

# Society Adopts Proved Reserves Definitions

SPE Directors voted Oct. 3 to approve the following proved reserves definitions developed since 1979 by a joint committee of SPE, AAPG, and API members. The board action endorses nomenclature that acknowledges present operating practices and accounts for the realities of reservoir evaluation and improved recovery techniques.

In Sept. 1979 the board authorized initial discussions with other groups to develop a uniform set of definitions for potential adoption by operators, governments, and other organizations. After AAPG and API representatives joined the project, working through an *ad hoc* joint committee, the first task was to evaluate the many existing proved reserves definitions. These included those formulated by SPE (July 1965 *JPT*, Page 815), AAPG, API, AGA, U.S. DOE, U.S. Securities and Exchange Commission, and the U.S. Financial Accounting Standards Board.

The committee's proposed definitions, written and refined during three 1980 meetings, first appeared for member comment in the Sept. 1980 *JPT* (Pages 1563- 65). About 20 members provided remarks that helped the committee prepare the final version that appears below. The principal change to the document since first published in *JPT* occurs in the last item in the glossary. The document now distinguishes between established and nonconventional "improved" (vs. the earlier "enhanced") recovery. AAPG also published the proposed definitions; that association's approval of these definitions is likely soon. Joint adoption of this document would provide a uniform set of proved reserves definitions for use in the exploration, drilling, and production communities that SPE and AAPG embrace. API has advised that it will no longer formally participate in the *ad hoc* committee's work. (API has stopped its program to collect and report reserves statistics.)

*Ad hoc* Reserves Definitions Committee Chairman W.R. Granberry of Tom Brown Inc. led coordination, writing, and editing efforts that took place in conjunction with AAPG and API. The committee intends to foster industry and government use of these definitions in reporting proved reserves. The committee's next project is to develop uniform definitions for "probable" and "possible" reserves categories. An AAPG member likely will act as chairman of the committee during this phase, since these concepts apply most directly to exploration.

As SPE representative to and chairman of the committee, Granberry worked with AAPG representatives James A. Hartman of Shell Oil Co., Noel D. Rietman of Diamond Shamrock Corp., and Richard R. Church of Mobil Oil Corp.; SPE representatives E.C. Babson of Babson and Sheppard and E.D. Holstein of Exxon Co. U.S.A.; API representatives Bert L. Waggoner of Conoco Inc., Shofner Smith of Phillips Petroleum Co., and William A. Daniel of Mobil Oil Corp.; and the executive directors of the three organizations. Many of these individuals are members of more than one of the three associations.

## PROVED RESERVES DEFINITIONS

### Proved Reserves

Proved reserves of crude oil, natural gas, or natural gas liquids are estimated quantities that geological and engineering data demonstrate with reasonable certainty to be recoverable in the future from known reservoirs under existing economic conditions.

### Discussion

Reservoirs are considered proved if economic producibility is supported by actual production or formation tests or if core analysis and/or log interpretation demonstrates economic producibility with reasonable certainty. The area of a reservoir considered proved includes (1) that portion delineated by drilling and defined by fluid contacts, if any, and (2) the adjoining portions not yet drilled that can be reasonably judged as economically productive on the basis of available geological and engineering data. In the absence of data on fluid contacts, the lowest known structural occurrence of hydrocarbons controls the lower proved limit of the reservoir.

Proved reserves are estimates of hydrocarbons to be recovered from a given date forward. They are expected to be revised as hydrocarbons are produced and additional data become available.

Proved natural gas reserves comprise nonassociated gas and associated-dissolved gas. An appropriate reduction in gas reserves is required for the expected removal of natural gas liquids and the exclusion of nonhydrocarbon gases if they occur in significant quantities.

Reserves that can be produced economically through the application of established improved recovery techniques are included in the proved classification when these qualifications are met: (1) successful testing by a pilot project or the operation of an installed program in that reservoir or one with similar rock and fluid properties provides support for the engineering analysis on which the project or program was based, and (2) it is reasonably certain the project will proceed.

