

DEFINITIONS OF OIL AND GAS RESOURCES AND RESERVES

The Companion Policy to National Instrument 51-101 *Standards of Disclosure for Oil and Gas Activities* sets out, in Part 2 of Appendix 1, the reserves definitions derived from Section 5 of Volume 1 of the Canadian Oil and Gas Evaluation Handbook (COGEH).

To further assist users of NI 51-101, Section 5 of Volume 1 of the COGEH, "Definitions of Resources and Reserves", is attached. (The Society of Petroleum Evaluation Engineers, Calgary Chapter has given the Alberta Securities Commission, and users of the Alberta Securities Commission's website, authority to reproduce or transmit Section 5 of Volume 1 of the COGEH.)

The COGEH itself can be obtained from the Petroleum Society of the Canadian Institute of Mining, Metallurgy and Petroleum, Calgary Chapter at www.petsoc.org.

SECTION 5
DEFINITIONS OF RESOURCES AND RESERVES

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5.1 Introduction

In February 2000, resources definitions were approved and published by the Society of Petroleum Engineers (SPE), World Petroleum Congress (WPC), and American Association of Petroleum Geologists (AAPG). These definitions are endorsed by this Handbook and are subject to review and further development.

The total oil and gas estimated to have originally existed in the earth's crust in naturally occurring accumulations is defined as original resources. Further breakdown of the original resources is depicted in Figures 5-1, 5-2, and 5-3 and described in this section. Original resources comprise discovered and undiscovered resources; in each of these, some are recoverable and some are unrecoverable.

The discovered recoverable resources are referred to as ultimate reserves — cumulative production plus future production (reserves). The discovered unrecoverable resources are divided into contingent resources, which are technically recoverable but not economic, and unrecoverable resources, which are neither technically recoverable nor economic.

The undiscovered future recoverable resources are simply future production and are referred to as prospective resources, which are technically recoverable and economic. The undiscovered unrecoverable resources are neither technically recoverable nor economic.

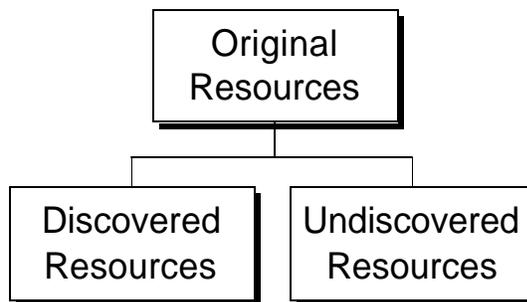


Figure 5-1 Original Resources.

Any estimation of resources or reserves for a hydrocarbon accumulation or group of accumulations is subject to both technical and economic uncertainties, and should be quoted as a range. In the case of reserves, the range of uncertainty is reflected in estimates for proved reserves, proved + probable reserves, and proved + probable + possible reserves. For resources, low estimate, best estimate, and high estimate categories are recommended. These categories represent conservative, realistic, and optimistic estimates for both reserves and resources, and are illustrated in Figures 5-4

and 5-5. As noted on each figure, the estimates of reserves and resources are mutually exclusive and must not be aggregated.

Specific definitions of resources and reserves are given in the following sections. Detailed guide lines for the estimation of each category follow each section.

