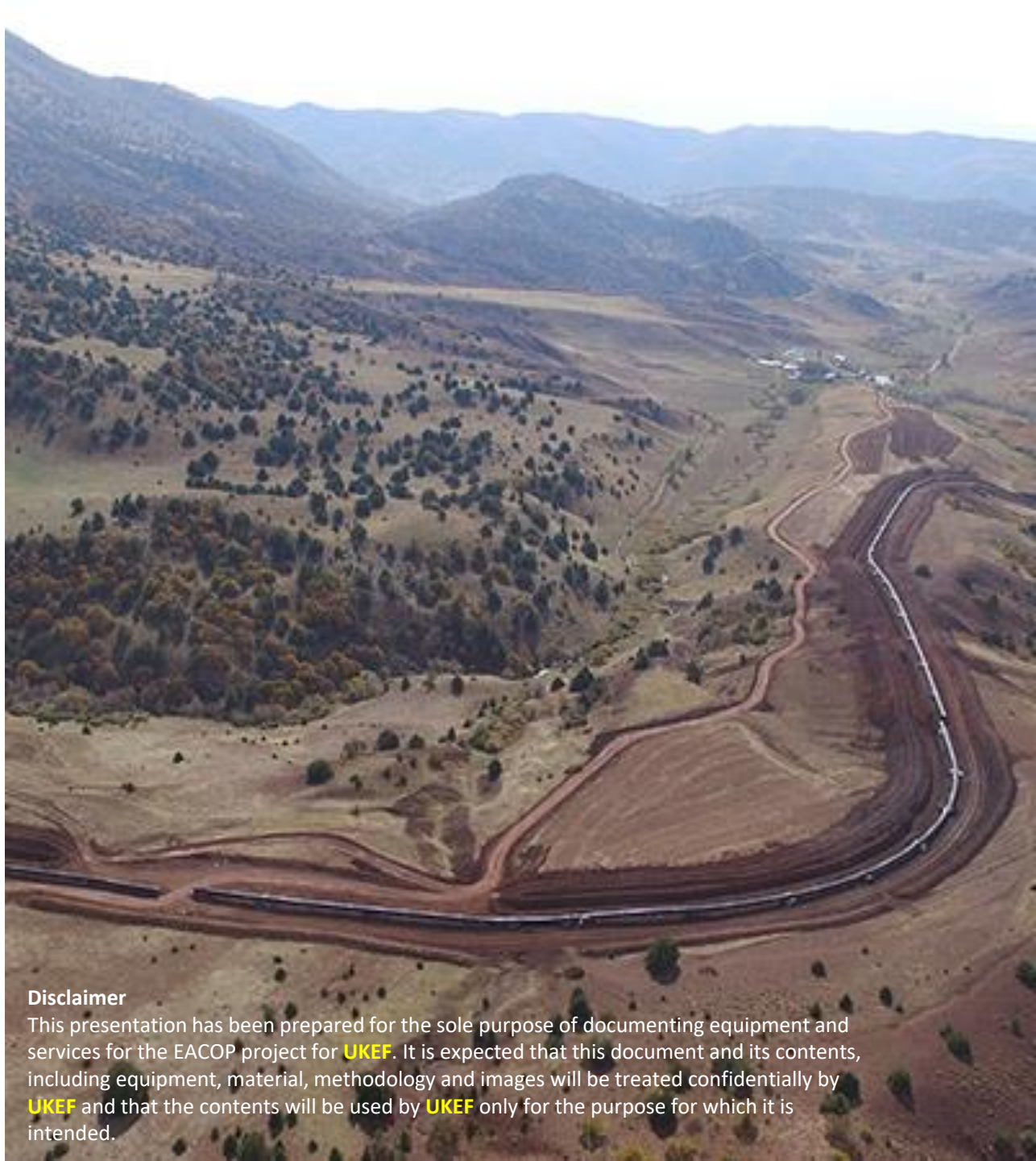
East African Crude Oil Pipeline (EACOP) Project

Description of packages about to be procured



Content

Slide No: Package



Main Electrical Power Generators

Technical Description	Main Electrical Power Generators (engine + generator)
Quantity	14 Each
Design Basis	• 5 – 7 MW packages • Liquid fuel (crude oil/diesel) reciprocating engine driven generator • Crude oil and diesel fuel system with associated treatment • Generator control room, synchronisation control, load sharing system, generator AVR panel, batteries, ICSS interface, and pressurised HVAC system • All main components baseplate fabricated and mounted
Technical Standards (ISO etc..)	• API 546 Synchronous AC Generator - 6.6 kV-3ph-50Hz • ISO 9001:2015 and 14001:2015 & OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Crude Oil Export Pumps

