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اءوتوريتي فيتروليوم نكارا بروني دارالسلام  
PETROLEUM AUTHORITY OF BRUNEI DARUSSALAM

## Brunei Darussalam Oil and Gas Exploration and Production Guidelines

### Volume 9: Field Management Guideline



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## Notice

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This guideline sets out the approach the Authority is likely to take, taking into account that each application will be assessed on its fact, case-by-case.

This guideline will be reviewed by the Authority from time to time, and amended as appropriate in light of further development, changes in law or practice.

this guideline is supplemental to and not a substitute for any law or regulation, and does not constitute legal advice.

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## Abbreviations

In this guideline, the following abbreviations are referred:

<b>AIM</b>	Asset Integrity Management
<b>API</b>	American Petroleum Institute
<b>ATL</b>	Agreed Technical Limits
<b>AWPB</b>	Annual Work Program and Budget
<b>CAPEX</b>	Capital Expenditure
<b>CO<sub>2</sub></b>	Carbon Dioxide
<b>COMAH</b>	Control of Major Accident Hazard
<b>EIDPMO</b>	Energy and Industry Department, Prime Minister's Office
<b>EOR</b>	Enhanced Oil Recovery
<b>EPMO</b>	Environmental Protection and Management Order
<b>FDP</b>	Field Development Plan
<b>FMG</b>	Field Management Guideline
<b>FYLE</b>	Full Year Latest Estimate
<b>GOR</b>	Gas Oil Ratio
<b>H<sub>2</sub>S</b>	Hydrogen Sulphide
<b>HR</b>	Human Resource
<b>HSSE</b>	Health, Safety, Security and Environment
<b>IOR</b>	Improved Oil Recovery
<b>KPIs</b>	Key Performance Indicators
<b>LBD</b>	Local Business Development
<b>OPEX</b>	Operating Expenditure
<b>WHSO</b>	Workplace Health and Safety Order

## Definitions

In this guideline, the following definitions are referred:

<b>FDP Addendum</b>	Supplementary and additional document that is required to be submitted post approval of the approved Field Development Plan with the specific updates relating to the scope of the required changes which should be sufficient for submission
<b>Field Production Philosophy</b>	This refers to set of methodologies, strategies, techniques and tools require for the optimisation and restoration of a field in a production phase of a hydrocarbon life cycle.

## 1. Introduction

The Field Management Guidelines (FMG) is Volume 9 of The Brunei Oil and Gas Exploration and Production Guidelines. This volume provides the guidelines for the oil and gas Operators in Brunei Darussalam throughout its post implementation and execution of field development that is, production activities prior to decommissioning and restoration of its assets.

These guidelines extend to the detail of principles, rights and obligations established in the regulations, by describing steps to be taken or clarifying conditions of implementations. They do not introduce concepts or commitments that fall outside the regulatory framework or unreasonable characteristic as judged against the standards and practices prevailing in the industry.

### 1.1 Background

Oil and Gas developments are commonly subjected to operational, technical, and commercial risks and uncertainties. As field matures, more geological and engineering data is gathered, new workflows and technologies emerge, business drivers and economic conditions change.

As a result, and commonly practiced, Operators will regularly re-assess the validity of development assumptions to maximize value and minimize risks. This commonly leads to adjustments to initial development plans approved by the Authority.

### 1.2 Objectives

The Field Management Guideline is Volume 9 of the Brunei Darussalam Oil and Gas Exploration and Production Guidelines. The objectives of this guideline are:

- (i) To sustainably optimise field's production safely throughout the field life cycle and therefore maximising its long-term value such as the ultimate recovery of oil and gas reserves.
- (ii) To clarify its requirement of the exchange of data and information between the Authority and the Operators, so that sound decisions can be made through sufficient approvals, notifications, reports and audits. Such clarification may not be as detail and prescriptive as found in industry's and Operator's standards and practices which represent the requirements at the operational level, and may be referred to but not replicated in these guidelines.

This guideline is also to ensure that development and production activities provide the highest possible total value of oil and gas for the sustained economic benefits of the Nation of Brunei in line with the Upstream Directive issued by the Ministry of Energy on 22 September 2011 (Appendix A).

### 1.3 Roles and Responsibilities

Oil and gas Operators in Brunei are responsible for compliance with all applicable laws and Government directives, and obligations to the specific petroleum contracts or agreements.

## 1.4 Scope of Work

This guideline provides guidance for oil and gas Operators in the field management in Brunei Darussalam during the production phase of the hydrocarbon lifecycle (Figure 1).



*Figure 1: Chart showing life-cycle phase of hydrocarbon resources with emphasis on the production phase for the field management guideline*

This guideline sets out the minimum requirements for the field management in accordance with the best industrial practices. Adherence to this guideline will be demonstrated through the reporting and submission of relevant information to the Authority.

This guideline may be revised and amended from time to time upon written notice by the Authority and subject to such revision or amendments being consistent with the provision of either the PSA or PMA as well as the applicable laws in force in Brunei Darussalam at the material time. All Operators shall adhere to relevant laws, regulations and guidelines as well as international standards.

