



**MINISTRY OF ENERGY AND ENERGY INDUSTRIES
REPUBLIC OF TRINIDAD AND TOBAGO**

TECHNICAL GUIDANCE DOCUMENT- GD 06

GUIDE TO MEEI'S APPROVAL REGIME
FOR
DEVELOPMENT PLANS

STATUORY INSTRUMENT

CONTRACT MANAGEMENT DIVISION



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1.0 Introduction

The Petroleum Act of 1949 and its subsequent revisions grants MEEI the authority to administrate and regulate the petroleum sector within the geographical scope of Trinidad and Tobago. Chapter 46 of 1969 states that to efficiently manage the industry we must *'make better provision for the exploration for, and the development and production of, petroleum, and for matters consequential or incidental thereto.'*

The authority to legislate and manage was therefore vested to MEEI by the Petroleum Act and is supplemented by Exploration and Production Licences and Production Sharing Contracts that is signed between the MEEI and respective operators.

As part of the obligations contain in these contracts, a significant part focuses on technical obligations that are to be honoured by the licensee. Section 43 of the act spells out in great detail the requirements and the information that forms part of the requirements. Once exploration and the appraisal part of the contractual obligations are satisfied and a commercial discovery is realised, the operator must submit a Development Plan to the MEEI. The US Department of Interior, Mineral Management Service defines development as *'those activities that take place following a discovery of mineral paying quantities, including but not limited to geophysical activity, drilling, platform construction and operation of all related onshore support facilities and which are for the purpose of producing the minerals discovered.'* This document will in its purpose provide guidelines of the content requirements that are necessary in order to meet these obligations, in essence Development Plan guidelines.



2.0 Policy Objectives and Intent of Guide¹

In reviewing Development Plans the Ministry of Energy used the following policy objectives namely:

1. To encourage the discovery and development of new reserves of petroleum and other minerals.
2. To regulate the surveying, exploration drilling, mining, production, development, processing, transporting, and marketing operations of the petroleum and other mining industries to ensure that existing laws (including the best conservation and safety practices) are observed.
3. To encourage the establishment of new industries and other expansion of existing industries related to petroleum and other mineral.
4. To access all Royalties, Dead Rents and Oil Impost duty to Government from the Petroleum and Mining Industries.
5. To develop and maintain basic operating and financial information concerning the petroleum industry in order to provide constant economic appraisal and to develop operational and economic forecasts.
6. Ensure environmental, health and safety standards for the industry are met and followed.

2.1 Considerations for Approval

- ◆ Development and production activities in a new field should be conducted in accordance with an approved Development Plan. A proposed Plan may apply

¹ Sections 1 and 3 was adopted from the SPE Paper 81176 “*Approval process for Oil and Gas Field development in Trinidad and Tobago*” written by Marc Rudder, Jerome Rajnauth and Penelope Bradshaw-Niles.



to one or more leases held by an individual operator or may be submitted by a group of operators.

- ◆ Data and information discussed in other documents previously submitted to the Minister or his representative do not constitute a part of the proposed Plan and may not be included by reference.
- ◆ Oil and Gas Development Plans are required for all new fields both marine and onshore.
- ◆ The Ministry of Energy may limit the amount of information required to be included in a Development Plan to that necessary to assure conformance with the Petroleum Act 1969 and the Petroleum Regulations 1970, other relevant laws and regulations and licence/contractual provisions.
- ◆ In determining the information to be included in a Plan, the Ministry of Energy considers current and expected operating conditions together with experience gained during past operations of a similar nature in the area of proposed activities.
- ◆ The Ministry of Energy requires a periodic review of the activities conducted under an approved Development Plan. If the review indicates significant changes from the Plan, the Minister shall require a revised Plan, or portions thereof.
- ◆ Approval of a Development Plan does not constitute the approval to engage in drilling, installation of facilities or other activities related to the Plan. Appropriate application must be submitted to the Minister and his approval obtained before engaging in these activities.
- ◆ Revisions to an approved or pending Development Plan, whether initiated by the operator or ordered by the Minister, shall be submitted to the Minister for approval. Only information related to the proposed changes need be submitted.
- ◆ To ensure safety and environmental protection, the Minister may authorize or direct the operator to conduct geological, geophysical or other surveys.



