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اءوتوريتي فيتروليوم نكارا بروني دارالسلام
PETROLEUM AUTHORITY OF BRUNEI DARUSSALAM

Brunei Darussalam Oil and Gas Exploration and Production Guidelines

Volume 10: Facilities Management Guidelines



Document Number
Issue
Release Date
Document Owner

PA Upstream Guideline No.10/2021
Revision 0
March 2021
Petroleum Authority of Brunei Darussalam

Revision Record

Revision Number	Description	Revision Date
Rev 0	Issuance of Facilities Management Guidelines	Petroleum Authority/ March 2021

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1 ABBREVIATIONS

In these guidelines, the following abbreviations are referred:

Table 1 List of Abbreviations

Terms	Definitions
AWPB	Annual Work Program and Budget
CM	Corrective Maintenance
COP (COO)	Cease of Production (Cease of Operation)
EPMO	Environmental Protection and Management Order, 2016
PM	Preventive Maintenance
PMA	Petroleum Mining Agreement as defined in the Petroleum Mining Act, Cap.44

2 DEFINITIONS

In these guidelines, the following definitions are referred:

Table 2 List of Definitions

Term	Definition
Annual Work Programme Budget	Refer to the Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 1 Annual Work Programme and Budget Guidelines, Rev. 0, August 2017 available at the website of Ministry of Energy, Brunei Darussalam. http://www.me.gov.bn/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fShared%20Documents%2fOil%20and%20Gas%20Exploration%20and%20Production%20Guideline&FolderCTID=0x01200019032D9F3F325542AF3026B4F21D6365
Authority	Petroleum Authority of Brunei Darussalam
Availability	The percentage of time during which an asset is available to operate for a stated period of time which is affected by both scheduled and unscheduled events.
Cessation of Operation or Cessation of Production (CoO or CoP)	Production has ceased permanently from a field, a group of fields, an asset within a field or a field acting as a hub.
Corrective Maintenance	A task carried out on the Facilities or an equipment when it failed or is faulty in order to bring it back into operation.
Development phase	At this stage a Field Development Plan (FDP) is formulated assuming the outcome from a feasibility study that at least one option is economical. The FDP include a sequence of activities prior to the first production from the field: Detailed design of facilities, procurement of the materials of construction, fabrication and installation of the facilities.
Environmental Protection and Management Order	Refer to the Environmental Protection and Management Order in 2016 available on the Attorney General's Chambers website, Prime Minister's Office, Brunei Darussalam. http://www.agc.gov.bn/AGC%20Images/LAWS/Gazette_PDF/2016/EN/S063.pdf
Facilities	Facilities means surface installations. Offshore Facilities are installation above seabed whilst onshore Facilities include installation above ground. Example of Facilities include flowlines, jacket, topside, subsea Facilities (subsea umbilical, risers and flowlines (SURF), subsea manifold, jumper, control system), storage tanks, storage/production vessels and all other equipment involved in the production of hydrocarbons up to final delivery to customers.
Field Management Guidelines	Refers to the Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 9 Field Management Guidelines, Rev. 1, April 2017 available at the website of the Ministry of Energy, Brunei Darussalam. http://www.me.gov.bn/Shared%20Documents/Forms/AllItems.aspx?RootFolder=%2fShared%20Documents%2fOil%20and%20Gas%20Exploration%20and%20