The scope of the guidelines focuses on field management and re-development activities of the Production Phase. It is important to note that due to the dependency of the Decommissioning and Restoration Phase with the Production Phase, this guideline has also included its requirements prior to making decisions or approvals for the next phase, that is Decommissioning and Restoration.

## 2. Minimum Requirements

This section refers to the minimum requirements of a management of Oil and Gas fields including its associated assets. Its compliance to this guideline will be demonstrated through the conduct and reporting of field performance and proposed activities and are substantiated by robust justifications to satisfy approval requirements.

The guideline is not intended to replicate prescriptive descriptions of actions, requirements or practices that the Operators have already adopted.

### 2.1 Assets

Operating assets are subject to challenging and changing conditions over a long period of time. Deviations, failures or change of behaviour to operate physical assets beyond what they were initially designed for are not uncommon risks that require mitigation to protect economic value and avoid health, safety and environmental impact. Assets also include all the personnel who design, operate and support Oil and Gas projects, hence their competence is crucial to address these challenges.

Operators are required to have the following policies and plans:

Items	Minimum Requirements
<b>Health, Safety, Security and Environment (HSSE) Policy</b>	<ul style="list-style-type: none"> <li>• Comply with all regulatory requirements (such as Pipeline Act, WSHO, COMAH and EPMO)</li> <li>• Define HSSE best practices for safe and reliable operations including optimizing footprint</li> <li>• Demonstrate efficient use of energy, minimize greenhouse gas emission and manage water and wastes disposal appropriately</li> <li>• Ensure the competence and compliance of all personnel involved including contractors</li> <li>• Review policy performance, capture lessons learnt at a company and industry level, and improve HSSE Policy if required</li> </ul>
<b>Human Resources Development Plan</b>	<ul style="list-style-type: none"> <li>• Comply with all regulatory requirements and directives such as stated in the Local Business Development (LBD) directives</li> <li>• Support the development of Bruneian Oil and Gas expertise, experience and capability</li> <li>• Identify competency gaps and define staff development and hiring plans accordingly</li> <li>• Address both short term and long-term succession plan to ensure organizational continuity</li> </ul>
<b>Asset Integrity Management (AIM) System</b>	<ul style="list-style-type: none"> <li>• Define Asset Integrity Management best practices</li> <li>• Determine wells, reservoirs and facilities integrity envelopes</li> </ul>

	<ul style="list-style-type: none"> <li>• Identify risks systematically through surveillance plans and integrated studies</li> <li>• Define and execute prevention or mitigation solutions that will reduce risk as low as practicably possible using best available technologies and processes</li> <li>• Ensure the competence and compliance of all personnel involved (including contractors) meets LBD requirement</li> <li>• Review system performance, capture lessons learnt at a company and industry level, and improve AIM Systems</li> </ul>
<p style="text-align: center;"><b>Production Management Plan</b></p>	<ul style="list-style-type: none"> <li>• Define and regularly review wells, reservoirs and facilities operating envelopes in line with field development plan or reservoir depletion strategy, facilities basis of design and other key production considerations such as H<sub>2</sub>S, CO<sub>2</sub> or sand production issues</li> <li>• Ensure compliance with approved Field Production Philosophy and Field Development Guideline for gas cap production (Refer to Volume 7: Field Development Guideline and Volume 8: Gas Cap Development Guideline)</li> <li>• Ensure optimal flow conditions through flow assurance best practices</li> <li>• Define annual production asset availability and facilities reliability (targets or plans) against the actual or track performance</li> <li>• Identify and implement production system optimization opportunities using cost-effective and innovative solutions</li> <li>• Ensure the competence and compliance of all personnel involved (including contractors) meets LBD requirement</li> <li>• Review performance, capture lessons learnt at a company and industry level and develop improvement plan</li> </ul>
<p style="text-align: center;"><b>Idle Assets Management Plan</b></p>	<ul style="list-style-type: none"> <li>• Ensure all idle assets such as long term closed-in wells, platforms, facilities and pipelines are being monitored and future utilization plan need to be in-place</li> <li>• Ensure safety and environmental standards are met although not currently in operation</li> </ul>

## 2.2 Data

Reliable data related to hydrocarbon management and operations are the foundation of sound exploitation decisions. Information Technology innovations have led to a great increase in the quantity, nature and complexity of data (such as measurements, surveys, models, interpretations, inspection reports and other studies) available to Operators. While additional information represents an opportunity to make better decisions, managing it requires adequate processes.

Operators are required to have fit-for-purpose surveillance, data acquisition and management plans:

