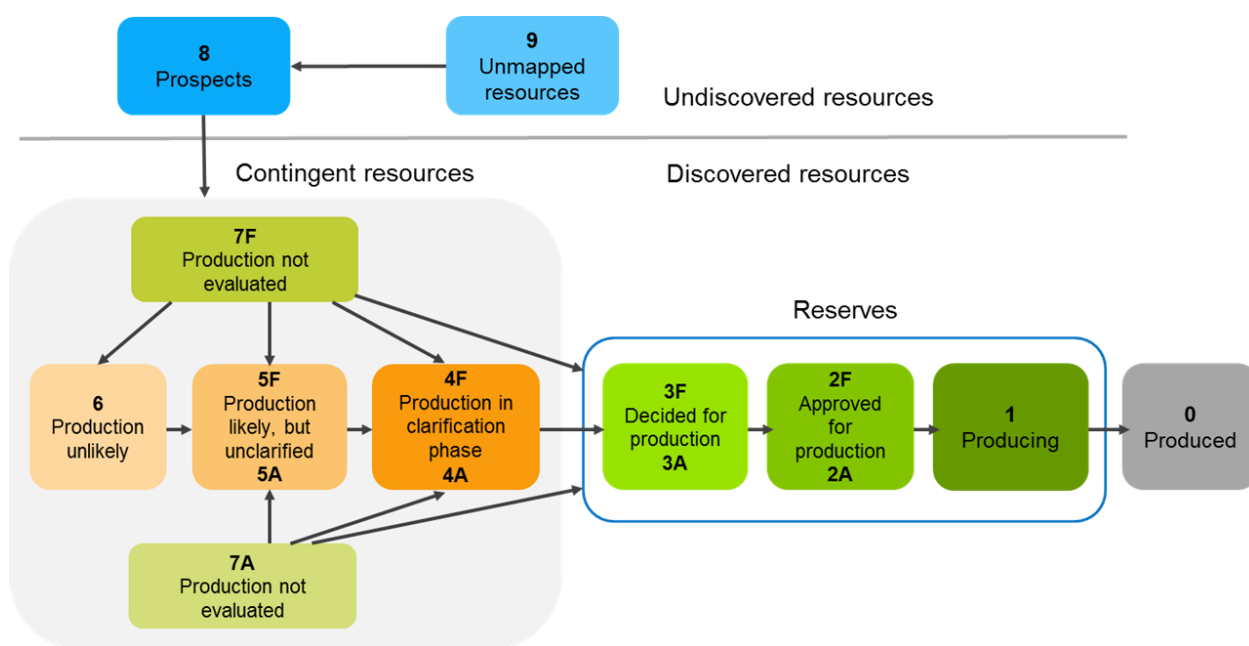




NORWEGIAN PETROLEUM
DIRECTORATE



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The Norwegian Petroleum Directorate's resource classification system 2016

Organisational unit:	Team
Analysis and framework	Resource accounts and forecasts (RoP)
Management involvement	
Approved by A&R management	
Quality assurance	
Internal consultation in expert networks and resource persons	
Comment	
<p>The resource class division is the same as for the 2001 system, but the description has changed. Updated due to new Regulations relating to resource management in the petroleum activities; in force January 1 2018.</p> <p>The work has been performed by a work group in NPD consisting of Tom Andersen, Maren Bjørheim, Per Blystad, Jan Bygdevoll and Kjell Reidar Knudsen.</p>	

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1 Introduction

Management of the petroleum resources on the continental shelf is an important task for the authorities. One of the Norwegian Petroleum Directorate's (NPD's) primary objectives is to maintain an overview of the overall petroleum resources so that the authorities have the best possible basis for planning measures to ensure good resource management and for forecasting future production and activity.

