

Gujarat State Petroleum Corporation Ltd.

FLARE GAS MONETISATION PROJECT QPS-SE#3

PROCESS DESIGN BASIS

Doc No: GERMI/DB-Process/GSPCL/09/25-26 R-0

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1. INTRODUCTION

1.1 Project Background

GSPC is Operator of CB-ONN-2002/3 Block Sanand Miroli Block in Gujarat, under the Production Sharing Contract (PSC) with the Government of India. GSPC has participating Interest (PI) of 55 % along with Jubilant Offshore Drilling Pvt. Ltd (JODPL), Hindustan Petroleum Corporation Ltd, (HPCL) & Geo Global Resources (GGR) as partners for the Block.

The Sanand-Miroli onshore block consisted of two parts i.e., Northern Sanand area and Southern Miroli area. During the exploration phase (July 2004 to July 2010), in Northern Sanand area, the Company drilled 11 wells (i.e., 9 exploratory wells and 2 appraisal wells). Of the wells drilled, oil discoveries were made in five exploratory wells i.e. SE-2, SE-4, SE-5, SE-8 and SE-10, of which a cluster consisting of SE-2, SE-4, SE-5 (oil wells) and SE-3 (gas well) were to be developed for production.

Quick Production System-SE#3 (QPS-SE#3) is located at Village Manipur, Taluka Daskroi, Dist. Ahmedabad, which is adjacent to Bopal/Ghuma and falls under Ahmedabad Urban Development Authority (AUDA). This QPS has production of about 15-16M3 of well fluid along with 1900-2000 SCM of Associated Natural Gas (ANG) per day from 2 operational wells namely SE#3 & SE#4. The water cut is 30% and 60% respectively. Presently, after internal consumption of around 400 SCMD at Bath Heater (15MT/Hr), balance 1500-1600 SCM per day of associated natural gas is flared at QPS since no consumer is available.

Augmentation of electrical power system commensurate with the Flare Gas Monetization Project: QPS-SE#3 power requirement including integration of Emergency Gas Generator are also in the scope of the project.

1.2 Scope of Document

Purpose of this document is to describe the basis of design and provide the process design data and criteria including the process design codes and standards that will be used for the design of various equipment, process systems, lines etc. The main objective of the document is to define the basis of design i.e. Process Design data, design Criteria and design philosophies for Flare Gas Monetization Project: QPS-SE#3, herein after referred to as "FGMP".

1.3 Codes and Standards

The following international codes and standards will be referred for the design and engineering services.

| Codes & Standards | Description |
|------------------------------|--|
| API 14C | Basic Surface Safety Systems |
| API RP 14E | Recommended Practice for Design and Installation of Offshore Production Platform Piping Systems |
| API 520 Part I | Sizing, Selection, and Installation of Pressure-Relieving Devices in Refineries |
| API 520 Part II | Pressure-Relieving Devices Installation |
| API 521 | Guide for Pressure-Relieving and Depressurizing Systems |
| API 526 | Flanged Steel Pressure Relief Valves |
| ASME B 31.3 | Process Piping |
| ASME B 31.4 | Pipeline Transportation Systems for Liquid Hydrocarbons and other Liquids |
| ASME Sec. II | Material Specifications and Properties Parts A,B,C&D |
| ASME Sec. VIII Div.1 | Rules for Construction of Pressure Vessels. |
| API 2000 | Venting Atmospheric and Low-Pressure Storage Tanks - Non-Refrigerated and Refrigerated |
| API 610 | Centrifugal Pumps For Petroleum, Heavy Duty Chemical and Gas Industry Services |
| API 676 | Positive Displacement Pumps- Rotary |
| API 617 | Axial and Centrifugal Compressors and expander – compressor for petroleum chemical and gas industry services |
| API 618 | Reciprocating Compressor for Petroleum, Petrochemical and Natural gas Industries. |
| API 619 | Rotary-type Positive Displacement Compressors for petroleum, Petrochemical and Natural Gas Industries |
| NFPA 20 | Standard for the Installation of Stationary Pumps for Fire Protection |
| NACE MR 0175/ ISO 15156 | Petroleum and Natural Gas Industries- Materials for use in H ₂ S containing environments in Oil& Gas Production |
| OISD-STD-118 | Layouts for Oil and Gas Installations |
| OISD-STD-119 | Selection, Operation and Maintenance of Pumps |
| OISD-STD-120 | Selection, Operation and Maintenance of Compressors |
| OISD-RP-123 | Selection, Operation and Maintenance of rotary equipment components |
| OISD-STD-125 | Inspection and Maintenance of Mechanical Seals |

| | |
|--------------|--|
| OISD-STD-127 | Selection operation inspection and maintenance of Diesel Engines |
| OISD-STD-189 | Standard On Fire Fighting Equipment For Drilling Rigs, Work Over Rigs and Production Installations |
| OISD-STD-188 | Corrosion Monitoring of Offshore & Onshore Pipelines |
| OISD-STD-186 | Simultaneous Operations in Exploration & Production industry |

Note-1: Relevant OMR and DGMS standards will be applicable.

2. DEFINITIONS / ABBREVIATIONS

2.1 Definitions

| Nomenclature | Description |
|-----------------------------|---|
| COMPANY | Gujarat State Petroleum Corporation Ltd. |
| ENGINEERING CONSULTANT (EC) | Gujarat Energy Research and Management Institute |
| EPCC Contractor | Engineering, procurement, construction and commissioning Contractor |
| PROJECT | Flare gas Monetization Project: QPS-SE#3 |

2.2 Abbreviations

| Abbreviations | Description |
|-----------------|--|
| API | American Petroleum Institute |
| ASME | American Society of Mechanical Engineers |
| AEOR | Aishwarya Enhanced Oil Recovery |
| BL | Battery Limit |
| BOPD | Barrels of Oil per Day |
| BLPD | Barrel of Liquid per Day |
| CO ₂ | Carbon Dioxide |
| CTM | Custody Transfer Meter |
| cP | Centi Poise |
| CPCB | Central Pollution Control Board |
| CPF | Central Processing Facility |
| CR | Control Room |
| CS | Carbon Steel |
| CSS | Control and Safety System |

| | |
|------------------|---------------------------------------|
| DCS | Distributed Control System |
| DGMS | Director General of Mines Safety |
| EIA | Environmental Impact Assessment |
| ESD | Emergency Shutdown |
| ESP | Electric Submersible Pump |
| FBE | Fusion Bond Epoxy |
| FGS | Fire and Gas System |
| FG | Fuel Gas |
| F&G | Fire & Gas |
| GLC | Ground Level Concentration |
| GOR | Gas to Oil Ratio |
| HAZID | Hazard Identification |
| HAZOP | Hazard and Operability Study |
| HC | Hydro Carbon |
| HHLL | High High Liquid Level |
| HLL | High Liquid Level |
| HMI | Human Machine Interface |
| HP | High Pressure |
| HVAC | Heat ventilation and Air Conditioning |
| H&MB | Heat & Mass Balance |
| H ₂ O | Water |
| H ₂ S | Hydrogen Sulfide |
| IA | Instrument Air |
| ICS | Integrated Control System |
| IS | Indian Standard |
| IWBH | Indirect Water Bath Heater |
| KOD | Knock Out Drum |
| LCP | Local Control Panel |
| LC | Level Control |
| LLL | Low Liquid Level |
| LLLL | Low Low Liquid Level |
| LP | Low Pressure |

