
TALISMAN

E N E R G Y

GATHERING SYSTEM FACILITIES AND GAS GATHERING SYSTEM

North Berland Pipeline

DRY SWEET GAS GATHERING SYSTEM

Producers Tie-In Specifications

Talisman Energy Canada
April 2007

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PRODUCER TIE-IN SPECIFICATIONS

Talisman Midstream -
North Berland Pipeline Gas Gathering System

1.0 DATA ACQUISITION REQUIREMENTS

| Item | Description | Specification | Notes |
|------|------------------------------|--|---|
| 1.1 | Fixed Frequency Radio | <p>The Producer must secure a radio path study (As a minimum, the LSD is required, the Lat/Long is preferred). Talisman should be consulted to explore options if the fixed frequency radio path study indicates a poor or inadequate profile. Costs to explore options will be at the cost of the Producer. Any operating costs resulting from other options will be paid by the Producer.</p> <p>Producer is responsible for all costs associated with installation and commissioning of communication infrastructure as outlined in the radio path study including towers, radios, repeaters and related configuration.</p> | <p>Confirm frequencies and other details with Talisman. Talisman will not accept any third party requests for tower access. The Producer must have a path study performed by 'Expert Communications' of Foothills Midstream Area.</p> |
| 1.2 | Remote Terminal Units | <p>Talisman has standardized on the Bristol models 'Control Wave Micro' utilizing Bristol 3820 transmitters or the Bristol model 'XFC XP' with three in one transmitters internal to the unit incorporating standardized programs and algorithms approved by Talisman. Electronic flow measurement (EFM) or remote terminal unit(s) (RTU) devices must provide the necessary control enablement, status monitoring and data uploading by/to the Talisman owned and operated Supervisory Control and Data Acquisition (SCADA) system.</p> | <p>Costs incurred by Talisman to enable interfacing to Talisman's SCADA System are required to be paid by the Producer. All RTUs must comply with API Chapter 21, Flow Measurement Using Electronic Metering Systems and AEUB Directive 017 Measurement Requirements for Upstream Oil and Gas Operations.</p> |
| 1.3 | RTU Programming | <p>Producer shall use the Talisman provided standard. Producer shall communicate any and all changes to the standard RTU configuration to Talisman. Configuration of the SCADA Host will be based on tag signals/addresses as configured in the standard RTU configuration load. The Producer is responsible for providing Talisman an updated Tag List for added and/or modified tag signals in the RTU configuration. This information shall be provided to Talisman in reasonable time for SCADA Host configuration prior to commissioning and startup. Also refer to section 1.7.</p> | <p>Producer is responsible for load.</p> |

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1.0 DATA ACQUISITION REQUIREMENTS

| Item | Description | Specification | Notes |
|------|--------------------------|---|---|
| 1.4 | Protocol | Primary: Bristol BSAP. Secondary: Modbus. | |
| 1.5 | Polling Requirements | Talisman SCADA as master. Producer RTU as slave. All RTUs will be time synced to the SCADA Master using MST. The RTU slave address will be assigned by Talisman for the RTU | All clocks set to Mountain Standard Time (M.S.T.). |
| 1.6 | SCADA Host Configuration | Talisman will provide the SCADA host configuration based on the standard RTU configuration and Producer supplied P&IDs. | Producer is responsible for all costs incurred by Talisman relating to SCADA Host configuration and commissioning |
| 1.7 | Power Requirements | Backup power source for 24 hours. Voltage monitoring signal will be provided to allow for a LOW Voltage alarm to be generated and communicated to the SCADA Host | Talisman recommends separate power supply for the radio and separate power supply for RTU. |
| 1.8 | Data Requirements | <p>Other technical solutions meeting the requirements for standard data set; equivalent latency, accuracy, completeness of data; and non-onerous connectivity to SCADA, as compared to the standard Bristol Control Wave Micro, may be considered. Final approval of solutions is at the sole discretion of Talisman. Costs incurred by Talisman in review and implementation of approved alternative solutions shall be reimbursed by the producer. Minimally required data, both real time and archived, as per API Chapter 21 requirements is as follows:</p> <ul style="list-style-type: none"> -daily averages for meter run differential pressure, static pressure, temperature and calculated flow, -meter information including but not limited to meter factor, orifice size, S.G. and Z, -time stamp in M.S.T., gas composition to C7+, -Dew point analyzer reading, -Calculated H2S Concentration, -emergency shutdown valve (ESD) and fuel gas valve position (open or closed), -compressor status and -fuel gas heater inlet and outlet temperature and flame status where applicable. | <p>Confirm data lists with Talisman. Talisman reserves the right to collect additional data as required. Data affiliated with the production, measurement and operation of facilities associated with gas, condensate and water production is required. An initial pre-start-up gas analysis is required followed by an actual analysis fourteen days after start of production . Prior to startup at the time of commissioning the RTU must be validated using an approved flow calculation application applying AEUB Directive 17 4.3.3.2 test cases.</p> |