Items	Minimum Requirements												
<p><b>Surveillance Plan</b></p>	<ul style="list-style-type: none"> <li>Ensure accurate and calibrated metering and production allocation for all wells. Testing frequency are as follows:                             <table border="1" data-bbox="451 359 1386 606"> <thead> <tr> <th data-bbox="451 359 672 399">Well Type</th> <th data-bbox="672 359 854 399">Frequency</th> <th data-bbox="854 359 1386 399">Data measure</th> </tr> </thead> <tbody> <tr> <td data-bbox="451 399 672 485">Oil Wells</td> <td data-bbox="672 399 854 485">Monthly</td> <td data-bbox="854 399 1386 485">Oil rate, gas rate, water rate, gas lift rate of gas lifted well, sand</td> </tr> <tr> <td data-bbox="451 485 672 569">Gas Wells</td> <td data-bbox="672 485 854 569">Monthly</td> <td data-bbox="854 485 1386 569">Gas rate, condensate rate, water rate and sand</td> </tr> <tr> <td data-bbox="451 569 672 606">Injection Wells</td> <td data-bbox="672 569 854 606">Continuously</td> <td data-bbox="854 569 1386 606">Volume injected (water, gas or EOR)</td> </tr> </tbody> </table> </li> <li>Ensure all new wells are tested immediately as soon as practicable (within 3 months) once on stream</li> <li>It is recommended to carry out zonal testing or run production logging tool to ensure accurate allocation for wells which have zones on commingle production</li> <li>Measure gas flaring and venting continuously</li> <li>Identify risks (including H<sub>2</sub>S, CO<sub>2</sub> and flow assurance risk including sand production levels) and opportunities encompassing all aspects of the production system (reservoirs, wells and surface facilities)</li> <li>Ensure essential well, reservoir and facilities surveillance data are taken such as down-hole pressure, flowing and closed in tubing head pressures, annuli pressures and flowline thickness measurement</li> <li>Review performance, capture lessons learnt at an asset, company and industry levels, and improve surveillance plans</li> <li>Operators are recommended to keep up to date with the best available and cost-effective proven technologies and workflows such as 4D Seismic, Real Time Monitoring or Smart Field solutions and implement these where justified</li> </ul>	Well Type	Frequency	Data measure	Oil Wells	Monthly	Oil rate, gas rate, water rate, gas lift rate of gas lifted well, sand	Gas Wells	Monthly	Gas rate, condensate rate, water rate and sand	Injection Wells	Continuously	Volume injected (water, gas or EOR)
Well Type	Frequency	Data measure											
Oil Wells	Monthly	Oil rate, gas rate, water rate, gas lift rate of gas lifted well, sand											
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Injection Wells	Continuously	Volume injected (water, gas or EOR)											
<p><b>Data Acquisition Plan</b></p>	<ul style="list-style-type: none"> <li>Meet regulatory requirements, and demonstrate regulatory compliance in a clear and transparent manner</li> <li>Reduce risks and uncertainties in support of exploitation decisions. Value of information considerations should be used to determine critical data</li> <li>Optimize data acquisition costs (avoid data acquisition redundancies)</li> <li>Define data reconciliation actions or alternative strategies if data quality fails to meet industry's standards</li> <li>Review performance, capture lessons learnt at an asset, company and industry levels, and improve data acquisition plans if required</li> </ul>												
<p><b>Data Management Plan</b></p>	<ul style="list-style-type: none"> <li>Comply with data transfer regulatory requirements as well as meeting regulatory requirements with regards to data confidentiality</li> <li>Provide data to the authority</li> <li>Assess data quality prior to conducting further analysis or making decisions</li> <li>Ensure that data is securely stored, backed up, routinely validated and efficiently accessible</li> </ul>												

	<ul style="list-style-type: none"><li>• Apply best and fit for purpose tools, technologies and innovative solutions in hydrocarbon data management and monitoring</li><li>• Review performance, capture lessons learnt at a company and industry level, and improve data validation workflows and data management plans if required</li></ul>
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## 2.3 Studies

Operators continuously acquire and study subsurface and surface information to reduce uncertainties, validate field performance against the development plan, mitigate risks and suggest development decisions that could further maximize asset value.

Operators are required to adhere to the following principles when conducting studies:

Items	Minimum Requirements
<b>Regulatory Requirements</b>	<ul style="list-style-type: none"> <li>• Meet all regulatory and petroleum contract requirements and directives</li> <li>• Ensure reserves and resources are being reported according to the Volume 2: Reserves and Resources Classification and Reporting Guidelines</li> </ul>
<b>Collaboration and Integration of Subsurface, Surface and Commercial Considerations (Reservoirs, Wells, Surface Facilities and Economics)</b>	<p>Studies are conducted by teams of experts in an integrated manner within various disciplines such as not limited to geoscience, reservoir engineering, production engineering, drilling, completion, surface engineering, operations and productions and economics. Their collaboration is critical to capture the interconnected nature and challenges of production systems. Operators should:</p> <ul style="list-style-type: none"> <li>• Ensure collaboration between the various disciplines</li> <li>• Implement industry's best practices and use of best available fit-for purpose technologies promoting collaboration</li> <li>• Use of best available and fit-for purpose workflows and technologies to build integrated asset models</li> </ul> <p>Peer, expert reviews and assurance are necessary to ensure risk assessments and uncertainties are being addressed and mitigated. Reviews and assurances are required to be:</p> <ul style="list-style-type: none"> <li>• Conducted by multidisciplinary teams (reservoirs, wells, surface facilities and economics)</li> <li>• Conducted on a regular basis (at least once a year) to ensure sound and methodologies and assumptions deriving to conclusions</li> <li>• Documented to capture conclusions including remedial actions and lessons learnt to continuously improve workflows and address competency gaps if necessary</li> <li>• Particular attention should be given to data quality, assumptions, calibration, uncertainty ranges, silo effects, heuristics and cognitive biases</li> </ul>
<b>Models Validation and Calibration</b>	<p>The construction of models (such as surveillance, geological, well, reservoir simulation or integrated asset models) is an essential step in trying to comprehend oil and gas assets and predict their performance.</p> <p>Models should be:</p> <ul style="list-style-type: none"> <li>• Fit-for-purpose and their level of complexity related to the amount of reliable data available</li> <li>• Calibrated and re-calibrated against reliable data</li> <li>• Used in conjunction with other tools and analyses to check their validity - validate with different methods</li> </ul>

