

Technical Presentation (Scope of Work)

Presented by:

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SCOP

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EPCF Contract *(the subject of this road show)*

Scope of Work:

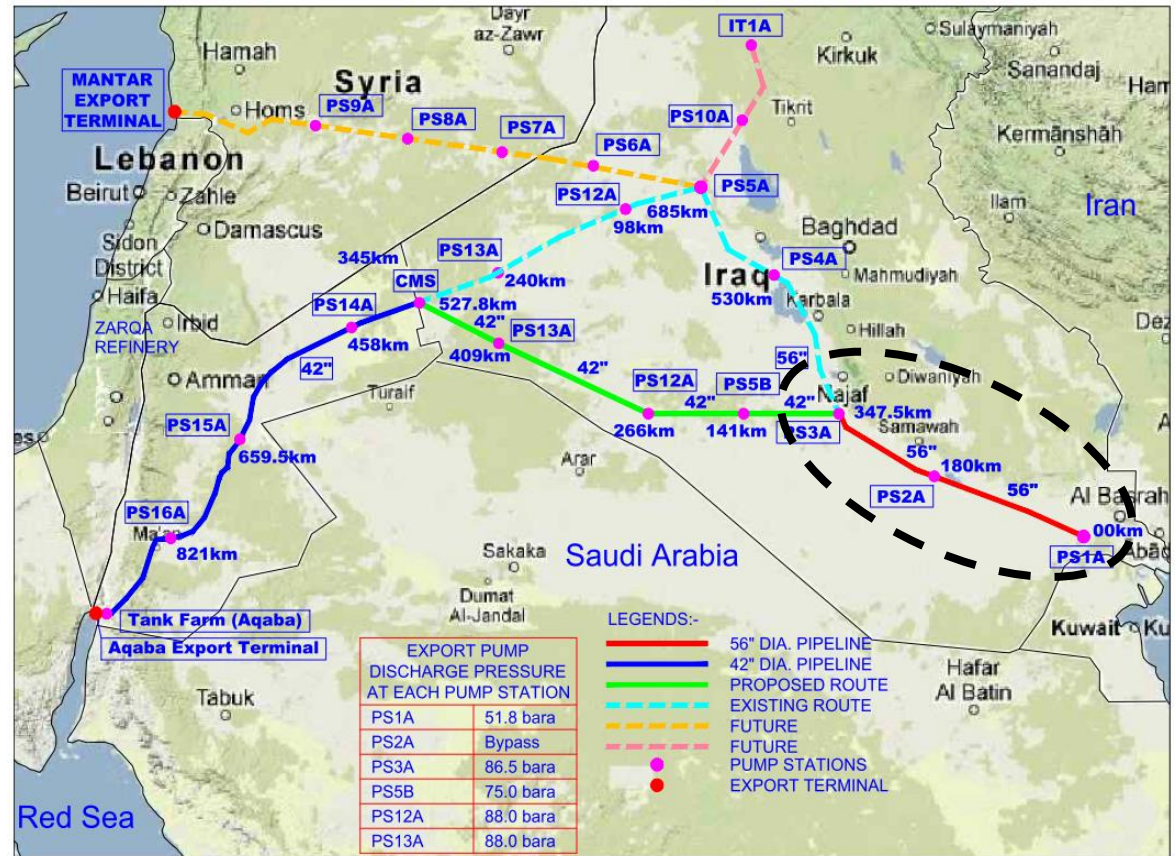
- From Rumaila (PS1A) to the outlet of (PS3A) at Al-Najaf
- 2.25 MMBOPD ultimate capacity of 56" Crude Oil pipeline (350 km) & 258 MMSCFD ultimate capacity of Sales and Fuel Gas 28" pipeline (350 km)
- 2 Pumping Stations (PS1A and PS3A) and 2 tank farms

Contract:

