

**GUIDELINES FOR DEEPWATER OPERATIONS PLAN
FOR A SUBSEA PROJECT**

I. APPROVAL OF DEEPWATER OPERATIONS PLAN

No well completion activities of temporarily abandoned subsea exploration wells nor drilling activities of subsea production wells shall be commenced until the lessee has submitted a Deepwater Operations Plan (DWOP) for the aforementioned well(s) and said plan has been approved by the Minerals Management Service (MMS) Regional Supervisor. MMS will base the DWOP approval upon a determination that the proposed equipment and procedures will adequately control the well(s) and produce gas and oil in a safe and prudent manner. The lessee should address detailed reservoir management issues in the Supplemental Plan of Exploration (SPOE) and the Development and Production Plan or Development Operation and Coordination Document (DOCD). Once approved by MMS, the DWOP supplements existing MMS regulations and will be the basis by which the lessee operates. The lessee must obtain regulatory approval for any deviation from the plan. The lessee should submit the DWOP to MMS in three parts as described in the following guidelines. Each part may refer to other submittals where appropriate to minimize duplication. Revisions to the parts shall be submitted for review, comment, and approval by MMS. Once approved by MMS, such revised part or portion thereof shall supersede previous submissions of that part.

II. CONCEPTUAL PART

A. The CONCEPTUAL PART should be submitted for approval after the operator has selected a concept for development and prior to the operator commencing with engineering design. When submitted as prescribed, the CONCEPTUAL PART provides an early opportunity for MMS and the operator to agree on a conceptual plan of development prior to major expenditures for engineering design. The CONCEPTUAL PART should address the general design basis and philosophy used to develop the field. At the operators discretion, the CONCEPTUAL PART may be submitted in conjunction with the PRELIMINARY PART. However, in doing so, the operator is at risk if MMS requires changes in the development concept or engineering design. Where the viability of development depends upon downhole commingling, the plan must identify the commingling strategies. The permitting process for commingling should be initiated in conjunction with submission of the CONCEPTUAL PART. Also, this part should reference the application for downhole commingling and state that the viability of the conceptual plan is dependent upon approval of downhole commingling.

B. The CONCEPTUAL PART should describe:

1. One or more plat drawing(s) showing the location of the proposed production development, including the leases to be developed, the location of the subsea structure(s), the host production platform/facility, and other relevant structures, shipping lanes, pipeline(s) and umbilical(s) corridor, etc. You must also include water-depth contours through the subsea and host platform/facility locations and other relevant locations.
2. A description of the reservoir development strategies which balance economics and resource conservation issues as well as detailed reservoir management information should be submitted with the SPOE or DOCD. All information contained in the Deepwater Operations Plan is considered proprietary by MMS.
3. An overview of the conceptual production system including:
 - a. A brief description of the method of development (e.g., single satellite well(s), clustered well(s), multi-well template configurations, etc.),
 - b. Identification of the host production platform/facility,
 - c. Offset distances between the host platform and subsea development,
 - d. Number and sizes of pipelines,
 - e. Type of subsea control system to be used (e.g., direct hydraulic, piloted hydraulic, electro-hydraulic multiplex, etc.),
 - f. Expected production stream including hydrogen sulfide and carbon dioxide content,
 - g. Anticipated shut-in tubing pressure,
 - h. Special production situations (e.g., hydrates, paraffin/asphaltene deposition, etc.),
 - i. Identification and a description of known hazards or unusual conditions including the presence of shallow gas, shallow water flow, soft sea floor conditions, loop currents, etc. (Plan of Exploration, SPOE or the DOCD may be referenced for this information as applicable.),
 - j. Application of new technologies and practices, and
 - k. Abandonment concept for the well(s), subsea structure(s), pipeline(s) and umbilical(s).

For multi-phase development concepts, this PART should identify the equipment and operations associated with each phase.

4. In the event that temporarily abandoned subsea exploration well(s) are being completed for production, the description should include:
 - a. The date the well(s) were drilled, and
 - b. Specific lease and well identification.

C. MMS may require changes to the CONCEPTUAL PART as deemed necessary

consistent with current laws and regulations. MMS will indicate its approval of this PART in writing. Approval will signify that MMS agrees in principle with the development of the reserves using the equipment and operational concepts described in the DWOP. Where a conceptual plan of development depends upon downhole commingling, MMS will approve this PART subject to approval of the downhole commingling application.