In emergency situations, the Minister may approve or require deviation from the approved Development Plan.



3.0 Legal Authority

The legal authority given to the MEEI is derived from three pieces of statutes listed as follows:

3.1 Petroleum Regulations Chapter 62:01

The authority under this section is as follows as it pertains to commercialisation and development:

Citation	Regulations
Regulation 43 (h)	The licensee shall exert his utmost efforts to develop an discovered fields to the maximum extent consistent with good petroleum industry practice and in particular observe sound technical and engineering principles
Regulation 43 (i)	All petroleum processing arrangements must be reported to the minister, who may upon examining such arrangements and contracts and inspecting the related plant and analyses call upon the licensee to alter any practices

3.2 Production Sharing Contract

Article 13.8

- (a) If the contractor declares that a discovery is commercial, the contractor shall submit within 90 days of such declaration:
- i. A proposed development plan
 - ii. A proposed designation of the production area



- iii. A comprehensive environmental impact study covering the proposed development and any related facilities or infrastructure inside or outside of the contract area.

All of which will be subject to the minister's approval. The development plan shall be deemed approved if the Minister does not respond within 90 days.

- (b) In the event the contractor and the minister unable to reach an agreement on changes proposed by the minister, the contractor will have a right to request determination on the disputed issues in which case the decision shall be binding on both minister and contractor.
- (c) Upon approval being granted the contractor shall proceed promptly and diligently and in accordance with good petroleum industry standards develop the discovery, to install all necessary facilities, to commence commercial production and produce the field in a manner that would achieve maximum economic recovery of the reserves.

Article 13.9 The development plan shall detail the contractor's proposals for development and operation of the production area and all facilities and infrastructure up to the measurement point required outside the production area. The development plan shall include production parameters, number and spacing of wells, the facilities and infrastructure to be installed for production, storage and transportation and loading of petroleum, an estimate of the overall costs of the development, profitability estimates, a production forecasts, estimated time and cost to complete each phase of the development, safety measures to be adopted, a description of the organisation and measures to be implemented for the hiring of national and any other particulars the Minister may direct.

Article 13.10 Any significant changes to the development plans related to the extension of the fields of for enhanced recovery projects shall be discussed among the



parties and if agreed shall be submitted in writing to the minister for his approval. If not approval communicated the plan is deemed approved within 90 days of receipt.

3.3 Exploration and Production Licence



4.0 Required Content for a generic Development Plan

1. EXECUTIVE SUMMARY

1. Licence and PSC description – a history and present status of the production license or PSC should be briefly described.
2. A Map of the development area showing the development area boundary, field limits, proposed wells, Licence and PSC boundaries.
3. A project Schedule showing timelines, milestones and key dates.
4. Total Capital Costs associated with the project.
5. Brief description of reservoir, reserves, development strategy, facilities and pipeline.
6. Estimation of recovery and hydrocarbon production profiles.

2. INTRODUCTION

1. State the purpose of the Development Plan and site obligations as listed in the PSC.
2. Content and Document priority.
3. Custodians for the document.

3. GEOLOGY AND GEOPHYSICS

1. Field Location

- (i) A map showing lease or contract area and location of field to be developed.
- (ii) A map showing surface location of any proposed structure or facility.
- (iii) For offshore locations, a bathymetric map showing surface locations of nearby fixed structures and wells. Water depths at the site of each proposed structure must be indicated.
- (iv) For onshore locations, cadastral sheets showing location of nearby infrastructure, houses, pipelines, schools, rivers etc. Wells and related facilities must also be shown.