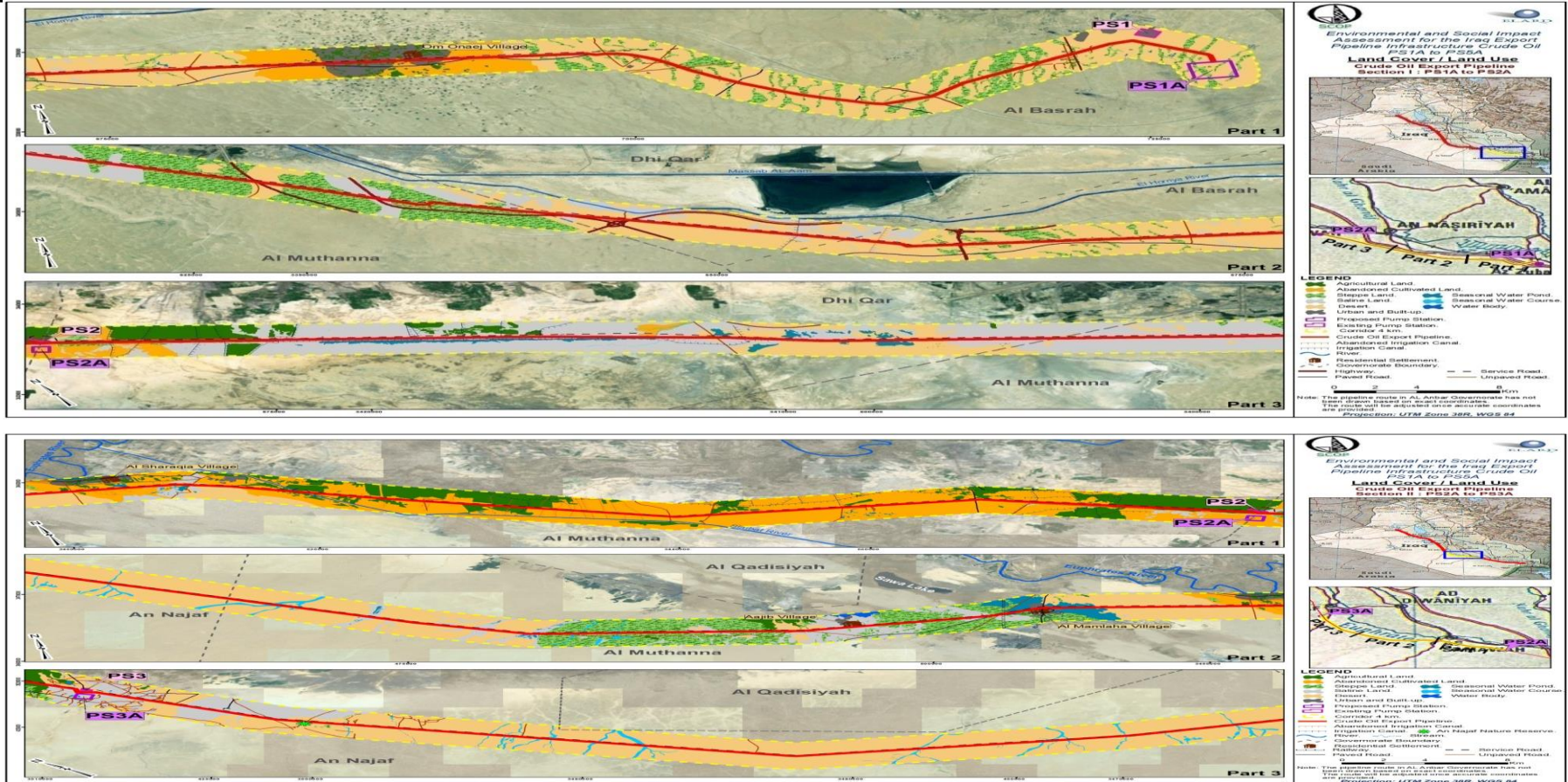
- EPCF contract based on deferred payment scheme
- MoO will own the assets and operate the pipeline

Status:

- FEED & EISHA completed for Pump Stations, and Concept for the Pipeline



LOCATION MAPS OF PUMP STATIONS AND PIPELINE ROUTE



The EPCF Contract - SOW

- **Basra (PS1A) to Al-Najaf (Outlet of PS5A)**

- The EPCF Contract (Phase-1 of the project) will be designed, procured and installed to transport 1mmbpd with pre-investments to allow the upgrade of the system to 2.25mmbpd of stabilized crude oil during phase-2 (future by others).
- The start point for the EPCF Contract is the new PS1A Pump Station, located at the Rumaila Oil Field, in the south of Basra.
- There will be 2 parallel pipelines:
 - A crude oil pipeline, with a 56" diameter; and
 - A gas pipeline (fuel gas and sales gas), with a 28" diameter.
- The pipelines will be under ground, with a 1 meter cover, in an existing pipeline corridor.
- There will be a Tank Farm, located near the PS1A Pump Station, with 7 days of crude oil storage of the design flow (7 Million barrel for Phase-1),(11X 104,000M³) and another Tank Farm near Al-Najf PS3A, with 5 days of crude oil storage ,(11X 94,000M³) of the design flow (5 Million barrel for Phase-1).**Tank farms are still under consideration for further phasing**
- The EPCF Contract will end at the PS3A outlet manifold.
- The approximate length of the pipelines is 350 km.
- The inlet manifold and metering stations will be located at PS1A and PS3A.