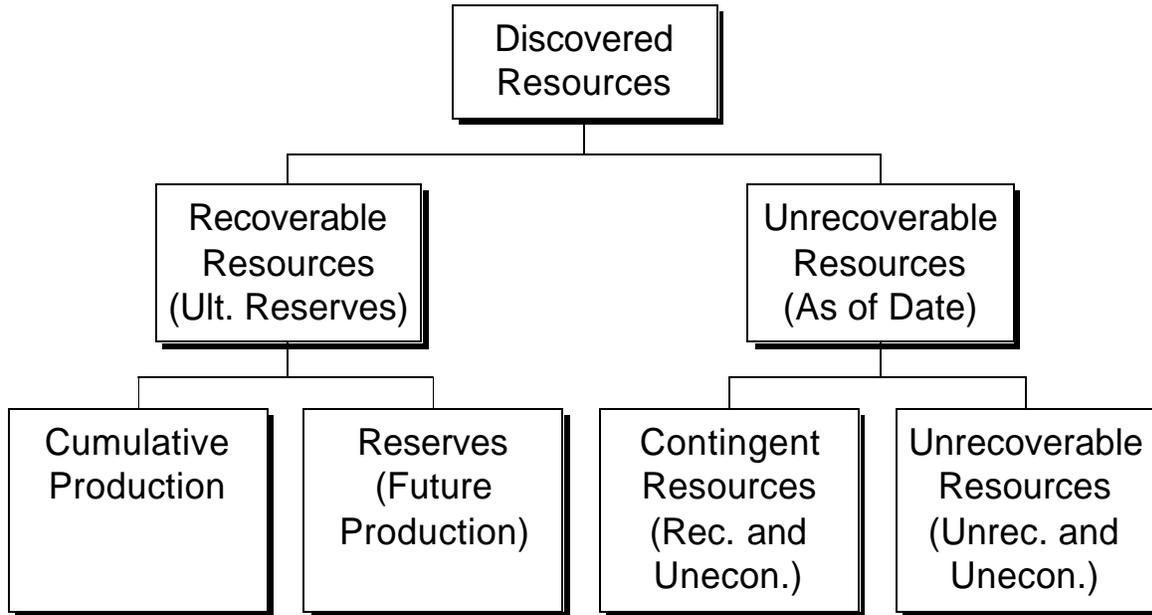


Figure 5-2 Discovered Resources.

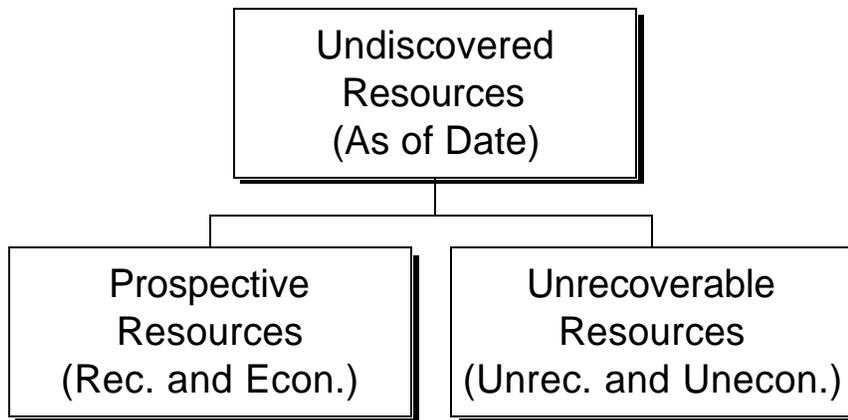


Figure 5-3 Undiscovered Resources.

5.2 Definitions of Resources

The following definitions rely in part on the “Petroleum Resources Classification and Definitions” (2000) published in draft by the Society of Petroleum Engineers (SPE) and World Petroleum Congress (WPC).

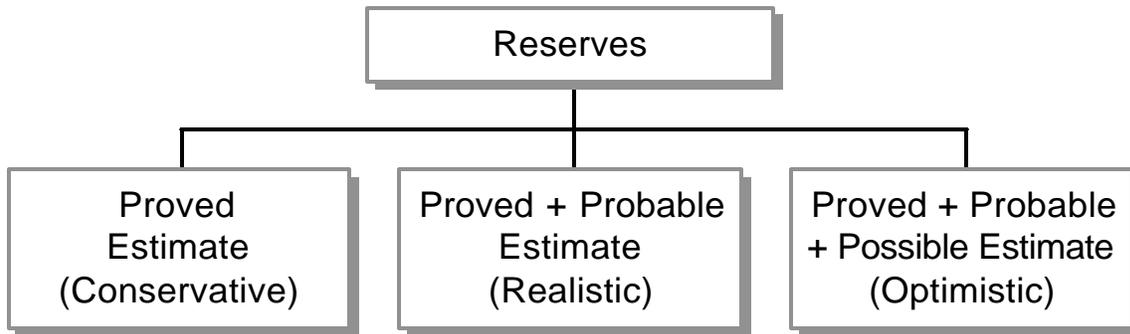


Figure 5-4 Reserves. Each reserves estimate (proved, proved + probable, proved + probable + possible) is mutually exclusive and must not be aggregated.