	<ul style="list-style-type: none"> <li>• Technically reviewed and assured before being used for further analysis and decision making</li> <li>• Documented and provide clear audit trail and documentations stating all assumptions and workflows</li> </ul>
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## 2.4 Risks and Opportunities

Operators continuously strive to identify risks and opportunities to maximize asset value. However, this exercise can be obscured by the complexity and uncertainties inherent in Oil and Gas projects.

Operators are required to:

Items	Minimum Requirements
<b>Subsurface and Surface Risk and Opportunities Identification</b>	<ul style="list-style-type: none"> <li>• Create, review and update regularly risk and opportunity register for reservoirs, wells and surface facilities</li> <li>• Identify and quantify risks and opportunities through:                             <ul style="list-style-type: none"> <li>○ Data gathering and analyses</li> <li>○ Integrated studies</li> <li>○ Multidisciplinary peer and expert reviews</li> <li>○ Performance Benchmarking at a field, project, company, country and industry level</li> <li>○ Adoption of innovative workflows and technologies</li> </ul> </li> <li>• Apply appropriate risk management tools, create mitigation and response plan for all risks identified and all risks have its owner</li> <li>• Capture lesson learnt into the risk and opportunity register</li> <li>• Promote learnings through knowledge and best practice sharing</li> </ul>

## 2.5 Planning and Executions

Project planning and executions are critical to realise opportunities whether they are hydrocarbon or non-hydrocarbon related.

Operators are required to:

Items	Minimum Requirements
<p><b>Project Planning</b></p>	<ul style="list-style-type: none"> <li>• Apply best industry practice in integrated project planning – consider business impact such as scope, time, cost, quality, resources and value such as production</li> <li>• Incorporate appropriate project management plan such as the following, but are not limited to:               <ul style="list-style-type: none"> <li>○ Project scoping</li> <li>○ Resources</li> <li>○ Cost and Schedule</li> <li>○ Procurement</li> <li>○ Quality Control</li> <li>○ Process Improvement</li> <li>○ Communications and Stakeholders</li> <li>○ Risks and Opportunities</li> </ul> </li> </ul>
<p><b>Project Execution</b></p>	<ul style="list-style-type: none"> <li>• Apply project management best practices pre-, during and post-execution period</li> <li>• Ensure execution programs are in place and assurances on readiness such as material, resources and logistics etc</li> <li>• Implement, monitor and control activities successfully. Ensure projects are executed within time, cost and agreed quality</li> <li>• Apply change control process in case of any deviation from the approved program. Ensure audit trails of changes are recorded and ensure related documents are updated</li> <li>• Conduct post implementation review or close out review upon completion of the project or activities</li> <li>• Timely update as-built drawings, associated documents and prepare close-out reports. Ensure all asset registers and documentation are consistent</li> <li>• Ensure asset handovers are carried out timely and have met all standard requirements for handovers. Also ensure outstanding punch list items are closed at the agreed time</li> <li>• Monitor performance, capture lessons learnt at a company and industry level, and improve processes if required</li> <li>• Promote learnings through knowledge and best practice sharing</li> </ul>

### 3. Activities for Approval by the Authority

This section refers to the information requirements and approval timelines for selected activities that were not part of previously approved development plans and could have a substantial influence on production, ultimate recovery, development costs, health, safety or environment.

Activities listed in this section are required for approval by the Authority. Approval timelines are based on a reasonable endeavour basis and subject to all concerns being resolved. Operators can apply for exception to these timelines if deemed necessary.

Where there are changes or deviations from the originally approved activities, Operators are required to notify and request for approval.

Category	Activity Required Approval	Information Required and Approval Duration
<b>New Well</b>	<ul style="list-style-type: none"> <li>• New well that is not included in the approved FDP</li> <li>• Appraisal well not included in the approved FDP</li> <li>• Exploration development well (early tie-ins) not included in the approved FDP</li> </ul>	<p>Information required: <b>Field Development Plan Addendum</b>. All supporting data and interpretations should be provided as per Volume 7: Field Development Guideline (FDG)</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>ninety (90) days</b> from the date that it receives the fully detailed and compliant FDP Addendum.</p>
<b>Trans-boundary Field</b>	<ul style="list-style-type: none"> <li>• Development of fields that extend beyond block boundaries within Brunei</li> <li>• Development of fields or reservoirs above or below any depth-limited block boundaries</li> </ul>	<p>Information required: <b>Unitised Field Development Plan</b> agreed between all parties involved with all supporting data and interpretations as per Volume 7: Field Development Guideline (FDG)</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>ninety (90) days</b> from the date that it receives the fully detailed and compliant proposal for fields within Brunei. Timelines for trans-border fields may also be subjected to a separate agreement between the Governments</p>