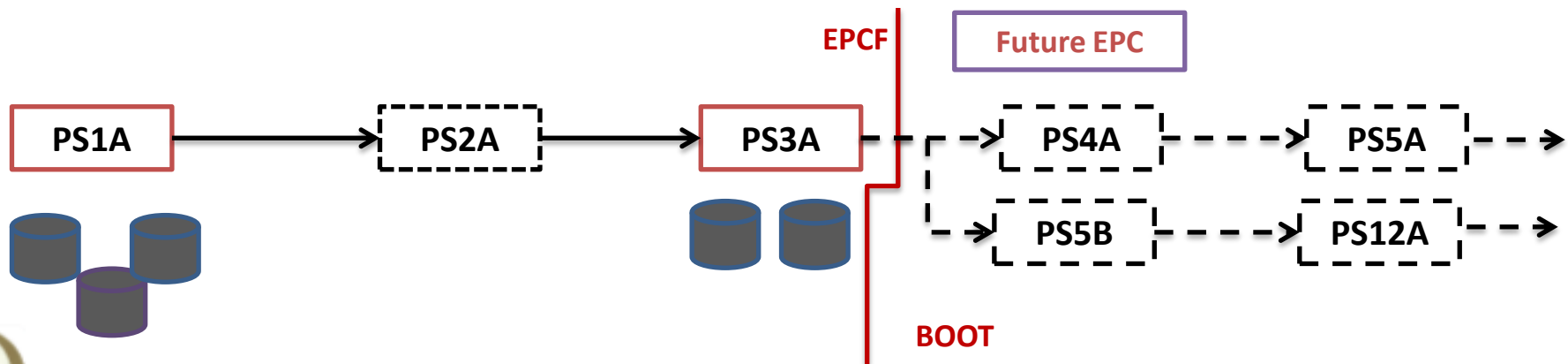


Project Overview / Phased Execution

- **FEED Design** was completed for the facilities of the Crude Oil Export Pipeline Project between North Rumailah (PS1A) to Haditha (PS5A) while the pipeline is at a Concept Study level.
- The **FEED** considered a flow of **2.25 MMBOPD and 284 MMSCFD of fuel and sales gas** from PS1A to PS5A with three (3) intermediate pump stations at PS2A, PS3A and PS4A.
- Due to the re-routing and the phased execution strategy, the EPCF Contract scope of works from **Rumaila (PS1A) to Najaf (PS3A outlet) is revised as shown in the following slides and the interface with IJEP BOOT Project moved from the outlet of PS5A to the Outlet of PS3A.**
- The overall project scope of work is divided into 5 EPC packages.
- EPCF Contract scope (the phase-1 of the overall scope of work) is based on operating flow rates limited to **1.0 MMBOPD of crude oil** and approximately **156 MMscfd of gas**.
- **PS5A FEED Documents will be used for PS3A, TENDERER shall take into consideration any changes in the design/ requirements due to the above.**
- **EISHA Study for the pipelines and all pump stations are completed and approved by MoE**

REVISED SCOPE OF WORK (PS1A to PS3A Outlet)

- EPC-1: Pump Stations (PS1A @North Rumailah , PS3A @Al-Najaf,
- EPC-2: Compressors Stations (PS1A @North Rumailah & PS3A @Al-Najaf
- EPC-3: Tank Farms (PS1A@ North Rumailah and PS3A @Al-Najaf
- EPC-4: Pipelines (Sections 1, 2)
- EPC-5: Automation, Metering, Telecoms and SCADA etc. (to the BOOT and future EPC battery limit)



REVISED SCOPE OF WORK (PS1A to PS3A Outlet)

DESCRIPTION	THE ULTIMATE DESIGN FOR THE EPC SECTION (PS1A TO PS3A)	EPCF CONTRACT SCOPE (PHASE I) [Subject to EPCF Detail Design]
Crude Oil Pipeline	56" / 348km (PS1A to PS3A)	56" / 348km (PS1A to PS3A)
Gas Pipeline	28" / 348km	28" / 348km
PS1A: Pumps: Compressors: Gas Turbine Generators: Storage Tanks:	(3W + 1S)(5000 M ³ IHR15MW EACH) (4W + 1S)(70MMSCFD EACH) (3W + 1S)(10MW EACH) 24(104,000M ³ EACH)	(2W + 1S) (3W + 1S) (3W + 1S) 11
PS2A: Pumps: Gas Turbine Generators:	(3W + 1S) (3W + 1S)	0 0
PS3A: Pumps: Compressors: Gas Turbine Generators: Storage Tanks:	(3W + 1S))(5000 M ³ IHR-13.5MW EACH) 0 (3W + 1S))(10MW EACH) 19 (94,000M ³)	(3W + 1S) reduced size (3W + 1S) (3W + 1S) 11

