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JSPEE EDITORIAL BOARD

David Gold    Richard Miller    Ron Harrell

MISSION

The mission of JSPEE is to support the SPEE By-Laws objectives "to promote the profession of petroleum evaluation engineering, to foster the spirit of scientific research among its Members, and to disseminate facts pertaining to petroleum evaluation engineering among its Members and the public." JSPEE should relate to reserves and/or property evaluation, recommended estimation and/or auditing practices, the practice of professional ethics or resources and/or reserves definitions. The subject matter should not duplicate opinions and conclusions available through other publications or public information.

DISCLAIMER

The material herein does not necessarily reflect the views or positions of the Society of Petroleum Evaluation Engineers, its officers, or members, nor is SPEE responsible for the statements made herein. Reproduction or distribution of any part of JSPEE without the written consent of the Society of Petroleum Evaluation Engineers or its author is prohibited. Any reproduction must contain conspicuous acknowledgment of the author and the JSPEE source.
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by Harold Vance, Petroleum Consultant, Houston, Texas

Presented at the Sixth Annual Meeting of the Society of Petroleum Evaluation Engineers
Warwick Hotel, Houston, Texas
November 17-18, 1968

"What Makes those Bank Engineers So Conservative?"
by Gerald E. Sherrod, Vice President, First National City Bank, New York, N.Y.

Presented at the Sixth Annual Meeting of the Society of Petroleum Evaluation Engineers
Warwick Hotel, Houston, Texas
November 17-18, 1968

"Life Insurance Company Loans On Oil & Gas Properties"
By K. Marshall Fagin, Manager, and W.T. Drummond, Assistant Manager, Oil and Gas
Investment Department, Southwestern Life Insurance Co., Dallas, Texas

Presented at the Sixth Annual Meeting of the Society of Petroleum Evaluation Engineers
Warwick Hotel, Houston, Texas
November 17-18, 1968

"The Skin Effect in Producing Wells"
by William Hurst, Petroleum Consultant, Houston, Texas, and J. Donald Clark and E. Bernard
Brauer, Members AIME, Union Oil Co. of California, Houston, Texas

Presented at the fall meeting of the AIME
Houston, Texas
October, 1967
SPE 1854
HISTORY

There has long been a need for a Society which would bring together for their mutual benefit the specialists in petroleum evaluation engineering. Realizing this need, Harold Vance, William Hurst and H. F. Poyner, Jr. secured a charter from the State of Texas for such a Society which is known as "The Society of Petroleum Evaluation Engineers". The number of the charter setting up such a corporation is NO. 187252 and was issued by the Secretary of the State of Texas on September 24, 1962.

This corporation was chartered under the Texas Non-Profit Corporation Act and its period of duration is perpetual. The corporation was organized exclusively for educational purposes and to promote the profession of petroleum evaluation engineering, to foster the spirit of scientific research among its members, and to disseminate facts pertaining to petroleum evaluation engineering among its members and the public.

The various technical associations, such as the American Institute of Mining, Metallurgical, and Petroleum Engineers, the American Association of Petroleum Geologists, and even the requirements of our engineering laws, provide no measure of the experience and ability of an individual in petroleum evaluation. Therefore, a need for this specialized Society is self-evident.

SPEE continues today to be strongly committed to providing educational and other services to its members and to the oil and gas industry, and to promoting the profession of petroleum evaluation engineering.

The professional activities of SPEE members are guided by By-Laws that require the highest ethical standards and that provide for a committee to review grievances filed against members. Principles of acceptable evaluation engineering practice address the relationships of members with the public, with employers, with clients, with other members, and with SPEE.

The standardization of oil and gas reserve definitions has been a principal goal of SPEE throughout its history. In 1987, SPEE, in cooperation with other industry groups, formulated and published definitions believed suitable for use throughout the oil and gas industry. These definitions were subsequently promulgated jointly by SPEE and by the Society of Petroleum Engineers. Comprehensive guidelines addressing the application of these definitions were then published by SPEE in December 1988 as Monograph I.

Each year since 1982, SPEE has surveyed its members and also other experts to obtain data regarding certain evaluation parameters in current use throughout the oil and gas industry. A statistical analysis of the results of this survey is published and a copy is made available to non-members for a modest fee. This annual survey is considered to be a valuable contribution to the profession of petroleum evaluation engineering because it provides a comparison basis for the parameters being used by any individual evaluator.

SPEE assists in the continuing education of its members through periodic technical meetings held by each local chapter, through an annual national meeting, and also by promulgating reports generated by the efforts of special committees such as the most recent report regarding severance taxes, "Summary of Oil & Gas Production Taxes." SPEE meetings provide an excellent forum for the exchange of technical and business information that can be specifically applied in the evaluation of oil and gas properties.

Local chapters meet in Austin, Calgary, Central Texas, California, Dallas, Denver, Houston, Midland, Oklahoma City, and Tulsa.
THE SOCIETY OF PETROLEUM EVALUATION ENGINEERS
BY-LAWS

ARTICLE I. NAME

This Society, which is incorporated under the laws of the State of Texas, shall be called "The Society of Petroleum Evaluation Engineers" (hereinafter "Society" or "SPEE").