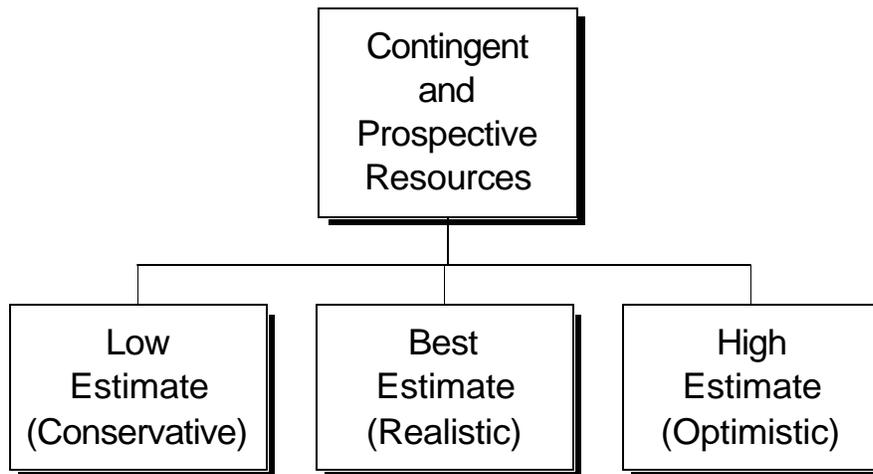


Figure 5-5 Contingent and Prospective Resources. Each resources estimate (low, best, and high) is mutually exclusive and must not be aggregated.

5.2.1 Original Resources

Original resources are those quantities of oil and gas estimated to exist originally in naturally occurring accumulations. They are, therefore, those quantities estimated on a given date to be remaining in known accumulations plus those quantities already produced from known accumulations plus those quantities in accumulations yet to be discovered. Original resources are divided into discovered and undiscovered resources, with discovered resources limited to known accumulations.

5.2.2 Discovered Resources

Discovered resources are those quantities of oil and gas estimated on a given date to be remaining in, plus those quantities already produced from, known accumulations. Discovered resources are divided into economic and uneconomic categories, with the estimated future recoverable portion classified as reserves and contingent resources, respectively.

a. Reserves

Those quantities of oil and gas anticipated to be economically recoverable from discovered resources are classified as reserves (see Section 5.4).

Estimated recoverable quantities from known accumulations that are not economic are classified as contingent resources. The definition of economic for an accumulation will vary according to local conditions of prices, costs, and operating circumstances and is left to the discretion of the country or company concerned. Nevertheless, reserves must be classified according to the definitions. In general, quantities must not be classified as reserves unless there is an expectation that the accumulation will be developed and placed on production within a reasonable timeframe.

In certain circumstances, reserves can be assigned to known accumulations even though development might not occur for some time. For example, fields might be dedicated to a long-term supply contract and will only be developed when they are needed to satisfy that contract.

b. Contingent Resources

Contingent resources are defined as those quantities of oil and gas estimated on a given date to be potentially recoverable from known accumulations but are not currently economic. Contingent resources include, for example, accumulations for which there is currently no viable market.

5.2.3 Undiscovered Resources

Undiscovered resources are defined as those quantities of oil and gas estimated on a given date to be contained in accumulations yet to be discovered. The estimated potentially recoverable portion of undiscovered resources is classified as prospective resources.

a. Prospective Resources

Prospective resources are defined as those quantities of oil and gas estimated on a given date to be potentially recoverable from undiscovered accumulations. They are technically viable and economic to recover.

5.2.4 Discovered and Undiscovered Unrecoverable Resources

Unrecoverable resources, whether discovered or undiscovered, are neither technically possible nor economic to produce. They represent quantities of petroleum that are in the reservoir after commercial production has ceased, and in known and unknown accumulations that are not deemed recoverable due to lack of technical and economic recovery processes.