Technical Description	Crude Oil Export Pumps
Quantity	18 Each
Design Basis	• 150 bar 110 kbpd • Fully wired with associated automation, instrumentation and control • All main components baseplate fabricated and mounted
Technical Standards (ISO etc..)	• API 541 electric motor and VFD • API 610 BB3 between bearing pump, axially split multistage design and sealing system • API 671 coupling • API 614 lube oil system • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Main Heat Exchangers

Technical Description	Main Heat Exchangers
Quantity	2 Each
Design Basis	• Shell and Tube Heat Exchangers • Hot Oil as heating medium • Recirculation 1450 m^3/hr ~ 20MW • Bulk Heater 2000 m^3/hr ~1MW
Technical Standards (ISO etc..)	• ISO 16812 • ISO 9001:2015 • ISO 14001:2015 • OHSAS 18001 (ISO45001:2015) • ASME VIII Div. 1 • TEMA R
Delivery Terms	FCA

Main HV Cables

Technical Description	Main HV Cables
Quantity	~4,000 KM
Design Basis	• 33kV - 45kV single core • Conductors: aluminium, round and stranded • 150 to 300 mm^2 section • Conductor Shield/ Screen: Extruded semi-conducting compound applied to the conductors.
Technical Standards (ISO etc..)	• IEC 60502-1 • IEC 60502-2 • IEC 60840 • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Main Electrical Transformers

Technical Description	Main Electrical Transformers
Quantity	11 Each
Design Basis	• Power and Distribution Transformers • 2 ea 45kV / 33kV, 3 ea 45kV/6.6kV, 5 ea 33kV/6.6kV, 1 ea 33 kV/33kV
Technical Standards (ISO etc..)	• KNAN (IEC 610990 or ONAN (IEC 60296) • IEC 60214-1 • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

24” Main Line Block Valves

Technical Description	24” Main Line Block Valves
Quantity	80 Valves
Design Basis	• Full bore, 24" diameter, piggable carbon steel trunnion mounted vertical stem ball valves, with fitted actuators • Rated for 100/150 barg
Technical Standards (ISO etc..)	• API 6D ANSI / AMSE Class 600#, 900', 1500# rating • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Pipe, Flanges, Elbows & Tees - 24" and above

Technical Description	Pipe, Flanges, Elbows & Tees - 24" and above
Quantity	1200 Fittings 20 Kilometres of Pipe
Design Basis	• Piping & fittings carbon steel 24” and above. • ASME Class 600 / 900 • 93.2 barg @ 100 Degrees Celsius
Technical Standards (ISO etc..)	ASME 31.3
Delivery Terms	FCA

Process Valves from 2" to 36"

Technical Description	Process Valves from 2” to 36”
Quantity	~7,000 Valves

Design Basis	• Ball Valves Floating & Trunnion Mounted Ball, Full and Reduced Bore
	• Flexible Wedge Gate Valves
	• Globe Valves
	• Swing Type & Dual Plate Check Valves
	• Plug Valves (Regular & Venturi Pattern)
	• Cat A Butterfly Valves
	  • SIZE (NPS): 2-36 (Note – 36” valves exist at MST);
	  • RATING: 150# - 900#; ENDS: FLANGED RF / FF / RTJ;
	  • BODY MATERIALS: Carbon Steel / Stainless Steel 316 / Ali-Bronze;
	  • TEMPERATURES: Carbon Steel -29/290°C, Stainless Steel -46/100°C, Ali-Bronze -29/100°C;
	  • FLUID SERVICE: Crude Oil / Utilities (Diesel, Water, Nitrogen, Air, Lube Oil, etc.);
	  • DESIGN LIFE: 25 years

Technical Standards (ISO etc..)	• API 6D • API 600 • API 602 / API 623 • API 594 • API 599 • API 609 • API valve standard, supported by ASME B16.34 • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Storage tanks

Technical Description	Storage tanks (except crude oil tank at Terminal Crude Oil)
Quantity	~35 Tanks
Design Basis	• Carbon steel (potential for small stainless steel tanks), welded sections, atmospheric cylindrical 2 - 20 m diameter • Diesel, Hot Oil, Crude Fuel Oil for fuel, Potable Water, slops and Fire Water Tanks storage • Cone up floors with peripheral drain • Fixed roofs with breathers
Technical Standards (ISO etc..)	• API 650 • NFPA
Delivery Terms	FCA

Pig Traps (Launchers and Receiver)

Technical Description	Pig Traps (Launchers and Receiver)
Quantity	9 Sets
Design Basis	• 24"/30" diameter proprietary design pressure vessels, carbon steel • 8 sets of launcher and receiver for 100 bar pressure • 1 set for 150 bar • Double barred tee for each set
Technical Standards (ISO etc..)	• ASME 31.3
Delivery Terms	FCA