<p><b>Secondary Recovery</b></p>	<p>Water Flooding</p> <ul style="list-style-type: none"> <li>• Implementation of water flooding in areas, reservoirs or fields not previously planned in the approved FDP</li> <li>• Changes to water flooding strategy (injection targets, injectors number, location and type)</li> </ul>	<p>Information required: <b>Field Development Plan Addendum</b>. All supporting data and interpretations should be provided as per Volume 7: Field Development Guideline (FDG)</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>ninety (90) days</b> from the date that it receives the fully detailed and compliant FDP Addendum</p> <p>Additional comments: Reservoir simulation models are generally used to design water floods. However, they rarely capture the full heterogeneities of real reservoirs and may fail to adequately predict sweep efficiency or water breakthrough (timing, severity) that could affect incremental recovery potential. Simulation models should be history matched against reliable production data (water, oil and gas production rates, and bottom hole pressures).</p> <p>Ideally, low, best and high case models should be built and matched to capture the range of uncertainties. Voidage replacement and sweep efficiency analyses should be conducted at field, compartment and pattern levels to identify injection issues and optimization opportunities.</p> <p>It is recommended to use fit-for-purpose best available technologies (4D Seismic for instance) and conduct appropriate surveillance techniques:</p> <ul style="list-style-type: none"> <li>• Saturation Logging survey in key wells every other year</li> </ul>
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	<ul style="list-style-type: none"> <li>• Injection tests and injection falloff surveys after one month from starting injection</li> <li>• Injection profiling tests for commingled reservoir when starting injection and every other year thereafter</li> </ul>	
	<p>Gas Injection</p> <ul style="list-style-type: none"> <li>• Implementation of gas injection in areas, reservoirs or fields not previously planned in the approved FDP</li> <li>• Changes to gas injection strategy (injection targets, number, location and type of injectors)</li> <li>• Gas dump-flood, internal injection and cross-flow injection</li> </ul>	<p>Information required: <b>FDP Addendum</b>. All supporting data and interpretations should be provided as per Volume 7: Field Development Guideline (FDG)</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>ninety (90) days</b> from the date that it receives the fully detailed and compliant FDP Addendum</p> <p>Additional comments: Reservoir simulation models are generally used to design gas cap injection. However, they rarely capture the full heterogeneities of real reservoirs and may fail to adequately predict reservoir behaviour. Simulation models should be history matched against reliable production data (water, oil and gas production rates, and bottom hole pressures).</p> <p>Ideally, low, best and high case models should be built and matched to capture the range of uncertainties. Voidage replacement and sweep efficiency analyses should be conducted at field, compartment and pattern levels to identify injection issues and optimization opportunities.</p>
<p><b>Tertiary Recovery</b></p>	<ul style="list-style-type: none"> <li>• Tertiary recovery technique implementation in areas, reservoirs or fields not previously planned in the approved FDP</li> </ul>	<p>Information required: <b>Field Development Plan Addendum</b>. All supporting data and interpretations should be provided as per</p>

	<ul style="list-style-type: none"> <li>• Changes to tertiary recovery technique strategy (injection targets, number, location and type of injectors)</li> </ul> <p>Tertiary recovery technique or Enhanced Oil Recovery (EOR) is a set of advanced and innovatory techniques used to increase recovery by altering oil properties. Implementation of these techniques generally presents challenges due to cost issues and uncertainty about their effectiveness</p> <p>EOR techniques include:</p> <ul style="list-style-type: none"> <li>• Miscible gas (natural gas, carbon dioxide or nitrogen) injected with or without water (alternately or continuously)</li> <li>• Thermal solutions (steam injection, in-situ combustion)</li> <li>• Chemical injection (polymer, surfactant, Alkaline Surfactant Polymer, microbial or liquid carbon dioxide)</li> <li>• Other techniques (such as low salinity water injection and plasma pulse technology)</li> </ul>	<p>Volume 7: Field Development Guideline (FDG)</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>ninety (90) days</b> from the date that it receives the fully detailed and compliant FDP Addendum.</p> <p>Additional comments: Applicability of these techniques is a function of reservoir parameters (such as depth, pressure, temperature, oil API gravity and viscosity, net pay, reservoir properties and heterogeneities) and surface considerations (such as miscible gas availability and processing constraints, health, safety and environmental considerations).</p> <p>The selected technique should be tested during pilot projects prior to full field implementation. Reservoir simulation models and advanced laboratory tests are generally used to design EOR plans.</p> <p>However, they rarely capture the full complexities of real reservoirs and can fail to predict incremental recovery potential. Simulation models should be history matched against reliable production and pressure data. Ideally, low, best and high case models should be built and matched to capture the range of uncertainties. Voidage replacement and sweep efficiency analyses should be conducted at field, compartment and pattern levels to identify injection issues and optimization opportunities.</p> <p>It is recommended to use fit-for-purpose best available technologies (4D Seismic</p>
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		<p>for instance) and conduct appropriate surveillance techniques:</p> <ul style="list-style-type: none"> <li>• Saturation Logging survey in key wells every other year</li> <li>• Injection tests and injection falloff surveys after one month from starting injection</li> <li>• Injection profiling tests for commingled reservoirs when starting injection and every other year thereafter</li> </ul>
<p><b>Production Management</b></p>	<ul style="list-style-type: none"> <li>• Modification of subsurface and well operating envelopes outside of limits defined in the approved FDP (such as production rates, GOR, Reservoir Pressure, <math>H_2S</math>, <math>CO_2</math> or sand production)</li> <li>• Modification of production philosophies from the approved FDP (such as commingled completion, adding perforation to zones, adding internal injection or dump flood zone)</li> <li>• Adding new or opening gas cap development zone.</li> <li>• Cease of production from wells and facilities.</li> </ul>	<p>Information required: <b>Production Philosophy Update</b> for modification of operating envelopes and production philosophies. All supporting data and interpretations should be provided.</p> <p><i>For managing Gas Cap field production, please also refer to the <b>Volume 8: Gas Cap Development Guideline (GCD)</b></i></p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>one (1) month</b> from the date that it receives the Production Management Plan Update</p> <p>As part of control process, production Operators are also required to submit <b>Field Production Philosophy Report</b> annually to the Authority. The objective of this report is to ensure compliance to the approved Production Philosophy Update.</p>
<p><b>Surface Facilities</b></p>	<ul style="list-style-type: none"> <li>• Change in number or type of platforms and/or production vessel that were not part of approved FDP or Basis of Design</li> <li>• Changes in Satellite Tie backs that were not part of approved FDP or Basis of Design</li> </ul>	<p>Information required: <b>Basis for Design, FDP Addendum or Rejuvenation Plan</b> with all supporting data (such as revised X-Y co-ordinates) and interpretations as per Volume 7: Field Development Guideline (FDG)</p>

