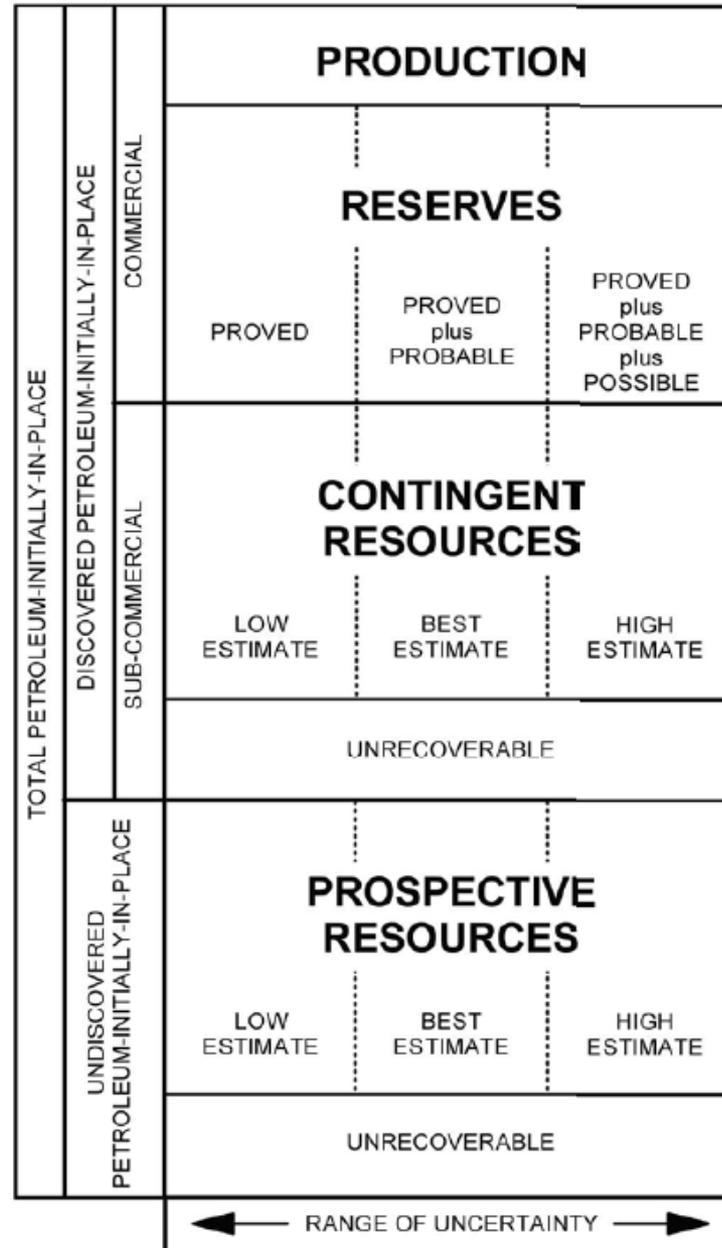
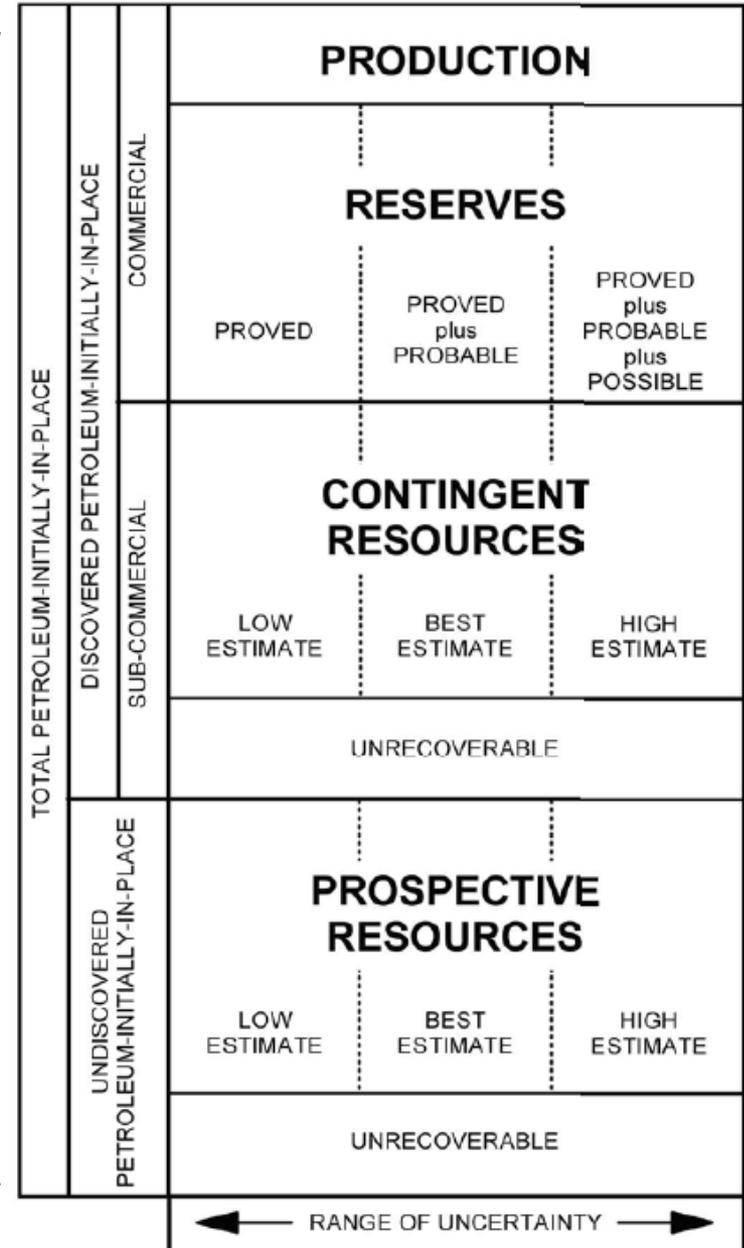


