

































**Production**

The cumulative quantity of *petroleum* that has been recovered at a given date. [*COGE Handbook*]

Recovering, gathering, treating, field or plant processing (for example, processing *gas* to extract *natural gas liquids*) and field storage of *oil* and *gas*.

The *oil* production function is usually regarded as terminating at the outlet valve on the *lease* or field production storage tank. The *gas* production function is usually regarded as terminating at the plant gate. In some circumstances, it may be more appropriate to regard the production function as terminating at the first point at which *oil*, *gas* or their by-products are delivered to a main pipeline, a common carrier, a refinery or a marine terminal.

**Production costs (or Operating costs)**

Costs incurred to operate and maintain wells and related equipment and facilities, including applicable *operating costs of support equipment and facilities* and other costs of operating and maintaining those wells and related equipment and facilities.

Lifting costs become part of the cost of *oil* and *gas* produced.

Examples of *production costs* are:

- (a) costs of labour to operate the wells and related equipment and facilities;
- (b) costs of repairs and maintenance;
- (c) costs of materials, supplies and fuel consumed, and supplies utilized, in operating the wells and related equipment and facilities;
- (d) costs of workovers;
- (e) *property* taxes and insurance costs applicable to *properties* and wells and related equipment and facilities; and
- (f) taxes, other than income and capital taxes.

**Professional organization**

A self-regulatory organization of engineers, geologists, other geoscientists or other professionals whose professional practice includes *reserves evaluations* or *reserves audits*, that:

- (a) admits members primarily on the basis of their educational qualifications;
- (b) requires its members to comply with the professional standards of competence and ethics prescribed by the organization that are relevant to the estimation, *evaluation*, *review* or *audit* of *reserves*



- data;*
- (c) has disciplinary powers, including the power to suspend or expel a member; and
- (d) is either:
  - (i) given authority or recognition by statute in a *jurisdiction* of Canada; or
  - (ii) accepted for this purpose by the *securities regulatory authority* or the *regulator*. [NI 51-101]

**Project**

A defined activity, or set of activities, that provides the basis for the assessment and classification of *resources*. [COGE Handbook]

**Project Evaluation Scenario Status**

The degree to which the project scenario has been developed. Three levels of development are identified - conceptual, pre-development, and development. For additional information, see section 2.4.7 Recovery Project Evaluation Scenario Status in section 2 of volume 2 of the *COGE Handbook*. (See also *conceptual (scoping) study*, *pre-development study*, and *development study*.) [COGE Handbook]

**Project Maturity Sub-Classes for Contingent Resources**

See also *development unclarified*, *development pending*, *development on hold*, and *development not viable*. [COGE Handbook]

**Property**

Includes:

- (a) fee ownership or a *lease*, concession, agreement, permit, licence or other interest representing the right to extract *oil* or *gas* subject to such terms as may be imposed by the conveyance of that interest;
- (b) royalty interests, *production* payments payable in *oil* or *gas*, and other non-operating interests in *properties* operated by others; and
- (c) an agreement with a foreign government or authority under which a *reporting issuer* participates in the operation of *properties* or otherwise serves as "producer" of the underlying *reserves* (in contrast to being an *independent purchaser*, broker, dealer or importer).

A *property* does not include supply agreements, or contracts that represent a right to purchase, rather than extract, *oil* or *gas*.

**Property acquisition costs**

Costs incurred to acquire a *property* (directly by purchase or *lease*, or indirectly by acquiring another corporate entity with an interest in the *property*), including:

- (a) costs of *lease* bonuses and options to purchase or *lease* a *property*;

- (b) the portion of the costs applicable to *hydrocarbons* when land including rights to *hydrocarbons* is purchased in fee;
- (c) brokers' fees, recording and registration fees, legal costs and other costs incurred in acquiring *properties*.