5.2.5 Resources Categories

Due to the high uncertainty in estimating resources, evaluations of these assets require some type of probabilistic method. Expected value concepts and decision tree analyses are routine; however, in high-risk, high-reward projects, Monte Carlo simulation can be used. In any event, three success cases plus a failure case should be included in the evaluation of the resources. See Section 9 for details on these methods.

a. Classification of Resources

When evaluating resources, in particular contingent and prospective resources, the following mutually exclusive categories are recommended:

- **Low Estimate:** This is considered to be a conservative estimate of the quantity that will actually be recovered from the accumulation. If probabilistic methods are used, this term reflects a P_{90} confidence level.
- **Best Estimate:** This is considered to be the best estimate of the quantity that will actually be recovered from the accumulation. If probabilistic methods are used, this term is a measure of central tendency of the uncertainty distribution (most likely/mode, P_{50} /median, or arithmetic average/mean.)
- **High Estimate:** This is considered to be an optimistic estimate of the quantity that will actually be recovered from the accumulation. If probabilistic methods are used, this term reflects a P_{10} confidence level.

5.3 General Guidelines for Estimation of Resources

(IN PROGRESS)

5.4 Definitions of Reserves

The following definitions and guidelines have been prepared by the Standing Committee on Reserves Definitions of the CIM (Petroleum Society) after many years of consultations and deliberations. These definitions and guidelines must be used by qualified evaluators when evaluating and reporting oil and gas reserves and related substances.

The definitions and guidelines are designed to assist

- evaluators in making reserves estimates on a reasonably consistent basis;
- 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.

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

5.4.1 Reserves Categories

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

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

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 + probable reserves.

c. Possible Reserves

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 + probable + possible reserves.

Other criteria that must also be met for the categorization of reserves are provided in Section 5.3.2.

5.4.2 Development and Production Status

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

a. Developed Reserves

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

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

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

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 classification (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.

5.4.3 Levels of Certainty for Reported Reserves

The qualitative certainty levels contained in the definitions in Section 5.4.1. 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 + probable reserves;
- at least a 10 percent probability that the quantities actually recovered will equal or exceed the sum of the estimated proved + probable + 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 will be 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 5.5.3.

5.5 General Guidelines for Estimation of Reserves

The following is a summary of fundamental guidelines that should be followed by reserves evaluators. These general guidelines provide guidance that should aid in improving consistency in reserves reporting, but provide only a brief summary of the issues that may arise in applying the reserves definitions. Although more detailed guidelines are being developed, it must be recognized that reserves definitions and associated guidelines cannot address all possible scenarios, nor can they remove the conditions of uncertainty that are inherent in all reserves estimates. It is the responsibility of the reserves evaluator to exercise sound professional judgement and apply these guidelines appropriately and objectively.

5.5.1 Uncertainty in Reserves Estimation

Reserves estimation has characteristics that are common to any measurement process that uses uncertain data. An understanding of statistical concepts and the associated

terminology is essential to understanding the confidence associated with reserves definitions and categories.

Uncertainty in a reserves estimate arises from a combination of error and bias:

- Error is inherent in the data that are used to estimate reserves. Note that the term “error” refers to limitations in the input data, not to a mistake in interpretation or application of the data. The procedures and concepts dealing with error lie within the realm of statistics and are well established.
- Bias, which is a predisposition of the evaluator, has various sources that are not necessarily conscious or intentional.

In the absence of bias, different qualified evaluators using the same information at the same time should produce reserves estimates that will not be materially different, particularly for the aggregate of a large number of estimates. The range within which these estimates should reasonably fall depends on the quantity and quality of the basic information, and the extent of analysis of the data.

5.5.2 Deterministic and Probabilistic Methods

Reserves estimates may be prepared using either deterministic or probabilistic methods.

a. Deterministic Method

The deterministic approach, which is the one most commonly employed worldwide, involves the selection of a single value for each parameter in the reserves calculation. The discrete value for each parameter is selected based on the estimator’s determination of the value that is most appropriate for the corresponding reserves category.

b. Probabilistic Method

Probabilistic analysis involves describing the full range of possible values for each unknown parameter. This approach typically consists of employing computer software to perform repetitive calculations (e.g., Monte Carlo simulation) to generate the full range of possible outcomes and their associated probability of occurrence.

c. Comparison of Deterministic and Probabilistic Estimates

Deterministic and probabilistic methods are not distinct and separate. A deterministic estimate is a single value within a range of outcomes that could be derived by a

probabilistic analysis. There should be no material difference between Reported Reserves estimates prepared using deterministic and probabilistic methods.

d. Application of Guidelines to the Probabilistic Method

The following guidelines include criteria that provide specific limits to parameters for proved reserves estimates. For example, volumetric estimates are restricted by the lowest known hydrocarbon (LKH). Inclusion of such specific limits may conflict with standard probabilistic procedures, which require that input parameters honour the range of potential values.