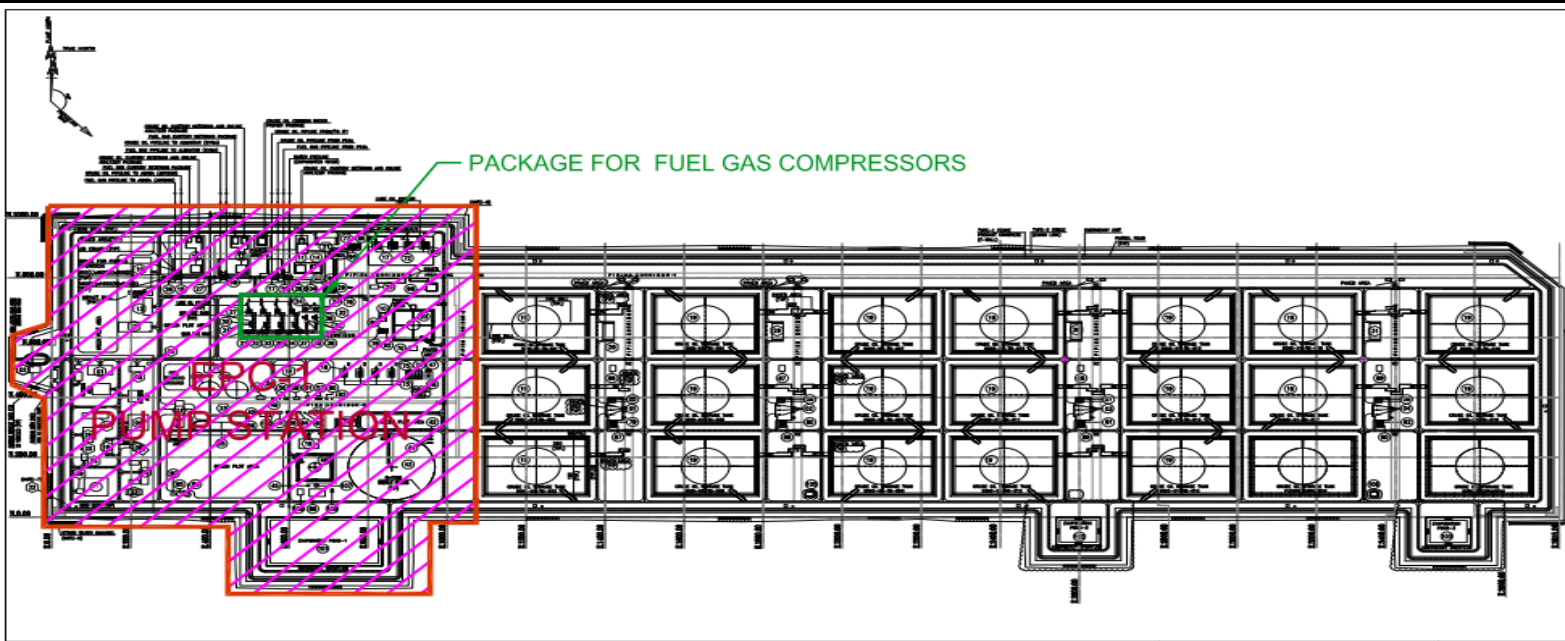
EPC-1 – Pump Stations

- Functional Scope;
- Battery Limit;
- Key Systems / Facilities;
- EPC – Phase I vs. Phase II Split.

EPC-1: PUMP STATION - FUNCTIONAL SCOPE

PUMP STATION	ORIGINAL SCOPE	PHASE 1 EPCF SOW	PHASE 2 FUTURE BY OTHERS
PS1A	2.25 MMBOPD (3 W +1S)	1.0 MMBOPD (2W + 1S)	+ 1.25 MMBOPD + (1W + 0S)
PS2A	2.25 MMBOPD (3 W +1S)	X	+ 2.25 MMBOPD +(3W + 1S)
PS3A	2.25 MMBOPD (3 W +1S)	(1.0 MMBOPD) (2W + 1S)	+ 1.25 MMBOPD +(1W + 0S)
PS4A	2.25 MMBOPD (3 W +1S)	X	+ 1.5 MMBOPD <i>to be determined later</i>
PS5A	2.25 MMBOPD (3 W +1S)	X	+ 1.5 MMBOPD <i>to be determined later</i>

EPC-1 PUMP STATIONS PS3A BATTERY LIMITS



NOTES:

- ALL DIMENSIONS ARE IN METERS UNLESS OTHERWISE MENTIONED
- PLANT CO-ORDINATES N. PLAN. E. AND ELEV. TO STM CO-ORDINATED METERS.
- AREA AND DIMENSIONS OF ALL EXISTING INFRASTRUCTURES SHALL BE CHECKED BY EPC CONTRACTOR/ENGINEER PRIOR TO ANY WORK BEING COMMENCED BY EPC CONTRACTOR.
- SAFETY OF ALL EXISTING AND NEW BUILDINGS AND WORK ARE TO BE MAINTAINED BY EPC CONTRACTOR.
- FIELD TO BATTERY LIMITS AND BATTERY LIMITS DRAWING FOR DETAILS OF EXISTING BUILDINGS.
- TEMPORARY ROAD, LIGHTS AND FENCING FOR HEAVY TRAFFIC AND TRANSPORTATION TO BE PROVIDED BY EPC CONTRACTOR.
- LOCATION OF SECURITY TOWER TO BE PROVIDED BASED ON AIR FORCE ORDER OF RECEIPT.
- OTHER A WORK SHALL BE PROVIDED AROUND THE PLANT FENCE. OTHER WORK DRAWING SHALL BE PROVIDED TO APPROVE PLANNING OF THE SITE. SEE SECTION 2.10-01 FOR DETAILS.

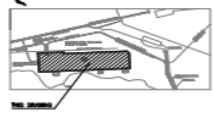
LEGEND:

BY OTHER
 FUTURE FACILITIES
 OPEN LINE FENCE
 PERMIT CORRIDOR (2'-WALL)
 ROAD
 GATE
 ROAD CORRIDOR (6")
 EXISTING
 SL. NO. FOR EQUIPMENT / PACKAGE LIST
 SL. NO. FOR BUILDING AND SHEDS LIST
 SPACE FOR MAINTENANCE

BATTERY LIMIT

DATE: 15/01/2018

THE SHEET:



REVISIONS:

NO.	DESCRIPTION	DATE	BY	CHKD.
01	ISSUED FOR PERMIT	15/01/2018
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BUILDINGS AND SHEDS LIST