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1.0 DATA ACQUISITION REQUIREMENTS

| Item | Description | Specification | Notes |
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| 1.9 | Remote Control Commands | Talisman requires SCADA remote shut-in and SCADA open (reset) control for receipt point or tie-in point ESD including fuel gas (where applicable) and water dew point analyzer bypass. The Producer shall not be able to reset an electronic ESD command from TMO. | TMO shall have the ability to ESD any production into the TMO gathering system from SCADA. This includes liquids or gas where applicable. In the case where it is agreed that a well site ESD is to be used as the tie-in ESD, the producer must retain the ability to independently ESD the well head ESD. The manual ESD reset latch still remains the final control element. |
| 1.10 | Other Electronic Data Access | Talisman requires electronic access to data as specified in 1.7 from all Producer wells delivering gas through a receipt point on a daily basis. Talisman requires the ability to download or export data in a .csv file format anytime. | This does not apply to solution gas. TMO strongly recommends any RTU installed upstream of a receipt point be in accordance with the attached specifications to allow for future receipt point movement. If a receipt point moves upgrade costs will be at the Producer expense. |

PRODUCER TIE-IN SPECIFICATIONS

Talisman Midstream -
North Berland Pipeline Gas Gathering System

2.0 DESIGN AND COMMISSIONING REQUIREMENTS

| Item | Description | Specification | Notes |
|------|---|--|---|
| 2.1 | Process Tie-in Connection | Talisman will install a manual block valve to connect new pipelines into the gas gathering system at the Producer's cost (materials and labour). Connections will be the same size as the Producer lateral. All direct tie ins connections to Talisman's gathering system should come with barred tees. | Ownership Limits. Cost recovery will be a lump sum payment. |
| 2.2 | Utility Tie-in Connections | Talisman will provide connections for fuel gas, instrument air / gas, drain and flare if available at the Producers cost (material and labour). The Producer fuel gas tie-in must be upstream of the receipt gas meter. | Ownership Limits. Cost recovery will be a lump sum payment. |
| 2.3 | Piping / Mechanical Requirements | Talisman requires the installation of a spectacle blind, a check valve, pipeline ESD valve, cathodic protection insulating kit and gas and hydrocarbons liquids sampling connections immediately upstream of an receipt point. | Installed by Producer. ESD remotely operable by Talisman. |
| 2.4 | Corrosion Requirements | The injection of a corrosion inhibitor may be required as specified by Talisman. Talisman reserves the right to so specify if in Talisman's sole discretion it is necessary. The inhibitor shall be consistent with the product utilized by Talisman and the rate of injection will be as specified by the chemical manufacturer or Talisman's Corrosion Group. Chemical injection requires Talisman approval. Continuous injection of an inhibited methanol is allowed in the gas gathering system with Talisman's prior approval. The Producer after approval of Talisman shall ensure their chemical product is compatible with that of the gas gathering system. Talisman's approved corrosion products are the following and only these products are permitted (Approval from both TLM Corrosion Engineering & TLM Operations will be required should a different product be requested by the Producer): -Inhibited Methanol - Baker Petrolite 1% mix CRW9152A -Continuous Inhibitor - Baker Petrolite CGO9178 -Batch Inhibitor - Baker Petrolite CG078 (1:1 with frac oil) | If another corrosion product must be substituted, please contact Mikael Johansson at 403-231-2992 for approval. |
| | | A corrosion coupon shall be installed upstream of the receipt point facility isolation valve such that it is positioned within regular production flows and does not interfere with pigging operations. High pressure retrievable coupons are recommended as the coupons can be retrieved without flow disruption. | Producer shall provide Talisman with corrosion coupon results quarterly. Send results to Mikael Johansson (Phone: 403-231-2992) |