	<ul style="list-style-type: none"> <li>• Changes in active surface facility system including the use of new or different technology/system that were not part of approved FDP or Basis of Design</li> <li>• Changes in pipeline routing that were not part of approved FDP or Basis of Design</li> <li>• Rejuvenation plans (including pipeline replacement)</li> <li>• Changes in operational and maintenance philosophy that were not part of approved FDP or Basis for Design.</li> </ul>	<p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>one (1) month</b> from the date that it receives the fully detailed and compliant FDP Addendum or the Rejuvenation Plan</p>
<p><b>Data</b></p>	<ul style="list-style-type: none"> <li>• Transfer of Information outside of Brunei including through sub-contractor</li> <li>• Transfer of physical data outside Brunei including through sub-contractor (e.g. cores, core plugs, fluid samples, original field tapes)</li> </ul>	<p>Information required: Information about data to be transferred, destination, recipient and transfer method together with a copy of the applicable Confidentiality Agreement</p> <p>Approval Timeline: The Authority will approve, propose to amend or deny all or part of the request within <b>two (2) months</b> from the date that it receives the Data transfer request</p>

## 4. Monthly Field Performance Report Submission

This section refers to the reporting of key performance indicators, highlights and lowlights. Key Performance Indicators (KPIs) listed below are required to be reported on a monthly basis (no later than the third week of the following month) to the Authority. The information should be presented in a visual manner, example using graphs and traffic lights where possible.

KPIs	Information Required
<b>Incidents</b>	<ul style="list-style-type: none"> <li>• Details about causes of the Major incidents (HSE or unplanned production interruption for instance) and remedial actions.</li> <li>• Learning from incidents.</li> </ul>
<b>HSE and Asset Integrity</b>	<ul style="list-style-type: none"> <li>• HSE performances (Main Key Performance Indicators, HSE statistics including environmental data).</li> <li>• Identified risks and mitigation plans. Compliance with inspection, maintenance, training, evacuation and emergency drills schedules. Changes to integrity or operating envelopes or HSE philosophy.</li> </ul>
<b>Production</b>	<ul style="list-style-type: none"> <li>• Monthly Production Performance (oil, condensate, gas and water) and cumulative volumes to date vs target.</li> <li>• Rolling 12 months monthly production forecasts update.</li> </ul>
<b>Injection Wells</b>	<ul style="list-style-type: none"> <li>• Injected volumes vs target, explanation for deviations from plans.</li> <li>• Rolling 12 months monthly injection forecasts update.</li> </ul>
<b>Production and Injection interruption</b>	<ul style="list-style-type: none"> <li>• Actual monthly production interruption for both planned and unplanned.</li> <li>• Updates to planned production interruption schedules and explanations for variations.</li> <li>• Reports of key unplanned production interruption including explanation for occurrence, associated deferment (such as third-party deferment) and recommendations to prevent reoccurrence.</li> </ul>
<b>Expenditures</b>	<ul style="list-style-type: none"> <li>• OPEX and CAPEX to date and full year latest estimate (FYLE) vs Full Year AWPB target, explanation for variations from plans.</li> </ul>
<b>Development Executions - Well Delivery Project Delivery</b>	<ul style="list-style-type: none"> <li>• Status progress of performance objectives (cost, time, on stream date).</li> <li>• Actual vs Initial approved FDP target, explanation for variations from plans.</li> <li>• Post implementation review (cost, time, objectives, volumes, production).</li> </ul>