Sl. No.	The No.	DESCRIPTION	Sl. No.	The No.	DESCRIPTION
1	8000-01-01	CRITICAL OIL BOOSTER PUMPS CLUSTER-1	1	8000-01-01	FIRE SHED
2	8000-01-02	CRITICAL OIL BOOSTER PUMPS CLUSTER-2	2	8000-01-02	NONHAZARDOUS BUILDING
3	8000-01-03	CRITICAL OIL BOOSTER PUMPS CLUSTER-3	3	8000-01-03	NONHAZARDOUS BUILDING
4	8000-01-04	CRITICAL OIL BOOSTER PUMPS CLUSTER-4	4	8000-01-04	NONHAZARDOUS BUILDING
5	8000-01-05	CRITICAL OIL BOOSTER PUMPS CLUSTER-5	5	8000-01-05	NONHAZARDOUS BUILDING
6	8000-01-06	CRITICAL OIL BOOSTER PUMPS CLUSTER-6	6	8000-01-06	NONHAZARDOUS BUILDING
7	8000-01-07	CRITICAL OIL BOOSTER PUMPS CLUSTER-7	7	8000-01-07	NONHAZARDOUS BUILDING
8	8000-01-08	CRITICAL OIL BOOSTER PUMPS CLUSTER-8	8	8000-01-08	NONHAZARDOUS BUILDING
9	8000-01-09	CRITICAL OIL BOOSTER PUMPS CLUSTER-9	9	8000-01-09	NONHAZARDOUS BUILDING
10	8000-01-10	CRITICAL OIL BOOSTER PUMPS CLUSTER-10	10	8000-01-10	NONHAZARDOUS BUILDING
11	8000-01-11	CRITICAL OIL BOOSTER PUMPS CLUSTER-11	11	8000-01-11	NONHAZARDOUS BUILDING
12	8000-01-12	CRITICAL OIL BOOSTER PUMPS CLUSTER-12	12	8000-01-12	NONHAZARDOUS BUILDING
13	8000-01-13	CRITICAL OIL BOOSTER PUMPS CLUSTER-13	13	8000-01-13	NONHAZARDOUS BUILDING
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39	8000-01-39	CRITICAL OIL BOOSTER PUMPS CLUSTER-39	39	8000-01-39	NONHAZARDOUS BUILDING
40	8000-01-40	CRITICAL OIL BOOSTER PUMPS CLUSTER-40	40	8000-01-40	NONHAZARDOUS BUILDING
41	8000-01-41	CRITICAL OIL BOOSTER PUMPS CLUSTER-41	41	8000-01-41	NONHAZARDOUS BUILDING
42	8000-01-42	CRITICAL OIL BOOSTER PUMPS CLUSTER-42	42	8000-01-42	NONHAZARDOUS BUILDING
43	8000-01-43	CRITICAL OIL BOOSTER PUMPS CLUSTER-43	43	8000-01-43	NONHAZARDOUS BUILDING
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45	8000-01-45	CRITICAL OIL BOOSTER PUMPS CLUSTER-45	45	8000-01-45	NONHAZARDOUS BUILDING
46	8000-01-46	CRITICAL OIL BOOSTER PUMPS CLUSTER-46	46	8000-01-46	NONHAZARDOUS BUILDING
47	8000-01-47	CRITICAL OIL BOOSTER PUMPS CLUSTER-47	47	8000-01-47	NONHAZARDOUS BUILDING
48	8000-01-48	CRITICAL OIL BOOSTER PUMPS CLUSTER-48	48	8000-01-48	NONHAZARDOUS BUILDING
49	8000-01-49	CRITICAL OIL BOOSTER PUMPS CLUSTER-49	49	8000-01-49	NONHAZARDOUS BUILDING
50	8000-01-50	CRITICAL OIL BOOSTER PUMPS CLUSTER-50	50	8000-01-50	NONHAZARDOUS BUILDING

MINISTRY OF OIL AND ITS ASSOCIATED COMPANIES, CONTRACTORS, MANUFACTURERS AND SUPPLIERS.

EPC-1 PUMP STATIONS (PS1A & PS3A)

KEY SYSTEMS / FACILITIES

- Gas Turbine Driven Main Crude Oil Export Pumps
- Gas Turbine Driven Generation
- Emergency / Black Start Diesel Generators
- Utility Systems (Raw Water, Fire Water, Instrument and Plant Air, Produced Water etc.)
- Civil Works (Site preparation, Peripheral & Plant Drainage, Fences, Site Access Road etc,)
- Buildings and Shelters

EPC-2 – Compressors Stations

- Functional Scope;
- Battery Limit;
- Key Systems / Facilities.

EPC-2: COMPRESSOR STATION - FUNCTIONAL SCOPE

PUMP STATION	ORIGINAL SCOPE	PHASE 1 EPCF SOW	PHASE 2 FUTURE BY OTHERS
PS1A	284 MMscfd (4W + 1S)	179.2 MMscfd (3W + 1S)	+ 104.8 MMscfd +(1W + 0S)
PS2A	X	X	X
PS3A	X	144.1 MMscfd (2W + 1S)	to be determined later
PS4A	X	X	X
PS5A	210 MMscfd (3W + 1S)	X	to be determined later

EPC-2 COMPRESSOR STATIONS

KEY SYSTEMS AND FACILITIES:

- Gas Turbine Driven Fuel Gas Compressors
- Motor Driven Auxiliary Fuel Gas Compressors
- Inter-stage and After Coolers, Pipe Racks etc.
- Unit Control Panels and Motor Control Centres (MCC's)
- Civil Works (Site preparation, Peripheral & Plant Drainage, Fences, Site Road etc,)
- Shelters