Reserve Definitions



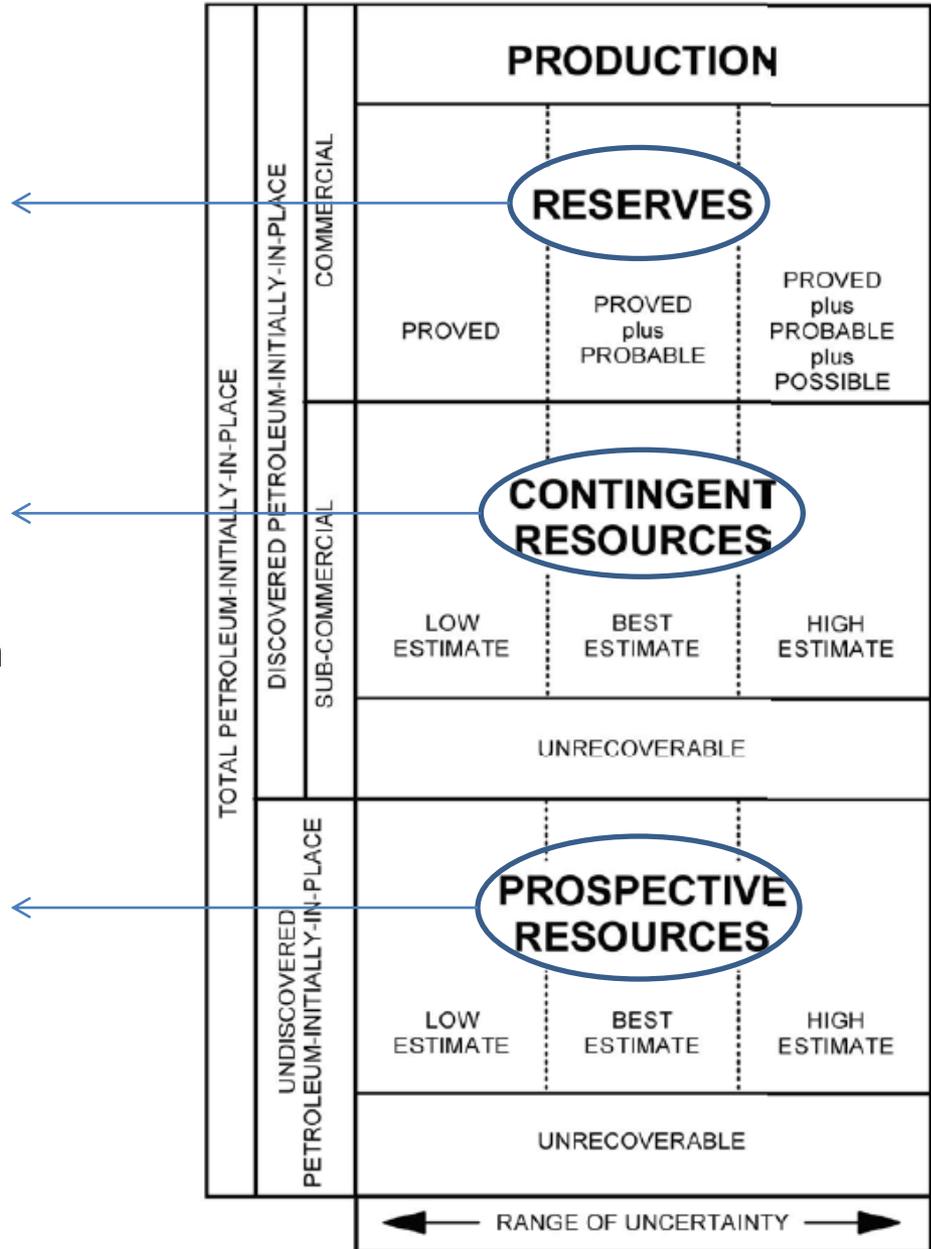
Reserve Definitions

- **Total Petroleum-initially-in-place** is subdivided into Discovered and Undiscovered Petroleum initially-in-place, reflecting whether or not the quantities are contained in “known accumulations”.
- **Discovered Petroleum-initially-in-place** may be classified as Commercial or Sub-Commercial, based on the criteria for commerciality.



Reserve Definitions

- **Reserves**—Those quantities of petroleum which are anticipated to be commercially recovered from known accumulations from a given date forward.
- **Contingent Resources**—Those quantities of petroleum which are estimated, on a given date, to be potentially recoverable from known accumulations, but which are not currently considered to be commercially recoverable.
- **Prospective Resources**—Those quantities of petroleum which are estimated, on a given date, to be potentially recoverable from undiscovered accumulations.



Reserve Definitions

Reserves are defined (refer to Appendix A for full definitions):

Reserves are those quantities of petroleum which are anticipated to be commercially recovered from known accumulations from a given date forward.

Thus, reserves must satisfy four criteria:

discovered,

recoverable,

commercial,

and remaining.

Estimation of Reserves

Estimation of reserves is done under conditions of uncertainty.

- The method of estimation is called **deterministic** if a single best estimate of reserves is made based on known geological, engineering, and economic data.
- The method of estimation is called **probabilistic** when the known geological, engineering, and economic data are used to generate a range of estimates and their associated probabilities.