<p><b>Idle Assets</b></p>	<ul style="list-style-type: none"> <li>• Number and type of idle assets such as closed-in wells and facilities.</li> <li>• Performance update (restoration, decommissioning, slot recovery, sidetracks and new added idle assets).</li> <li>• Updates on plans to utilize them or no further use.</li> </ul>
<p><b>Production Testing</b></p>	<ul style="list-style-type: none"> <li>• Compliance to production testing programs. Actual vs target and explanation for deviations.</li> </ul>
<p><b>Well Interventions and Repairs</b></p>	<ul style="list-style-type: none"> <li>• Actual vs target and total number of interventions planned for the year, explanation for variation of number of interventions. Updates on recent interventions and performance.</li> <li>• Well interventions may include Coil Tubing Intervention, Wireline, Well Head Maintenance and Workover operations.</li> </ul>
<p><b>Data Acquisition and Surveillance</b></p>	<ul style="list-style-type: none"> <li>• Progress status vs target and explanations for delays if applicable.</li> </ul>
<p><b>Interpretation and Modeling</b></p>	<ul style="list-style-type: none"> <li>• Progress status on major interpretations or modeling studies (such as seismic interpretation of new data, major rework of static and simulation models, integrated asset modeling).</li> </ul>
<p><b>Multidisciplinary Reviews</b></p>	<ul style="list-style-type: none"> <li>• Schedule and status of multidisciplinary reviews to assess field performance and identify risks and opportunities.</li> </ul>
<p><b>Data Management</b></p>	<ul style="list-style-type: none"> <li>• Comments on data quality or data management concerns and remedial actions.</li> </ul>

## 5. Annual Field Performance Review Submission

This section refers to the multidisciplinary review of assets performance, data surveillance and acquisition plans, studies, risks & opportunities and planning & execution plans.

The objective of the Annual Field Performance Review is to provide an update to the Authority on fields' actual performance against development plan or the latest prediction of the fields' performance. The multidisciplinary reviews will also include discussions on potential opportunities that may be possible for short to long term implementation and risks that may be associated by the implementation.

Presentation style report should be provided for each field no later than two weeks ahead of the review. Operators are required to provide all supporting data and interpretations including models (via desk top review if necessary) to assist both parties in conducting the review.

The review should include the following outline:

KPIs	Information Required
<b>Executive Summary</b>	<ul style="list-style-type: none"> <li>• Short description of reservoir, development concept and history.</li> <li>• Comparison of ultimate recoveries, reserves, recovery factors (current and forecasted) and costs vs previous year and FDP.</li> <li>• Comparison of recovery factors vs Agreed Technical Limits (ATL) or any recovery factor benchmarks.</li> <li>• Production and injection historical plots at field level (including number of active wells) and comparison with previous year's and FDP's forecasts.</li> <li>• Production and injection forecasts at field level (including number of active wells) and comparison with previous year's and FDP's forecasts.</li> <li>• Comparison with depletion case forecast prior to implementation of secondary or tertiary recovery.</li> <li>• High priority risks and opportunities.</li> </ul>
<b>Assets</b>	<ul style="list-style-type: none"> <li>• HSSE (incidents, risks, training and evacuation or emergency drills compliance, remedial actions).</li> <li>• HR considerations (hiring, training and local talent development compliance, capability gaps and remedial actions).</li> </ul>

	<ul style="list-style-type: none"> <li>• Asset Integrity compliance (incidents, inspection and maintenance, repairs, upgrades schedules, changes to maintenance philosophy).</li> <li>• Production interruptions.</li> <li>• Changes to production management strategy.</li> <li>• Idle assets (wells and surface facilities) status, future plans.</li> <li>• Updates on decommissioning/abandonment plans and activities if applicable.</li> </ul>
<p style="text-align: center;"><b>Data</b></p>	<ul style="list-style-type: none"> <li>• Surveillance plans compliance for the past year (metering or allocation issues, comments on data quality and adequacy of plans and technology), actions and schedule to improve plan for the following year.</li> <li>• Data acquisition compliance and plans, data acquired during the previous year, comments about data quality, schedule for the following year.</li> <li>• Compliance to well testing programs.</li> <li>• Data management improvement or concerns and actions.</li> </ul>
<p style="text-align: center;"><b>Studies</b></p>	<ul style="list-style-type: none"> <li>• Integrated multidisciplinary reviews schedule (previous and following year), justification for deviations, conclusions and lessons learnt.</li> <li>• Production and injection historical plots (including number of active wells) and comparison with previous year's and FDP's forecasts (at reservoir, compartment or sector level depending on injection strategy and maturity).</li> <li>• Comments on modeling strategy and the representativeness of current models used to derive reserves estimates and to make development decisions. Remedial actions if necessary.</li> <li>• Comments on uncertainty analysis strategy.</li> <li>• Detailed update on interpretations or modeling studies (such as seismic and petrophysical interpretations, well test and production data analysis, decline curve analysis, Voidage replacement and sweep efficiency analysis, update of static and simulation models, history matching, integrated asset modeling).</li> <li>• Interpretations and modeling schedule vs plans, justification for deviations, schedule for the following year.</li> </ul>