| | |
|----------------|---------------------------------------|
| LPH | Litre Per Hour |
| LR | Long Radius |
| LV | Level Control Valve |
| MCC | Motor Control Centre |
| MFB | Minimum Flow Bypass |
| MP | Medium Pressure |
| MMSCFD | Million Standard Cubic Feet per Day |
| MOP | Maximum Operating Pressure |
| N ₂ | Nitrogen |
| NFPA | National Fire Protection Association |
| NG | Natural Gas |
| OISD | Oil Industry Safety Directorate |
| OMR | Oil Mines Regulations |
| PA | Plant Air |
| PCP | Progressive Cavity Pump |
| PFD | Process Flow Diagram |
| P&ID | Piping and Instrumentation Diagram |
| PCB | Pollution Control Board |
| PCS | Process Control System |
| PCV | Self-Regulated Pressure Control Valve |
| PLC | Programmable Logic Controller |
| PLR | Pig Launcher Receiver |
| PRV | Pressure Relief Valve |
| PVRV | Pressure Vacuum Relief Valve |
| PSV | Pressure Safety Valve |
| PTFE | Poly Tetra Fluoro Ethylene |
| PUF | Poly Urethane Foam |
| PV | Pressure Control Valve |
| RFQ | Request For Quotation |
| QRA | Quantitative risk assessment |
| SCF | Standard Cubic Feet |
| SDV | Shutdown Valve |

| | |
|-------|--|
| SEHMS | Skin Effect Heat Management System |
| SIL | Safety Integrity Level |
| STB | Stock Tank Barrel |
| TBA | To Be Advised |
| TBC | To Be Confirmed. |
| TC | Temperature Control |
| TCV | Self-Regulated Temperature Control Valve |
| TP | Tie-In point |
| UPS | Uninterruptable Power Supply |
| VFD | Variable Frequency Drive |

3. REFERENCE DOCUMENTS

| Doc. No. | Description |
|--------------------------|-------------------------------------|
| GERMI/BDP/GSPCL/02/25-26 | Feasibility and Basic design Report |

4. UNITS OF MEASUREMENTS

All Dimensions & weights measurement shall be expressed in international unit system.

| Quantity or Variable | Metric Units | Imperial / Field Units |
|-----------------------------|-------------------------------|------------------------|
| Capacity | m ³ | BBL |
| Liquid Flow by Volume | m ³ /hr or L/H | BOPD/BLPD |
| Gas Flow by Volume | kgmol/h or Nm ³ /h | MMSCFD |
| Liquid / Gas Flow by Weight | kg/h or kg/s | |
| Length | mm or m | |
| Pipe Diameter | mm N.B. | |
| Surface Area | m ² | |
| Volume | m ³ | BBL |
| Pressure | kPag, barg or mmWG | |
| Design Pressure | kPag, barg or mmWG | |
| Differential Pressure | kPa, bar or mmWG | |
| Pressure Losses | kPa/km or bar/km | |
| Power | kW | |

| | | |
|-------------|----------------------------|--|
| Heat Duty | kcal/h or kJ/h or kW or MW | |
| Temperature | °C , °K | |
| Viscosity | cP or Pa.s (Pascal-second) | |

Standard conditions of temperature and pressure is defined as temperature of 15.56 °C (60 °F) and an absolute pressure of 101.325 kPa (14.696 psia) and Normal conditions of temperature and pressure is defined as temperature of 0 °C (32 °F) and an absolute pressure of 101.325 kPa (14.696 psia) for volume calculations of gas.

5. METEOROLOGICAL DESIGN DATA

The following data is applicable for the field.

The climate is hot and semi-arid with a tropical monsoon climate. The city experiences extreme temperatures, especially during the summer months, with very dry conditions except for the monsoon season. Rainfall is concentrated during the monsoon season (June to mid-September), and the city also experiences high wind speeds particularly during the monsoon season and summer months, with the wind most often from the west for 7.0 months. The average relative humidity in Ahmedabad is around 55%. For designing the facility following environmental parameters are applicable:

- Location : Village Manipur, Taluka Daskroi, Dist. Ahmedabad
- Site elevation : 55m above MSL
- Temperature
 - Avg. Maximum, °C : 40
 - Avg. Minimum, °C : 13
- Humidity : 35% - 90% Relative Humidity
- Annual avg. rainfall : 824 mm
- Basic wind load : 39 m/s
- Prevailing direction : The predominant wind direction is SSW.
- Seismic design criteria: Zone- III (Latest edition of BIS -1893)

6. EXISTING FACILITIES

This section gives an overview of the existing surface facilities at QPS-SE#3 well-pad and are broadly described as below:

- Production Well
- Production and Test manifolds
- Bath heater
- Production and test separators
- Knock out drums for flare and sales gas
- Electrical Substations and Instrument & Telecom Rack Room
- Flare stack & Solid & liquid Waste Storage Pit

- Firefighting system i.e. Pump, Tank and fire ring etc.
- Production fluid transfer pumps
- Tube well

7. NEW FACILITIES & SCOPE OF WORK

The Scope of supply together with the attachments defines and covers the guidelines for design, engineering, selection of equipment, procurement, fabrication, assembly and testing of FGMP required for QPS-SE#3 including transportation, delivery and integration of complete package at site.

The Scope of supply is not limited to the below mentioned items; EPC Contractor shall supply all required items for the satisfactory operation of the FGMP.

The FGMP package will be located in Outdoor location without any shelter. EPC contractor to supply equipment suitable for extreme weather condition prevalent in the area.

This section describes the broad scope of new surface facilities & upgradation requirements in existing facilities in QPS-SE#3 as part of this project.

Flare Gas Monetization Project

- Internal piping augmentation and modification to route liberated gas from separators to the FGMP.
- Augmentation of power system based on adequacy checks
- Augmentation of Fire water system based on adequacy checks
- The following type of Mechanical Equipment are envisaged for the Project:
 - Reciprocating compressor
 - Membrane type Gas dehydration Unit
 - Centrifugal Pumps
 - Controlled Volume Pumps (part of Chemical Dosing package)
 - Inlet KOD Vessel
 - Close Blowdown Vessel
 - Instrument Air Package
 - Odorant Dosing Package
 - F&G detectors and panel
 - Any other type of equipment as required by Company for the project
- All Skid mounted Equipment shall be provided with a lifting frame or spreader bar complete with slings and shackles to enable a single point lift. The lifting frame and spreader bar shall be permanently marked with safe working load and shall be tested and certified by a competent authority.
- Modification in piping, civil infrastructure, electrical & instrumentation works

for integration of new FGMP & other associated facilities.

8. PROCESS DESIGN DATA

8.1 Well Fluid Composition

Refer Annexure-1 for fluid composition

8.2 Chemical Injection

No process chemical injection is envisaged under FGMP.

However, EM odorant shall be injected at the upstream of custody meter as a safety requirement for an easy identification of any breach of containment.

The dosing of Ethyl Mercaptan on volume control basis in the dehydrated gas will be used for the purpose of odorization and its dosing rate shall be maintained between 6-12ppm.