***Prospect***

A geographic or stratigraphic area, in which the *reporting issuer* owns or intends to own one or more *oil* and *gas* interests, which is geographically defined on the basis of geological data and which is reasonably anticipated to contain at least one *reservoir* or part of a *reservoir* of *oil* and *gas*.

***Prospective resources***

Those quantities of *petroleum* estimated, as of a given date, to be potentially recoverable from undiscovered *accumulations* by application of future development projects.

Prospective resources have both an associated *chance of discovery* and a *chance of development*. [*COGE Handbook*]

***Prospective resources data***

Means

- (a) an estimate of the volume of *prospective resources*, and
- (b) the *risked* net present value of *future net revenue* of *prospective resources*; [*NI 51-101*]

***Proved property***

A *property* or part of a *property* to which *reserves* have been specifically attributed.

***Proved reserves***

See Part 2 of this Glossary. [*COGE Handbook*]

***Qualified reserves auditor***

An individual who:

- (a) in respect of particular *reserves data*, *resources* or related information, possesses professional qualifications and experience appropriate for the estimation, *evaluation*, *review* and *audit* of the *reserves data*, *resources* and related information; and
- (b) is a member in good standing of a *professional organization*. [*NI 51-101*]

***Qualified reserves evaluator***

An individual who:

- (a) in respect of particular *reserves data*, *resources* or related information, possesses professional qualifications and experience appropriate for the estimation, *evaluation* and *review* of the *reserves data*, *resources* and related information; and
- (b) is a member in good standing of a *professional organization*. [*NI 51-101*]

<b>Qualified reserves evaluator or auditor</b>	A <i>qualified reserves evaluator</i> or a <i>qualified reserves auditor</i> . [NI 51-101]
<b>Recovery process analogue</b>	A recovery process that is an <i>established technology</i> or <i>technology under development</i> in the <i>analogue reservoir</i> that can be applied to the subject <i>reservoir</i> being evaluated. [COGE Handbook]
<b>Recovery technology status</b>	See <i>established technology</i> , <i>technology under development</i> , and <i>experimental technology</i> . [COGE Handbook]
<b>Refinery</b>	A refinery (depending on the processes in the facility) can use different <i>crude oils</i> , conventional (unprocessed) or synthetic (already <i>upgraded</i> once) including <i>heavy crude oil</i> and <i>bitumen</i> , to make final products for the market or specialized products for further processing, like petrochemicals. [COGE Handbook]
<b>Regulator</b>	The <i>securities regulatory authority</i> or a person who holds a specified position with the <i>securities regulatory authority</i> (in several instances, its Executive Director or Director) in each <i>jurisdiction</i> . [NI 14-101]
<b>Reporting issuer</b>	(a) A " <i>reporting issuer</i> " as defined in <i>securities legislation</i> ; or (b) in a <i>jurisdiction</i> in which the term is not defined in <i>securities legislation</i> , an issuer of securities that is required to file financial statements with the <i>securities regulatory authority</i> .
<b>Reservation</b>	In relation to a report on <i>reserves data</i> or <i>resources</i> (if applicable), a modification of the standard report of an <i>independent qualified reserves evaluator or auditor</i> on <i>reserves data</i> or <i>resources</i> set out in <i>Form 51-101F2</i> , caused by a departure from the <i>COGE Handbook</i> or by a limitation in the scope of work that the <i>independent qualified reserves evaluator or auditor</i> considers necessary. A modification may take the form of a qualified or adverse opinion or a denial of opinion.
<b>Reserves</b>	See Part 2 of this Glossary. [COGE Handbook]
<b>Reserves data</b>	Estimates of <i>proved reserves</i> and <i>probable reserves</i> and related <i>future net revenue</i> estimated using <i>forecast prices</i> and <i>costs</i> . [NI 51-101]
<b>Reservoir</b>	A subsurface rock unit that contains an <i>accumulation of petroleum</i> . [COGE Handbook]
<b>Reservoir Analogue</b>	A <i>reservoir</i> with similar rock properties (lithological, depositional,

diagenetic, and structural), fluid properties (*hydrocarbon* type, composition, density, and viscosity), *reservoir* conditions (depth, temperature, and pressure) and drive mechanisms that can be used as a model for the subject *reservoir* being evaluated. [*COGE Handbook*]