	Production%20Guideline&FolderCTID=0x01200019032D9F3F325542AF3026B4F21D6365
Integrity	Ability of facilities to perform its required function effectively and efficiently whilst protecting HSSE.
Maintenance Philosophy	A document that outlines the maintenance strategies of the Facilities including the use of reliability centered maintenance (RCM), use of condition-based monitoring (CBM) and interrogation and risk-based inspection methodologies to ensure the safety, reliability and availability of the Facilities.
Operating Manual	A reference document for the operation team of the Operator to run the Facilities as per the intended function and/or design.
Operating Philosophy	A document that outlines the operation principles of the Facilities during normal operation, start-up and shutdown in order to ensure safe, efficient and cost-effective operation.
Petroleum (Pipe-lines) Act	Refers to the Petroleum (Pipe-lines) Act, Laws of Brunei, Revised Edition 1984, Chapter 45. http://www.agc.gov.bn/AGC%20Images/LAWS/ACT_PDF/cap045.pdf
Pipeline	A system of connected lengths of pipe that is used for transporting petroleum products including water (produced and treated water) from a place of main storage to a point of distribution or a point of export from Brunei.
PMA	Petroleum mining agreement and/or production sharing agreement.
Pollution Control Guidelines	Refers to the Pollution Control Guidelines for Industrial Development, August 2002 available at the Department of Environment, Parks and Recreation Ministry of Development, Brunei Darussalam. http://www.env.gov.bn/SitePages/Pollution%20Control%20Guidelines%20for%20Industrial%20Development.aspx
Preventive Maintenance	A scheduled routine task carried out on the Facilities or an equipment to reduce the likelihood of failure.
Production phase	Production, treatment, transport, storage and extraction of petroleum and its by-products including injection, recycling, recompression, pressure maintenance, treatment of discharged water, water flooding.
Reliability	The percentage of time during which an asset is able to perform the required function(s) under specified operating conditions for a stated period of time which is affected by unscheduled events.
Safety Critical Element/ Equipment	Any equipment the failure of which would cause or contribute substantially to, or a purpose of which is to prevent, or limit the effect of, a major accident.
Upstream Operators	The entity approved by the Authority (or if prior to the Authority, a previous regulatory authority) to conduct and direct upstream petroleum operations for either itself as an entity or on behalf of contractor parties under the respective PMAs.

3 INTRODUCTION

3.1 Objectives

The Facilities Management Guidelines is Volume 10 of the Brunei Darussalam Oil and Gas Exploration and Production Guidelines. The objective of these guidelines is to ensure that Upstream oil & gas Operators in Brunei Darussalam are in compliance with best industrial practices in the operation and maintenance of their Facilities until the end of economic field life to achieve the highest-level safety, reliability and availability of the said Facilities.

3.2 Roles and Responsibilities

Upstream oil and gas Operators in Brunei are responsible for compliance with all applicable laws and Government directives, and obligations under their respective PMAs and related agreements to ensure the highest level of safety, reliability and availability of facilities.

For clarity, Upstream Operators remain liable to reporting and other obligations in applicable laws outside of these guidelines.

3.3 Overview

This volume provides guidelines for Upstream oil and gas Operators in the management of Oil and Gas Facilities in Negara Brunei Darussalam during the production phase of the field lifecycle.



Figure 3: Chart showing life-cycle phase of hydrocarbon resources with emphasis on development and production phase for Facilities management

These guidelines sets out the minimum requirement for the operation and maintenance of onshore and offshore Facilities including pipelines, in accordance with the best industrial practices. Adherence to these guidelines will be demonstrated through the reporting and submission of relevant information on the integrity status, reliability and availability of the Facilities to the Authority.

These guidelines may be revised or amended from time to time upon written notice by the Authority and subject to such revision or amendments being consistent with the provisions of applicable laws in force in Brunei Darussalam.

All Operators shall adhere to and comply with generally accepted standards of good international petroleum industry practice and all Applicable Laws in force from time to time.

4 OPERATION OF FACILITIES

4.1 Introduction

This section refers to the production phase of any Facilities as defined in Section 2 (Definitions) above, that is within the care of Operator until a declaration for Cease of Production (CoP) or Operation (CoO) has been approved by the Authority, unless the Facilities are otherwise transferred to and with the agreement of the Authority.

4.2 Operating Reference Documents

4.2.1 Operating Manual

All key Facilities should have an operating manual for the operation team to run the Facilities as per intended functions.

4.2.2 Operating Philosophy

The Operating Philosophy should be developed during the Development phase for new fields whereas for brownfield Facilities, an update and addendum to the existing Operating Philosophy is required.

The Operating Philosophy is a live document and shall be updated as required from time to time. The Operating Philosophy should address and include information that is relevant to the safety, reliability and availability of the Facilities, including, but not limited to, the following:

- Security of supply to customers;
- Safety Critical Elements/ Equipment;
- Processing equipment operating envelope;
- Utility and safeguarding system; and
- Startup/shutdown procedures.

The operating reference documents and other supporting documentation shall be provided to the Authority upon request.

4.3 Minimum Requirement of Functional Facilities

This section refers to the minimum requirements of functional Facilities and/or equipment to support the operations. Table 3 below shows the minimum requirements of functional Facilities.