Dozing rate will be such that the odorant (EM) concentration in natural gas at the extreme end of the network is minimum 2 PPM irrespective of the suggested dozing rates. Also, it should be safe for human as well as materials and equipment used in DESIGN BASIS.

8.3 Production Fluid Gathering and processing

The total production from well nos. SE#3, SE#4 and SE#5 shall flow to separator platform. From here combined associated NG and Non associated NG will flow to a common inlet knock out drum of the FGMP facilities for further processing. The Degassed Liquid shall continue to flow as per existing practice to the storage tanks.

8.4 Studies

Following modification and studies shall be carried out within the scope of this project.

- Current fluid composition data validation for the project.
- Electrical load study and necessary augmentation for integrating new facilities at FGMP
- Instrument air requirement study and installation of new Air compressor facility
- Safety studies viz HAZID, HAZOP and QRA for the project
- Adequacy check of the existing Firefighting facilities, HC detection system etc. shall be carried out as part of this project & necessary modification, if any, shall be identified and implemented.
- All tie -in with inlet gas, flare header, produced water and processed crude etc.
- All associated system design & augmentation to meet the design intent, shall be part of the project.

9. EQUIPMENT DESIGN PHILOSOPHY

9.1 General

The EPCC Contractor shall develop package engineering based on the design basis, specifications, drawings, etc. Basic engineering documents provided are for guidance and are minimum / indicative only. It is the responsibility of the EPC contractor to develop any missing information based on good engineering practices for completing the project in all respect meeting quality requirement and desired level of operational efficiency. The successful EPCC Contractor shall carry out package engineering over and above of that mentioned in the tender, required to deliver the package with no extra cost. All such activities shall be vetted by the consultant /GSPCL.

EPCC Contractor shall carry out design and fabrication of skid mounted units as per latest codes & standards. To the extent possible, Skid Integration shall be ensured to reduce piping, cabling, and panel count. This lowers CAPEX and simplifies commissioning. Suggested skid integration is to combine odorization, USM and GC into a single instrumentation skid.

In addition to above, a smart PLC Architecture comprising of a shared PLC across compressor, GDU, and odorization, to enables centralized control and reduced panel costs shall be preferred.

All possible efforts have been made to establish a link between the Basic Engineering, Scope of work, Design basis, Standard Specifications, Standards and Drawings so that the EPC contractor has clear cut frame work of guidelines within which the engineering would be performed. Despite this, it may still be required to apply judgment and reason to certain areas based on experience and sound engineering practice to achieve desired results.

EPCC contractor must understand and undertake clearly that it is the sole responsibility of the MPC contractor to complete all works in all respect leading to mechanical completion and make the plant ready for commercial operation. Codes and standards included shall be followed and considered as the minimum requirement.

The requirement of any statutory body like Chief Controller of Explosive (CCE), Nagpur, India, Environmental Clearances, Factory Inspector, and DGMS, OISD etc. shall govern where these are more stringent than the requirement specified in the document.

9.2 Mechanical Design Criteria

Equipment and piping systems shall be designed for the most stringent coincident temperature and pressure conditions, accommodating the maximum expected working pressure and temperature without causing a relieving condition. The design shall be such that instrument safeguarding systems or availability of emergency power are not relied upon for overpressure protection. Abnormal conditions shall be evaluated

considering a single contingency. A double or multiple contingencies shall not be considered, but if one failure is a result of another failure, both failures are to be considered as one contingency. Guide for “Pressure Relieving and Depressurizing Systems”, API RP 521 (latest edition) “Pressure Relief & Disposal System”, OISD-STD-106 shall be followed for evaluating failures. All pressure vessels should be designed based on ASME / ASTM and ANSI codes.

Design Pressure for Pressure Containing Equipment

The design pressure shall be as specified in the datasheet / equipment list. Where design pressure is not mentioned in datasheet / equipment list, following methodology shall be followed.

The maximum internal or external pressure will be used in determining the minimum permissible wall thickness of equipment and piping. Note that the minimum permissible wall thickness may be derived from a lower operating pressure, but higher operating temperature.

Pressure system protected by a pressure relief device connected to the flare system shall have a mechanical design pressure, calculated at the location of the relieving device, as the higher of the following:

a) For operating pressure up to and including 70 kg/cm²g, design pressure shall be the highest of the following:

- Maximum operating pressure (kg/cm²g) x 1.1
- Maximum operating pressure + 2.0 kg/cm²g
- 3.5 kg/cm²g.

b) For a full liquid system at the discharge of a centrifugal pump, the mechanical design pressure shall be as under:

$$P_{des} = P_{max \text{ suction}} + \Delta P_{max}$$

Where,

$P_{max.suction}$ = Maximum pressure at suction vessel bottom during suction system relieving conditions

ΔP_{max} = Pump differential pressure at pump shutoff head with maximum operating density.

c) For a full liquid system at the discharge of a positive displacement pump, the mechanical design pressure shall be the higher of:

- $P_{des} = P_{rated \text{ discharge}} + 2 \text{ kg/cm}^2$
- $P_{des} = 1.1 \times P_{rated \text{ discharge}}$

Mechanical Design Temperature

For systems operating at or above 0°C, the mechanical design temperature shall be the higher of the following:

- $T_{des} = 65\text{ }^{\circ}\text{C}$
- $T_{des} = T_{max} + 15\text{ }^{\circ}\text{C}$
- $T_{des} = T_{relief}$ (excluding fire relief temperatures)

Where:

T_{max} – Maximum operating temperature expected considering different possible operations for the equipment or system, including air drying or gas drying process

T_{relief} – Temperature corresponding to pressure relief conditions

Minimum Design Metal Temperature (MDMT)

Designer shall specify MDMT. Ambient temperature data indicated in meteorological shall be applied, as a minimum.

10. MANWAY SIZE

For vessels less than 900mm diameter, where no access is required, hand hole of minimum 8" shall be provided in place of body flanges. Size of man way shall be as follows:

| Diameter (Vessel) | Man-way size |
|-----------------------------|--------------|
| Up to 900 mm | 18" NB |
| Above 900 mm & up to 1500mm | 20" NB |
| Above 1500 mm | 24" NB |

11. HOLDUP CRITERIA

Unless specified in preceding paragraphs of this document or mentioned in process datasheet, following minimum requirement towards hold-ups for vessels is recommended.

Designers can adopt criteria that call for higher hold-up volumes, if warranted from a design point of view. The working hold up volumes are expressed as minutes of liquid residence time between Low Operating Level (LL) and High Operating Level (HL) while additional hold ups shall apply between the operating levels and corresponding tripping levels (LLL / HHL), when a shutdown is stipulated.

