Field Development Planning
An example from Norway

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Introduction

- Legislation

- Development Planning - Field Development Plan
  - why
  - content
  - impact assessment
  - approval procedures
  - authority focus and roles

- Implementation phase
Legislation
Hierarchy of legislation

- The petroleum Act
- Regulations to the petroleum Act
- Guidelines to the petroleum Act and associated regulations
“Production of petroleum shall take place in such a manner that as much as possible of the petroleum in place in each individual petroleum deposit, or in several deposits in combination, will be produced.

The production shall take place in accordance with prudent technical and sound economic principles and in such a manner that waste of petroleum or reservoir energy is avoided.

The licensee shall carry out continuous evaluation of production strategy and technical solutions and shall take the necessary measures in order to achieve this.”
If a licensee decides to develop a petroleum deposit, the licensee shall **submit to the Ministry for approval** a plan for development and operation of the petroleum deposit.

The plan shall contain an account of economic aspects, resource aspects, technical, safety related, commercial and environmental aspects, as well as information as to how a facility may be decommissioned and disposed of when the petroleum activities have ceased.
PDO - Plan for Development and Operation

- A comprehensive document describing the various aspect of a planned field development (the production facilities).

PIO - Plan for Installation and Operation

- A comprehensive document describing the various aspect of the plan for development and operation of facilities for transport and utilisation of petroleum (i.e. pipelines and terminals)
Development Planning
Why PDO?

The overall objective from a governmental point of view is to ensure a:

- real influence with the objective to achieve a maximised added value for society at large;
- qualitative good government approval process; and
- efficient evaluation of the development plan.
Development Planning
Governmental interaction prior to PDO

Objectives

- Ensure that the authorities considerations are smoothly included in the field development during the early planning phase
- Obtain an efficient approval process

Measures

- Perform ”Area-study” (study the effect of the new field development in a broader geographic perspective)
- Gather information by participation in licence committee meetings
- Have an early dialogue with operator
- Make in-house evaluations and investigate alternative solutions/interpretations
- More meetings with operator to influence decisions or clarify questions
Field Development Process
An generic example

Production License (SC equivalent)

Exploration

Discovery
- Evaluation of Concepts incl Impact Assessment Programme

Public Hearing of Impact Assessment Programme

Comments on the Impact Assessment Programme

Production, Flaring and Discharge Permits
- PDO approved by Government/Parliament

PDO evaluated by authorities, IA on public hearing

A PDO is prepared and submitted to Authorities for approval (incl IA)
PDO administrative procedure

- Licensees
  - PDO application

- Ministry of Labour and Social Administration
- Norwegian Petroleum Directorate

- Approval/recommendations

- Ministry of Petroleum and Energy
  - Consultation for comments to Impact Assessment
  - Proposition
    - Consultation for comments
    - Royal Decree

- Government
- Parliament

- Ministries, authorities, other interested parties
- Ministries
Development Planning
Requirement to Submit a PDO

- A PDO is a description of all important aspects of the development (ref Section 4-2 of the Petroleum Activities Act)

- A PDO shall be submitted to the Ministry for approval when a licensee decides to develop a petroleum deposit,

- The Ministry may require an account of the impact on the environment or other affected activities (Impact Assessment)

- Substantial contractual obligations must not be undertaken, nor construction work started, until the PDO has been approved, unless by consent from the Ministry

- On application from the licensee the Ministry may waive the requirement to submit a PDO

- The Ministry shall be notified and approve any significant deviation or alteration of the plan and a new plan may be required
Content of PDO
Document from the Operator

- Appraisal History and Development Studies
- Production Geology
- Reservoir Technology
- Production and Drilling Technology
- Installations and Facilities
- Operations and Maintenance
- Economic Evaluation
- Safety and Environment
- Project Organization and Execution
- Removal of Installations
- Future Development / Area Planning

PDO 12
PDO – Production Geology

- Structural geology
- Stratigraphy and sedimentology
- Petrophysics
- Resource volume estimates
- Estimate uncertainties
PDO evaluation – Geosciences

Objective

- Is the data quality and reservoir interpretation sufficiently matured for a development decision?
- Do we agree with the conclusions in the PDO?

Measures

- Review the work done by the operator
  - meetings and dialog with operator
- Make some in-house evaluations and interpretations
  - based on well- and seismic data, maps, etc.
PDO – Reservoir Technology

- Basic reservoir data
- Production strategy/development scenario
- Reservoir technology
- Reserve estimate
- Production profiles
- Estimate uncertainties
- Additional resources/future IOR measures
- Reservoir management
PDO evaluations – Reservoir technology

Objective is to ensure good reservoir management through:

- selection of an optimal production strategy (max recovery);
- ”gas solution” for oil fields;
- possibilities for acceptable recovery of marginal oil resources in gas fields;
- IOR measures are included in the plans;
- a reliable production profile; and
- correlation between geo-model – reservoir model – production strategy and production facilities.