Table 3 Minimum requirements of functional Facilities and/or equipment

Facilities/ Equipment		Minimum Requirement
4.3.1	Production metering	<ul style="list-style-type: none"> • Production metering should be installed at specific locations throughout Operator's Facilities to account hydrocarbon production and losses from reservoir until export. Certain locations include; <ul style="list-style-type: none"> ○ Flowline ○ Export pipeline ○ Storage tank inlet and outlet ○ Custody transfer (fiscal metering) • A minimum of two (2) operating metering devices should be installed at each location. Each meter needs to be calibrated as per manufacturer specification to ensure accurate measurement is maintained throughout the production phase.
4.3.2	Production testing	<ul style="list-style-type: none"> • The Operator should provide production testing equipment and/or facilities to conduct production testing as per Field Management Guidelinesⁱⁱ.
4.3.3	Waste Management	<ul style="list-style-type: none"> • All wastes generated from the operation of Facilities shall be handled in compliance with EPMOⁱⁱⁱ and the Pollution Control Guidelines^{vi}.
4.3.4	Pipelines	<ul style="list-style-type: none"> • All pipelines shall be operated and handled in compliance with the Petroleum (Pipe-lines) Act Chapter 45 and any directions from the Authority thereto^v.
4.3.5	Industrial emission	<ul style="list-style-type: none"> • Under Section 5.3 of the Volume 1 Annual Work Programme and Budget Guidelinesⁱ, the Operator is required to provide monthly emission plans for the particular year as well as a 5-year emission management plan. • The Operator is also required to study the opportunity to further reduce the industrial emission without major impact to production and Facilities performance as per Field Management Guidelinesⁱⁱ.

	Facilities/ Equipment	Minimum Requirement
4.3.6	Material Management	<ul style="list-style-type: none"> The Operator should ensure that they have sufficient spares in stock for their critical equipment without major impact to production and Facilities performance.
4.3.7	Changes to Facilities	<p>Operator shall have a process in place to manage any changes and deviations to the Facilities which include but not limited to:</p> <ul style="list-style-type: none"> Facilities, system or equipment modification or replacement Operating Procedures Process control, automation and/or safeguarding system The use of new or different technology/system <p>The Operator shall provide the information to the Authority within an acceptable timeline highlighting any changes or deviation to the Facilities notifying the following but not limited to:</p> <ul style="list-style-type: none"> Impact to HSSE Impact to hydrocarbon production Identify the need for change Justify the request for change Identify and assess the risk and mitigation Includes a review and authorization process for evaluating proposed adjustments to the Facilities <p>Such changes must be reflected in the as-built drawings and submitted to the Authority upon request.</p>

5 MAINTENANCE OF FACILITIES

5.1 Introduction

Maintenance of Facilities, similar to Operation of Facilities, refers to maintenance activity throughout the production phase of any facility within the care of the Operator until a declaration for Cease of Production (CoP) or Cease of Operation (CoO) has been approved by the Authority, unless the Facilities are transferred to a third party with the agreement of the Authority.

Maintenance in these guidelines refer to both Preventive and Corrective Maintenance. Preventive Maintenance (PM) is a scheduled routine task carried out on the Facilities or an equipment to reduce the likelihood of failure. Corrective Maintenance (CM) is a task carried out on the Facilities or an equipment when it failed or is faulty in order to bring it back into operation.

5.2 Maintenance Philosophy

All key Facilities should have their own Maintenance Philosophy. This is to ensure for inspection and maintenance is conducted and must include Safety Critical Elements/Equipment.

The Operator is required to provide to the Authority their inspection and maintenance plan in line with the Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 1 Annual Work Programme and Budget Guidelines in Section 8 on Asset Maintenance Planⁱ. The Operator is strongly advised to benchmark against industry's best practices for the inspection and maintenance standards of their Facilities.

Changes to the annual maintenance plan shall be controlled internally. Key inspection and maintenance activities in the plan (e.g. turn around and non-turnaround) shall be described covering at least:

- Requirement for shutdown
- Affected Facilities and locations
- Impact of oil and gas production
- Cost and schedule
- Scope of work

Detailed information of the inspection and maintenance activity should be provided and submitted to the Authority upon request.

5.3 Minimum Requirement of Inspection and Maintenance Plan

This section refers to the minimum requirements of inspection and maintenance plan which covers the following items but not limited to:

- Pipeline
- Structural
- Mechanical
- Electrical
- Subsea facilities (subsea umbilical, risers and flowlines (SURF), subsea manifold, jumper, control system)
- Production testing facilities
- Metering facilities
- Safeguarding system
- Idle Facilities and pipelines (idle asset)
- Utilities

For each of the facility, the Operator is required to provide a timely routine inspection and maintenance plan as their reference to guide the operation and maintenance teams in mapping their inspection and maintenance activities as described in Section 5.1.