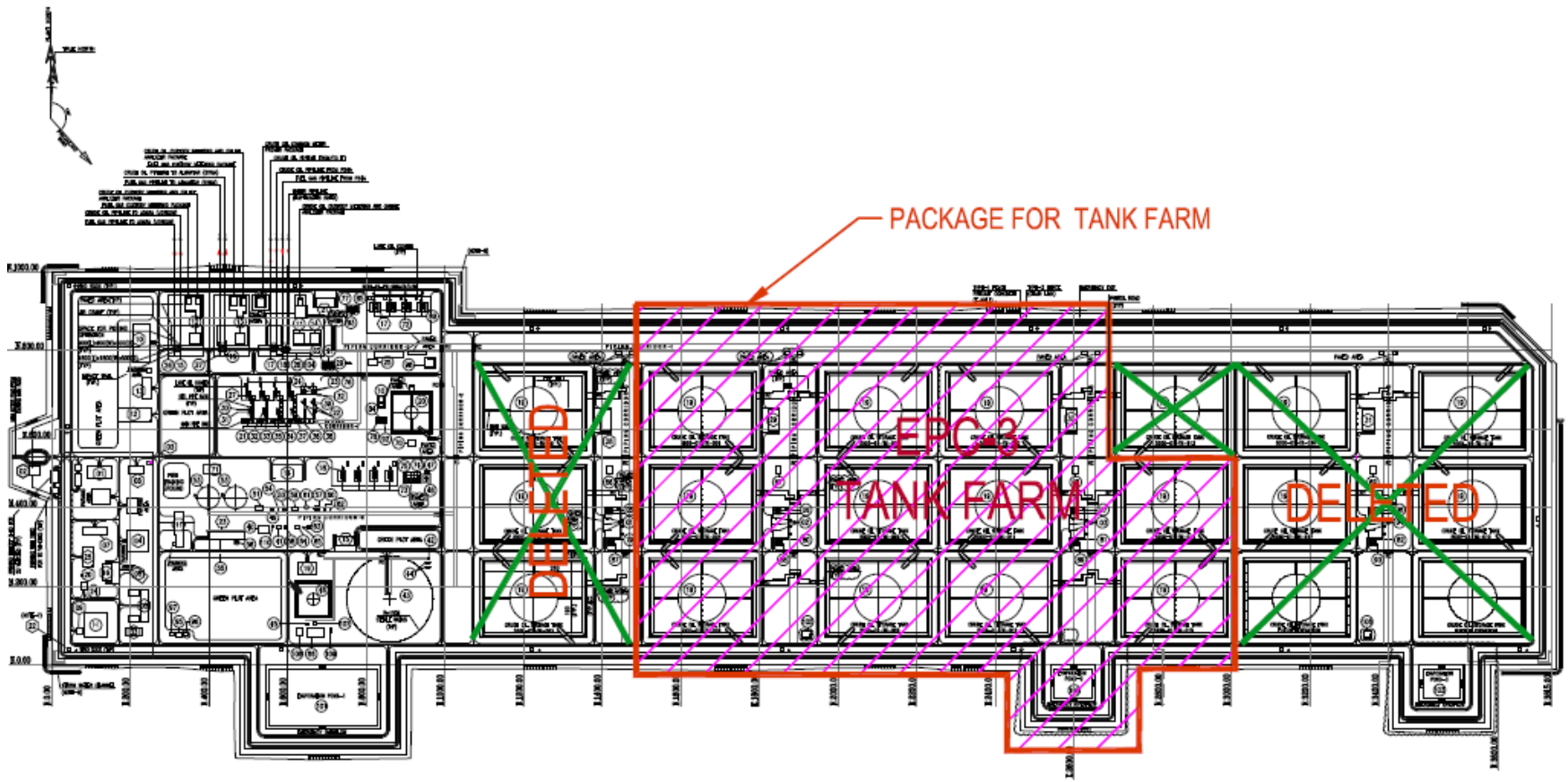
EPC-3 – TANK FARMS

- Functional Scope;
- Battery Limit;
- Key Systems / Facilities.

EPC-3: TANK FARM - *FUNCTIONAL SCOPE*

TANK FARM	ORIGINAL SCOPE	PHASE 1 <u>EPCF SOW</u>	PHASE 2 <u>FUTURE BY OTHERS</u>
PS1A	7 Days Storage at 2.25 MMBOPD (24 Crude Oil Storage Tanks)	7 Days Storage for 1.0 MMBOPD (11 Crude Oil Storage Tanks)	<i>TBC - 7 Days Storage for 1.25 MMBOPD (13 Crude Oil Storage Tanks)</i>
PS2A	X	X	X
PS3A	X	5 Days Storage for 1.0 MMBOPD (11 Crude Oil Storage Tanks - dif. Dimensions vs. PS1A Tanks)	X
PS4A	X	X	X
PS5A	5 Days Storage at 2.25 MMBOPD (19 Crude Oil Storage Tanks)	X	TBC

EPC-3 TANK FARM – PS3A BATTERY LIMITS



EPC-3 TANK FARM - *PS1A/PS3A KEY SYSTEMS / FACILITIES*

- Crude Oil Storage Tanks
- Crude Oil Piping
- Motor Driven Crude Oil Booster Pumps
- Utility Systems (Fire Water, Produced Water, Instrument and Plant Air, etc.)
- Civil Works
- Buildings

EPC-4 – PIPELINE

- EPC/BOOT Interfaces;
- Functional Scope;
- Package scope of work;
- Phase-II provisions;
- Battery limits;