2. Field descriptions – Location and size of each field and the geology of each area.

The geology should include the following:

- (a) A map showing a plan view of the surface and bottom-hole locations and giving the measured and vertical depths for each proposed well.
- (b) Current interpretations of relevant geological and geophysical data, including the geological and sedimentological models used, geochemical analyses, core analyses, regional stratigraphy and geological sequence of events as well as petrophysical evaluation.
- (c) Current structure maps showing the surface, top of formation and bottom-hole location of each proposed well and the depths of expected productive formations.
- (d) Interpreted structure sections showing the depths of expected productive formations and type logs.
- (e) Isopach maps for each formation

3. Database:

- (a) Well Data – appraisal data taken from well drilled, logs data, borehole data and summary of cores taken.
- (b) Seismic data – summary of seismic surveys and structural configuration of the field should be presented using:
 1. Shot Point Map
 2. Time map
 3. Depth map
 4. Velocity Map
 5. Interpretation of seismic sections through the wells

4. Depth conversion – time-depth relationship

5. Seismic interpretation and seismic resolution of the reservoir – MIV Isopachs, faulting/compartmentalisation

6. Seismic Interpretation and structural configuration

7. Depositional model and biostratigraphic study findings

8. Petrophysics - The petrophysical documentation should include the following:

- Formation parameters (lithology, porosity, permeability, water saturation, cut-



- off criteria, interpretation method),
- Comparison of laboratory analyses (core measurements and water analyses) with log derived data,
- Fluid contacts, pressure data
- Reservoir zonation,
- Formation temperature
- Method for correcting measured depth to true vertical depth
- Porosity maps, net to gross maps, water saturation maps and permeability maps of each reservoir zone
- Interpretation methods used and findings

4. RESERVOIR ENGINEERING

- 1. Fluid analysis** – Hydrocarbon PVT data, Water analysis
- 2. Reservoir properties** – Oil in place and GIIP (gas in place) proven, probable and possible, Datum depths, pressures and temperatures for each reservoir
- 3. Well optimisation and production profiles.**
- 4. Reserves in place.** The following volume estimates should be documented:
 - Reservoir rock volume,
 - In place hydrocarbons at reservoir conditions,
 - In place hydrocarbons at surface conditions.

The volumes should be subdivided according to hydrocarbon types, and also according to the deposits and reservoir units, which are included in the plan. The method of calculation of the resource estimate should be stated, and the uncertainties of the calculations should be described and quantified.

- 5. Field data** – water production, predicted tubing head pressures
- 6. Reservoir performance evaluation -**
 - (i) Detailed Reserve Evaluation for each sand in each Fault block, stating clearly reserve definition by category and abandonment conditions.



- (ii) Reservoir Performance Predictions, including basis of predictions such as model used, input parameters, PVT analysis, drive mechanisms, number and location of wells. Included must be a scenario of unitisation where applicable.
- (iii) a technical evaluation of technology and reservoir engineering practices intended to increase the ultimate recovery of oil and gas, i.e. secondary, tertiary, pressure maintenance, re-injection of produced fluids, compression, etc., and a discussion of the adequacy of existing plant and equipment with respect to planned project.
- (iii) A reservoir management plan.
- (iv) Evaluation of various drive-mechanisms and the decision basis for the choice of mechanism, supported by necessary data basis (core analyses, miscibility studies, simulations etc.), should be stated. As a rule, drive mechanisms and expected production and injection rates should be documented by reservoir simulation. Results from sensitivity analyses should be included.

