Petroleum Systems and Geologic Assessment of Oil and Gas in the San Joaquin Basin Province, California

Chapter 29

Glossary

By T.R. Klett, James W. Schmoker, Ronald R. Charpentier, Thomas S. Ahlbrandt[1], and Gregory F. Ulmishek[2]

Selected terms of particular importance to the U.S. Geological Survey assessment of undiscovered resources in total petroleum systems are defined here. The definitions are intended to be generally explanatory rather than strictly technical. No attempt has been made to include a detailed listing of common industry definitions.

Access Probability. The probability, expressed as a decimal fraction, of sufficient access (political and physical) to a particular assessment unit within a given time frame for the activities necessary to find an accumulation of minimum size and to add its volume to proved reserves. The time frame for this assessment is 30 years.

Accumulation. An accumulation is one or more pools or reservoirs of petroleum that make up an individual production unit and is defined by trap, charge, and reservoir characteristics. Two types of accumulations are recognized, conventional and continuous.

Assessment Unit (AU). A mappable volume of rock within a total petroleum system that encompasses accumulations (discovered and undiscovered) that share similar geologic traits and socio-economic factors. Accumulations within an assessment unit should constitute a sufficiently homogeneous population such that the chosen methodology of resource assessment is applicable. A total petroleum system might equate to a single assessment unit. If necessary, a total petroleum system can be subdivided into two or more assessment units in order that each unit is sufficiently homogeneous to assess individually. An assessment unit may be identified as conventional, if it contains conventional accumulations, or as continuous, if it contains continuous accumulations.

Assessment Unit Probability. The assessment unit probability, expressed as a decimal fraction, represents the likelihood that, in a given assessment unit, at least one undiscovered accumulation of a selected minimum size exists that has the potential for its volume to be added to proved reserves in a given time frame. The assessment unit probability is the product of the probabilities of the three geologic attributes (charge, rocks, and timing) and the probability of access.

Associated/Dissolved Gas. Natural gas that occurs in an oil accumulation, either as a free gas cap or in solution; synonymous with gas in oil accumulations.

Barrels of Oil Equivalent (BOE). A unit of petroleum volume in which the gas portion is expressed in terms of its energy equivalent in barrels of oil. For this assessment, 6,000 cubic feet of gas equals 1 barrel of oil equivalent (BOE).

Cell. A subdivision or area within an assessment unit having dimensions related to the drainage areas of wells (not to be confused with finite-element cells). Three categories of cells are recognized, cells tested by drilling, untested cells, and untested cells having potential to provide additions to reserves within the forecast span of the assessment. A continuous assessment unit is a collection of petroleum-containing cells.

Composite Total Petroleum System. A mappable entity encompassing all or a portion of two or more total petroleum systems. The concept of composite total petroleum systems is applied when accumulations within an assessment unit are assumed to be charged by more than one source rock.

Continuous Accumulation. A petroleum accumulation that is pervasive throughout a large area, that is not significantly affected by hydrodynamic influences, and for which the chosen methodology for assessment of sizes and number of discrete accumulations is not appropriate. Continuous accumulations lack well-defined down-dip water contacts. The terms continuous accumulation and continuous-type accumulation are used interchangeably.

Conventional Accumulation. A discrete accumulation commonly bounded by a down-dip water contact and significantly affected by the buoyancy of petroleum in water. This geologic definition does not involve factors such as water

[1] U.S. Geological Survey, Denver, Colo; present affiliation; GSL Energy Coporation, Denver, Colo.

[2] U.S. Geological Survey, Denver, Colo.; present affiliation: Direct Petroleum Exploration, Inc., Denver, Colo.

depth, regulatory status, or engineering techniques.

Cumulative Petroleum Production. Reported cumulative volume of petroleum that has been produced. Cumulative oil, cumulative gas, and cumulative production are sometimes used as abbreviated forms of this term.

Estimated Ultimate Recovery (EUR). The total expected recoverable volume of oil, gas, and natural gas liquids production from a well, lease, or field under present economic and engineering conditions; synonymous with total recovery.

Field. A production unit consisting of a collection of oil and gas pools that when projected to the surface form an approximately contiguous area that can be circumscribed.

Field Growth. The increases in known petroleum volume that commonly occur as oil and gas fields are developed and produced; synonymous with reserve growth.

Forecast Span. A specified future time span in which petroleum accumulations have the potential to provide additions to reserves. A 30-year forecast span is used in the USGS assessments and affects (1) the minimum undiscovered accumulation size, (2) the number of years in the future that reserve growth is estimated, (3) economic assessments, (4) the accumulations that are chosen to be considered, and (5) the risking structure as represented by access risk.