Nonetheless, it is required that the guidelines be met regardless of analysis method. Accordingly, when probabilistic methods are used, constraints on input parameters may be required in certain instances. Alternatively, a deterministic check may be made in such instances to ensure that aggregate estimates prepared using probabilistic methods do not exceed those prepared using a deterministic approach including all appropriate constraints.

5.5.3 Aggregation of Reserves Estimates

Reported Reserves typically comprise the aggregate of estimates prepared for a number of individual wells, reservoirs, and/or properties/fields.

When deterministic methods are used, Reported Reserves will be the simple arithmetic sum of all estimates within each reserves category. Evaluators and users of reserves information must understand the effect of summation on the probabilities of estimates. The probability associated with the arithmetic sum for a number of individual estimates is different from that of each of the individual estimates. Arithmetic summation of independent high probability estimates will result in a total with a higher probability; arithmetic summation of low probability estimates will yield a total with a lower probability.

As the definitions and guidelines require a conservative approach in the estimation of proved reserves, the minimum probability target for proved Reported Reserves will be satisfied with a deterministic approach as long as there are enough independent entity estimates in the aggregate. Where a very small number of entities dominate in the Reported Reserves, a specific effort to meet the probability criteria may be required in preparing deterministic estimates of proved reserves. Since proved + probable reserves prepared by deterministic methods will approximate mean values, the probability associated with the estimates will essentially be unaffected by aggregation.

When probabilistic techniques are used in reserves estimation, statistically based mathematical aggregation is performed within the probabilistic model. It is critical that such models appropriately include all dependencies between variables and components within the aggregation. Where dependencies and specific criteria contained in the guidelines have been treated appropriately, reserves for the various categories would be defined by the minimum probability requirements contained in Section 5.3.1, subject to the following considerations.

Reported Reserves for a company will typically not be the aggregate results from a single probabilistic model, since reserves estimates are used for a variety of purposes including planning, reserves reconciliation, accounting, securities disclosure, and asset transactions. These uses will generally necessitate tabulations of reserves estimates at lower aggregation levels than the total Reported Reserves. For these reasons and due to the lack of general acceptance of probabilistic aggregation up to the company level, reserves should generally not be aggregated probabilistically beyond the field (or property) level.

Statistical aggregation of a tabulation of values, which does not result in a straightforward arithmetic addition, is not accepted for most reporting purposes. Consequently, discrete estimates for each reserves category resulting from separate probabilistic analyses, which may, as appropriate, include aggregation up to the field level, should be summed arithmetically. As a result, Reported Reserves will meet the probability requirements in Section 5.4.3 regardless of dependencies between separate probabilistic analyses, and may be summed with deterministic estimates within each reserves category.

It is recognized that the foregoing approach imposes an additional measure of conservatism when proved reserves are derived from a number of probabilistic analyses since the sum of independent 90 percent probability estimates has greater than 90 percent probability. Nonetheless, this is considered to be an acceptable consequence given the need for a discrete accounting of component proved reserves estimates.

Conversely, this approach will cause the sum of proved + probable + possible reserves derived from a number of probabilistic analyses to fail to meet the 10 percent minimum probability requirement. Given the limited application for proved + probable + possible Reported Reserves, this is also considered to be an acceptable consequence.