7. Reservoir and Production technology

- (i) A description of anticipated production-related problems and proposed solutions.
- (ii) A description of plans for artificial lift where relevant.
- (iii) A description of the production strategy
- (iv) A rate sensitivity analysis should be included
- (v) Information on the composition of the reservoir fluid

8. Proposed reservoir development

Details of the following should be included:

- Drilling programs
- Completion programs
- Well locations
- Expected reservoir sweep
- Estimate of the range of reserves

If needed, injection fluid profiles. For sub-sea completions, a separate and comprehensive document must be submitted which includes well-head, flow-lines,



manifolds and satellite well systems. This section should also cover drill string, bit selection, casing design, BOP system, mud system, deviation program, completion methods and related down-hole equipment, corrosion control, pore pressure, temperature profiles, drilling time, well cost and well testing. A well evaluation program, including wire-line logging, coring, formation tests and special logs should be included. A summary of possible technical and operational problems that may occur during the activities and identified risks, as well as planned precautionary measures should be prepared.

5. FACILITIES

- 1. Development concept** – overview, development phases for each field – diagram of infrastructure
- 2. Contract quantity and details of supply**
- 3. Duty and design life** – gas, oil and condensate capabilities
- 4. Meteorological, oceanographic and seismic criteria** including:
 - storm wind and wave characteristics
 - seismic conditions
 - seismic hazard analysis and design of seismic design parameters
 - Environmental Impact statement
 - Meteorological conditions must include normal winds
 - Oceanographic conditions must include normal tides, currents, waves
 - Storm wind, wave and tide characteristics
- 5. Platform Location and platform co-ordinates** including location characteristics and marine activity
- 6. Platform manning classification**
- 7. Platform configuration and layout**
 - Functional Specification
 - Design configuration
 - Design layout



8. Platform Structure

- Specification
- Topside design
- Jacket design
- Skirt Pile design

9. Platform installation

10. Production Facilities

This should include the following:

a. Process system specification - A summary of the main and standby capacities of major utility and service systems, together with the limitations and restrictions on operation.

(ii) A summary of the method of metering hydrocarbons produced and utilised.

(iii) A brief description of systems for collecting and treating oil, water and other discharges.

(iv) A brief description of any fluid treatment and injection facilities.

(v) A brief description of the main control systems and their interconnections with other onshore or offshore facilities.

b. Other areas:

- Process design
- Process support systems – Specifications, detail designs, electrical power and distribution, Emergency and life support systems
- Accommodation and temporary refuge – specifications, detail designs
- Evaluation, escape and rescue – Specification and design
- Process control – Emergency shutdown, process shutdown and unit shutdown, detail design
- Communication – Specification, communication design, detail design
- Mechanical handling - Specification and detail design



- Measurement – Specification, detail design

11. Pipeline

- Specification and detail design
- Onshore installation – route description and issues, metering specifications – gas metering, condensate metering
- Offshore installation - route description and issues
- Pipeline reception design
- Control and communications
- Environment considerations – site environmental impact assessment
- Future pipelines

12. Further Development phases

6. DRILLING AND WELL TECHNOLOGY

This should include the following areas:

1. Phase 1 and 2 of drilling – specifications and platform design
2. Well duration
3. Rig selection and specifications
4. Well profiles
5. Pore pressure profiles
6. Casing Plan and casing wear, contingency casing strings
7. Bit selection
8. Drilling fluid selection
9. Cementing philosophy
10. Well completion design
11. BOP philosophy
12. Wellhead systems
13. Christmas trees
14. Well work over and intervention



15. Well monitoring, control and production operations – wellhead control panel, wellhead temperature/pressure monitoring, sand production monitoring
16. Reservoir management – contingency for falling production rates, pressure surveys, well testing
17. Well services – work overs, well kill facilities, routine maintenance

The drilling and production facilities should include the following:

- (i) The drilling section should briefly describe the drilling package and well work over capabilities.
- (ii) A description of surface production and treatment facilities including separators, demulsification, dehydration, hydrate formation and treatment where relevant, gathering systems, pipelines and pumps, compressors and compressor station(s)/ platform(s).
- (iii) A description of Terminal(s) and Pump Station(s), including storage, dehydration, and receipt, treatment and disposal of ballast water. Terminal in this section includes oil, gas and water treatment systems.
- (iv) A detailed description of measurement facilities