Gas Accumulation. An accumulation with a gas to oil ratio of 20,000 cubic feet/barrel or greater.

Gas in Gas Accumulations. Gas volumes in gas accumulations.

Gas in Oil Accumulations. Gas volumes in oil accumulations.

Gas to Oil Ratio (GOR). Ratio of gas to oil (in cubic feet/barrel) in an accumulation. GOR is calculated using known gas and oil volumes at surface conditions.

Geologic Province. A USGS-defined area having characteristic dimensions of perhaps hundreds to thousands of kilometers encompassing a natural geologic entity (for example, sedimentary basin, thrust belt, delta) or some combination of contiguous geologic entities.

Grown Petroleum Volume. Known petroleum volume adjusted upward to account for future reserve growth. Thirty years of reserve growth is considered for the USGS assessments.

Known Petroleum Volume. The sum of cumulative production and remaining reserves as reported in the databases used in support of the assessment. Also called total recoverable volume (sometimes called ultimate recoverable reserves or estimated ultimate recovery).

Liquids to Gas Ratio (LGR). Ratio of total petroleum liquids (including oil, condensate, and natural gas liquids) to gas (in barrels/million cubic feet) in a gas accumulation. The LGR is calculated using known petroleum liquids and gas volumes at surface conditions. This ratio is used to assess the liquid coproducts associated with undiscovered gas in gas accumulations.

Minimum Accumulation Size. The smallest accumulation size (volume of oil in oil accumulations or volume of gas in gas accumulations) that is considered in the assessment process for conventional accumulations.

Minimum Petroleum System. The mappable part of a total petroleum system for which the presence of essential elements has been proved by discoveries of petroleum shows, seeps, and accumulations.

Minimum Total Recovery per Cell. The smallest total recovery per cell (volume of oil or gas) that is considered in the assessment process for continuous accumulations.

Natural Gas Liquids (NGL). Petroleum that occurs naturally as a gas in the reservoir, but is a liquid under surface conditions. Natural gas liquids are commonly reported separately from crude oil.

Natural Gas Liquids to Gas Ratio (for oil accumulations). Ratio of natural gas liquids to gas (in barrels/million cubic feet) in an oil accumulation, calculated using known natural gas liquids and gas volumes at surface conditions. This ratio is used to assess the natural gas liquids associated with undiscovered gas in oil accumulations.

Nonassociated Gas. Natural gas that occurs in a gas accumulation; synonymous with gas in gas accumulations.

Oil Accumulation. An accumulation with a gas to oil ratio of less than 20,000 (in cubic feet/barrel).

Oil in Gas Accumulations. Oil volumes in gas accumulations. For this assessment, oil in gas accumulations was calculated along with other liquids rather than separately.

Oil in Oil Accumulations. Oil volumes in oil accumulations.

Petroleum. A collective term for oil, gas, natural gas liquids, and tar.

Play. A set of known or postulated oil and gas accumulations sharing similar geologic, geographic, and temporal properties, such as source rock, migration pathway, timing, trapping mechanism, and hydrocarbon type. A play may differ from an assessment unit; an assessment unit can include one or more plays.

Remaining Petroleum Reserves. Volume of petroleum in discovered accumulations that has not yet been produced. Remaining reserves is used as an abbreviated form of this term.

Reserve Growth. The increases in known petroleum volume that commonly occur as oil and gas accumulations are developed and produced; synonymous with field growth.

Subsurface Allocation. An allocation of potential additions to reserves to land entities based on subsurface ownership of mineral rights.

Surface Allocation. An allocation of potential additions to reserves to land entities based on surface ownership.

Sweet Spot. An area within a continuous accumulation where production characteristics are relatively more favorable than elsewhere.

Total Petroleum System (TPS). A mappable entity encompassing genetically related petroleum that occurs in seeps, shows, and accumulations (discovered or undiscovered) which have been generated by a pod or by closely related pods of mature source rock, together with the essential mappable geologic elements (source, reservoir, seal, and

overburden rocks) that controlled fundamental processes of generation, migration, entrapment, and preservation of petroleum.

Total Recovery. The total expected recoverable volume of oil, gas, and natural gas liquids production from a well, lease, or field under present economic and engineering conditions; synonymous with estimated ultimate recovery.

Undiscovered Petroleum Resources. Resources postulated from geologic information and theory to exist outside of known oil and gas accumulations.

USGS Assessed Petroleum Volumes. The quantities of oil, gas, and natural gas liquids that have the potential to be added to reserves within some future time frame, which for this assessment is 30 years. The USGS assessed petroleum volumes include those from undiscovered accumulations, whose sizes are greater than or equal to the selected minimum accumulation size, and from the reserve growth of fields already discovered.