Standardised and functional classification of the resources is an essential prerequisite for:

- Framing international energy and minerals policy
- Authorities' resource management
- Industry's planning activities
- Financial analyses and allocation of capital

Use of the classification system is founded on Section 19 of the Regulations relating to resource management in the petroleum activities (Resource Management Regulations)

Section 19. Classification of petroleum resources on the Norwegian continental shelf

The petroleum resources shall be classified in accordance with the resource classification system of the Norwegian Petroleum Directorate.

<http://www.npd.no/en/Regulations/Regulations/Resource-management-regulations/>

The originally recoverable petroleum resources shall be classified according to their position in the development chain from a discovery is made, or a new effort to increase the recoverable resources of a field is identified, and up to the point when the resources have been produced. A discovery or a field may have resources of several classes. All petroleum resources shall to the extent possible be designated by P10 - P expected - P90.

While the needs for classification vary, the industry and the authorities have increasingly seen a need in recent years to develop systems that are more equal. Both parties also need systems that can link relevant information such as costs, investments and emissions/discharge of different components to the classified petroleum volumes.

This document is a revision of the NPD's document from 2001; however, it is emphasised that the actual division into resource classes has not been changed from the original document from 2001.

1.1 History and background

In 1996, the Norwegian Petroleum Directorate developed a classification system that uses project maturity as a basis for classification. This makes it possible to link different types of information (production, costs and environmental data) and provides flexibility, which has proven to be very useful for the NPD's purposes. In 2000, the World Petroleum Congress (WPC), Society of Petroleum Engineers (SPE) and American Association of Petroleum Geologists (AAPG) published a classification system (the SPE system) which covered total petroleum resources. This system presented an

opportunity for comprehensive classification, but without including project maturity as a key element in the classification. In 2001, the NPD in cooperation with the oil companies, further developed its classification system from 1996 based on experience gained through use. The revised system was a further development of the maturity principle in the 1996 system, and closer aligned to the SPE system.

After 2001, the SPE system has been updated and expanded. It was replaced as from 2007 by the Petroleum Resource Management System (hereinafter referred to as "PRMS"). PRMS is maintained by SPE and supported by WPC, AAPG, the Society of Petroleum Evaluation Engineers (SPEE) as well as the Society of Exploration Geophysicists (SEG).

Project maturity is the explicit basis for the classification in PRMS. The similarity between the NPD's classification system and PRMS is thus stronger than before.

The United Nations' resource classification system, which was developed after 2001, the United Nations Framework for Fossil and Mineral Reserves and Resources (hereinafter referred to as "UNFC-2009") is also of great significance for the work on resource classification and resource management. As indicated by the name, this is a classification system that includes fossil energy; coal and petroleum, as well as minerals, including uranium and thorium. The classification system can also be used on renewable resources and for projects for CO₂ injection for geological storage. UNFC-2009 is a generic, principled system where volumes are classified based on three fundamental criteria: Economic and social sustainability, project status and feasibility, and geological knowledge.

Converting resource numbers from other systems to UNFC-2009 may take place through a "bridging document" developed for PRMS and CRISCO, or directly to UNFC-2009. In the latter case, the alignment to UNFC-2009 must be demonstrated through a detailed mapping, and by development of a separate bridging document. This is a comprehensive process that also requires acceptance from UNECE.

The NPD has also presented the resource accounts for the Norwegian continental shelf in accordance with UNFC-2009 ([link](#)) by using the PRMS bridging document. In the future, the NPD will present the annual resource accounts both in accordance with its own classification system and with UNFC-2009. For users of the NPD's classification system, the overview will be useful if one wishes to use, or gain familiarity with UNFC-2009.

2 Basis for classification

The NPD's resource classification system is used for petroleum reserves and resources on the Norwegian shelf. The system is designed to ensure that the authorities get a coherent reporting from the licensees in connection with the NPD's annual updates of the resource accounts for estimated recoverable resources.