**Resource Type** Describes the *accumulation* and is determined by the combination of the type of *hydrocarbon* and the rock in which it occurs. For additional information, see section 2.1.3 Resource Types of section 2 of volume 2 of the *COGE Handbook*. [*COGE Handbook*]

**Resources** *Petroleum* quantities that originally existed on or within the earth's crust in naturally occurring *accumulations*, including discovered and undiscovered (recoverable and *unrecoverable*) plus quantities already produced. *Total resources* is equivalent to *total petroleum initially-in-place*. [*COGE Handbook*]

**Review** In relation to the role of a *qualified reserves evaluator or auditor* in respect of *reserves data*, steps carried out by the *qualified reserves evaluator or auditor*, consisting primarily of enquiry, analytical procedures, analysis, review of historical *reserves* performance and discussion with *reserves* management staff related to a *reporting issuer's reserves data*, with the limited objective of assessing whether the *reserves data* is "plausible" in the sense of appearing to be worthy of belief based on the information obtained by the *qualified reserves evaluator or auditor* as a result of carrying out such steps. Examination of documentation is not required unless the information does not appear to be plausible.

A *reserves* review, due to the limited nature of the investigation involved, does not provide the level of assurance provided by a *reserves audit*. Although *reserves* reviews can be done for specific applications, they are not a substitute for an *audit*. [*COGE Handbook*]

**Risked** Adjusted for the probability of loss or failure in accordance with the *COGE Handbook*. [*NI 51-101*]

**SEC** The Securities and Exchange Commission of the United States of America. [*NI 14-101*]

**Securities legislation** The statute (in most cases entitled the "Securities Act") and subordinate legislation (in most cases including regulations or rules) specified, for each *jurisdiction*, in *NI 14-101*.

References in *NI 51-101* to *securities legislation* are to be read as references to *securities legislation* in the particular *jurisdiction*.

**Securities regulatory authority** The securities commission or comparable body specified, for each *jurisdiction*, in *NI 14-101*.

References in *NI 51-101* to the *securities regulatory authority* are to be read as references to the *securities regulatory authority* in the particular *jurisdiction*.

**SEDAR** The System for Electronic Document Analysis and Retrieval referred to in National Instrument 13-101 *System for Electronic Document Analysis and Retrieval (SEDAR)*.

**Service well** A well drilled or completed for the purpose of supporting *production* in an existing *field*. Wells in this class are drilled for the following specific purposes: *gas* injection (*natural gas*, propane, butane or flue *gas*), water injection, steam injection, air injection, salt-water disposal, water supply for injection, observation, or injection for combustion.

**Shale gas** *Natural gas*:

- (a) contained in dense organic-rich rocks, including low-permeability shales, siltstones and carbonates, in which the *natural gas* is primarily adsorbed on the kerogen or clay minerals, and
- (b) that usually requires the use of hydraulic fracturing to achieve economic production rates. [*NI 51-101*]

**Solution gas** *Gas* dissolved in *crude oil*.

**Stratigraphic test well** A drilling effort, geologically directed, to obtain information pertaining to a specific geologic condition. Ordinarily, such wells are drilled without the intention of being completed for *hydrocarbon production*. They include wells for the purpose of core tests and all types of expendable holes related to *hydrocarbon* exploration.

*Stratigraphic test wells* are classified as

- (a) "exploratory type" if not drilled into a proved *property*; or

- (b) "development type", if drilled into a proved *property*. Development type stratigraphic wells are also referred to as "evaluation wells".

