Field development and portfolio evaluation
How to achieve acreages?

• Discoveries from exploration

• Buying at an open marked
Corporate’s challenge – to select the best opportunities

Corporate needs to have a “common process” to make the right choices
Resources and reserves

Static information / Recourses (in place)

$$\text{STOIIP} = \text{GRV} \times \text{Porosity} \times \text{So} \times \frac{\text{N/G}}{\text{Bo}}$$

- GRV = Gross Rock Volume
- So = Oil saturation
- N/G = Net out of Gross volume
- Bo = Formation volume factor or shrinkage factor

Dynamic information / Reserves (producible)

Produced volumes = STOIIP * Recovery Factor
Dynamic parameters - equations

- Darcys law \( Q = \frac{-K A (P_b - P_a)}{\text{viscosity} \times L} \)
- Production Index \( \text{PI} = \frac{Q_T}{(P_G - P)} \)

  • The productivity index (PI) takes into account the reservoir characteristics at the inlet of the well, through the specification of a relation between the inlet total flow rate \( Q_T \), the well inlet pressure \( P \) and the reservoir pressure \( P_G \). For a one phase oil well or for a two phase gas-oil homogeneous mixture in the well, the relation is given by:

\[
Q_T = PI(t) \times (P_G - P)
\]
Governning documents

• Link to FR 01 - Exploration

• Link to FR 02 - Field development and IOR

LINK TO ARIS
Technical evaluation and commercial analysis (in all DG processes). All the disciplines involved in an evaluation.
Resourses and reserves

Figur 4.2 Oljedirektoratet si ressursklassifisering
(Kilde: Oljedirektoratet)
The Capital Value Process

The Capital Value Process (CVP) is our stage gate decision process for investment.
Needs for Exploration projects passing DG0

Exploration projects passing DG0 shall demonstrate economic potential for the discovery and that the in-place volume uncertainty has been reduced to a level that it is not the main development risk. The DG0 shall be approved by the receiving business area, based on a recommendation from the Exploration business area.

Required work leading up to DG0:

- When appraisal is needed or warranted:
  - Conduct appraisal activities and evaluate results
  - Evaluate and QC volumes and remaining risks of the discovery. The volume estimates shall be based on the expected discovered recoverable resources with associated ranges (P90-P10) included, and the economics shall be calculated for this case
  - Identify and assess additional prospects and segments that may impact the development concept.
  - For unconventional hydrocarbons this will mean additional subsurface potential in general update the value of the business case
BUSINESS PLANNING (DG1)

The purpose of the business planning phase (leading up to DG1) is to justify further development of the business case, and the establishment of an investment project. Feasibility studies shall demonstrate that one concept is technically, commercially and organizationally feasible, and that value chain fit, economic analysis and relevant stakeholder analysis justify further development.

The business planning phase shall:

- Frame the business case, develop objectives and set direction
- Document that the business case is in line with group strategies
- Identify possible development stoppers
- Demonstrate technical- and economic feasibility
- Identify possible concepts and any added value opportunities
- Identify the needs and potential for new technology
- Identify schedule for regulatory applications
- Align relevant stakeholders around further development
- Establish the decision documents for DG1
CONCEPT PLANNING (DG2)

The purpose of the concept planning phase (leading up to DG2) is to identify alternative concepts, select a viable concept, define and document the selected concept and develop Design basis for approval at DG2.

A concept is described with the following main elements:

- Commercial (e.g. legislation, agreements, licensing, financing, marketing and supply, product sharing, taxes)
- Reservoir or energy resource (e.g. depletion strategy, flow assurance)
- Technical (e.g. drilling & well, facilities)
- Operations (e.g. plant start-up, operation and maintenance)
- The concept shall be selected based on defined criteria in due time prior to DG2.
- The concept planning phase shall:
  - Provide a firm definition of the Design basis
  - Evaluate and compare alternative concepts
  - Screen-out non-viable options and mature the preferred concept to fulfill business case objectives
  - Develop basis for project execution (including identification of applicable permits or regulatory approvals)
  - Align relevant stakeholders around further development
  - Establish the decision documents for DG2
DEFINITION (DG3)

The purpose of the definition phase (leading up to DG3) is to further mature, define and document the business case based on the selected concept for project sanction. Any options or technical solutions not selected prior to DG2 shall be decided prior to DG3.

The definition phase shall:
✓ Execute Front End Engineering Design (FEED) studies
✓ Mature the business case to avoid late project changes
✓ Plan and prepare the execution phase
✓ Prepare submittal of application(s) to the authorities
✓ Establish the basis for agreement (e.g. contract) awards
EXECUTION (DG4)

The purpose of the execution phase (leading up to DG4) is to realize the business case.

The execution phase shall:

- Detail design, procure, construct (including install) and complete the agreed facilities and wells
- Perform handover to Asset / operations
- Prepare for start-up, operation and maintenance
- Establish Termination agreement
High exploration activity

• Brynhild well finalised August 2010
• Late 2010/2011:
  - 4 planned exploration wells (Dougal, McHenry, Dr. No, Theta NE)
  - 2 exploration extension wells
  - Possible Beta Vest appraisal
• 2012, possible candidates
  - Pinky/Dunkel, Olga, Fanten, Carmen*
• 2013, possible candidates
  - Langemann, Brynhild Sør, Slogen, Mju
Value drivers

Are there any critical time drivers?

Do we understand the commercial issues?

Do we know the strategic issues?
Infrastructure

• Are there alternative tie-in hosts?
• Do we know the capacity in tie-in host?
• Weight and space available on the platform
• Fluid compatibility - quality
• Competition with other projects
• Commercial issues
• Unitization and redetermination
Project plan

- Manning (capacity, competence and project continuity)
- Time schedule
- Partner alignment
- Authority alignment / PDO
- Is there a need to apply for a deviation from governing documents
Database

• Seismic quality and coverage
• Formation fluids
• Core samples (what is present and what is needed, and for which purpose)
• Wells / Log information; available and needed
• Dynamic data available and needed
• Special studies, Mineralogy, SCAL, Rel/perm, biostrat, geochemistry, LFP etc; available and / or needed
Producibility vs appraisal program

• Do we have analogue production experience?
• Are we fully aware of the drive mechanisms?
• Do we know enough to understand the mechanical strength of the reservoir rocks?
• Is there a need to introduce unconventional methods, and which consequences does that make?
• Do we have a «disposal» strategy? (cuttings, water, CO2)
• Etc.
Standard equipment / facility

- “Claes Olsson” prospects and fields
- Problematic HPHT fields (Technology and HSE elements)
- Complicated flow assurance (Infra structure)
- Need for heavy boosting (Facility robustness)
Well – cost / benefit discussions

• In case of only one well; Will it be a need for a more comprehensive sampling program?

• Cores and or image-logs

• Dynamic test information (consider how long the test needs to be)

• Planned side track(s)

• Overburden information (Vs og Vp, seal integrity, potential for waste / deposal of produced water, CO2 and cuttings)

• Evaluation of 4D potential (for reservoir monitoring)
Reservoir characterization and modelling

Regional/conceptual geological understanding?

*Is there a need for a 3D model? If yes!*
Testing of dynamic flow in reservoirs – controlling questions

- Why do we do dynamic fluid testing in wells?
- When should we plan for dynamic tests?
- What are the constrains we have to face, in doing good dynamic tests?
- What kind of testing tools and programs do we use?
- What can we read from dynamic tests and what are the pit faults?
- Where can I find raw data and interpretations of dynamic tests?
- Why is geology an important basis, for understanding test results?
- Who are the specialists and when should I contact one of them?
There’s never been a better time for good ideas