

Short Course on
Petroleum Reserve Estimation, Production, and
Production Sharing Contract (PSC)

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Definitions of Reserves and Resources

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Definitions of Reserves

Resources:

- Resources are the total quantities of oil and gas and related substances that are estimated, at a particular time, to be contained in, or that have been produced from, known accumulations, plus those estimated quantities in accumulations are yet to be discovered.

DISCOVERED RESERVES:

- **Discovered Resource:** Discovered resources, which may also be referred to as initial volumes in place, are those quantities of oil and gas and related substances that are estimated, at a particular time, to be initially contained in known accumulations and those that will remain in known accumulations, based on known technology under specified economic conditions that are generally accepted as being a reasonable outlook for the future.

Definitions of Reserves

- **Initial Reserve:** Initial reserves are those quantities of oil and gas and related substances that are estimated, at a particular time, to be recoverable from known accumulations. They include cumulative production plus those quantities that are estimated to be recoverable in the future by known technology under specified economic conditions that are generally accepted as being a reasonable outlook for the future.
- **Unrecoverable Volumes:** Unrecoverable Volumes are those quantities of oil and gas and related substances that are estimated, at a particular time, to remain in known accumulations because they are not recoverable by known technology under specified economic conditions that are generally accepted as being a reasonable outlook for the future. Unrecoverable volumes may be further divided into currently uneconomic volumes and residual uneconomic volumes.

Definitions of Reserves

- **UNDISCOVERED RESOURCES or FUTURE INITIAL VOLUMES in PLACE**
- **Undiscovered Resource:** Undiscovered Resource, which may also be referred to as Future Initial Volumes in place, are those in-place quantities of oil and gas and related substances that are estimated at particular time, to exist in accumulations yet to be discovered.
- **Future Initial Reserve:** Future Initial Reserve are those quantities of oil and gas and related substances that are estimated, at a particular time, to be recoverable from accumulations yet to be discovered by known technology under specified economic that are generally accepted as being a reasonable outlook for the future.

Definitions of Reserves

- **Future Unrecoverable Volumes:** Future Unrecoverable Volumes are those quantities of oil and gas and related substances that are estimated, at a particular time, to remain in accumulations yet to be discovered because they are not recoverable by known technology under specified economic conditions that are generally accepted as being a reasonable outlook for the future.

Definitions of Reserves

- **REMAINING RESERVE**
- Remaining reserves are estimated quantities of oil and natural gas and related substances anticipated to be recoverable from known accumulations, from a given date forward, by known technology under specified economic conditions that are generally accepted as being a reasonable outlook for the future.
- **Remaining Proved reserve:** Remaining Proved reserve are those remaining reserves that can be estimated with a high degree of certainty, which for the purpose of reserve classification means that there is generally an 80 percent or greater probability that at least estimated quantity will be recovered. This reserve may be divided into “proved developed” and “proved undeveloped” to identify the status of development. The proved developed may be further divided into producing and non-producing categories.

Definitions of Reserves

- **Proven Reserve:** Proven reserve are those quantities of petroleum which, by analysis of geological and engineering data, can be estimated with reasonable certainty to be commercially recoverable, from a given date forward, from known reservoirs and under current, economic conditions, operating methods, and government regulations. Proved reserves can be categorized as developed or undeveloped.
- If deterministic methods are used, then 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.

Definitions of Reserves

- The parameter that often has the greatest variability in the reserve estimation is the area chosen to represent the areal extent of the pool.
- In North America in case of an isolated gas well with little or no geological control, it is frequent practice to assign reserve to one section (640 acre, 1 sq. mile).
- For single oil well, the area assigned would generally be less for than for gas well because the flow characteristics for oil result in smaller drainage area. A typical practice is to assign proved reserve to area ranging from 1/4th section for light crude oil to 1/16th section or less for heavy crude oils.

Definitions of Reserves

- **In general, 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, if any. (2) The un-drilled portions of the reservoir that can reasonably be judged as commercially productive on the basis of available geological and engineering data.
- In the absence of data on fluid contacts, the lowest known occurrence of hydrocarbons controls the proved limit unless otherwise indicated by definitive geological, engineering or performance data.

Definitions of Reserves

- **Probable Reserves:** Probable reserves are those unproved reserves which by 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 be equal or exceed the sum of estimated proven plus probable reserves.

In general, probable reserves may include

- (1) reserves anticipated to be proved by normal step-out drilling when 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,**

Definitions of Reserves

(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 estimation.

(4) Reserves attributed to improved recovery methods that have been established by repeated commercially successful applications.

(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 work-over, treatment, re-treatment, change of equipment, or other mechanical procedure, where such procedure has not been proved successful in wells which exhibit similar behavior in analogous reservoirs.

(7) Incremental reserves in proven reservoirs when an alternative interpretation of performance or volumetric data indicates more reserves than can be classified as proved.

Definitions of Reserves

- **Possible Reserve:** 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 the estimated proved plus probable plus possible reserves.

Definitions of Reserves

- In general, possible reserve 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 are.