III. PRELIMINARY PART

- A. The PRELIMINARY PART should be submitted for approval after the operator has substantially completed the production system design and prior to commencing procurement and fabrication. When submitted as prescribed, the PRELIMINARY PART provides an opportunity for approval of the production system and associated operations plan prior to major commitments and expenditures for hardware.
- B. The PRELIMINARY PART should describe changes to the development concept presented in the CONCEPTUAL PART. For multi-phase development concepts, this PART should additionally update the description of the phases of development, equipment, and operations associated with each phase. Also, for multi-phase development concepts, this PART should update the operator's conceptual basis for developing in phases and goal/milestone achievements required of earlier phases for the operator to commence with subsequent phases of development. This PART should also describe test and operating plans in summary and should identify all alternative compliance measures.
- C. The PRELIMINARY PART should contain the following information:
 - 1. General and representative description and schematic of the typical wellbore, casing, and completion to the extent that it is necessary to support the alternative compliance measures, including:
 - a. Hole sizes,
 - b. Casing and tubing sizes,
 - c. Casing setting and liner top,
 - d. Cement tops,
 - e. Anticipated casing shoe leak-off pressures,
 - f. Surface Controlled Subsurface Safety Valve (SCSSV) setting depth and pressure rating,
 - g. Downhole chemical injection point(s), and
 - h. Completion technique (e.g., cased hole gravel pack, open hole gravel pack, perforated, etc.).

Note: The DWOP will not need to be revised to modify the well data provided in this PART as the Application for Permit (APD) and Sundry Notices for the well(s) will supersede this information.

2. General description of the subsea production system equipment and associated provisions including:
 - a. Subsea structure(s);
 - b. Subsea manifold(s) including:
 - (1) Nominal pipe sizes, differential pressure ratings (internal and external as applicable), and applicable design codes,
 - (2) Location and nominal size of valves used and their means of actuation (remotely operated vehicle (ROV), diver, or remote operated).
 - c. X-mas tree(s) and wellhead including:
 - (1) Nominal bore sizes,
 - (2) Identification and the normal position of all powered valves,
 - (3) Valves which may be overridden by ROV or diver intervention,
 - (4) Schematics as required to illustrate the tree in various modes of operation, e.g., production and workover,
 - (5) Identification of the valve designated as the Underwater Safety Valve (USV),
 - (6) Casing and tubing hanger provisions,
 - (7) Differential pressure rating of the tree and wellhead,
 - (8) Tubing hanger penetration provisions, and
 - (9) Anticipated hydraulic operating pressure through the tubing hanger (as applicable) to open the SCSSV at well shut-in tubing pressure;
 - d. Planned pipeline(s), subsea connection(s), and riser(s) at the host production platform/facility including:
 - (1) Nominal pipeline sizes, differential pressure rating (internal and external as applicable), and applicable design codes,
 - (2) Location and nominal sizes of valves used and their means of actuation (ROV, diver, or remote operated);

Note: The DWOP will not need to be revised to modify the pipeline information provided in this PART as Pipeline Applications and Reports will supersede this information.

- e. Umbilical(s) and connection(s);
- f. Pipeline pigging provisions;
- g. Chemical injection provisions;
- h. Corrosion prevention/inhibition provisions demonstrating that the pipelines and subsea equipment will have adequate service life. The information contained in this section may include but is not limited to:
 - (1) Materials used for the production wetted surfaces of the wellbore, X-mas tree, pipelines, risers, and piping through the platform shutdown valves and internal protective measures, i.e., coatings, and
 - (2) Cathodic protection systems and external coating systems (as applicable) for the subsea structure(s), subsea manifold(s), X-mas tree(s), and pipeline(s) and riser(s), and any other subsea equipment; and