A key term in the classification system is 'project'. The NPD does not have an inherent definition of the term, but applies the PRMS' definition in this context:

A project represents the link between the petroleum accumulation and the decision-making process, including budget allocation. A project may, for example, constitute the development of a single reservoir or field, or an incremental development in a producing field, or the integrated development of a group of several fields and associated facilities with a common ownership. In general, an individual project will represent a specific maturity level at which a decision is made on whether or not to proceed (i.e., spend money), and there should be an associated range of estimated recoverable resources for that project.

There are a number of decision milestones in the maturation of a project. These milestones are partly incorporated as terms and conditions in (newer) production licenses on the Norwegian continental shelf, and are referred to in the PDO/PIO guidelines (not applicable to BOI).

Decision to initiate project - BOI: Start of feasibility studies.

Decision to concretise - BOK : Milestone where the licensees have identified at least one technically and financially feasible concept that provides a basis for commencing studies that lead to concept selection.

Decision to continue - BOV: Milestone where the licensees decide to continue studies for one concept that leads to a Decision to Implement.

Decision to implement – BOG: Milestone where the licensees make an investment decision which results in submission of a PDO or PIO.

The outcome of all of these milestones could be a decision to take the project to the next phase and continue work. However, the decision could also be to shelve or postpone the project, or possibly to re-start the work with a different set of preconditions. In all instances, the classification will reflect relevant project maturation. Figure 1 below shows the connection between project maturation and resource classes including a short description of the main activity in the phase leading up to the different milestones.

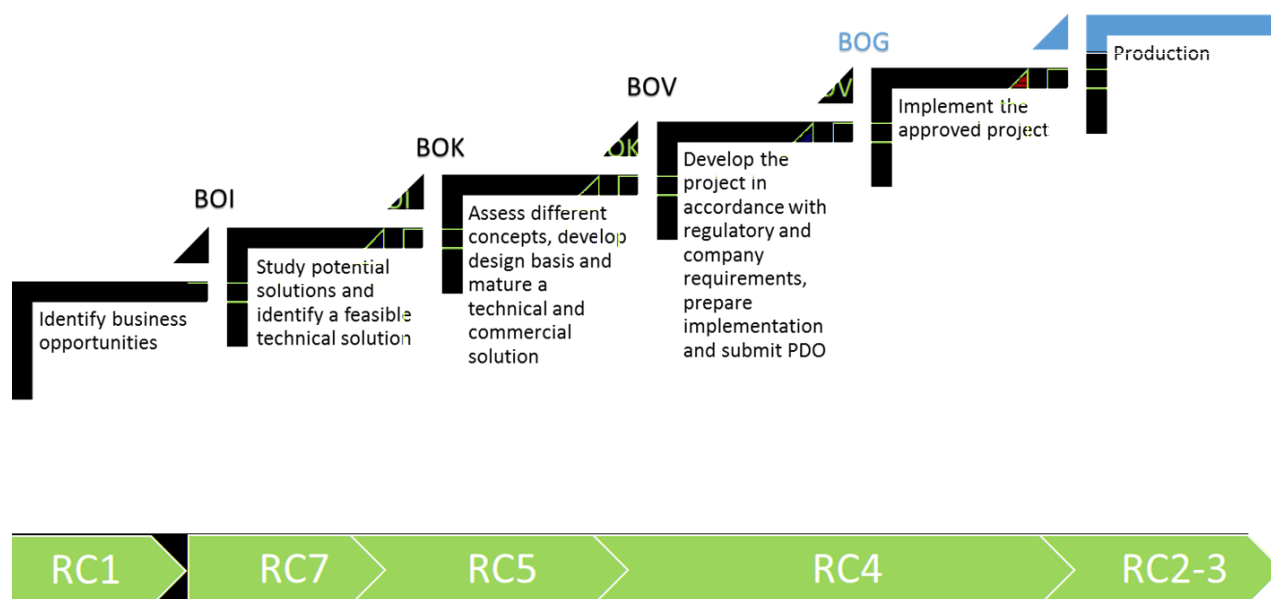


Figure 1 The connection between project maturation and resource classes

3 Classes and sub-classes

The petroleum resources are divided into classes that reflect knowledge concerning the petroleum volumes and the maturity of the development project. The classes largely correspond with those used in internationally recognised classification systems, such as PRMS 2007 and UNFC 2009.