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2.0 DESIGN AND COMMISSIONING REQUIREMENTS

| Item | Description | Specification | Notes |
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| 2.4 | Corrosion Requirements | Talisman utilizes 'smart pigs' for pipeline inspection purposes. Risers and tie-in connections to the Talisman system must not impede or hinder or make unusable 'smart pigs' within the Talisman gathering system. Talisman's Corrosion group reserves the right to review all tie-in proposals to ensure that system smart pig ability is not compromised. Producer shall notify Talisman Operations, not less than 1 week prior to conducting all inline pipeline inspections that tie directly into Talisman's gathering system. | |
| | | The Producer shall provide and install immediately upstream of the receipt point a cathodic protection insulating kit. | |
| | | Talisman may at its discretion require the Producer for a period of time deemed necessary by Talisman to collect any water and solids samples recovered during pigging activities or normal system operation and send them for analysis to determine the compositional nature of the materials entering the system. Analysis results shall be submitted to Talisman for review. | |
| | | All methanol used in the Cutbank-Musreau Gas Gathering System should be inhibited as per Talisman Energy system requirements. | |
| 2.5 | Pipeline ESD Valve | Fire safe to API 604 and equipped with: fail close actuator, manual reset latch, solenoid valve, open and close limit switches and high / low pressure pilot. | Installed by Producer. Remote valve operation (control) by Talisman Control Center. Valve position (status) signals to Talisman control center. |
| 2.6 | Producer Facility Design | Talisman reserves the right to review and approve the design of all facilities connecting into the gas gathering system prior to turn-on. | The Producer is required to provide to Talisman a complete Engineering Drawing Package (stamped by a registered APEGGA Professional Engineer) applicable to the facilities as soon as is reasonably possible for Talismans review and approval. The Producer is required to resubmit a "as-built" drawings package stamped by the same Professional Engineer. |

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2.0 DESIGN AND COMMISSIONING REQUIREMENTS

| Item | Description | Specification | Notes |
|------|---------------------------------|--|---|
| 2.6 | Producer Facility Design | Producer facilities may not encroach on or be installed on the Talisman right-of-way without the appropriate agreements in place. | Producer is required to acquire the Pipeline Installation License (PIL) for the overlapping pipeline right-of-way tie-in area(s). |
| | | The maximum operating pressure (MOP) may not exceed current AEUB pipeline approvals. | Contact the Foothills Development Engineer to acquire exact MOP data. |
| | | Talisman approved gas or liquid meters and sampling points must be provided for each product stream. | See 'Measurement Standards and Requirements' section for additional details. |
| | | Three phase separators incorporating separate product stream measurement and gas and liquid sampling analysis are required. Hydrocarbons liquids (condensate) if re-injected into the Talisman system may only be injected downstream of the gas meter. | Any Producer desirous of utilizing a two phase separator must demonstrate to Talisman that water in liquid form does not exist or have a potential to exist. Water and condensate may be tanked and trucked out. No recombined gas and liquid analysis is acceptable. |
| | | The Producer must incorporate into the design of facilities a means to depressurize and blow down the Producer pipeline at both ends. | Alternative to consider is a buy back (return gas) meter. |
| 2.7 | Facility Commissioning | The Producer is required to keep Talisman informed of the project schedule and progress to prevent any delays in start-up and commissioning of facilities. | |
| | | Producer representatives and contractors are required to participate in a safety indoctrination prior to accessing any Talisman sites or facilities. All Producer representatives and contractors shall have a daily permit and all necessary regulatory permits prior to conducting any work on Talisman sites. Notification shall be given 72 hours in advance of any construction commencement. Work on Talisman Lease or R.O.W. will be carried out strictly by Talisman Representatives | Arrangement are to be made with Talismans Operations by contacting 'Midstreams Operations Foreman at (780) 723-9800. Daily permits may be obtained at the Talisman Edson Control Center Phone:(780) 723-9732 / 9734 Fax: (780) 723-9538 / 9821 |