- i. Sufficient drawings and schematics, as needed, to depict the required information including, in particular, drawings and schematics of the following:
 - (1) Subsea structure(s) and subsea manifold(s) (as applicable) including plan and other views showing overall size with all major components labeled,
 - (2) X-mas tree including plan, front, and other views to show the position of all major pressure containing components, and
 - (3) General mechanical flow diagram of the subsea production system X-mas tree(s) and subsea manifold(s) that is sufficiently detailed to adequately support the description of the test and operating procedures contained in this PART to include but not be limited to show:
 - All flowpath and flow control devices that are potentially wetted by reservoir fluids,
 - Pressure sensing and chemical injection points,
 - X-mas tree/manifold connection,
 - Tree cap components (as applicable), and
 - Chemical injection distribution system;
 - j. Any operating constraints imposed as a result of equipment temperature and/or equipment pressure limitations.
3. General mechanical flow diagram of the surface production equipment including but not limited to:
 - a. Production process equipment specific to support of subsea production; and
 - b. All ancillary equipment required to support the subsea production system including but not limited to:
 - (1) Hydraulic power unit (HPU),
 - (2) Chemical injection unit (CIU),
 - (3) Storage and handling facilities for methanol, corrosion inhibitor, and other chemicals that may be used in the operation of the subsea production system,
 - (4) Subsea control console, and
 - (5) Electrical power supply equipment (as applicable).
4. Description of supplementary fire, gas detection, and vapor detection systems (as applicable) for the surface production equipment specified in paragraph 3 above, including the chemical injection unit and the chemical storage and handling facilities.
5. Description of the Surface/Subsea Safety System and Emergency Support Systems (ESS) including but not limited to:
 - a. Overall system architecture and hierarchy,
 - b. Interface philosophy and means between the surface and subsea systems (as applicable),
 - c. Interface philosophy and means between the drilling rig and the subsea systems to support simultaneous drilling, completion, and/or workover operations and production operations,

- d. Premise of design (i.e., description of segregation of responsibility between the surface and subsea systems),
- e. Means for executing Safety System and ESS shutdown of subsea production and associated equipment (HPU, CIU, and surface production equipment),
- f. Duration of time required for closure of the pipeline boarding SDV(s) and USV(s) after automatic detection of an abnormal condition or activation of an Emergency Shutdown (ESD),
- g. Duration of time required for closure of the SCSSV(s) after the ESD has been initiated,
- h. Illustrations and diagrams, as required, to show the subsea control system hardware components, interconnections, and interfaces to the host production platform/facility and power supplies (as applicable), and
- i. Shutdown logic diagram(s) and other drawings, as required, to illustrate the subsea shutdown system functions and the interfaces to the host production platform/facility.

Note: Minor changes to the surface and subsea production equipment information provided in this part will not necessitate refiling a DWOP.

- 6. Description of the methods and frequency for testing the USV(s), SCSSV(s), boarding SDV(s), and the function of the host production platform/facility ESD system as it pertains to the subsea production system and the subsea ESD system (as applicable) including but not limited to:
 - a. A summary of the USV and SCSSV test process from well shut in to the well being returned to production; a statement of the maximum leak rate approval criteria (volume per time), minimum pressure differential for the test, and minimum test monitoring period; and a sample calculation to show how the leak rate (maximum acceptable leak rate) is determined for the minimum monitoring period and maximum allowable pressure change for those test processes where the leak rate is to be determined by monitoring for pressure drop or rise,
 - b. A summary of the boarding SDV test process and a statement of the approval criteria,
 - c. A summary of the host platform/facility ESD and subsea ESD systems test process, a statement of the frequency of subsea well shut in, and a summary of the method for determining closure of the USV(s) and SCSSV(s), as applicable,
 - d. A summary of the method(s) for ensuring the performance of subsea sensors that are used as safety system sensor devices for initiating safety shutdown action, and
 - e. A summary of the process for testing the integrity of the safety system control circuit between the safety system sensor devices and the shutdown devices.
- 7. A description of:
 - a. Method used for monitoring the pressure in the subsea well production annulus,
 - b. Process to be used for venting pressure from this annulus,