Fiscal Metering Skids

Technical Description	Fiscal Metering Skids
Quantity	2 Each
Design Basis	• Multi path Ultrasonic and measurement capacities to be 10:1 turndown, including: flow elements, meter prover (or meter prover connections if temporary), sampling system, density measurement instrument, temperature and pressure measurement instruments (for compensation), and flow computers. • Meter technology based on their expected performance (+/- 0.3% for fiscal) in the operating range as well as reliability and operability.
Technical Standards (ISO etc..)	• ISO standard, API MPMS for Flow measurements • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Nitrogen Skids

Technical Description	Nitrogen Skids
Quantity	1 Each
Design Basis	• 1 off membrane generator skid at Storage Terminal for 2 - 5 tpd 97%
Technical Standards (ISO etc..)	• Cylinders BS 4366
Delivery Terms	FCA

Pumps (except Export Pumps)

Technical Description	Pumps (except crude oil export pumps)
Quantity	~150 Pumps
Design Basis	• Centrifugal pumps, 2 per set, for Diesel (7 sets), Hot Oil (1 set), CFO (3 sets), Potable Water (7sets), slops (3 sets), Crude Oil Transfer, Crude Oil Circulating and Fire Water, • From 100 l/min to 1000 l/min • From 5 - 10 bar max pressure • Positive displacement (chemical injection) pumps for Drag Reducing Agent
Technical Standards (ISO etc..)	• API 610
Delivery Terms	FCA

Pressure Controls Skids and Ancillaries

Technical Description	Pressure Controls Skids and Ancillaries
Quantity	7 Skids
Design Basis	• Proprietary, custom design of skid, rated for 150/100 barg, with 24"/12" diameter manifolds, 3 sets of pressure relief valves, pressure measurement and transmitters with a local display panel
Technical Standards (ISO etc..)	• ASME 31.3 • Vendor standards
Delivery Terms	FCA

Bulk Heaters

Technical Description	Bulk Heaters
Quantity	7 Each
Design Basis	• Fired Heater Packages, Hot Oil System Heat Duty Sizing ~1600 kW for each heating coil loop • Forced draft burners, pilot c/w ionisation rod for each package • Fuel skid with oxygen analyser for each package • Heaters shall be direct dual fuel fired, forced draft, all radiant heaters to API 560; primary fuel - crude oil (see specification attached below), secondary fuel – diesel, and shall be capable of automatic fuel changeover • With all necessary equipment for crude oil conditioning
Technical Standards (ISO etc..)	• API 560 • API 530 • TEMA and ASME VIII Div 1 • ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Vapor Recovery Units

Technical Description	Vapor Recovery Units
Quantity	1 Unit
Design Basis	• Custom-built skid containing compressor/fan, surge drum, condensate drum, manifold, filter with instrumentation and controls with transmitter to central control
Technical Standards (ISO etc..)	• ASME 31.3 • Vendor standards • API 617 for compressor/blower
Delivery Terms	FCA

Export Load-out Arms and Ancillaries

Technical Description	Export Marine Load-out Arms and Ancillaries
Quantity	3 Arms
Design Basis	• 16" diameter, 3D pivot and 6m reach • ESD/quick release • Anti-rupture couplings
Technical Standards (ISO etc..)	• ASME • Specialist Marine codes
Delivery Terms	FCA

Active Fire Protection Systems

Technical Description	Active Fire Protection Systems
Quantity	7 Systems
Design Basis	• Sprinkler systems, foam package, monitors and hydrants • Assembly of compatible equipment including valves & piping
Technical Standards (ISO etc..)	• NFPA
Delivery Terms	FCA

EHT Cables, Connections & Ancillaries

Technical Description	Pipeline EHT Cables, Connections & Ancillaries
Quantity	~4,500 Kilometers (3 cores x 1,500 km)
Design Basis	• Long Line Heat Tracing (LLHT) System to heat the pipeline system to 50°C or above • For installation in a raceway under the insulation of the pipelines to keep the crude oil from precipitating wax • Installation in sections of approximately 30 km in length • Maximum voltage of 6.6 kV (Ph/Ph) 50 Hz • Three phase AC power using three single cores with star connected at the far end.
Technical Standards (ISO etc..)	• ISO 9001:2015 • 14001:2015 • OHSAS 18001 (ISO45001:2015)
Delivery Terms	FCA

Emergency Generators

Technical Description	Emergency Generators
Quantity	7 Units
Design Basis	• Diesel Generators with auto-start capability 500kVA and delivering 400V
Technical Standards (ISO etc..)	• ASME 31.3 for interconnecting pipework • Vendor standards
Delivery Terms	FCA