EPC-4: Pipeline - Phase 1, Phase 2 and BOOT Scope Split

PIPELINE BLOCK DIAGRAM

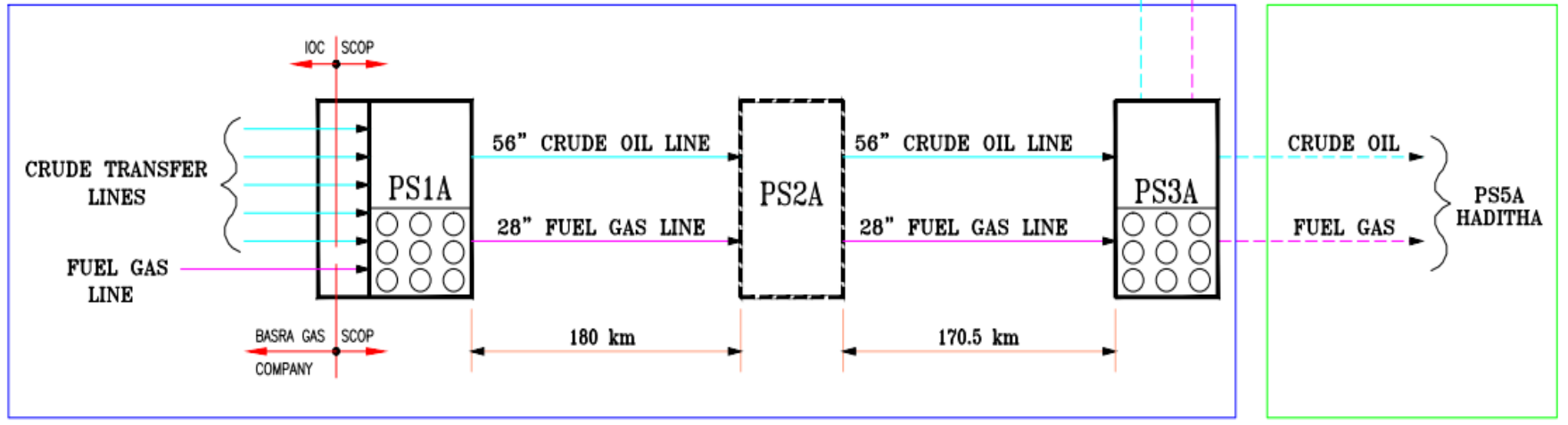
56" API 5L X70 PSL2 (0.96"-0.81"-0.69")
28" API 5L X70 PSL2 (0.51"-0.43"-0.37")
13 BVS

LEGEND:
 CRUDE OIL —
 FUEL GAS —
 FUTURE CRUDE OIL LINE - - -
 FUTURE FUEL GAS LINE - - -

PHASE-1

BOOT
JORDAN

PHASE-2



EPC-4: PIPELINES - FUNCTIONAL SCOPE

PL SECTION	ORIGINAL SCOPE	PHASE 1 <u>EPCF SOW</u>	PHASE 2 <u>FUTURE BY OTHERS</u>
PS1A to PS2A (56" CRUDE OIL & 28" GAS)	180 km Pipeline with Launcher/Receivers	<i>2.25 MMBOPD Crude Oil, 284 MMscfd Fuel Gas, 180 km Pipeline and Launcher/Receivers facility at PS2A</i>	X
PS2A to PS3A (56" CRUDE OIL & 28" GAS)	167.5 km Pipeline with Launcher/Receivers	<i>2.25 MMBOPD Crude Oil, 284 MMscfd Fuel Gas, 170.5 km Pipelines and Receivers with Tee-off valve at PS3A</i>	X
PS3A to PS4A (CRUDE OIL & GAS)	182.5 km Pipeline with Launcher/Receivers	X	182.5 km Pipeline with Launcher/Receivers
PS4A to PS5A (CRUDE OIL & GAS)	155 km Pipeline with Launcher/Receivers	X	155 km Pipeline with Launcher/Receivers

EPC-4: Phase-1 Scope of Work for Pipeline from PS1A to Inlet of PS3A

- Scraper Receiver at PS1A for Crude from IOC's and Fuel Gas Pipelines from Basra Gas Company.
- Scraper Launcher at PS1A for Crude Oil and Fuel Gas Pipelines.
- Pipelines from PS1A to PS2A for Crude Oil and Fuel Gas.
- Crude Oil and Fuel Gas Pipelines Block Valve Stations.
- Scraper Launcher and Receiver at PS2A for Crude Oil and Fuel Gas Pipelines.
- Pipelines from PS2A to PS3A for Crude Oil and Fuel Gas.
- Scraper Receiver at PS3A for Crude Oil and Fuel Gas Pipelines plus space for future Scarper Receiver from Najaf.

EPC-4: Phase-1 Provisions required for Future Expansion

The SCOPE OF WORK of Pipelines Provisions required at PS2A and PS3A for Future Expansion are as follow:

- Tee-off valve provision for Phase 2 at PS2A.
- Tee-off valve provision for Phase 2 at PS3A.

EPC-5: *AUTOMATION, METERING, TELECOM, ETC.*

- Functional scope;
- Package scope of work.