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2.0 DESIGN AND COMMISSIONING REQUIREMENTS

| Item | Description | Specification | Notes |
|------|---|--|-------|
| 2.7 | <p align="center">Facility Commissioning</p> | <p>During construction the Producer shall provide reasonable advance notification to Talisman of the Producers commissioning schedule to accommodate Talisman personnel attending for inspection and approval of facilities installation. Minimally, Talisman shall witness the facilities functional check prior to start-up. The calibration, configuring and adjusting of primary, secondary and tertiary measurement equipment may be witnessed by Talisman at the time of site commissioning prior to Talisman issuance of a 'turn-on' approval. The remote activation via SCADA of devices configured to provide remote control shall be tested and their functioning verified. Status monitoring functionality shall also be verified and tested. Documentation in support of calibrations shall be provided to Talisman.</p> | |

PRODUCER TIE-IN SPECIFICATIONS

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3.0 MEASUREMENT REQUIREMENTS

| Item | Description | Specification | Notes |
|------|--|---|--|
| 3.1 | Transportation and Processing Procedure Agreement | Provisions pertaining to gas quality, data acquisition, facilities design, commissioning and measurement requirements contained in the Transportation and Processing Procedures Contract are applicable to this facility. | |
| 3.2 | RTU Device Requirements | Talisman has standardized on the Bristol models 'Control Wave Micro' utilizing Bristol 3820 transmitters or the Bristol model 'XFC XP' with three in one transmitters internal to the unit incorporating standardized programs and algorithms approved by Talisman. Electronic flow measurement (EFM) or remote terminal unit(s) (RTU) devices must provide the necessary control enablement, status monitoring and data uploading by/to the Talisman owned and operated Supervisory Control and Data Acquisition (SCADA) system. | The RTU and or EFM device(s) shall adhere to requirements specified in the American Petroleum Institute (API) Chapter 21, Flow Measurement Using Electronic Metering Systems, various American Gas Association (AGA) and Alberta Energy and Utilities Board (AEUB) standards and requirements. |
| 3.3 | RTU Reporting Requirements | RTU reporting and archiving functionality is required. | Talisman minimally requires flow, pressure, temperature, meter information in compliance with AEUB requirements but not limited to meter factor, orifice size, S.G., and compressibility and gas composition time stamped in M.S.T.. Thirty-five (35) days autonomy is required. |
| 3.4 | RTU Control Requirements | RTU control functionality is required. | Minimally Talisman requires the ability to remotely close the receipt point facility isolation and fuel gas valve via SCADA. |
| 3.5 | RTU Status Requirements | RTU near real-time status reporting functionality is required. | Minimally Talisman requires the receipt point isolation valve position status, pressure, compressor running status, fuel gas heater flame status and fuel gas inlet and outlet temperature to be communicated near real-time via SCADA. |
| 3.6 | RTU Atmospheric Pressure Configuration | Talisman requires atmospheric pressure be configured in the RTU. | Based on actual elevation utilizing the following formulas, 14.73 - (0.0005 x elevation) psi. For SI units 101.560 - (0.0113 x elevation) kPa. |

3.0 MEASUREMENT REQUIREMENTS

| Item | Description | Specification | Notes |
|------|-------------------------------------|---|--|
| 3.7 | Transmitters Requirements | Talisman requires Bristol 3820 transmitters except where integral to the Bristol model 'XFC XP' flow computer. Transmitters must be of the "SMART" type and provide output signal as either analog or digital, provide for continuous compensation for changes in operating temperatures, variations in static line pressure, remote re-ranging, configuration and diagnostics using either a dedicated hand held or laptop computer with appropriate software and a local indication with remote configuration lock out capability. | All field instruments must be capable of operating between minus forty and plus 60 degrees Celsius and incorporate in their design a means of adjusting the calibration to compensate for a shift in ambient temperature. |
| 3.8 | Gas Metering Requirements | Orifice meters must incorporate a 'quick change' type of orifice fitting enabling plate changes and inspections without shutting in production. Where multi run flow metering is utilized separate temperature, pressure and flow transmitters for each run c/w local indicators. Talisman must approve all meters (orifice or non-orifice meters) incorporated into the facilities design. Metering designs should be submitted to Talisman for Talisman's approval before any facilities preliminary engineering design is initiated. Primary meters of a type other than orifice may be utilized by permission of Talisman. Producer shall not use more than one AGA calculation for the same meter run. No signal splitting shall be permitted for the primary meter run measurements (ie differential pressure, static pressure, temperature). | Orifice meter design per AEUB Directive 017 'Measurement Requirements for Upstream Oil and Gas Operations' specifying which version of American Gas Association (AGA) Report #3 Orifice Metering of Natural Gas is applicable. Instances where flow conditioners are utilized must comply with installation requirements specified in AGA Report #3 (1992) 'Orifice Metering of Natural Gas'. |
| 3.9 | Liquid Metering Requirements | AEUB, AGA, API and industry approved turbine or positive displacement liquid meters with temperature correction. The meters must be equipped with electronic pickups for RTU integration, uploading to SCADA and incorporate a local totalizer. Talisman must approve all liquid meters (turbine, PD or other) and related secondary and tertiary devices incorporated into the facilities design. Metering designs should be submitted to Talisman for Talisman's approval before any facilities detailed engineering design is initiated. | Located upstream of a snap acting liquid level valve. Proving taps installed between the meter and the snap acting liquid level valve c/w isolating double block and bleed or cavity vented valves. Strainer/filter upstream of the meter. For receipt points meter factors must be updated twice yearly or after repairs or change outs. Proving will be conducted by Talisman at the cost of the Producer. |