Measures

- Review the work done by the operator
  - meetings with operator
  - evaluate results from reservoir simulations
  - discuss uncertainties and sensitivities with operator
- Make some in-house evaluations interpretations
  - adjust or build new reservoir model
PDO – Production and Drilling Technology

- Drilling aspects
- Production chemistry aspects
- Well completion aspects
PDO – Installations and Facilities

- Criteria for concept selection
- Production facilities
  - Platform structures
  - Topside arrangements
  - Subsea facilities
  - Process and auxiliary facilities
  - Metering systems
  - Storage and transport systems
- Regularity (equipment “up-time”)
- Constraints/possibilities for tie in of other fields
- Capital cost estimate
PDO evaluations – Technology

Objective to ensure
- Selected concept enable a good reservoir management
- Area-considerations are sufficiently reflected in the concept
- Reliable estimates of cost (CAPEX, OPEX) and schedule
- Metering systems according to regulations
- Environmental “best available techniques”

Measures
- Review the basis for concept selection
  - meetings with operator
  - evaluate process leading up to concept selection
  - discuss issues of concern with operator
- In-house evaluations
PDO – Operation and Maintenance

- Operating principles
- Organisation and manning
- Operating cost
PDO – Economic analysis

- General economic assumptions and evaluation method
  - Oil and gas price assumptions
  - Currency development
  - Tariffs –income and –expenses
  - Net Present Value (NPV) and Internal Rate of Return (IRR)

- Results
  - Pre tax
  - After tax

- Economic uncertainty evaluations
  - High/low oil and gas recovery
  - Higher lower costs (Capex and Opex)
  - Delayed production start-up
PDO – Safety and Environment

Petroleum Safety Authorities (PSA)
- Safety management
- Concept safety
- Working environment
- Emergency preparedness

State Pollution Control Agency
- Permits for emissions and discharges
PDO – Project Organization and Execution

- Development phases
- Milestones
- Project organisation
- Manning
- Quality management
PDO – Impact Assessment (IA)

- The IA should normally include a detailed assessment of the impact on
  - The environment
  - Possible risks of pollution
  - Other affected activities

- The purpose is to ensure that these effects are taken into account
  - Planning for the development
  - Conditions for approval of PDO
  - Decision basis for the authorities

- Process open to the public
  - Relevant parties have a right to express their opinion
Exemption from impact assessment requirement

- Application for exemption to the Ministry
- Relevant for small developments
  - <4,000 bbl oil/day or 500,000 m³ gas/day
  - with no significant impacts on environment or other industries
- Impact assessment duty may already be fulfilled
Authorities’ PDO/PIO process

- **Impact assessment (when required)**
  - Received by the Ministry 2-3 months before submission of the PDO
  - Consultation process with all relevant authorities, institutions and groups

- **PDO/PIO**
  - Received by the Ministry
  - Consultation with
    - Norwegian Petroleum Directorate
    - Ministry of Labour and Social Administration/Petroleum Safety Authority

- **Ministry drafts white paper**
  - Consultation with relevant ministries

- **Proposition submitted for approval**
  - Approval by the Parliament if investments >10 bill. NOK ($1,5 bill)
  - Approval by the King in Council
PDO process –
Roles of the Ministry of Petroleum and Energy

- Receive Impact Assessment review and PDO
- Coordinate evaluation of impact assessment review with
  - several ministries;
  - affected industries; and
  - interests organisations, etc.
- Coordinate evaluation of the PDO from
  - the Norwegian Petroleum Directorate; and
  - other ministries.
- Consider the effect on society as a whole
  - socio – economic evaluations;
  - evaluate the impact on the activity level in offshore and onshore industry; and
  - evaluate the effects on employment.
- Draft Royal Decree or Proposition to the Parliament
PDO process –
Roles of the NPD

- Ensure that the plans are consistent and with conclusions that are thoroughly evaluated and documented
- Ensure that all important aspects of the development are included in the plan, according to acts and regulations
- Focus on areas where there is a difference between what is optimal for the society and what is optimal for the licensees
  - Ensure an acceptable ”gas-solution” for ”oilfields”
  - Ensure good oil recovery for ”gas fields”
  - Coordination between other fields in the same area
  - Utilize existing infrastructure
  - Prepare for 3rd party access
- Make recommendations and provide the best possible basis for decision for Ministry and Parliament/Government
- Document the NPD evaluations in a PDO-evaluation report
- Present conclusions to the Ministry
Exemption from PDO requirement

- Application for exemption to the Ministry
- Relevant for small deposits
  - Close to a deposit with an approved PDO
  - Can be drilled and produced from facilities comprised by a PDO
  - Coordination or unitisation agreements must be in place
  - Modifications should not result in increased risk to people, environment, property or financial interests
  - Satisfactory solution for gas marketing should be in place
  - etc.
Implementation phase
NPD interaction after PDO approval

- Follow-up of conditions in the PDO approval
- Follow-up that safety and working environment are in line with regulations
- Report discrepancies to the Ministry
- Information
  - licensee meetings
  - Ad hoc meetings on project status
Production phase

- Petroleum Act Section 4-4
  Stipulation of production schedule etc.
- The Ministry shall, …, approve the production schedule.
- Burning of petroleum in excess of the quantities needed for normal operational safety shall not be allowed unless approved by the Ministry.
- Upon application from the licensee, the Ministry shall stipulate, for fixed periods of time, the quantity which may be produced, injected or cold vented at all times. … The Ministry shall base this stipulation on the production schedule on which the development plan is based, unless new information on the deposit or other circumstances warrant otherwise.
Production phase (II)

- For oil fields
  - Yearly production permit
- For gas fields
  - Production permits for longer periods (up to field lifetime)

- Prognoses for production including expenses to be reported yearly
- NPD make aggregated prognoses for use in national budget and other planning