5.5.4 General Requirements for Classification of Reserves

The following general conditions must be satisfied in the estimation and classification of reserves.

a. Drilling Requirements

Proved, probable, or possible reserves may be assigned only to known accumulations that have been penetrated by a wellbore. Potential hydrocarbon accumulations that have not been penetrated by a wellbore may be classified as prospective resources.

b. Testing Requirements

Confirmation of commercial productivity of an accumulation by production or a formation test is required for classification of reserves as proved. In the absence of production or formation testing, probable and/or possible reserves may be assigned to an accumulation on the basis of well logs and/or core analysis that indicate that the zone is hydrocarbon bearing and is analogous to other reservoirs in the immediate area that have demonstrated commercial productivity by actual production or formation testing.

c. Economic Requirements

Proved, probable, or possible reserves may be assigned only to those volumes that are economically recoverable. The fiscal conditions under which reserves estimates are prepared should generally be those which are considered to be a reasonable outlook on the future. If required by securities regulators or other agencies, constant or other prices and costs also may be used. In any event, the fiscal assumptions used in the preparation of reserves estimates must be disclosed.

Undeveloped recoverable volumes must have a sufficient return on investment to justify the associated capital expenditure in order to be classified as reserves, as opposed to contingent resources.

d. Regulatory Considerations

In general, proved, probable, or possible reserves may be assigned only in instances where production or development of those reserves is not prohibited by governmental regulation. This provision would, for instance, preclude the assignment of reserves in designated environmentally sensitive areas. Reserves may be assigned in instances where regulatory restraints may be removed subject to satisfaction of minor conditions. In such cases, the classification of reserves as proved, probable, or

possible should be made with consideration given to the risk associated with project approval.

5.5.5 Procedures for Estimation and Classification of Reserves

The process of reserves estimation falls into three broad categories: volumetric, material balance, and decline analysis. Selection of the most appropriate reserves estimation procedures depends on the information that is available. Generally, the range of uncertainty associated with an estimate decreases and confidence level increases as more information becomes available, and when the estimate is supported by more than one estimation method. Regardless of the estimation method employed, the resulting reserves estimate should meet the certainty criteria in Section 5.4.

a. Volumetric Methods

Volumetric methods involve the calculation of reservoir rock volume, the hydrocarbons in place in that rock volume, and the estimation of the portion of the hydrocarbons in place that ultimately will be recovered. For various reservoir types at varied stages of development and depletion, the key unknown in volumetric reserves determinations may be rock volume, effective porosity, fluid saturation, or recovery factor. Important considerations affecting a volumetric reserves estimate are outlined below:

- **Rock Volume:** Rock volume may simply be determined as the product of a single well drainage area and wellbore net pay or by more complex geological mapping. Estimates must take into account geological characteristics, reservoir fluid properties, and the drainage area that could be expected from the well or wells. Consideration must be given to any limitations indicated by geological, geophysical data or interpretations, as well as pressure depletion or boundary conditions exhibited by test data.
 - **Elevation of Fluid Contacts:** In the absence of data that clearly define fluid contacts, the structural interval for volumetric calculations of proved reserves should be restricted by the lowest known structural elevation of occurrence of hydrocarbons (LKH) as defined by well logs, core analyses, or formation testing.
- **Effective Porosity, Fluid Saturation and Other Reservoir Parameters:** These are determined from logs and core and well test data.
- **Recovery Factor:** Recovery factor is based on analysis of production behaviour from the subject reservoir, by analogy with other producing

reservoirs and/or by engineering analysis. In estimating recovery factors, the evaluator must consider factors that influence recoveries, such as rock and fluid properties, hydrocarbons in place, drilling density, future changes in operating conditions, depletion mechanisms, and economic factors.

b. Material Balance Methods

Material balance methods of reserves estimation involve the analysis of pressure behaviour as reservoir fluids are withdrawn, and generally result in more reliable reserves estimates than volumetric estimates. Reserves may be based on material balance calculations when sufficient production and pressure data are available. Confident application of material balance methods requires knowledge of rock and fluid properties, aquifer characteristics, and accurate average reservoir pressures. In complex situations, such as those involving water influx, multi-phase behaviour, multi-layered, or low permeability reservoirs, material balance estimates alone may provide erroneous results.

Computer reservoir modelling can be considered a sophisticated form of material balance analysis. While modelling can be a reliable predictor of reservoir behaviour, the input rock properties, reservoir geometry, and fluid properties are critical. Evaluators must be aware of the limitations of predictive models when using these results for reserves estimation.