These classes are

- Reserves
- Contingent resources
- Undiscovered resources

Reserves and contingent resources comprise the total discovered recoverable resources. Sub-classes are defined in order to make it possible to divide the resources in a manner that reflects the status prior to and after important decision milestones in the process of maturing the project up to development and recovery (production).

In an effort to retain the link to customary terms used in Norway, we choose to align the (Norwegian) term 'Resource Class', abbreviated as 'RC', with the term 'Sub-class'.

An overview of classes, associated sub-classes, project categories and uncertainty categories is shown in Table 1 and Figure 2 below, and these are defined in Chapter 5.

A combination of Resource Class (RC1, RC2 ...) and project category (F, A) is used where this is relevant. Uncertainty category is not used to define classes, but to indicate the uncertainty in the estimates.

Class	Resource Class (Sub-class)	Resource Class Code	Project category	Uncertainty - category
	Produced	RC0		
Reserves	In production	RC1		L, B, H
	Approved for production	RC2	F, A	L, B, H
	Decided for production	RC3	F, A	L, B, H
Contingent resources	Production in clarification phase	RC4	F, A	L, B, H
	Production likely, but not clarified	RC5	F, A	L, B, H
	Production unlikely	RC6		L, B, H
	Production not evaluated	RC7	F, A	L, B, H
Undiscovered resources	Prospects	RC8		L, B, H
	Unmapped resources	RC9		L, B, H

Table 1 Overview of classes, resource classes (sub-classes), project categories and uncertainty categories

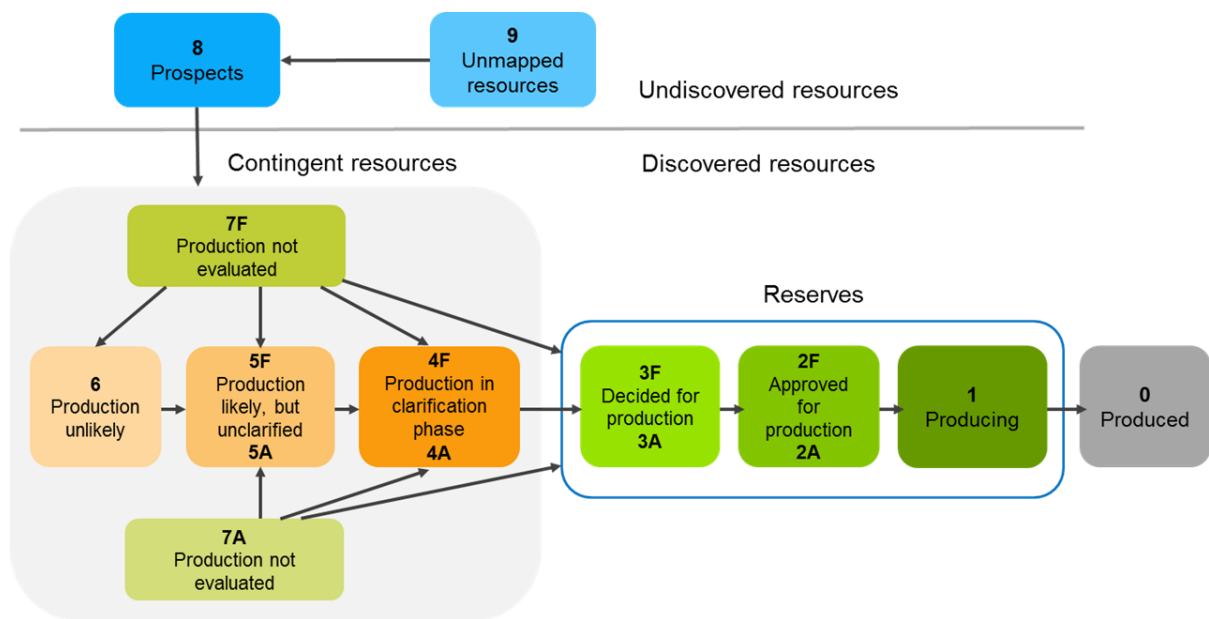


Figure 2 Schematic overview of the NPD's classification system

4 Regulatory requirements

In accordance with Section 50a of the Petroleum Regulations, the operators must submit data to the national budget process.