***Sub-economic contingent resources***

Those *contingent resources* that are not currently economically recoverable. There should be a reasonable expectation of a change in economic conditions within the near future that will result in them becoming economically viable. [*COGE Handbook*]

***Support equipment and facilities***

Equipment and facilities used in *oil and gas activities*, including seismic equipment, drilling equipment, construction and grading equipment, vehicles, repair shops, warehouses, supply points, camps, and division, district or field offices.

***Supporting filing***

A document filed by a *reporting issuer* with a *securities regulatory authority*. [*NI 51-101*]

***Synthetic crude oil***

A mixture of liquid *hydrocarbons* derived by upgrading *bitumen*, *kerogen* or other substances such as coal, or derived from *gas* to liquid conversion and may contain sulphur or other compounds. [*NI 51-101*]

***Synthetic gas***

A gaseous fluid

- (a) generated as a result of the application of an in-situ transformation process to coal or other *hydrocarbon*-bearing rock; and
- (b) comprised of not less than 10% by volume of methane. [*NI 51-101*]

***Technical contingency***

A technical issue that must be resolved to allow the *commercial* application of a recovery process technology to a specific *reservoir*. [*COGE Handbook*]

***Technology under development***

A recovery process that has been determined to be technically viable via field test and is being field tested further to determine its economic viability in the subject *reservoir*. *Contingent resources* may be assigned if the *project* provides information that is sufficient and of a quality to meet the requirements for this *resource class*. (Note: this replaces the definition in the *COGE Handbook* volume 1, Appendix A - Glossary. [*COGE Handbook*])

***Tight Oil***

*Crude oil*

- (a) contained in dense organic-rich rocks, including low-permeability shales, siltstones and carbonates, in which the *crude oil* is primarily contained in microscopic pore spaces that are poorly connected to one another, and

- (b) that typically requires the use of hydraulic fracturing to achieve economic *production* rates. [NI 51-101]

<b><i>Total petroleum initially-in-place</i></b>	<p>That quantity of <i>petroleum</i> that is estimated to exist originally in naturally occurring <i>accumulations</i>.</p> <p>It includes that quantity of <i>petroleum</i> that is estimated, as of a given date, to be contained in <i>known accumulations</i>, prior to <i>production</i>, plus those estimated quantities in <i>accumulations</i> yet to be discovered. [COGE Handbook]</p>
<b><i>Total resources</i></b>	<p>Refer to <i>total petroleum initially-in-place</i> as both terms are equivalent. [COGE Handbook]</p>
<b><i>Total volume (m<sup>3</sup>): bitumen in-place (m<sup>3</sup>) (TV:BIP)</i></b>	<p>The ratio of the total volume of material under consideration for mining to the total contained <i>bitumen</i> within the ore component of that volume. The in-place <i>bitumen</i> content is derived exclusively from the component model blocks or zones, which have been determined to be <i>ore</i>, through an <i>ore-waste</i> discrimination process. [COGE Handbook]</p>
<b><i>Undeveloped reserves</i></b>	<p>See Part 2 of this Glossary. [COGE Handbook]</p>
<b><i>Undiscovered petroleum initially-in-place</i></b>	<p>That quantity of <i>petroleum</i> that is estimated, on a given date, to be contained in <i>accumulations</i> yet to be discovered.</p> <p>The recoverable portion of <i>undiscovered petroleum initially-in-place</i> is referred to as <i>prospective resources</i>; the remainder is <i>unrecoverable</i>. [COGE Handbook]</p>
<b><i>Undiscovered resources</i></b>	<p>Refer to <i>undiscovered petroleum initially-in-place</i> as both terms are equivalent. [COGE Handbook]</p>
<b><i>Undiscovered unrecoverable petroleum initially-in-place</i></b>	<p>That portion of <i>undiscovered petroleum initially-in-place</i> which is estimated, as of a given date, not to be recoverable by future development <i>projects</i>.</p> <p>A portion of these quantities may become recoverable in the future as <i>commercial</i> circumstances change or technological developments occur; the remaining portion may never be recovered due to the physical/chemical constraints represented by subsurface interaction of fluids and <i>reservoir</i> rocks. [COGE Handbook]</p>
<b><i>Undiscovered unrecoverable resources</i></b>	<p>Refer to <i>undiscovered unrecoverable petroleum initially-in-place</i> as both terms are equivalent.</p>
<b><i>Unproved property</i></b>	<p>A <i>property</i> or part of a <i>property</i> to which no <i>reserves</i> have been specifically attributed.</p>