In the event any damage(s) to the Facilities is identified, the Operator shall carry out necessary studies, and inspections as required, to determine the severity and damaging impact to the integrity, availability and reliability of the Facilities. The Operator is expected to have mitigation plan(s) including repairs or replacements within an acceptable timeline. Any deviation from Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 1 Annual Work Programme and Budget Guideline, in Section 8 under Asset Maintenance Planⁱ be notified to the Authority, on some critical case or condition e.g. security of supply, this may require approval from the Authority. Table 4 shows the minimum requirements for inspection and maintenance plan.

Table 4 Minimum requirements for Inspection and Maintenance of Facilities

Item	Description	Minimum Requirement
5.3.1	Pipeline	<ul style="list-style-type: none"> • Inspection should cover both internal and external aspects of the pipeline which include but not limited to: <ul style="list-style-type: none"> ○ Wall thickness ○ Coating and painting ○ Cathodic protection ○ Contact point corrosion • Equipment attached to the pipeline such as pipeline gauges, transmitters, etc. should be inspected and function tested. • Internal inspection should be carried out on a Risk Based Inspection (RBI) approach. • External inspection should be carried out every three (3) to five (5) years. • Maintenance should include cathodic replacement, paint, coating and equipment such as pipeline gauges, transmitters, etc. • Routine pigging should be carried out as per design or based on latest pipeline inspection outcome. • Intelligent pigging for critical pipelines that impact inland gas and production.

Item	Description	Minimum Requirement
5.3.2	Structural	<ul style="list-style-type: none"> • Structural inspection and maintenance (not limited to coating and painting) to determine structural integrity should be carried out on the following structures but not limited to: <ul style="list-style-type: none"> ○ Jacket ○ Topside ○ Helipad ○ Production storage ○ Onshore infrastructure
5.3.3	Mechanical	<ul style="list-style-type: none"> • Mechanical static equipment which include but not limited to: <ul style="list-style-type: none"> ○ Pressure vessels ○ Heat exchangers ○ Tanks ○ Piping ○ Lifting equipment ○ Boilers ○ Launchers and receivers • Inspection and maintenance for lifting equipment such as cranes, gantry and chain blocks should also include load test and must be inspected yearly while lifting accessories such as slings and shackles should be inspected every six (6) months as directed by SHENA requirements^{iv}. • Rotating equipment such as pumps, compressors, gas turbine should be inspected and maintained based on the recommendation from the Original Equipment Manufacturer (OEM).
5.3.4	Electrical	<ul style="list-style-type: none"> • Inspection and maintenance of electrical equipment for any risk of electrical failure which include but not limited to: <ul style="list-style-type: none"> ○ Electric cables ○ Cable trays ○ Junction boxes ○ Switchboards ○ Transformers
5.3.5	Subsea facilities (subsea umbilical, risers and flowlines (SURF), subsea manifold, jumper, control system)	<ul style="list-style-type: none"> • Inspections and maintenance of subsea facilities which include but not limited to: <ul style="list-style-type: none"> ○ Manifolds and jumper ○ Control system ○ SURF
5.3.6	Production testing facilities	<ul style="list-style-type: none"> • Production testing facilities must be inspected and maintained to the condition that production testing can be done effectively at any given time.

Item	Description	Minimum Requirement
5.3.7	Metering facilities	<ul style="list-style-type: none"> • Inspection and maintenance of metering facilities should be carried out to ensure that the metering equipment is working well within the prescribed accuracy.
5.3.8	Safeguarding System	<ul style="list-style-type: none"> • Safeguarding system must be inspected, maintained and function tested which include but not limited to: <ul style="list-style-type: none"> ○ Alarm system ○ Emergency shutdown valves ○ Pressure relief system ○ Fire and gas detectors ○ Firewater system
5.3.9	Idle Facilities and Pipelines	<ul style="list-style-type: none"> • Any Facilities and pipelines that are not in operation must be inspected and maintained from time to time to ensure that Facilities and pipelines are safe and accessible by personnel. • All Facilities and pipelines which are no longer in operation shall be isolated, depressurize and hydrocarbon-free and/or flush and clean.
5.3.10	Utilities	<p>Inspections and maintenance of utilities which include but not limited to:</p> <ul style="list-style-type: none"> • Fuel gas system • Power generation system • Flare and vent systems • Sump and drain system • Potable water system • Instrumentation system

5.4 Minimum Requirement on Reporting for Planned Shutdown, Integrity status and Inspection and Maintenance Activities

Table 5 below shows the minimum requirements on the reporting of maintenance activities during planned shutdown, Integrity status of the Facilities including idle Facilities and pipelines, inspection and maintenance activities: plan vs actual and annual close-out report.