- Identifying reserves as ***proved, probable, and possible*** has been the most frequent classification method and gives an indication of the probability of recovery. Because of potential differences in uncertainty, caution should be exercised when aggregating reserves of different classifications.

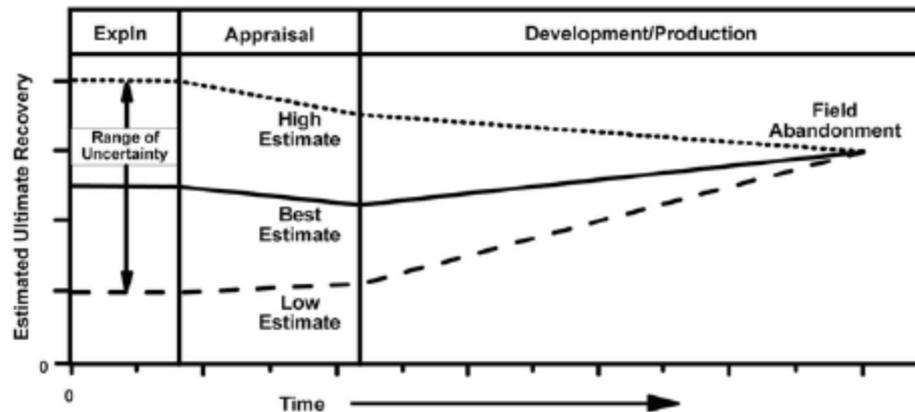
Estimation of Reserves

RESOURCE UNCERTAINTY CATEGORY	RESERVES		OTHER RESOURCES
	Scenario	Probabilistic	Scenario
LOW ESTIMATE	Proved (1P)	P90	Low
BEST ESTIMATE	Proved plus Probable (2P)	P50	Most Likely
HIGH ESTIMATE	Proved plus Probable plus Possible (3P)	P10	High

- **Proven.** If deterministic methods are used, the term reasonable certainty is intended to express a high degree of confidence that the quantities will be recovered. If probabilistic methods are used, there should be at least a 90% probability that the quantities actually recovered will equal or exceed the estimate.
- **Probable** reserves are those unproved reserves which analysis of geological and engineering data suggests are more likely than not to be recoverable. In this context, when probabilistic methods are used, there should be at least a 50% probability that the quantities actually recovered will equal or exceed the sum of estimated proved plus probable reserves.
- **Possible** reserves are those unproved reserves which analysis of geological and engineering data suggests are less likely to be recoverable than probable reserves. In this context, when probabilistic methods are used, there should be at least a 10% probability that the quantities actually recovered will equal or exceed the sum of estimated proved plus probable plus possible reserves

Estimation of Reserves

Reserves estimates will generally be revised as additional geologic or engineering data becomes available or as economic conditions change.