The portion of reserves estimated as proved, probable, or possible should reflect the quantity and quality of the available data and the confidence in the associated estimate.

c. Production Decline Methods

Production decline analysis methods of reserves estimation involve the analysis of production behaviour as reservoir fluids are withdrawn. Confident application of decline analysis methods requires a sufficient period of stable operating conditions after the wells in a reservoir have established drainage areas. In estimating reserves, evaluators must take into consideration factors affecting production decline behaviour, such as reservoir rock and fluid properties, transient versus stabilized flow, changes in operating conditions (both past and future), and depletion mechanism.

Reserves may be assigned based on decline analysis when sufficient production data are available. The decline relationship used in projecting production should be supported by all available data.

The portion of reserves estimated as proved, probable, or possible should reflect the confidence in the associated estimate.

d. Future Drilling and Planned Enhanced Recovery Projects

The foregoing reserves estimation methodologies are applicable to recoveries from existing wells and enhanced recovery projects that have been demonstrated to be economically and technically successful in the subject reservoir by actual performance or a successful pilot. The following criteria should be considered when estimating incremental reserves associated with development drilling or implementation of enhanced recovery projects. In all instances, the probability of recovery of the associated reserves must meet the certainty criteria contained in Section 5.4.

i. Additional Reserves Related to Future Drilling

Additional reserves associated with future drilling in known accumulations may be assigned where economics support and regulations do not prohibit the drilling of the location.

Aside from the criteria stipulated in Section 5.4, factors to be considered in classifying reserves estimates associated with future drilling as proved, probable, or possible include

- whether the proposed location directly offsets existing wells or acreage with proved or probable reserves assigned,
- the expected degree of geological continuity within the reservoir unit containing the reserves,
- the likelihood that the location will be drilled.

In addition, where infill wells will be drilled and placed on production, the evaluator must quantify well interference effects, that portion of infill well recovery that represents accelerated production of developed reserves, and that portion that represents incremental recovery beyond those reserves recognized for the existing reservoir development.

ii. Reserves Related to Planned Enhanced Recovery Projects

Reserves that can be economically recovered through the future application of an established enhanced recovery method may be classified as follows.

Proved reserves may be assigned to planned enhanced recovery projects when the following criteria are met:

- Repeated commercial success of the enhanced recovery process has been demonstrated in reservoirs in the area with analogous rock and fluid properties.
- The project is highly likely to be carried out in the near future. This may be demonstrated by factors such as the commitment of project funding.
- Where required, either regulatory approvals have been obtained, or no regulatory impediments are expected, as clearly demonstrated by the approval of analogous projects.

Probable reserves may be assigned when a planned enhanced recovery project does not meet the requirements for classification as proved; however, the following criteria are met:

- The project can be shown to be practically and technically reasonable.
- Commercial success of the enhanced recovery process has been demonstrated in reservoirs with analogous rock and fluid properties.
- It is reasonably certain that the project will be implemented.

Possible reserves may be assigned when a planned enhanced recovery project does not meet the requirements for classification as proved or probable; however, the following criteria are met:

- The project can be shown to be practically and technically reasonable.
- Commercial success of the enhanced recovery process has been demonstrated in reservoirs with analogous rock and fluid properties, but there remains some doubt that the process will be successful in the subject reservoir.

5.5.6 Validation of Reserves Estimates

A practical method of validating and confirming that reserves estimates meet the definitions and guidelines is through periodic reserves reconciliation of both entity and aggregate estimates. The tests described below should be applied to the same entities or groups of entities over time, excluding revisions due to differing economic assumptions:

- Revisions to proved reserves estimates should generally be positive as new information becomes available.

- Revisions to proved + probable reserves estimates should generally be neutral as new information becomes available.
- Revisions to proved + probable + possible estimates should generally be negative as new information becomes available.

These tests can be used to monitor whether procedures and practices employed are achieving results consistent with certainty criteria contained in Section 5.4. In the event that the above tests are not satisfied on a consistent basis, appropriate adjustments should be made to evaluation procedures and practices.