12. VENT, DRAIN AND VENTILATION NOZZLE.

| Vessel Volume | Length (Horizontal Vessel) | Vent Nozzle | Drain Nozzle | Ventilation Nozzle |
|-------------------------------|----------------------------|-------------|--------------|--------------------|
| Less than 6.0 m ³ | | 1 1/2" NB | 1 1/2" NB | |
| 6.0 - 15.0 m ³ | | 2" NB | 2" NB | |
| More than 15.0 m ³ | | 2" NB | 3" NB | |
| | 3000 mm – 4500 mm | | | 4" NB |
| | 4500 mm – 7500 mm | | | 6" NB |
| | >7500 mm | | | 8" NB |

13. NOZZLE REQUIREMENT FOR VESSELS

1. Minimum sizes of vessel nozzles shall be as:
 - Process or instrument nozzle in unclad vessel: 1½" NB
 - Process or instrument nozzle in internally lined vessel: 3" NB
2. The following fluid velocity shall be maintained at various nozzles of process vessels;

| Nozzle | Velocity Range, m/sec | Momentum Criteria Ro.V2 max (kg.m.s2) Ro- kg/m3 V2 – m/sec | Remark |
|--------------|-----------------------|---|-------------------------------------|
| Inlet (Feed) | | <= 1400 with no inlet device | Sized based on 110% normal vol flow |
| | | <= 4500 with inlet device | |
| | | <= 6000 mainly gas with inlet device | |
| Gas Outlet | | <= 4500 | Sized on normal vol flow |
| HC Liquid | 1 - 3 | | Sized based on 110% normal vol flow |
| Water Outlet | 2 - 4 | | Sized on normal vol flow |

The values in the above table shall satisfy the following:

- a) Liquid lines shall not be sized less than 2" NB even if falling within the values in the above table range
- b) The line size shall be increased to keep pressure drop to a minimum
- c) For all other process piping, it shall be established by calculation that the selected velocities are considerably lesser than the erosion velocity
- d) Nozzle sizing shall be minimum one size higher than the associated piping. In case of threshold values, the next higher NB size shall be selected.

14. LINE SIZING

Lines shall be sized for the controlling operating case determined by analysis of flow rates, operating pressures, and temperature for all identified operating modes. Pressure drop due to piping components are to be accounted for in terms of equivalent length.

All piping shall be sized / designed to eliminate / minimize the impact of pressure surge due to transient operating condition and events. A minimum pipe size shall be established for all process piping to ensure adequate mechanical integrity. The hydraulic study and line sizing shall be performed with ASPEN HYSYS (Version 10.0) software.

1. The sizing of single-phase liquid lines shall be based on considerations of pressure drop and velocity

| Liquid Line Service | | Velocity Range, m/sec | Press. Drop, kg/cm ² /Km, Max |
|----------------------|---------------------------------------|-----------------------|--|
| Pump Suction | Boiling Liquid | 0.6 | 1.0 |
| | Non-Boiling Liquid | 2.3 | 3.5 |
| Pump Discharge | Disch Press < 50 kg/cm ² g | 3.5 | 4.6 |
| Process Liquid Lines | Boiling Liquid | 0.6 | 1.0 |
| | Non-Boiling Liquid | 2.3 | 3.5 |
| Water Lines | Cooling & Service water | 2.3 | 13.5 |
| Gravity Lines | General | 0.4-0.6 | 0.25-0.4 |

2. Two phase Line Sizing

The criteria for sizing of multiphase piping shall be the erosional velocity i.e. actual fluid velocity shall be maintained below the erosional velocity. Wellhead flow-lines, well testing lines and other lines made of steel and transporting two phase or multiphase flow, has to be designed on the basis of erosion velocity.

As a guideline, the velocity above which erosion may occur can be calculated by the following empirical equation:

$$V_e = \frac{C}{\sqrt{\rho_m}}$$

Where

V_e = Erosion velocity (m/s)

ρ_m = Gas/liquid mixture density at flowing condition (kg/m³)

C = Empirical constants

According to API-14E

C = 150 to 200 (for continuous service)

C = 250 (for intermittent service)

When solid and/or corrosive contaminants are present a safety factor 0.75 must be applied to the C factor.

3. Vapor line sizing,

For gas piping, generally the velocity shall be limited to 20 m/s. Lower velocity shall be considered where pressure drop limitations exists or due to other process considerations.

4. Flare header sizing,

- For flare header piping the Mach number shall be limited to 0.5 (max) for headers and 0.7 (max) for branch lines subject to back pressure limitations.
- The RV inlet piping size should be such that the pressure drop is less than 3% of the RV set pressure.
- Back pressures shall not exceed MAWP of the flare system.
- Discharge piping should be designed so that the backpressure does not exceed

an acceptable value for any pressure relief valve in the system. i.e. back pressure should not compromise the relieving capacity of a RV below the relieving requirement.

15. SOFTWARES

Hydraulics, Thermal study & Surge analysis for Production fluid intra-field Pipeline network including Trunk line shall be carried out using Pipesim / OLGA.

Hydraulics, Thermal study & Surge analysis for Injection water intra-field Pipeline network & Main pipeline shall be carried out using Pipenet & HYSYS Version 10.

Hydraulics, Thermal study & Surge analysis for Diluted Polymer solution pipelines shall be carried out using In-house Spreadsheet, HYSYS Version 10 & Pipenet.

16. SPARING PHILOSOPHY

The following summarizes the sparing philosophy envisaged for the major equipment.

- Reciprocating compressor shall have 2W+1S sparing philosophy
- Pumps shall have 1W+1S sparing philosophy
- No spare for Odorant Unit, but its pump will be 1W+1S
- No spare for Static Equipment

17. INSTRUMENTATION & CONTROL

Existing Distributed Control System is provided to perform the following Functions

- Control and Monitoring
- Fire and Gas Monitoring and Shutdown
- Emergency shutdown
- Data Record

All the critical controls & shutdown signals between any package PLCs, new/existing systems shall be hardwired. All signals from the new facilities shall be interfaced to existing plant control system.

All the ESD and F&G instruments shall be minimum SIL 2 rated. All the ESD & F&G system shall be SIL 3 rated.

H₂S detection system shall be provided for complete facility and interfaced with plant control system.

For more details refer Instrumentation Design Basis (B302PTL3-BHAG-IC-BD-0001).

18. PIPING & INSULATION

Piping Design Basis shall define the detailed design requirements for overall piping, and painting and corrosion protection standards.

Insulation thicknesses to be adopted as per the applicable standard and codes

For details about piping system, refer Piping Design Basis Doc No. GERMI/BDP/GSPCL/08/25-26.

19. ENVIRONMENTAL CONTROL

1. Emission norms as stipulated by CPCB and other mandatory regulations like GSPCB, shall be satisfied for the project.
2. SO₂ ground level concentration contribution of the project shall be less than the allowable limit.
3. Noise level:
 - i) 85 dB (A) at 1 meter from source
 - ii) 70 dB (A) at the fence
4. No effluent discharge from the complex is envisaged. 100% re-use is to be planned and facilities are to be designed accordingly.
5. Total complex emissions (gaseous SO₂, NO_x etc. and liquid and solid if any) to meet ENVIRONMENTAL CLEARANCE stipulations and other applicable regulations.

20. SAFETY

1. This section presents a short list of safety aspects that will be reflected, as appropriate, in the FEED or in the detailed design & engineering stages. This list is not intended to be a complete enumeration of safety features for a project.
2. Push buttons for stopping critical motors, if identified, shall be provided at a safe location, away from the fire-zone of the respective motors. This is in addition to usual start / stop push buttons provided for such motors.
3. Gas detectors shall be provided in the critical process and utilities area.
4. Suction / discharge valves of suction filter should be close to the pump in order to avoid hydrocarbon wastage during filter cleaning and pump maintenance.
5. Flare line isolation valve at unit battery limits should be installed only in the horizontal line with stem in horizontal position to avoid free fall of gate and blockage of flare system.
6. It is mandatory to adhere to stipulations of OISD standards for minimum inter-equipment spacing and inter-distance between process unit and utilities.