***Unrecoverable*** That portion of discovered or undiscovered *petroleum initially-in-place* quantities which is estimated, as of a given date, not to be recoverable by future development *projects*. A portion of these quantities may become recoverable in the future as commercial circumstances change or technological developments occur; the remaining portion may never be recovered due to the physical/chemical constraints represented by subsurface interaction of fluids and *reservoir* rocks. [*COGE Handbook*]

***Upgrader*** An upgrader is a facility that processes either *heavy crude oil* or *bitumen* into products that can either flow without diluent being added or other blends of *crude* with properties that are now desirable in a typical *refinery*. Many different blends can be made at an upgrader for the final user. One of the most common (sweet synthetic) is the premium *crude*, which is made from a blend of treated naphtha, kerosene (distillate) and gas oil. This product has been sold in the market place since the late 1960s. It is also possible to make untreated blends of upgraded *crude oils* and final products like diesel fuel. Typically, gasoline is not made at an upgrader. [*COGE Handbook*]

***Upgrading*** Upgrading is a term used to describe the process of changing the structure or improving the quality of a *heavy crude oil* or *bitumen* to allow either further use as a final product or feedstock to a *refinery*. Typically, *heavy oils* and *bitumen* contain large amounts of asphaltenes, metals, sulphur, and nitrogen components. Removal of these components or impurities will usually result in a higher price for the upgraded *oil*.

Constituents like asphaltenes are long chain aromatic ring type hydrocarbons that are prone to coking (a term which results in these long chain molecules breaking and then rejoining to form even longer chain molecules), which will plug or foul equipment and catalyst. [*COGE Handbook*]

***U.S. federal securities laws*** The federal statutes of the United States of America concerning the regulation of securities markets and trading in securities and the regulations, rules, forms and schedules under those statutes, all as amended from time to time. [*NI 14-101*]



## **PART 2      DEFINITIONS OF *RESERVES***

This Part is derived from Section 5 of Volume 1 of the *COGE Handbook* (Second Edition, September 1, 2007). Consult a current edition of the *COGE Handbook* for updates and for additional explanation and guidance.

The following *reserves* definitions and guidelines are designed to assist evaluators in making *reserves* estimates on a reasonably consistent basis, and assist users of evaluation reports in understanding what such reports contain and, if necessary, in judging whether evaluators have followed generally accepted standards.

The guidelines outline

- general criteria for classifying *reserves*,
- procedures and methods for estimating *reserves*,
- confidence levels of individual entity and aggregate *reserves* estimates,
- verification and testing of *reserves* estimates.

The determination of *oil* and *gas reserves* involves the preparation of estimates that have an inherent degree of associated uncertainty. Categories of *proved*, *probable*, and *possible reserves* have been established to reflect the level of these uncertainties and to provide an indication of the probability of recovery.

The estimation and classification of *reserves* requires the application of professional judgement combined with geological and engineering knowledge to assess whether or not specific *reserves* classification criteria have been satisfied. Knowledge of concepts including uncertainty and risk, probability and statistics, and deterministic and probabilistic estimation methods is required to properly use and apply *reserves* definitions. These concepts are presented and discussed in greater detail within the guidelines in Section 5.5 [of the *COGE Handbook*].

The following definitions apply to both estimates of individual *reserves* entities and the aggregate of *reserves* for multiple entities.