PRODUCER TIE-IN SPECIFICATIONS

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3.0 MEASUREMENT REQUIREMENTS

| Item | Description | Specification | Notes |
|------|---------------------------------------|--|---|
| 3.10 | Fuel Gas Metering Requirements | Fuel gas meters compliant with AEUB, API and industry standards must be incorporated into the facilities design up-stream of the sales (receipt point) gas meter. Meters upstream of the sales gas meter need not be approved by Talisman. Typically these are orifice, temperature and pressure compensated PD or turbine meters. If however, Talisman gas is provided to the Producer as fuel gas Talisman must approve all gas meters and related secondary and tertiary devices expected to be incorporated into the facilities design. Metering designs should be submitted to Talisman for Talisman's approval before any facilities detailed engineering design is initiated. | Fuel meters measuring Talisman gas cannot exceed a maximum measurement uncertainty of 3%. A six year minimum calibration or verification frequency is required. Fuel gas volumes greater than 500 m3/day must be measured. Less than 500 m3 /day requires an engineering estimate. For PD meters pressure and temperature shall be taken from the upstream side of the meter within twenty (20) pipe diameters. |
| | | Fuel gas line heaters when utilized shall incorporate in their design inlet and outlet temperature transmitters, flame detection and a fuel gas isolation c/w with solenoid for remote operation via SCADA. | Inlet and outlet temperature and flame status/alarm communicated to SCADA via the RTU. Fuel gas ESD valve activation shall be remotely enabled from SCADA. |
| 3.11 | General Sampling Requirements | Dedicated sample probes must be installed downstream of gas meters and upstream of liquid meters. Gas must be sampled through the top of the pipe and liquid sampling through the side of the pipe. Sample points must be uniquely, clearly marked and identified with non-destructible tags. | Sample cylinders are required to be analyzed at monthly intervals. The presence of H ₂ S requires an on-site tutweiller test. Talisman retains the right to check gas and liquids off the de-hydrators and separators for free water at their discretion. |
| | | A gas and liquid (inclusive of water) analysis is required at the time of tie-in application submission. Fourteen days after initial turn-on a flowing gas and liquid analysis is required. A liquid and a re-combination gas analysis is also required for all wells with liquid associated with production. | |