21. PROCESS GUARANTEE

The Contractor shall offer the best and proven design of plant and the equipment which can be capable of delivering its guaranteed output continuously.

Any work/ equipment and material which may not have been specifically mentioned in this specification but are required to make the plant complete in every respect in accordance with technical specification necessary for safe operation to meet the guaranteed performance of the plant and statutory norms shall be deemed to have been covered under the scope of this specification and shall be provided by the Contractor.

Process Guarantee Test run (PGTR) of the entire plant of FGMP for 72 hours in order to demonstrate that the processed gas is conforming to the PNGRB specifications at the specified flow rate and pipeline conditions. This PGTR has to be carried out within 30 days of the successful commissioning.

22. ANNEXURES

Annexure-1: Well Fluid Compositions

Annexure-2: Water in gas analysis

Annexure-3: QPS-SE#3 Oil and Gas Production Profiles

Annexure-1: Well Fluid Compositions

Gas Analysis of QPS-SE#3

Gujarat Energy Research and Management Institute
Ground Floor, Energy Building, PDPU Campus, Raisan Village,
Gandhinagar, Gujarat-382007



| Analysis of Natural Gas Sample | |
|-------------------------------------|---|
| Format No. GERMI/PRW/NG/02 | Issue No.01 |
| Report No. GERMI/PRW Lab/NG/2022/03 | Date of issue : 17-10-2022 |
| Client Name: GSPC | Location : Sanand#3 QPS (Sanand Part A Field) |
| Source of sample : Sanand#3 QPS | Date of Sample Collection : 22-09-2022 |
| Pressure: 2.0 kg/cm ² | Date of Sample Received: 22-09-2022 |

Method of Analysis: Sample analysed by NGA-Agilent 7890B GC system using DC-200 (30ft) and DC 200 (2ft) with TCD.

Compositional Data (as per ISO 6974-4:2000)

| Sr. No. | Components | % Volume |
|---------|----------------|----------|
| 1 | Methane | 83.976 |
| 2 | Ethane | 2.674 |
| 3 | Propane | 0.750 |
| 4 | i-Butane | 0.267 |
| 5 | n-Butane | 0.127 |
| 6 | i-Pentane | 0.106 |
| 7 | n-Pentane | 0.097 |
| 8 | Hexane+ | 0.825 |
| 9 | Carbon dioxide | 0.771 |
| 10 | Nitrogen | 0.603 |

By Calculations: (as per ISO 6976:1995-Reaffirmed 2003)

| | |
|---|---------|
| Specific Gravity [with respect to air] | 0.6101 |
| Gross Calorific Value (K Cal/Cubic meter) | 9529.61 |
| Net Calorific Value (K Cal/Cubic meter) | 8600.34 |

Remarks: Calculations are carried out on air free basis

| Analyzed by | | Verified by | | Approved by | |
|-------------------------|--|---|--|----------------------|--|
| Anant K Das Fellow | | Dr M A Rasheed Scientist-C | | P. H. Rao PRS-PRW | |
| Flory Kothari Fellow | | Dr P L S Rao Sr. Scientific Officer | | | |



Remarks:

1. ISO Standard methods have been used for analysis of Natural gas samples.
2. The test report does not indicate the quality of product or usage of product or suitability of the product.
3. The test related to the samples supplied by the client/agency.
4. Reproduction of this report in whole or in part by any means except with written permission of testing Agency shall be deemed to be an infringement.
5. The report/result are not to be used for publicity.

Gas Analysis of SE#4

Gujarat Energy Research and Management Institute
Ground Floor, Energy Building, PDU Campus, Raisan Village,
Gandhinagar, Gujarat-382007



| Analysis of Natural Gas Sample | | |
|--------------------------------------|--|--------------------------|
| Format No. GERMI/PRW/NG/02 | Issue No.01 | Date of Issue:03-08-2022 |
| Report No. :GERMI/PRM/NG/2023/Nov/04 | Date of issue : 10-11-2023 | |
| Client Name: GSPC Ltd | Location : Sanand East Field | |
| Source of sample : SE #4 | Date of Sample Collection : 08-11-2023 | |
| Pressure:2.5 kg/cm ² | Date of Sample Received: 09-11-2023 | |

Method of Analysis: Sample analysed by NGA-Agilent 7890B GC system using DC-200 (30ft) and DC 200 (2ft) with TCD.

Compositional Data (as per ISO 6974-4:2000)

| Sr. No. | Components | % Volume |
|---------|----------------|----------|
| 1 | Methane | 83.618 |
| 2 | Ethane | 2.862 |
| 3 | Propane | 0.858 |
| 4 | i-Butane | 0.324 |
| 5 | n-Butane | 0.245 |
| 6 | i-Pentane | 0.081 |
| 7 | n-Pentane | 0.000 |
| 8 | Hexane+ | 0.000 |
| 9 | Carbon dioxide | 0.796 |
| 10 | Nitrogen | 0.670 |

By Calculations: (as per ISO 6976:1995-Reaffirmed 2003)

| | |
|---|---------|
| Specific Gravity (with respect to air) | 0.5950 |
| Gross Calorific Value (K Cal/Cubic meter) | 9299.62 |
| Net Calorific Value (K Cal/Cubic meter) | 8387.43 |

Remarks: Calculations are carried out on air free basis

| Analyzed by | | Verified by | | Approved by | |
|--------------------|--|--------------------------|--|-------------------------------------|--|
| Madhvi G Fellow | | Dr M A Rasheed DGM | | Dr Syed Zahoor Hasan Head-PRM | |
| Flory K Fellow | | Dr P L S Rao DGM | | | |



Remarks:

1. ISO Standard methods have been used for analysis of Natural gas samples.
2. The test report does not indicate the quality of product or range of product or suitability of the product or material.
3. The test related to the samples supplied by the client/agency.
4. Reproduction of this report in whole or in part by any third party without the permission of testing Agency shall be deemed to be an infringement.
5. The appearance of use not to be used for publicity.

Gas analysis of SE#5

Energy Building,
Pondit Deendayal Petroleum University Campus,
Raisan Village, Gandhinagar – 382 007, Gujarat, INDIA
Phone : +91-79-25275757
Fax : +91-79-23275380
E-mail : information@germi.org
Website : www.germi.org



ENERGY EDUCATION
ENERGY RESEARCH & DEVELOPMENT
ENERGY TRAINING
ENERGY CONSULTANCY

| Analysis of Natural Gas Sample | | |
|--------------------------------------|---|---------------------------|
| Format No. GERMI/PRW/NG/02 | Issue No.01 | Date of issue: 03-08-2022 |
| Report No. :GERMI/PRM/NG/2024/Oct/04 | Date of issue : 29-10-2024 | |
| Client Name: GSPC Ltd | Location : Sanand Part -A,CB-ONN-2002/3 | |
| Source of sample : SE#5 | Date of Sample Collection : 28 10 2024 | |
| Pressure: 2.5 Kg/cm ² | Date of Sample Received: 28-10-2024 | |

Method of Analysis: Sample analysed by NGA-Agilent 7890B GC system using DC-200 (30ft) and DC 200 (2ft) with TCD.