### **Reserves Categories**

*Reserves* are estimated remaining quantities of *oil* and *natural gas* and related substances anticipated to be recoverable from *known accumulations*, as of a given date, based on

- analysis of drilling, geological, geophysical and engineering data;
- the use of established technology;
- specified economic conditions, which are generally accepted as being reasonable, and shall be disclosed.

*Reserves* are classified according to the degree of certainty associated with the estimates.

- (a) **Proved reserves** are those *reserves* that can be estimated with a high degree of certainty to be recoverable. It is likely that the actual remaining quantities recovered will exceed the estimated *proved reserves*.
- (b) **Probable reserves** are those additional *reserves* that are less certain to be recovered than *proved reserves*. It is equally likely that the actual remaining quantities recovered will be greater or less than the sum of the estimated *proved* plus *probable reserves*.
- (c) **Possible reserves** are those additional *reserves* that are less certain to be recovered than *probable reserves*. It is unlikely that the actual remaining quantities recovered will exceed the sum of the estimated *proved* plus *probable* plus *possible reserves*.

Other criteria that must also be met for the classification of *reserves* are provided in [Section 5.5.4 of the *COGE Handbook*].

### **Development and Production Status**

Each of the *reserves* categories (*proved*, *probable* and *possible*) may be divided into *developed* and *undeveloped* categories:

- (a) **Developed reserves** are those *reserves* that are expected to be recovered from existing wells and installed facilities or, if facilities have not been installed, that would involve a low expenditure (e.g., when compared to the cost of drilling a well) to put the *reserves* on *production*. The *developed* category may be subdivided into producing and non-producing.

**Developed producing reserves** are those *reserves* that are expected to be recovered from completion intervals open at the time of the estimate. These *reserves* may be currently producing or, if shut-in, they must have previously been on *production*, and the date of resumption of *production* must be known with reasonable certainty.

**Developed non-producing reserves** are those *reserves* that either have not been on *production*, or have previously been on *production* but are shut-in and the date of resumption of *production* is unknown.

- (b) **Undeveloped reserves** are those *reserves* expected to be recovered from *known accumulations* where a significant expenditure (e.g., when compared to the cost of drilling a well) is required to render them capable of *production*. They must fully meet the requirements of the *reserves* category (*proved, probable, possible*) to which they are assigned.

In multi-well pools it may be appropriate to allocate total pool *reserves* between the *developed* and *undeveloped* categories or to subdivide the *developed reserves* for the pool between *developed producing* and *developed non-producing*. This allocation should be based on the estimator's assessment as to the *reserves* that will be recovered from specific wells, facilities, and completion intervals in the pool and their respective development and *production* status.

#### **Levels of Certainty for Reported Reserves**

The qualitative certainty levels referred to in the definitions above are applicable to “individual *reserves* entities”, which refers to the lowest level at which *reserves* calculations are performed, and to “reported *reserves*”, which refers to the highest level sum of individual entity estimates for which *reserves* estimates are presented. Reported *reserves* should target the following levels of certainty under a specific set of economic conditions:

- at least a 90 percent probability that the quantities actually recovered will equal or exceed the estimated *proved reserves*;
- at least a 50 percent probability that the quantities actually recovered will equal or exceed the sum of the estimated *proved plus probable reserves*; and
- at least a 10 percent probability that the quantities actually recovered will equal or exceed the sum of the estimated *proved plus probable plus possible reserves*.

A quantitative measure of the certainty levels pertaining to estimates prepared for the various *reserves* categories is desirable to provide a clearer understanding of the associated risks and uncertainties. However, the majority of *reserves* estimates are prepared using deterministic methods that do not provide a mathematically derived quantitative measure of probability. In principle, there should be no difference between estimates prepared using probabilistic or deterministic methods.

Additional clarification of certainty levels associated with *reserves* estimates and the effect of aggregation is provided in Section 5 [of the *COGE Handbook*].

## Questions

Please refer questions to any of the following:

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