EPC-5: *AUTOMATION, METERING AND TELECOM – FUNCTIONAL SCOPE PHASE 1 SCOPE*

Automation Functional Requirement:

- ICSS comprises of DCS, ESD, F&G systems, IAMS, CMS, MIS and electrical DCS.
- SCADA to monitor pipeline and pump stations
- DCS compatible with Foundation Field Bus (FF). ESD and F&G systems are SIL 3 rated.
- FF used for Tank farm MOVs and RTG
- Conventional 4-20mA/HART instruments for pump station and BVS.
- **Master Control room in PS1A and DRCC at PS3A will be ergonomically designed with process wise segregation of consoles**
- Local Equipment room (LER) considered for each cluster of storage tanks
- OPC/Ethernet based redundant fiber optic connectivity between various systems and packages
- Crude oil Custody transfer metering skids with bidirectional prover and water draw skid
- Custody transfer Ultrasonic metering skid for Fuel gas
- Separate Pipeline Leak detection Systems for Crude oil export pipeline and fuel gas pipelines
- RTU and ESD PLC at each BVS. ESD PLC interfaced with PS1A ICSS over SIL rated Safety network
- F&G system with Fire station interface for monitoring

EPC-5: AUTOMATION, METERING AND TELECOM – PHASE 1 SCOPE OF WORK

Automation Scope:

- Design Procurement , installation and commissioning of SCADA Master control facility for entire pipeline from PS1A to PS3A inlet
- Engineering, supply installation and commissioning of ICSS pertaining to:
 - *PS1A and PS3A tank farm facilities including booster pumps*
 - *PS1A and PS3A Pumping station including common utilities and power generation*
 - *PS1A and PS3A Compressor station.*
- ICSS scope covers, DCS, ESD, F&G, Tank farm management system.
- Supply and commissioning of field instrumentation for all above three facilities. **This might be reconsidered to be supplied by all other EPC's packages contractors**
- Supply and commissioning of RTU, field instrumentation for pipeline BVSs up to PS3A and integrate with SCADA system over redundant fiber optic backbone system
- Provide RTU for above ground facilities of pipeline at PS2A and integrate with SCADA system
- Supply and commissioning of pipeline leak detection system for pipeline from PS1A-PS2A and PS2A-PS3A Custody transfer metering systems at PS1 A

EPC-5: AUTOMATION, METERING AND TELECOM – FUNCTIONAL SCOPE PHASE 1 SCOPE

Telecom Functional Requirement:

- FOC is considered as main backbone for communication link.
- Digital Microwave Radio is considered as redundant communication link
- SDH and DWDM are considered as Transmission systems.
- Trunk Radio, Telephone, LAN, Weather Monitoring system, Master clock system are considered as Operational Systems
- PAGA and Hotline Telephone are considered as vital telecommunication systems.
- ACS, Fence & Pipeline Intrusion detection system, Radar and CCTV are considered as security systems.
- VHF-AM and Aeronautical NDB are considered as Air to Ground communication link.
- Telecom tower supports all the vital and operational telecom systems.

EPC-5:AUTOMATION, METERING AND TELECOM – PHASE 1 SCOPE OF WORK

Telecom:

- Supply and Commissioning of Telecom & Security systems (FOC, SDH STM-64, CCTV, ACS, Fence and Pipeline Intrusion Detection, DWDM, PAGA, Telephone, LAN, Meteorological, Videoconferencing, Tetra Radio, Digital Microwave Radio, VHF-AM, Aeronautical NDB, Entertainment system, Antenna & Tower) at **PS1A**.
- Supply and Commissioning of Telecom systems (SDH STM-64, Digital Microwave Radio, Fence and Pipeline Intrusion Detection System, Antenna & Tower, passively cooled shelter) at **PS2A**.
- Supply and Commissioning of Telecom systems (FOC, SDH STM-64, CCTV, ACS, Fence and Pipeline Intrusion Detection, DWDM, PAGA, Telephone, LAN, Meteorological, Videoconferencing, Tetra Radio, Digital Microwave Radio, VHF-AM, Aeronautical NDB, Entertainment system, Antenna & Tower) at **PS3A**.
- Supply and Commissioning of Telecom systems (SDH STM-64, Digital Microwave Radio, Fence and Pipeline Intrusion Detection System, Antenna & Tower and Telecom room) at **PS3A**.
- Supply and Commissioning of backbone redundant Fiber Optic Cable along the pipeline between **PS1A-PS2A-PS3A**.

EPC-5: AUTOMATION, METERING AND TELECOM – *PROVISIONS REQUIRED FOR FUTURE EXPANSION*

Automation:

- SCADA Systems shall have the capability to cater Phase2 pipelines expansion requirement including additional pumping stations and BOOT scope interface requirement.
- PS1 A -ICSS Systems shall have the capability to cater Phase2 expansion.
- Metering system shall have provision for installation of additional meter runs during Phase 2 expansion.

Telecom:

- Expansion of Telecom & Security systems (FOC, SDH STM-64, CCTV, ACS, Intrusion Detection, PAGA, Telephone, LAN) at PS1A .
- Expansion of Telecom & Security systems (FOC, SDH STM-64, DWDM) at PS3A

EPC-5: AUTOMATION, METERING AND TELECOM – *PREINVESTMENT FOR PHASE 2*

Automation:

- Adequate space shall be considered in Master control room / DRCC for Phase 2 expansion and boot requirement.
- Control room/DRCC and Local equipment room space shall be adequate to meet Phase 2 expansion.
- Metering system shall have provision for installation of additional meter runs during Phase 2 expansion.
- Performance of all common systems, Instruments including pipeline leak detection system installed during Phase 1 shall be capable to address Phase-2 requirements

Telecom:

- Adequate Space and power supply requirement shall be considered inside PS1A and PS3A Telecom Building for Phase 2 requirement.

Coffee Break