7. HSSE PLAN AND POLICY

The should include the following;

- 1. HSE Goals**
- 2. Safety Case**
- 3. HSSE management and system plan** – include arrangement, organization of activities during development and HSE goals and performance standards.
- 4. Environmental impact** – EIA, CEC statements
- 5. Abandonment**
- 6. Safety Management**
 - (i) A shallow hazard analysis for proposed drilling and platform sites and



pipelines routes in offshore locations.

- (ii) A Hazard Assessment (HAZOP) of all major components of equipment and plant.
- (iii) Information concerning the presence of toxic substances such as hydrogen sulphide and proposed precautionary measures.
- (iv) Details of planned monitoring of the integrity of platform, pipeline and other installations.
- (v) Engineering drawings and description of all major structures, plant, equipment and safety systems to be installed, and a summary of their design criteria. Standards and codes of practice applied must also be stated.
- (vi) A description of management of change system.

7. Safety Information

This should include the following:

- a. A Safety Manual
- b. Emergency Response Plan
- c. Emergency shutdown system (layout plan included)
- d. Risk analysis/ criteria for ranking
- e. Electrical zoning or area classification
- f. Colour coding philosophy
- g. Design and layout plan for fire prevention system /fireproofing
- h. Sensor/gas detectors layout plan
- i. Details of lighting system - normal and emergency
- j. Details of ventilation system (gas detection and shutdown philosophy)
- k. Details of relief/depressurization, explosion protection and vent/flare system
- l. Details of deluge system
- m. Details of annunciation /alarm warning system (visible and audible)
- n. Details of personnel evacuation vessels
- 7. Environmental Information
- o. Spill Contingency Plan
- p. Details of produced water treatment system



- q. Details of the effluent handling system (catchment, containment, treatment and discharge)
- r. Flare/vent dispersion analysis
- s. Details of the storage facilities for chemicals and fuel
- t. Environmental Monitoring Plan
- u. Details of the sewer treatment system

9. Health Information

- 1. Detail of portable water system
- 2. Details of measures for minimizing health hazards (noise, radiation and vibration)

8 OPERATION AND MAINTENANCE PHILOSOPHY

1. Platform manning

2. Operating crew

3. Supervision and control

4. Logistic Support

- Helicopter operations
- Supply vessel operations
- Lifting operations
- Standby vessel operations

5. Maintenance

- Maintenance philosophy
- Maintenance scheme
- Maintenance methods
- Maintenance shutdowns and turnarounds
- Well servicing



6. **Project Execution** – Should include Execution strategy, procurement and contract strategy and project management team
7. **Key operational risks and uncertainties and ways of mitigating these risks**
9. **DEVELOPMENT SCHEDULE** – a detail schedule including key targets and milestones
 - ◆ Cost estimates - CAPEX estimates for development, OPEX estimates

10. COMMERCIALITY

- ◆ Field unitisation
 - ◆ Gas and LNG sales
 - ◆ Economics and economic risks
- (i) In the case of gas-condensate fields or high GOR fields, an economic evaluation of the feasibility of implementing pressure maintenance or recycling (a) early in the life of the field's production history, and (b) later in the life of the field's production history.
 - (ii) A detailed Economic Analysis of the project covering all major components of Capital and Operating Expenditure, stating all notable assumptions made including production forecast and price. A Cost/Benefit Analysis and Risk Analysis must be included.
 - (iii) A discussion of the measures proposed to maximize local inputs in terms of services, materials and manpower.
 - (iv) The information on Gas Contracts should include all assumptions used in the calculations. The different variables contained in the calculation to the extent necessary are presented in a time related distribution. Central variables are:
 - Prices and price trends of products sold,
 - Currency exchange rates,
 - Inflation,
 - Requirements in relation to return,