3.0 MEASUREMENT REQUIREMENTS

| Item | Description | Specification | Notes |
|------|--|---|---|
| 3.12 | Sampling of Single Zone - Single or Multiple Wells | Talisman requires that monthly gas and liquid (inclusive of water) spot sampling be undertaken for the first six months of production flowing through the receipt point. Talisman further requires that the Producer authorize their commercial laboratory facility to deliver to Talisman via the electronic 'Protrend' software application monthly gas and liquid analysis results resulting from the monthly gas and liquid spot samples. An evaluation of each of the first six months of spot analysis received by Talisman will be performed to determine the extent of compositional fluctuation. If it is thusly determined that the resulting gas and liquid analysis is non-fluctuating then yearly spot sampling may be undertaken thereafter. If however, the resulting analysis of sampling data reveals a fluctuating composition then monthly, continuous, proportional to flow gas and liquid samplers must be installed at the receipt point. Inappropriate sample results derived from continuous sampling would require near real time gas chromatographs be installed. | Gas and liquid analysis is required to C ₇ ⁺ for all spot samples. |
| 3.13 | Sampling of Multiple Zones - Single or Multiple Wells | Multiple zone multiple wells flowing across a receipt point require the installation of continuous, proportional to flow gas and liquid samplers. Sample cylinders are required to be analyzed at monthly intervals. | Gas and liquid analysis is required to C ₇ ⁺ for continuous proportional to flow samplers. |
| 3.14 | Analysis Using Gas Samplers | The Producer shall be responsible for the drawing of monthly samples, the subsequent delivery of the samples to a certified laboratory for analysis, analysis utilizing low temperature fractional distillation or other industry approved method acceptable to the Producer and to Talisman and all costs incurred. The analysis shall determine the amounts of LPG, pentane plus, sulfur, carbon dioxide, hydrogen sulphide, other species of sulphur, ethane, any other materials being extracted and saved or other substances required for the purposes of measurement. Gas and liquid analysis is required to C ₇ ⁺ . The results of the analysis shall be made electronically available to Talisman via Protrend. After review and on approval of Talisman the results of analysis of samples shall be deemed to be typical of all gas received at the receipt point from the date identified to Talisman by the Producer and shall be used for measurement and allocation purposes for the receipt point. | Talisman requires the Producer remove samples and have the laboratory analysis performed at specific times of the month to accommodate production accounting business processes. The schedule should be confirmed with the local Talisman Development Engineer. |

PRODUCER TIE-IN SPECIFICATIONS

Talisman Midstream -
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GAS QUALITY SPECIFICATIONS

| Item | Description | Specification |
|------|---|--|
| 1.1 | Gas | Hydrocarbon gas production shall be free of deleterious substances, sand, completion fluids (drilling mud, acid, fractionation sand, etc.) waxes, asphaltenes, crude oil, Sx ("Sulphur"), or other objectionable substances in such quantities as may, in Talisman's sole discretion, be injurious to their facilities. |
| 1.2 | Water Content | For tie ins downstream of the 4-3-060-22-W5M Dehy Compression facility: -Maximum 0.064 kg / 10 ³ m ³ (4 lbs / mmscf). -Water must be in the gas phase at pipeline operating pressures. No free water. For tie ins upstream of the 4-3-060-22-W5M Dehy Compression facility: -Maximum 0.12 kg / e3m3 (7.5 lbs / mmscf). -Water must be in the gas phase at pipeline operating pressures. |
| 1.3 | Hydrocarbon Liquids | Maximum 0.12 kg / 10 ³ m ³ (7.5 lbs/ mmscf). Liquids must be in the gas phase at pipeline operating pressures. No free liquids. |
| 1.4 | Hydrogen Sulfide | Hydrogen sulfide (H2S) content of the hydrocarbon gas and liquid production shall not exceed AEUB pipeline approvals of 0 mol / kmol (0%). |
| 1.5 | Total Sulphur | Total sulphur content of the hydrocarbon gas and liquid production shall not contain more than one-hundred and fifteen (115) milligrams of total sulphur per cubic meter. |
| 1.6 | Carbon Dioxide | Hydrocarbon gas and liquid production shall not contain more than two (2%) percent by volume of Carbon Dioxide. |
| 1.7 | Oxygen | Hydrocarbon gas and liquid production shall not exceed more than zero point four (0.4%) percent by volume of oxygen. |
| 1.8 | Pressure | Hydrocarbon gas and liquid production shall not exceed the allowable Talisman Maximum Operating Pressure (MOP) as dictated by the lowest applicable MOP maintained within the gas gathering system. |
| 1.9 | Temperature | Hydrocarbon gas and liquid production shall maintain an operating temperature regime greater than zero (0) degrees Celsius and less than forty nine (49) degrees Celsius. |
| 1.10 | Dehydration - Methanol Injection | Hydrocarbon gas and liquid production shall be sufficiently dehydrated or contain sufficient quantities of inhibited methanol for hydrate suppression to ensure that the condensed water does not cause hydrates to form downstream of the Facility Inlet. |
| 1.11 | Gross Heating Value | Hydrocarbon gas and liquid production shall not have a Gross Heating Value (GHV) less than thirty-six (36) Mega-Joules per cubic meter of production. |