"The reporting must include extensive financial company data, projects, resource volumes and forecasts for production, costs and environmental emissions as specified by the recipient."

The guideline to the National Budget process states that reporting must conform to the NPD's resource classification.

5 Definition of sub-classes and supplementary explanations

Class	Code	Resource Class (Sub-class)	Definition	Explanation
		Produced	Petroleum that has been produced and sold.	<p>The resource class comprises volumes that have been produced for sale from fields in production and fields that have been shut down.</p> <p>Petroleum that has been delivered free of charge or as compensation to another party is not regarded as having been sold. If this volume is subsequently sold, this will be included in RC 0 from the other party.</p> <p>Produced volumes are not considered reserves, but are used to estimate original reserves.</p>
Reserves	RC1	In production	Remaining recoverable and marketable petroleum volumes in projects that have started production.	<p>Includes petroleum that is expected to be sold from fields that have started producing.</p> <p>Also includes remaining petroleum volumes in fields that are temporarily shut down.</p> <p>Volumes that have been purchased and are expected to be sold at a later date shall not be included. Petroleum that was received free of charge, or as compensation from another party and that is expected to be sold at a later date, shall be included in this classification.</p>
	RC2	Approved for production	Recoverable and marketable petroleum volumes in projects that are approved, but have not yet started production.	<p>Mainly comprises petroleum in fields that are under development and have an approved PDO or PDO exemption</p> <p>For operational fields, major projects (e.g. further development under a new or changed PDO) <u>shall</u> be included here as a separate project.</p> <p>Optimisation within approved plans, such as measures for improved recovery that were adopted by the licensees but have not been implemented, can be classified as separate projects and be included in this resource class.</p>
	RC3	Decided for production	Recoverable and marketable petroleum volumes in projects that the licensees have decided to implement, but without the necessary authority approvals	<p>Projects that have been given the go-ahead by the licensees, but do not yet have the authorities' PDO approval or a PDO exemption.</p> <p>The project must be reported in this resource class when implementation (BOG) of the project has been decided by the licensees.</p> <p>This resource class also contains additions from deposits that are not covered by an already approved PDO for fields with resources in RC 1 and 2, if the implementation decision (BOG) has been made and authority approval is required.</p> <p>This resource class is also used for petroleum volumes in fields that will be sold at a later date without substantial investments, but where the production schedule has not yet been approved by the authorities. This is mainly gas that, when recovered early, will reduce the opportunities for optimal oil production.</p>

Table 2 Classes and sub-classes (part1)

Class	Code	Resource Class (Sub-class)	Definition	Explanation
Contingent resources	RC4	Production in clarification phase	Recoverable petroleum volumes from projects in the planning phase, where concrete activity is ongoing to clarify how to execute production.	The project must be reported in this resource class when a decision to concretise (BOK) has been made, and up to the decision to implement (BOG).
	RC5	Production likely, but not resolved	Recoverable petroleum volumes from projects where production is likely, but not resolved.	The project must be reported in this resource class when a decision to initiate project (BOI) (Start of feasibility studies) has been made, and up to the decision to concretise (BOK).
	RC6	Production is unlikely	Discovered petroleum volumes in discoveries where, even in the long term, profitable production is not expected.	This category contains petroleum volumes that are considered too small to be relevant for production, or that require considerable changes in technology, change in access to infrastructure, significantly higher price expectations, etc., in order to ensure profitable recovery.
	RC7	Production not evaluated	Recoverable petroleum volumes in immature projects that only have a preliminary resource estimate.	Applies to discoveries where a discovery evaluation report has not yet been prepared, or that are considered too immature to be moved to another RC for other reasons. Also includes petroleum volumes in potential projects to increase the recovery in fields and discoveries that already have resources in more mature resource classes. The projects are moved from this RC when a decision to initiate project BOI is made, or when the project is shelved.
Undiscovered resources	RC8	Prospect	Estimated, but unproven recoverable petroleum volumes in mapped prospects.	The prospects have an associated discovery probability that describes the possibility of proving petroleum volumes upon drilling. Risk-weighted estimates that represent calculated petroleum volumes multiplied by the discovery probability for each prospect are used for aggregation.
	RC9	Unmapped resources	Estimated, but unproven recoverable petroleum volumes associated with geological plays.	Plays contain potential petroleum volumes associated with leads, as well as the number of prospects that can be mapped in the future (postulated prospects). Resource estimates reflect estimated amounts multiplied by the discovery probability.