Reserves to be recovered by improved recovery techniques that have yet to be established through repeated economically successful applications will be included in the proved category only after successful testing by a pilot project or after the operation of an installed program in the reservoir provides support for the engineering analysis on which the project or program was based.

Estimates of proved reserves do not include crude oil, natural gas, or natural gas liquids being held in underground storage.

### **Proved Developed Reserves**

Proved developed reserves are a subcategory of proved reserves. They are those reserves that can be expected to be recovered through existing wells (including reserves behind pipe) with proved equipment and operating methods. Improved recovery reserves can be considered developed only after an improved recovery project has been installed.

### **Proved Undeveloped Reserves**

Proved undeveloped reserves are a subcategory of proved reserves. They are those additional proved reserves that are expected to be recovered from (1) future drilling of wells, (2) deepening of existing wells to a different reservoir, or (3) the installation of an improved recovery project.

## **GLOSSARY OF TERMS**

**Crude Oil.** Crude oil is defined technically as a mixture of hydrocarbons that existed in the liquid phase in natural underground reservoirs and remains liquid at atmospheric pressure after passing through surface separating facilities. For statistical purposes, volumes reported as crude oil include: **(1)** liquids technically defined as crude oil; **(2)** small amounts of hydrocarbons that existed in the gaseous phase in natural underground reservoirs but are liquid at atmospheric pressure after being recovered from oilwell (casinghead) gas in lease separators\*; and **(3)** small amounts of nonhydrocarbons produced with the oil.

**Natural Gas.** Natural gas is a mixture of hydrocarbons and varying quantities of nonhydrocarbons that exists either in the gaseous phase or in solution with crude oil in natural underground reservoirs. Natural gas may be subclassified as follows.

*Associated Gas.* Natural gas, commonly known as gas-cap gas, which overlies and is in contact with crude oil in the reservoir.\*\*

*Dissolved Gas.* Natural gas which is in solution with crude oil in the reservoir.

*Nonassociated Gas.* Natural gas which is in reservoirs that do not contain significant quantities of crude oil.

Dissolved gas and associated gas may be produced concurrently from the same wellbore. In such situations, it is not feasible to measure the production of dissolved gas and associated gas separately; therefore, production is reported under the heading of associated-dissolved or casinghead gas. Reserves and productive capacity estimates for associated and dissolved gas also are reported as totals for associated-dissolved gas combined.

**Natural Gas Liquids.** Natural gas liquids (NGL's) are those portions of reservoir gas which are liquefied at the surface in lease separators, field facilities, or gas processing plants. Natural gas liquids include but are not limited to ethane, propane, butanes, pentanes, natural gasoline, and condensate.

**Reservoir.** A reservoir is a porous and permeable underground formation containing an individual and separate natural accumulation of producible hydrocarbons (oil and/or gas) which is confined by impermeable rock and/or water barriers and is characterized by a single natural pressure system.

In most situations, reservoirs are classified as oil reservoirs or as gas reservoirs by a regulatory agency. In the absence of a regulatory authority, the classification is based on the natural occurrence of the hydrocarbon in the reservoir as determined by the operator.

**Improved Recovery.** Improved recovery includes all methods for supplementing natural reservoir forces and energy, or otherwise increasing ultimate recovery from a reservoir. Such recovery techniques include (1) pressure maintenance, (2) cycling, and (3) secondary recovery in its original sense (i.e., fluid injection applied relatively late in the productive history of a reservoir for the purpose of stimulating production after recovery by primary methods of flow or artificial lift has approached an economic limit). Improved recovery also includes the enhanced recovery methods of thermal, chemical flooding, and the use of miscible and immiscible displacement fluids.

\*From a technical standpoint, these liquids are termed "condensate"; however, they are commingled with the crude stream and it is impractical to measure and report their volumes separately. All other condensate is reported as either "lease condensate" or "plant condensate" and included in natural gas liquids.

\*\*Where reservoir conditions are such that the production of associated gas does not substantially affect the recovery of crude oil in the reservoir, such gas may be reclassified as nonassociated gas by a regulatory agency. In this event, reserves and production are reported in accordance with the classification used by the regulatory agency.