Planned shutdown is defined as “any activities to be carried out that require certain facilities to temporarily suspend its operations and such activities have been included in the Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 1 Annual Work Programme and Budget Guideline, under section 6.7ⁱ.

Table 5 Minimum requirement for the reporting on inspection and maintenance activities

Item	Description	Minimum Requirement
5.4.1	Planned shutdown	<p>Under section 6.7 of the Volume 1 AWPB Guidelinesⁱ, the Operator is required to provide the estimated scheduled deferment for key turnarounds activities. Additional information shall be provided to the Authority upon request, prior to the planned shutdown activity;</p> <ul style="list-style-type: none"> ○ Impact to inland gas security and downstream customer(s) ○ Expected production deferment ○ Maintenance scopes ○ Affected Facilities and locations ○ Plan start date and duration including depressurization, ramping down, total shutdown period and startup/ramping up ○ Cost and resources ○ Risks and mitigations <p>In the event of any changes or deviations to the key turnaround activities reported under section 6.7 of the Volume 1 AWPB Guidelinesⁱ, the Operator shall inform the Authority prior to the planned shutdown activity with the following, but not limited to, information:</p> <ul style="list-style-type: none"> ○ Impact to inland gas security & downstream customer(s) ○ Impact to production deferment ○ Impact to cost & resources ○ Impact to start date ○ Impact to shutdown duration ○ Reason for change

Item	Description	Minimum Requirement
5.4.2	Integrity status of the Facilities including idle Facilities and pipelines	<ul style="list-style-type: none"> • The Operator shall provide a comprehensive monthly report on the integrity status of the Facilities including pipeline and Facilities that are not in operation (idle asset). • For the Facilities that are in operation, Operators to include the number of SCE deviations (approved and non-approved). • Quarterly engagements between Authority with Operator (if required).
5.4.3	Inspection and Maintenance Progress (Plan Vs. Actual)	<ul style="list-style-type: none"> • Monthly reporting on the activities should include but not limited to the following: <ul style="list-style-type: none"> ○ Number of inspection(s) and maintenance activities executed against planned, ○ Cost on inspection and maintenance activities executed against plan, ○ Any deviation(s) resulting from inspection and maintenance activities, ○ HSSE matters. • The report is to be provided to measure the progress of the inspection and maintenance activities against the inspection and maintenance plan under section 8 of the Volume 1 AWPB Guidelines¹ and any changes or deviations. • Operator to provide details of any backlog inspection & maintenance activities.
5.4.4	Inspection and Maintenance annual close-out report	<ul style="list-style-type: none"> • All inspection and maintenance record must be kept and submitted to the Authority upon request with the following information within ninety (90) days but not limited: <ul style="list-style-type: none"> ○ Actual scope completed vs plan ○ Actual cost vs plan ○ Actual start date and duration vs plan ○ Findings from the inspection(s) and plan of actions required ○ Deployment of special technology and/or technical expertise during the inspection and/or maintenance activities ○ Lesson(s) learnt

6 REFERENCES

In these Guidelines, the following documents are referred:

- i. Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 1 Annual Work Programme and Budget Guideline, Rev. 0, August 2017.
- ii. Brunei Darussalam Oil and Gas Exploration and Production Guidelines Volume 9 Field Management Guideline, Rev. 1, April 2017.
- iii. Environmental Protection and Management Order, 2016, Department of Environment, Parks and Recreation.
- iv. Lifting Operation, Industry Guidance Note, IGN 01/2019, Rev.1, 13th June 2019, SHENA.
- v. Petroleum (Pipe-lines) Act, Laws of Brunei, Revised Edition 1984, Chapter 45.
- vi. Pollution Control Guideline for Industrial Development, August 2002, Department of Environment, Parks and Recreation.