- c. A summary of the diagnostic process to be used to verify the integrity of the production casing annulus, and
 - d. The frequency of inspection for production annulus pressure.
- 8. A description of the process used for determining static bottomhole pressure for the subsea well(s) (as applicable); if a calculation method is to be used, an example should be provided that qualifies the calculation method.
- 9. A description of the erosion and corrosion monitoring strategies for the subsea wells, manifold piping, and pipelines.
- 10. A description of the well production allocation test process.
- 11. A description of the processes required to conduct normal operations which may include but not limited to:
 - a. Well lift-in and cleanup including venting thermally induced pressure from the production casing annulus and neutralizing well stimulation fluids,
 - b. Cold startup with the pipeline(s) pressured,
 - c. Cold startup with the pipeline(s) depressured,
 - d. Pipeline repressuring via means other than choking the subsea well production with the X-mas tree choke,
 - e. Pipeline pigging and batch corrosion inhibitor treating,
 - f. Hydrate plug elimination from the pipeline(s) and chemical injection line(s),
 - g. Paraffin/asphaltene deposit removal from the pipeline(s) and well tubing (as applicable),
 - h. Other through flowline operations (as applicable),
 - i. Methanol handling (i.e., off loading to the host platform storage facilities),
 - j. Remote well killing operation (if applicable), and
 - k. A summary of the simultaneous operations strategies to be employed and other measures to be used to manage simultaneous production, drilling and other operations, and coordination between the drilling vessel and host platform/facility, and
- l. Flaring, if planned, including the expected volume and duration.
- 12. A description of those operations performed during equipment installation and commissioning that confirm integrity. In particular, this description should include but not be limited to the hydrostatic test operations and sequence for the subsea pipeline(s), subsea manifold(s), X-mas tree, and chemical injection supply circuits.
- 13. A description of the subsea production system inspection program and capabilities which may include but not be limited to:
 - a. Pipeline inspection,
 - b. Cathodic system effectiveness inspection,
 - c. External coating inspection, and

- d. Pipe wall thickness inspection.
14. A description of the subsea production system maintenance capabilities which may include but not be limited to:
 - a. Wireline,
 - b. Coil tubing and concentric workover,
 - c. Conventional workover, and
 - d. Repair of X-mas tree, subsea manifold, control pod, and pipeline components.
 15. A summary of the hazard analysis process the owner/operator has employed to identify, evaluate, and where unacceptable, take measures to reduce the likelihood and/or minimize the consequences of uncontrolled releases and other safety or environmental incidents. Those analyses performed for components not included in the American Petroleum Institute's Recommended Practices 14C should be included in this summary. The description of the hazard analysis process may include but not be limited to:
 - a. Identification of the hazard analyses performed,
 - b. Method used for each analysis,
 - c. Scope of each analysis,
 - d. Qualification of persons participating in each analysis, and
 - e. Status of the recommendations.
 16. A description of the alternative compliance means (e.g., techniques, procedures, equipment, and/or activities) relative to existing OCS regulations that are incorporated into the subsea production system. This description should include but not be limited to:
 - a. The identification of the regulation and requirement for which alternative compliance is provided,
 - b. A description of the alternative compliance means provided,
 - c. The reason the alternative compliance means is preferred or required, and
 - d. The basis for justification (including a hazard analysis, as applicable) that the alternative compliance means affords an appropriate degree of protection.
 17. A description of the operation and maintenance personnel training program.
- D. MMS may require specific changes to the equipment and procedures described in this PART but will not require changes to the development concept as approved for the CONCEPTUAL PART submission. Should the operator have initiated changes to the development concept approved by MMS in the CONCEPTUAL PART, then MMS may disallow such changes. MMS will indicate its approval of this PART in writing. Approval will signify that MMS agrees to the production system plan, its operations, and its test procedures as described in this PART, and MMS agrees to the alternative compliance measures.

IV. **FINAL PART**

- A. The FINAL PART should be submitted for approval within 90 days of initiating production. This PART provides updates for information that the lessee submitted in the PRELIMINARY PART. The Final DWOP, for which the operator is to be held accountable, must properly reflect the production system and its operations.
- B. The FINAL PART may be used to update any information previously submitted. For multi-phase development concepts, this PART should additionally update the description of the equipment and operations associated with each phase. Also for multi-phase developments, this PART should update the goal/milestone achievements required of earlier phases for the operator to commence with subsequent phases of development. This PART should also update the test and operating procedures that the operator will be held accountable.
- C. MMS may require adjustment to the documentation, changes to updated test procedures to reflect the spirit of the alternative compliance means as approved in the PRELIMINARY PART, and/or changes to updated operating procedures. Written approval of this PART will signify that MMS agrees with the changes made to the PRELIMINARY PART.
- D. For projects that propose continued development drilling beyond MMS's approval of the DWOP FINAL Part, MMS may advise the operator in the FINAL approval letter that MMS will require additional operational summaries to update project milestones and achievements. This approach is similar to the annual unit operations plan required for unitized acreage.