Perimeter Lighting

Technical Description	Perimeter Lighting
Quantity	~10,500 meters
Design Basis	• Spot-light type lighting at 4m • 150 lux total coverage for CCTV
Technical Standards (ISO etc..)	• IEC
Delivery Terms	FCA

Field Instruments

Technical Description	Field Instruments
Quantity	~3,000 Each
Design Basis	• Analyser, Flow Transmitters, Level Transmitter, Temperature Transmitter, Pressure Transmitter, Vibration Transmitter, Ultrasonic Flow Metering, Flow Control Valve, Safety Shutdown Valves, Motor Operated Valve, Safety Relief Valve
Technical Standards (ISO etc..)	• ANSI • ISA • API • ASME • EN • IEC • ISO
Delivery Terms	FCA

Main Controls Cabling to SCADA/ICSS and Telecom Network Interconnect

Technical Description	Main Controls Cabling to SCADA/ICSS and Telecom Network Interconnect
Quantity	~200 Kilometers
Design Basis	• Single pair, triad core, multi-core control cable
Technical Standards (ISO etc..)	• IEC
Delivery Terms	FCA

Field Telecom Cables / Junction Boxes

Technical Description	Field Telecom Cables / Junction Boxes
Quantity	~3,200 Kilometers FOC ~400 patch cabinets ~1500 junction boxes
Design Basis	• 48 core FOC • 96 core FOC
Technical Standards (ISO etc..)	• IEC
Delivery Terms	FCA

Control Room Pre-engineered Buildings

Technical Description	Pre-engineered Buildings for Electrical Instrumental and Telecommunication Systems Technical Rooms
Quantity	~97 Buildings
Design Basis	• From single module (40' container) to a six-module structure
Technical Standards (ISO etc..)	• Vendor Standards
Delivery Terms	FCA

Chemical and Drag Reduction Injection

Technical Description	Chemical and Drag Reduction Injection
Quantity	8 Skids
Design Basis	• Proprietary, custom-built skid for mixing, storage and injection • 7 off for Drag Reducing Agent with two sets of positive displacement metering pumps • 1 off for Corrosion inhibitor
Technical Standards (ISO etc..)	• ASME 31.3 • Vendor standards
Delivery Terms	FCA

Navigation & Berthing Aids System

Technical Description	Navigation & Berthing Aids System
Quantity	1 Each
Design Basis	• Full set of latest technology Telecoms for Ship-to-shore and vice versa • Berthing aids for one mooring
Technical Standards (ISO etc..)	• International Marine Standards
Delivery Terms	FCA

EPC Studies

Technical Description	EPC Studies
Quantity	Multiple
Design Basis	• Access Road Studies • Crude Fuel Oil (CFO) Tank heating Study • Crude Oil Storage Tanks Thermal Study • Foundation Comparison / Optimisation Study • HYSYS/OLGA steady state and dynamic simulation Study • LOF Relief Disposal Study - Preliminary routing and Preliminary disposal • Long Line Heat Tracking (LLHT) Circuit Length Study • Pipeline Block Valves Station Localisation Study • Pipeline Construction Access Road Study Methodology • Pipeline Upheaval Buckling Study • Power Distribution System • Power Generators Study • Process optimisation Study (Bulk Heating vs EHT) • Thermal Optimisation Study (Crude Oil Storage Tanks and Crude Oil Bulk Heaters) • Vapour recovery study • Wastewater Treatment Technology Selection Study • Wax handling Study.
Technical Standards (ISO etc..)	N/A
Delivery Terms	N/A

PLANT Certification

Technical Description	Plant Certification and verification Services
Quantity	1 Service
Design Basis	• Third Party Certifying Authority (TPCA) shall certify the works (ie Engineering, Procurement, Construction, Commissioning) by ensuring that the works are in accordance with the contracts requirements including applicable Specifications, Codes and Standards. • The TPCA shall deliver the Certification by ensuring design review, quality check, quality control monitoring at various Project Package Contractors' construction, manufacturing test facilities (including their sub-contractors and equipment vendors' facilities).
Technical Standards (ISO etc..)	• Design Dossier, EACOP Requirements and Local/National regulations
Delivery Terms	N/A

Technical Risk Analysis / Quantitative Risk Analysis

Technical Description	Technical Risk Analysis / Quantitative Risk Analysis
Quantity	7 Workshops & 1 Study
Design Basis	• Three milestone-related Risk Workshops for both Technical and Project Risk; one QRA Study and a Certification Workshop and Report
Technical Standards (ISO etc..)	• N/A
Delivery Terms	FCA

Piping Electrical Trace Heating Cable

Technical Description	Piping Electrical Trace Heating Cable
Quantity	10,000 m
Design Basis	• 400V, self regulating high current tape/cable for application to outdoor steel piping
Technical Standards (ISO etc..)	• IEC
Delivery Terms	FCA