Compositional Data (as per ISO 6974-4:2000)

| Sr. No. | Components | % Volume |
|---------|----------------|----------|
| 1 | Methane | 84.5785 |
| 2 | Ethane | 2.4327 |
| 3 | Propane | 0.5970 |
| 4 | i-Butane | 0.1791 |
| 5 | n-Butane | 0.0807 |
| 6 | i-Pentane | 0.0343 |
| 7 | n-Pentane | 0.000 |
| 8 | Hexane+ | 0.4575 |
| 9 | Carbon dioxide | U / U93 |
| 10 | Nitrogen | 0.9218 |

| By Calculations: (as per ISO 6976:1995-Reaffirmed 2003) | |
|---|---------|
| Specific Gravity (with respect to air) | 0.5989 |
| Gross Calorific Value (K Cal/Cubic meter) | 9341.25 |
| Net Calorific Value (K Cal/Cubic meter) | 8425.41 |
| Molecular weight | 17.3137 |

Remarks: Calculations are carried out on air free basis

| Analyzed by | | Verified by | | Approved by | |
|----------------------|--|---------------------|--|-------------------------------------|--|
| Madhvi G. Fellow | | Dr P L S Rao DGM | | Dr Syed Zaheer Hasan Head-PRM | |
| Aadarsh R. Fellow | | | | | |



Remarks:

1. ISO Standard methods have been used for analysis of Natural gas samples.
2. The test report does not indicate the quality of product or usage of product or suitability of the product or material.
3. The test related to the samples supplied by the client/agency.
4. Reproduction of this report in whole or in part by any means except with written permission of testing Agency shall be deemed to be an infringement.
5. The report/result are not to be used for publicity.

Annexure-2: Dew Point Analysis of Combined Gas

Date: 22/7/2020

GUJARAT STATE PETROLEUM CORPORATION
 LIMITED
 GSPC Bhavan
 B h Udyog Bhavan Sector 11
 Gandhinagar
 Gandhinagar
 INDIA
 382010

Certificate of Analysis TO20-006094.001
 ULR No : TC684220000043020F

| | | | |
|-----------------------------|---|-------------------------|--|
| PRODUCT DESCRIPTION: | Producing gas | GROUP : | Petroleum and Products LPG/Propane/Butane |
| SAMPLE SOURCE: | As Supplied | CLIENT ID: | SE84 & SE83 well composite |
| SOURCE ID: | NA | SGS ORDER N°: | 3020280 |
| LOCATION: | AHMEDABAD | SAMPLE RECEIVED: | 03/07/2020 |
| SAMPLE TYPE: | As submitted | SAMPLE ANALYSED: | 22/07/2020 |
| | | SAMPLE BY: | SGS |
| | | DATE SAMPLED: | 24/06/2020 |
| | PRESSURE: 2 KG TIME: 10.57 CYLINDERED NO: HYDRO 008 TC684220000043020F LPG/Propane/Butane | | |
| SAMPLE CONTAINER | | | |

NABL Accredited Tests

| METHOD | PROPERTY | RESULT | UNITS |
|--|--|--------|---------|
| DISCIPLINE: Chemical ASTM D1545-2015 | Analysis of Natural Gas by GC Water Content - Ferencs Calculated g | 2.2486 | % (w/w) |
| | (1) Dew point by dew point meter = 25.4 degC 2) Moisture content (Onsite) = 23000 ppm | | |

End of Analytical Results

This laboratory is accredited under ISO/IEC 17025. The results reported herein have been performed in accordance with the laboratory's term of accreditation except calibration/tests marked with an asterisk (*) in this report which are not within the scope of accreditation for our laboratory.

This report relates specifically to the sample tested as received. All tests have been performed using the latest revision of the methods indicated, unless specifically marked otherwise on the report. The latest available issue of the test methods in our possession has been used. Precision parameters apply in the determination of the above results. Users of the data shown on this report should refer to the latest published revisions of ASTM D-3244; IP 367; ISO 4259 and Appendix E of IP Standard Methods for Analysis and Testing when utilising the test data to determine conformance with any specification or process requirement. This report shall not be reproduced except in full, without the written approval of the laboratory.

Authorized Signatory

Authorized Signatory



VJAY SANKPAL - Super User
 2207202018090R0000156561

Shivaj Salunkhe - Operation manager-Lab
 Page 1 of 1

Annexure-3: Production Profile

Sanand Field Part:A (Field production)

Projection of ANG Production

| | Month | Days | Monthly Combined Rate (Well SE#3 & SE#4) | | | |
|--------------|--------|------|--|-------|-------|------------------------|
| | | | Net Crude oil | Water | ANG | Available ANG for sale |
| | | | SCM/M | SCM/M | SCM/M | SCM/M |
| BE (2025-26) | Apr-25 | 30 | 265.06 | 140 | 54426 | 42426 |
| | May-25 | 31 | 270.89 | 146 | 55660 | 43260 |
| | Jun-25 | 30 | 259.25 | 143 | 53304 | 41304 |
| | Jul-25 | 31 | 265.31 | 150 | 54525 | 42125 |
| | Aug-25 | 31 | 262.72 | 152 | 53970 | 41570 |
| | Sep-25 | 30 | 251.76 | 149 | 51692 | 39692 |
| | Oct-25 | 31 | 257.58 | 156 | 52862 | 40462 |
| | Nov-25 | 30 | 246.80 | 153 | 50621 | 38621 |
| | Dec-25 | 31 | 252.47 | 160 | 51757 | 39357 |
| | Jan-26 | 31 | 249.93 | 162 | 51205 | 38805 |
| | Feb-26 | 28 | 223.45 | 148 | 45753 | 34553 |
| | Mar-26 | 31 | 244.86 | 166 | 50105 | 37705 |
| BE (2026-27) | Apr-26 | 30 | 234.89 | 163 | 48189 | 36189 |
| | May-26 | 31 | 240.20 | 170 | 49245 | 36845 |
| | Jun-26 | 30 | 230.02 | 166 | 47124 | 35124 |
| | Jul-26 | 31 | 235.18 | 174 | 48146 | 35746 |
| | Aug-26 | 31 | 232.68 | 176 | 47598 | 35198 |
| | Sep-26 | 30 | 222.76 | 172 | 45532 | 33532 |
| | Oct-26 | 31 | 227.70 | 179 | 46503 | 34103 |
| | Nov-26 | 30 | 217.96 | 175 | 44475 | 32475 |
| | Dec-26 | 31 | 222.75 | 183 | 45412 | 33012 |
| | Jan-27 | 31 | 220.29 | 185 | 44868 | 32468 |
| | Feb-27 | 28 | 196.75 | 169 | 40035 | 28835 |
| | Mar-27 | 31 | 215.38 | 189 | 43781 | 31381 |
| BE (2027-28) | Apr-27 | 30 | 206.80 | 185 | 42297 | 30297 |
| | May-27 | 31 | 211.67 | 192 | 43422 | 31022 |
| | Jun-27 | 30 | 202.89 | 187 | 41746 | 29746 |
| | Jul-27 | 31 | 207.65 | 195 | 42854 | 30454 |
| | Aug-27 | 31 | 205.64 | 196 | 42571 | 30171 |
| | Sep-27 | 30 | 197.08 | 191 | 40924 | 28924 |
| | Oct-27 | 31 | 201.66 | 199 | 42006 | 29606 |
| | Nov-27 | 30 | 193.23 | 194 | 40378 | 28378 |
| | Dec-27 | 31 | 197.70 | 202 | 41443 | 29043 |
| | Jan-28 | 31 | 195.73 | 203 | 41163 | 28763 |
| | Feb-28 | 29 | 181.26 | 191 | 38245 | 26645 |
| | Mar-28 | 31 | 191.80 | 206 | 40603 | 28203 |
| BE (2028-29) | Apr-28 | 30 | 183.73 | 201 | 39023 | 27023 |
| | May-28 | 31 | 187.91 | 209 | 40045 | 27645 |
| | Jun-28 | 30 | 179.97 | 203 | 38485 | 26485 |
| | Jul-28 | 31 | 184.04 | 211 | 39490 | 27090 |
| | Aug-28 | 31 | 182.11 | 213 | 39213 | 26813 |
| | Sep-28 | 30 | 174.38 | 207 | 37680 | 25680 |
| | Oct-28 | 31 | 178.27 | 215 | 38660 | 26260 |
| | Nov-28 | 30 | 170.68 | 210 | 37147 | 25147 |
| | Dec-28 | 31 | 174.47 | 218 | 38110 | 25710 |
| | Jan-29 | 31 | 172.57 | 219 | 37835 | 25435 |