<p><b>Risk and Opportunities</b></p>	<ul style="list-style-type: none"> <li>• Opportunity register: List, quantify and rank major subsurface and surface risks and opportunities (reservoirs, wells and surface facilities).</li> <li>• Discussion about current strategy, idle wells, new technologies, IOR or EOR applicability and opportunities.</li> <li>• Discussion about maturation of Prospective and Contingent Resources if applicable.</li> <li>• List of actions to mitigate risks, reduce uncertainties or capture opportunities. Actions should be prioritized to maximize asset value (high, medium and low priority). Clear schedules and accountabilities should be provided.</li> </ul>
<p><b>Planning and Execution</b></p>	<ul style="list-style-type: none"> <li>• Drilling schedule and costs vs plans, justifications for deviations, comment on performance and remedial action if necessary, schedule and costs for following year.</li> <li>• Interventions schedules and costs, justifications for deviations, comment on performance and remedial action if necessary, schedule and costs for following year.</li> </ul>

## 6. Submission and Reviews

The Authority requires that all required information such as the FDPs addendums, change proposal and reports that are submitted have to be comprehensive but fit-for-purpose stand-alone documents which have a complete set of information and/or references attached. With regards to FDP addendums, the specific updates relating to the scope of the required changes will be sufficient for submission.

Operator shall submit to the Authority **two (2) hard copies** and **one (1) electronic copy** of the proposed activities (in Section 3 of this guideline). Operators may also organize engagement or review meetings with the Authority or upon request by the Authority to enhance understanding within the timeline (in Section 3 of this guideline).

## References

In this guideline, the following references are referred:

<b>1</b>	Volume 7: Field Development Guideline, Revision 1, August 2021 by Petroleum Authority of Brunei Darussalam Document Number: PA Upstream Guidelines No.7/2019
<b>2</b>	Volume 8: Gas Cap Development Guideline, Revision 0, August 2021 by Petroleum Authority of Brunei Darussalam Document Number: Upstream Guidelines No.8/2021

## Appendices

In this guideline, the following appendix is referred:

<b>A</b>	Upstream Directive No. 1/2011: - Field Development Plan for Maturing Hydrocarbon Development Projects
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## Appendix A



### **UPSTREAM DIRECTIVE NO 1/2011:- FIELD DEVELOPMENT PLAN FOR MATURING HYDROCARBON DEVELOPMENT PROJECTS.**

In order to ensure that the hydrocarbon resources of Brunei Darussalam are appropriately explored, developed and managed to maximize its value for the sustained economic benefits of the nation, the Government of His Majesty the Sultan and Yang Di-Pertuan of Brunei Darussalam hereby issues the Upstream Directive No 1/2011: Field Development Plan for Maturing Hydrocarbon Development Projects.

Field Development Plan (FDP) for maturing hydrocarbon development projects must be submitted by each operator to Energy Department at Prime Minister's Office (EDPMO) and are required to meet the following requirements as follows with the exception of well reservoir management (WRM) activities like workovers, repairs and simple re-completion :-

1. Every discovered field in the acreage under the operatorship of an operator should have the **complete full life cycle opportunities as per the SPE Petroleum Resource Maturation System (SPE-PRMS) (Attachment 1) i.e. from reserves up to the contingent resources evaluated and justification for the remaining volumes deemed unrecoverable needs to be provided.** This assessment should be done with a certain degree of rigor and quality inline with proper reservoir management practices. Operators are required to submit plans on how the contingent and prospective resources will be matured and prudently produced. These plans will be visited on an annual basis to track progress and to identify obstacles that prevent progress.

2. **The operator needs to demonstrate that the development project has the objective of maximizing economic ultimate recovery from the target field, blocks or reservoirs.** The plan must first evaluate the Technical Limit recovery taking into account the full reservoir life cycle and must cover secondary recovery

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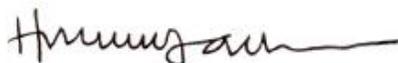


e.g. water-flooding at start of production and tertiary recovery schemes. It should clearly show where the economic limit is and what is the corresponding recovery factor achieved.

3. For gas development projects, the emphasis should be same, demonstrating how to maximize economic ultimate recovery of the total hydrocarbon fluids inline with proper reservoir management practices, for not just the natural gas but also its condensate. In the case of condensate gas fields, if the depletion of the reservoirs results in reservoir pressure decline causing condensate to drop out in the reservoirs resulting in unrecoverable condensate, alternative schemes such as dry gas recycling needs to be considered and presented as an option with the economics fully evaluated.

4. Overall, in the studies operators are required to come up with **holistic, life cycle area development plan**, which include the complete exploration programme, that synergies with the development plans or options of the existing discovered fields. Small discovered accumulations that may not seem to justify anything else other than primary depletion may be part of a cluster development with secondary and tertiary schemes if the exploration prospects and other discovered blocks nearby are taken into consideration.

5. At all time operators are required to demonstrate **high standard of safety, asset integrity and environmental** considerations are in-place in the Field Development Plan.

Issued by:   
Office of the Minister of Energy, Prime Minister's Office  
Bandar Seri Begawan, BRUNEI DARUSSALAM

Issued on: 22 September 2011



Attachment 1

SPE-PRMS (SPE Petroleum Resource Maturation System) :-