Reserve Definitions - Proved

- Reserves are considered proved if the commercial producibility of the reservoir is supported by actual production or formation tests. In this context, the term proved refers to the actual quantities of petroleum reserves and not just the productivity of the well or reservoir. In certain cases, proved reserves may be assigned on the basis of well logs and/or core analysis that indicate the subject reservoir is hydrocarbon bearing and is analogous to reservoirs in the same area that are producing or have demonstrated the ability to produce on formation tests.
- The area of the reservoir considered as proved includes
 - 1) the area delineated by drilling and defined by fluid contacts,
 - 2) the undrilled portions of the reservoir that can reasonably be judged as commercially productive on the basis of available geological and engineering data.
- Reserves may be classified as proved if facilities to process and transport those reserves to market are operational at the time of the estimate or there is a reasonable expectation that such facilities will be installed.

Reserve Definitions - Proved

Reserves which are to be produced through the application of established improved recovery methods are included in the proved classification when

- (1) successful testing by a pilot project or favorable response of an installed program in the same or an analogous reservoir with similar rock and fluid properties provides support for the analysis on which the project was based, and,
- (2) it is reasonably certain that the project will proceed.

Reserve Definitions - Proved

Proven reserves can be subdivided into developed and undeveloped.

Developed: Developed reserves are expected to be recovered from existing wells including reserves behind pipe. Improved recovery reserves are considered developed only after the necessary equipment has been installed, or when the costs to do so are relatively minor.

Developed reserves may be sub-categorized as producing or non-producing.

Producing: Reserves subcategorized as producing are expected to be recovered from completion intervals which are open and producing at the time of the estimate. Improved recovery reserves are considered producing only after the improved recovery project is in operation.

Non-producing: Reserves subcategorized as non-producing include shut-in and behind-pipe reserves. Shut-in reserves are expected to be recovered from

- (1) completion intervals which are open at the time of the estimate but which have not started producing,
- (2) wells which were shut-in for market conditions or pipeline connections, or
- (3) wells not capable of production for mechanical reasons.

Behind-pipe reserves are expected to be recovered from zones in existing wells, which will require additional completion work or future recompletion prior to the start of production.

Undeveloped Reserves: Undeveloped reserves are expected to be recovered:

- (1) from new wells on undrilled acreage,
- (2) from deepening existing wells to a different reservoir, or
- (3) where a relatively large expenditure is required to (a) recomplete an existing well or (b) install production or transportation facilities for primary or improved recovery projects.

Reserve Definitions - Probable

Probable reserves may include

1. reserves anticipated to be proved by normal step-out drilling where sub-surface control is inadequate to classify these reserves as proved,
2. reserves in formations that appear to be productive based on well log characteristics but lack core data or definitive tests and which are not analogous to producing or proved reservoirs in the area,
3. incremental reserves attributable to infill drilling that could have been classified as proved if closer statutory spacing had been approved at the time of the estimate,
4. reserves attributable to improved recovery methods that have been established by repeated commercially successful applications when
 - (a) a project or pilot is planned but not in operation and
 - (b) rock, fluid, and reservoir characteristics appear favorable for commercial application,
5. reserves in an area of the formation that appears to be separated from the proved area by faulting and the geologic interpretation indicates the subject area is structurally higher than the proved area,
6. reserves attributable to a future workover, treatment, re-treatment, change of equipment, or other mechanical procedures, where such procedure has not been proved successful in wells which exhibit similar behavior in analogous reservoirs, and
7. incremental reserves in proved reservoirs where an alternative interpretation of performance or volumetric data indicates more reserves than can be classified as proved.

Reserve Definitions - Possible

Possible reserves may include:

- (1) reserves which, based on geological interpretations, could possibly exist beyond areas classified as probable,
- (2) reserves in formations that appear to be petroleum bearing based on log and core analysis but may not be productive at commercial rates,
- (3) incremental reserves attributed to infill drilling that are subject to technical uncertainty,
- (4) Reserves attributed to improved recovery methods when
 - a) a project or pilot is planned but not in operation and
 - b) rock, fluid, and reservoir characteristics are such that a reasonable doubt exists that the project will be commercial, and
- (5) reserves in an area of the formation that appears to be separated from the proved area by faulting and geological interpretation indicates the subject area is structurally lower than the proved area.