Table 3 Classes and sub-classes (part 2)

Project-category	Definition	Explanation
F	First development project for a deposit	<p>A project is classified as project category F (First) when it is the first development project for one or more deposits. Used for projects in RC 2,3,4,5 and 7.</p> <p>Projects with additional resources in new deposits in fields/discoveries must also be classified as F (First) when inclusion of the resources will increase the petroleum volumes in place in the field/discovery.</p> <p>Projects must have a PDO or PDO exemption.</p>
A	Project to optimise the recovery from a deposit	<p>A project is classified as project category A (Additional) when recoverable petroleum volumes associated with the project lead to improved recovery of petroleum in place (increased recovery rate) in deposits that are in production or with projects classified as F (First). Used in RC 2, 3, 4, 5 and 7.</p> <p>The resource volumes in A projects may be negative in some instances, for example, when improved oil recovery requires gas injection, or where improved recovery entails an accelerated production. Also includes projects that can extend production by reducing costs.</p>

Table 4 Project categories ¹

¹ Project categories are not used for projects in RC 0, 1, 6, 8 and 9.

Uncertainty category	Definition	Explanation
Low estimate (L)	Low estimate of petroleum volumes that are expected to be recovered from a project.	<p>The low estimate must be lower than the base estimate. The probability of being able to recover the indicated estimate or more must be shown (e.g. P90).</p> <p>Compared with the base estimate, the low estimate should express potential negative changes with regard to mapping of the reservoir, reservoir/fluid parameters and/or recovery rate.</p>
Base estimate (B)	Best estimate of petroleum volumes that are expected to be recovered from a project.	<p>The base estimate must reflect the current understanding of the scope, properties and recovery rate of the reservoir. The base estimate will be calculated using a deterministic or stochastic method. If the base estimate was calculated using a stochastic method, the base estimate shall be stated as the expected value.</p>
High estimate (H)	High estimate of petroleum volumes that are expected to be recovered from a project.	<p>The high estimate must be higher than the base estimate. The probability of being able to recover the indicated estimate or more must be shown (e.g. P10).</p> <p>Compared with the base estimate, the high estimate should express potential positive changes with regard to mapping of the reservoir, reservoir/fluid parameters and/or recovery rate</p>

Table 5 *Uncertainty categories*

6 Definitions

6.1 Definitions in Section 1-6 of the Act of 29 November 1996, No. 72 relating to petroleum activities [the Petroleum Act]

Petroleum deposit

An accumulation of petroleum in a geological unit, limited by rock characteristics by structural or stratigraphic boundaries, contact surface between petroleum and water in the formation, or a combination of these, so that all the petroleum comprised is in pressure communication through liquid or gas throughout. In cases of doubt, the Ministry will determine what shall be regarded as a petroleum deposit.

Recovery/Production

Production of petroleum, including drilling of production wells, injection, assisted/improved recovery, treatment and storage of petroleum for transport, and shipment of petroleum for transport by ship, as well as the construction, placing, operation and use of a facility for the purpose of production.