| | | | | | | |
|--------------|--------------|--------|--------|--------|-------|-------|
| | Feb-29 | 28 | 154.16 | 199 | 33927 | 22727 |
| | Mar-29 | 31 | 168.80 | 222 | 37288 | 24888 |
| BE (2029-30) | Apr-29 | 30 | 161.54 | 216 | 35821 | 23821 |
| | May-29 | 31 | 165.05 | 225 | 36743 | 24343 |
| | Jun-29 | 30 | 157.92 | 219 | 35294 | 23294 |
| | Jul-29 | 31 | 161.33 | 227 | 36199 | 23799 |
| | Aug-29 | 31 | 159.48 | 228 | 35928 | 23528 |
| | Sep-29 | 30 | 152.54 | 222 | 34507 | 22507 |
| | Oct-29 | 31 | 155.79 | 231 | 35388 | 22988 |
| | Nov-29 | 30 | 148.99 | 225 | 33985 | 21985 |
| | Dec-29 | 31 | 152.13 | 234 | 34849 | 22449 |
| | Jan-30 | 31 | 150.30 | 235 | 34581 | 22181 |
| | Feb-30 | 28 | 134.12 | 213 | 30992 | 19792 |
| | Mar-30 | 31 | 146.68 | 237 | 34045 | 21645 |
| | BE (2030-31) | Apr-30 | 30 | 140.20 | 231 | 32688 |
| May-30 | | 31 | 143.07 | 240 | 33511 | 21111 |
| Jun-30 | | 30 | 136.72 | 233 | 32173 | 20173 |
| Jul-30 | | 31 | 139.50 | 242 | 32980 | 20580 |
| Aug-30 | | 31 | 137.71 | 243 | 32715 | 20315 |
| Sep-30 | | 30 | 131.55 | 237 | 31403 | 19403 |
| Oct-30 | | 31 | 134.17 | 246 | 32186 | 19786 |
| Nov-30 | | 30 | 128.14 | 239 | 30892 | 18892 |
| Dec-30 | | 31 | 130.65 | 248 | 31659 | 19259 |
| Jan-31 | | 31 | 128.90 | 250 | 31396 | 18996 |
| Feb-31 | | 28 | 114.85 | 226 | 28121 | 16921 |
| Mar-31 | | 31 | 125.41 | 252 | 30872 | 18472 |
| BE (2031-32) | | Apr-31 | 30 | 119.69 | 245 | 29623 |
| | May-31 | 31 | 121.95 | 254 | 30350 | 17950 |
| | Jun-31 | 30 | 116.35 | 247 | 29119 | 17119 |
| | Jul-31 | 31 | 118.51 | 257 | 29830 | 17430 |
| | Aug-31 | 31 | 116.79 | 258 | 29570 | 17170 |
| | Sep-31 | 30 | 111.38 | 251 | 28366 | 16366 |
| | Oct-31 | 31 | 113.39 | 260 | 29053 | 16653 |
| | Nov-31 | 30 | 108.09 | 253 | 27866 | 15866 |
| | Dec-31 | 31 | 110.00 | 262 | 28538 | 16138 |
| | Jan-32 | 31 | 108.32 | 264 | 28281 | 15881 |
| | Feb-32 | 29 | 99.76 | 248 | 26216 | 14616 |
| | Mar-32 | 31 | 104.97 | 266 | 27768 | 15368 |
| | BE (2032-33) | Apr-32 | 30 | 99.97 | 258 | 26625 |
| May-32 | | 31 | 101.64 | 268 | 27257 | 14857 |
| Jun-32 | | 30 | 96.76 | 261 | 26131 | 14131 |
| Jul-32 | | 31 | 98.33 | 270 | 26748 | 14348 |
| Aug-32 | | 31 | 96.69 | 271 | 26494 | 14094 |
| Sep-32 | | 30 | 91.98 | 264 | 25394 | 13394 |
| Oct-32 | | 31 | 93.41 | 274 | 25988 | 13588 |
| Nov-32 | | 30 | 88.82 | 266 | 24905 | 12905 |
| Dec-32 | | 31 | 90.16 | 276 | 25483 | 13083 |
| Jan-33 | | 31 | 88.54 | 277 | 25232 | 12832 |
| Feb-33 | | 28 | 78.52 | 251 | 22563 | 11363 |
| Mar-33 | | 31 | 85.32 | 279 | 24730 | 12330 |
| | | Apr-33 | 30 | 81.02 | 271 | 23690 |
| | May-33 | 31 | 82.13 | 281 | 24230 | 11830 |

| | | | | | | |
|--------------|--------|----|-------|-----|-------|-------|
| BE (2033-34) | Jun-33 | 30 | 77.94 | 273 | 23207 | 11207 |
| | Jul-33 | 31 | 78.95 | 283 | 23732 | 11332 |
| | Aug-33 | 31 | 77.37 | 284 | 23484 | 11084 |
| | Sep-33 | 30 | 73.35 | 276 | 22486 | 10486 |
| | Oct-33 | 31 | 74.22 | 286 | 22988 | 10588 |
| | Nov-33 | 30 | 70.31 | 278 | 22008 | 10008 |
| | Dec-33 | 31 | 71.10 | 289 | 22495 | 10095 |
| | Jan-34 | 31 | 69.54 | 290 | 22249 | 9849 |
| | Feb-34 | 28 | 61.41 | 263 | 19873 | 8673 |
| | Mar-34 | 31 | 66.45 | 292 | 21758 | 9358 |
| | Apr-34 | | | | | |

Sanand Field Part:A (Field production)