- Oil, gas, condensate and NGL sales (volumes),
- Gas purchases,
- Income from tariffs,
- Investments,
- All operating costs,
- All essential conditions for tax calculations, including assumptions on financing,
- Final disposal,
- Any credits in relation to income, expenses, taxes etc. included in the calculations

10. LOCAL CONTENT STRATEGY

- Engineering and Construction management
- Project management
- Fabrication and Assembly
- Local equipment and material suppliers
- Installation
- Summary

11. Required figures, attachments, enclosures and appendices

FIGURES

1. Regional Map
2. Area map location of block and field
3. Structural elements
4. Bathymetric Map
5. Paleobathymetric and paleoenvironmental summary
6. Depositional environments
7. Core photos
8. Life of field sales forecast
9. Field Location map



10. Infrastructure map
11. Development Schedule
12. Production forecasts
13. Reserves
14. Range of volume per well/ reservoir segment for each development case
15. Key risks, uncertainties and mitigation
16. Drilling acquisition program
17. Fluid properties from gas and water samples
18. Water production profile
19. datum depths, pressures and temperatures
20. Predicted well tubing head pressures
21. Platform location coordinates
22. Platform location soil conditions
23. Predicted emission profile
24. Temperature profile
25. Rig
26. Topsides and pipelines
27. Jacket and Top
28. Local content summary

APPENDICES

1. Well and Seismic data source
2. Reserve static description
3. Reservoir dynamic description
4. Data Acquisition and reservoir surveillance
5. Drilling and Completion basis of designs
 - ◆ Casing
 - ◆ Drilling Fluids
 - ◆ Cementing



- ◆ Bits
 - ◆ Wellhead and Christmas Tree
 - ◆ Completion
6. Well by well SOR's
 7. Depth vs days for each well

ENCLOSURES

1. Seismogram maps of each reservoir
2. Structural maps of each reservoir
3. Amplitude Map
4. Stratigraphic correlation
5. Structural correlation
6. Gross Interval Isopach of each sand
7. Net sand isopach of each sand
8. Net pay isochore of each sand
9. Location of proposed wells and take points

11. OTHER INFORMATION

1. Oil Spill contingency plan – contact MEEI, HSE Division of preparations of an oil spill contingency plan for your area.
2. Hydrogen Sulphide information –
 - ✓ The H₂S information must accompany the development plan document and must contain the following:



- ✓ Classification – whether H₂S present and in what concentrations. Classification of either H₂S present, H₂S absent or H₂S unknown must be stated.
- ✓ Concentration – If present, the estimated amounts that may be encountered during development and/or production
- ✓ H₂S Contingency Plan – If area is classified as H₂S present or unknown, then a contingency plan must be prepared and attached to development plan See appendix 1 – H₂S Contingency Plan for guidelines

5.0 Issuance of Approval

Approval of the Development Plan submitted will be issued by the Contract Management Division within the stipulated time period of 90 days.



Appendix 1 – Ministry of Energy and Energy Industries Hydrogen Sulphide Plan²

In the event that Hydrogen Sulphide is detected a Contingency Plan must be prepared within 20 days of detection.

The Plan must include the following:

1. Sensor Location for Production Operations must be done based on design analysis such as dispersion modelling
2. Calibration of H₂S sensors
3. Respirator and Personal Protective Equipment availability
4. Alternative measures for protection against Sulphur Dioxide (SO₂) if your burn gas containing H₂S.
5. Measurements taken to eliminate the impact of flaring, venting of gas containing H₂S.
6. Highlight all affected areas both manned and unmanned that could be affected by H₂S.

² Source – US Minerals Management Service Gulf of Mexico OCS Region NTL No. 98-16 August 10, 1998 *'Notice to Lessees and operators of Federal Oil, Gas and Sulphur Leases on the outer continental shelf, Gulf of Mexico, OCS Region.'*