6.2 Definitions from Section 2 of the Regulations relating to resource management in the petroleum activities (Resource Management Regulations).

Discovery

one petroleum deposit, or several petroleum deposits together, which have been discovered in the same wellbore and in which testing, sampling or logging has established the probability of the existence of mobile petroleum. (The term discovery includes both commercial and technical discovery).

Field

a petroleum deposit, or several petroleum deposits together, that are covered by an approved Plan for Development and Operation (PDO) or has been granted an exemption from the PDO requirement.

Prospect

a possible petroleum trap with a mappable, delimited reservoir rock volume.

Potential prospect (Lead)

a potential petroleum trap where the extent and quality of available data is insufficient for mapping or delimitation of the reservoir rock volume.

6.3 Other definitions

Reserves

comprise the remaining, recoverable, marketable petroleum resources which the licensees have decided to develop and for which the authorities have approved a PDO or have granted exemption

from the PDO requirement. Reserves also comprise petroleum resources which the licensees have decided to develop but for which the authorities have not yet approved a PDO or granted a PDO exemption.

Comment:

In connection with resource classification, reserves include petroleum volumes in RC 1, 2 and 3.

Resources

all estimated volumes of petroleum.

Resources originally in place

volumes of petroleum, which have been mapped according to geological methods, and which according to geological and reservoir engineering methods have been estimated to be present in a deposit. The estimate shall indicate volumes at market conditions.

Comment:

Gas originally in place is divided into free gas and associated gas (dissolved in oil). Associated fluid originally in place means components dissolved in gas that will change into a liquid phase during the relevant/planned processing. Oil resources originally in place are often called STOOIP (Stock Tank Oil Original In Place) and correspondingly, gas resources originally in place are called GOIP (Gas Original In Place). Resources originally in place are not classified.

Recovery factor

the ratio between the recoverable volume of petroleum from a petroleum deposit and the volume of petroleum originally in place in the deposit.

Originally recoverable petroleum volumes:

Total, marketable volumes of petroleum, from production start until production has ceased, based on the applicable estimate of volumes in place and recovery factor.

Reference point for reserves

The reference point for reserves is the point for transfer of ownership or requirements related to produced petroleum volumes from a licensee to another party. When the licensee transfers produced resources to its own operations, the reference point is regarded as being the point where transfer to another party would naturally have taken place. Examples of such points are the point for transfer to another production licence, or the first point where a sale at arm's length terms to another party can take place.

Supplementary resources

Supplementary resources includes recoverable resources that may increase the reserves/resources in a field/discovery through increasing the resources in place. This normally applies to deposits that are not covered by an approved PDO for a field, or included in the current plans for development of a discovery, and that are located in the same production licences. Supplementary resources are classified as F (First) in the classification system.

Contingent resources

Petroleum resources that are proven but a production decision has not yet been made.

Undiscovered resources

The volumes of petroleum that are estimated to potentially be recovered from deposits that have not yet been proven through drilling

Discovery probability

Describes the possibility of proving petroleum in a prospect through drilling. The discovery probability is determined as the product of the probabilities of the existence of the play, presence of reservoir, of trap, of migration of petroleum into the trap and of storage of petroleum in the trap (see play).

Improved recovery

Measures that improve the production result compared with original plans. This can take place through producing a larger share of the volumes in place, and/or that they are produced at a lower cost or faster. The volumes from improved recovery can appear both positive and negative. For example, use of gas to increase oil reserves will reduce the gas reserves.

Historic production

Historic production is the total production of petroleum for delivery and sale from a field. Historic production refers to a point in time, usually the last turn of the year.

Play

A play is a geographically and stratigraphically delineated area where a specific set of geological factors are present, so that petroleum could form in recoverable volumes. These factors are reservoir rocks, trap, mature source rock and migration paths, and that the trap was formed before the migration of petroleum stopped. All discoveries, prospects, leads and postulated prospects within the same play are characterised by the play's specific set of geological factors.