Projection of NANG Production

| | Month | Days | Monthly Combined Rate (Well SE#5) | | |
|--------------|--------|------|-----------------------------------|-------|--------|
| | | | Heavy oil | Water | NANG |
| | | | SCM/M | SCM/M | SCM/M |
| BE (2025-26) | Apr-25 | 30 | | | |
| | May-25 | 31 | | | |
| | Jun-25 | 30 | | | |
| | Jul-25 | 31 | | | |
| | Aug-25 | 31 | | | |
| | Sep-25 | 30 | | | |
| | Oct-25 | 31 | 2.62 | 14.8 | 164300 |
| | Nov-25 | 30 | 2.61 | 14.8 | 157676 |
| | Dec-25 | 31 | 2.68 | 15.2 | 161574 |
| | Jan-26 | 31 | 2.66 | 15.0 | 160228 |
| | Feb-26 | 28 | 2.38 | 13.5 | 143517 |
| | Mar-26 | 31 | 2.61 | 14.8 | 157570 |
| BE (2026-27) | Apr-26 | 30 | 2.51 | 14.2 | 151217 |
| | May-26 | 31 | 2.57 | 14.6 | 154956 |
| | Jun-26 | 30 | 2.46 | 14.0 | 148708 |
| | Jul-26 | 31 | 2.53 | 14.3 | 152385 |
| | Aug-26 | 31 | 2.50 | 14.2 | 151116 |
| | Sep-26 | 30 | 2.40 | 13.6 | 145023 |
| | Oct-26 | 31 | 2.46 | 14.0 | 148609 |
| | Nov-26 | 30 | 2.36 | 13.4 | 142617 |
| | Dec-26 | 31 | 2.42 | 13.7 | 146143 |
| | Jan-27 | 31 | 2.40 | 13.6 | 144926 |
| | Feb-27 | 28 | 2.15 | 12.2 | 129810 |
| | Mar-27 | 31 | 2.36 | 13.4 | 142521 |
| BE (2027-28) | Apr-27 | 30 | 2.27 | 12.8 | 136775 |
| | May-27 | 31 | 2.32 | 13.2 | 140157 |
| | Jun-27 | 30 | 2.23 | 12.6 | 134506 |
| | Jul-27 | 31 | 2.28 | 12.9 | 137831 |
| | Aug-27 | 31 | 2.27 | 12.8 | 136683 |
| | Sep-27 | 30 | 2.17 | 12.3 | 131172 |
| | Oct-27 | 31 | 2.23 | 12.6 | 134416 |
| | Nov-27 | 30 | 2.14 | 12.1 | 128996 |
| | Dec-27 | 31 | 2.19 | 12.4 | 132186 |
| | Jan-28 | 31 | 2.17 | 12.3 | 131084 |
| | Feb-28 | 29 | 2.02 | 11.4 | 121606 |
| | Mar-28 | 31 | 2.14 | 12.1 | 128910 |
| | Apr-28 | 30 | 2.05 | 11.6 | 123712 |
| | May-28 | 31 | 2.10 | 11.9 | 126771 |
| | Jun-28 | 30 | 2.02 | 11.4 | 121660 |
| | Jul-28 | 31 | 2.07 | 11.7 | 124668 |
| | Aug-28 | 31 | 2.05 | 11.6 | 123629 |

| | | | | | |
|--------------|--------------|--------|------|------|--------|
| BE (2028-29) | Sep-28 | 30 | 1.97 | 11.1 | 118645 |
| | Oct-28 | 31 | 2.02 | 11.4 | 121578 |
| | Nov-28 | 30 | 1.93 | 11.0 | 116676 |
| | Dec-28 | 31 | 1.98 | 11.2 | 119561 |
| | Jan-29 | 31 | 1.97 | 11.1 | 118565 |
| | Feb-29 | 28 | 1.76 | 10.0 | 106199 |
| | Mar-29 | 31 | 1.93 | 11.0 | 116598 |
| BE (2029-30) | Apr-29 | 30 | 1.85 | 10.5 | 111897 |
| | May-29 | 31 | 1.90 | 10.8 | 114664 |
| | Jun-29 | 30 | 1.82 | 10.3 | 110041 |
| | Jul-29 | 31 | 1.87 | 10.6 | 112761 |
| | Aug-29 | 31 | 1.85 | 10.5 | 111822 |
| | Sep-29 | 30 | 1.78 | 10.1 | 107313 |
| | Oct-29 | 31 | 1.82 | 10.3 | 109967 |
| | Nov-29 | 30 | 1.75 | 9.9 | 105533 |
| | Dec-29 | 31 | 1.79 | 10.2 | 108142 |
| | Jan-30 | 31 | 1.78 | 10.1 | 107242 |
| | Feb-30 | 28 | 1.59 | 9.0 | 96057 |
| | Mar-30 | 31 | 1.75 | 9.9 | 105462 |
| | BE (2030-31) | Apr-30 | 30 | 1.68 | 9.5 |
| May-30 | | 31 | 1.72 | 9.7 | 103713 |
| Jun-30 | | 30 | 1.65 | 9.3 | 99531 |
| Jul-30 | | 31 | 1.69 | 9.6 | 101992 |
| Aug-30 | | 31 | 1.68 | 9.5 | 101143 |
| Sep-30 | | 30 | 1.61 | 9.1 | 97065 |
| Oct-30 | | 31 | 1.65 | 9.3 | 99464 |
| Nov-30 | | 30 | 1.58 | 9.0 | 95454 |
| Dec-30 | | 31 | 1.62 | 9.2 | 97814 |
| Jan-31 | | 31 | 1.61 | 9.1 | 97000 |
| Feb-31 | | 28 | 1.44 | 8.2 | 86883 |
| Mar-31 | | 31 | 1.58 | 9.0 | 95390 |
| BE (2031-32) | | Apr-31 | 30 | 1.52 | 8.6 |
| | May-31 | 31 | 1.55 | 8.8 | 93808 |
| | Jun-31 | 30 | 1.49 | 8.5 | 90025 |
| | Jul-31 | 31 | 1.53 | 8.7 | 92251 |
| | Aug-31 | 31 | 1.52 | 8.6 | 91483 |
| | Sep-31 | 30 | 1.46 | 8.2 | 87794 |
| | Oct-31 | 31 | 1.49 | 8.4 | 89965 |
| | Nov-31 | 30 | 1.43 | 8.1 | 86338 |
| | Dec-31 | 31 | 1.47 | 8.3 | 88473 |
| | Jan-32 | 31 | 1.45 | 8.2 | 87736 |
| | Feb-32 | 29 | 1.35 | 7.6 | 81392 |
| | Mar-32 | 31 | 1.43 | 8.1 | 86280 |
| | BE (2032-33) | Apr-32 | | | |

Remarks

Well is subhydrostatic & based on preliminary material balance analysis :

- Estimated OGIP : 17.8 million Sm³ (0.62 BCF)
- At abandonment Res. Pr. Of 600 psi, expected cu. NANG production : 0.318 million Sm³ (0.62 BCF)

Imp: With limited data & straight-line extrapolation, estimated OGIP and EUR is highly uncertain. Also, water migration in future cannot be ruled out, which has impact on OGIP & EUR.

- Well produces heavy oil (API:21.37) & water

Lift may require within 3-4 months to unload heavy oil with water