ARTICLE II. OBJECTIVES

The objectives of this Society are to promote the profession of petroleum evaluation engineering, to foster the spirit of scientific research among its Members, and to disseminate facts pertaining to petroleum evaluation engineering among its Members and the public.

ARTICLE III. MEMBERS

SECTION 1. An applicant may qualify to become a Member who has:

(a) A bachelor's or advanced degree in engineering or geology; and

(b) Ten years experience in the evaluation of oil and gas properties. Five years responsible petroleum engineering experience, or five years teaching petroleum engineering courses in a college or university accredited by the Accreditation Board of Engineers and Technology (ABET) may be substituted for five years of experience in the evaluation of oil and gas properties. Experience in the evaluation of oil and gas properties shall mean that the principal employment on a consistent basis regularly involves the evaluation of oil and gas properties. "Evaluation" of oil and gas properties includes, but is not limited to, the responsible determination of petroleum reserve/resources estimates, the responsible determination of production forecasts, and the responsible inclusion of the economic impacts of reserves/resources and production estimates; and

(c) If an engineer legally offering engineering services directly to the public, or if employed in an engineering capacity by a firm that legally provides professional engineering services to the public: a license or registration as a professional engineer. Licensure or registration is not required for engineers working exclusively as an employee within a corporate structure that: (1) does not provide engineering services to the public, and (2) does not require that its engineering personnel be licensed or registered as a professional engineer. If after admittance to the Society, an unlicensed Member becomes an engineer legally offering engineering services directly to the public, or if employed in an engineering capacity by a firm that legally provides professional engineering services to the public, the Member must obtain licensure or registration within three years of the job status change or shall be suspended from the Society. Exceptions to allow more than three years to obtain licensure or registration may be granted, but only under extenuating circumstances, the sufficiency of which shall be determined by a unanimous vote of the Executive Committee. The membership status of unlicensed or unregistered Members in good standing as of June 1, 2007 will remain unaffected by the provisions of this Section.

(d) If a geologist, they must be: (1) a Certified Petroleum Geologist as designated by the American Association of Petroleum Geologists (AAPG), or (2) certified as a member of the Society of Independent Professional Earth Scientists (SIPES), or (3) certified by the applicant's residence regulations, if such certification is available.

SECTION 2. An application to become a Member must be approved by the Executive Committee.

SECTION 3. A membership application is received where the applicant does not meet the above qualifications in their entirety, the Board of Directors, by unanimous vote, may waive certain requirements upon petition by the applicant and the applicant's sponsors.

SECTION 4. An additional category of membership shall be created subject to the criteria and limitation of rights noted below. The Board of Directors shall set the percent of total membership which shall be available to this additional category of membership. An applicant may apply to become an Associate Member who has:

(a) The qualifications described in Section 1, except that an Associate Member shall be required to demonstrate at least five years of experience in the evaluation of oil and gas properties (rather than the ten years required for Members), one half of which time (2-1/2 years) can be satisfied by the substitution of either 2-1/2 years of responsible petroleum engineering practice or 2-1/2 years of teaching petroleum engineering courses in an accredited college or university.

(b) An Associate Member must apply to change status from Associate Member to Member as soon as the Associate Member can demonstrate that they have fulfilled the requirements described in Section 1, but in no event later than ten years from the date of admission to the Society as an Associate Member. Any Associate Member that does not convert to Member within ten years of admission to the Society as an Associate Member will be suspended.

(c) An Associate Member shall pay the dues as shall be determined by the Executive Committee.

(d) An Associate Member may vote for officers and directors and on such matters as may properly come before the membership, but an Associate Member may not act as a sponsor for a Member or an Associate Member applicant. An Associate Member may not hold national office.

ARTICLE IV. ADMISSION OF NEW MEMBERS

Section 1. Every applicant for admission as a Member or Associate Member shall submit an application on a form authorized by the Executive Committee, signed by the applicant and endorsed by not less than three Member sponsors who are in good standing, stating the applicant's training and experience and such other facts as shall be prescribed from time to time by the Executive Committee. Associate Members may not act as sponsors. The application, after being screened by the Qualifications Committee, will be forwarded to the Executive Committee. The application must then be approved by the Executive Committee after each Member of that committee has determined that the applicant fulfills the qualifications required
under Article III. Applications, correspondence and presentations, written or spoken, will be in English. Financial transactions will be in U. S. dollars.

SECTION 2. To facilitate the formation of local chapters in international regions, and regions deemed remote by the Board of Directors, the sponsor requirement of this Section may be waived by a 2/3s majority vote of the Board of Directors for up to three founding local chapter applicants who: (1) reside in the region, (2) who meet the requirements of Article III, Section 1, (3) who submit an application on a form authorized by the Executive Committee, signed by the applicant and endorsed by not less than three industry professionals who can attest to the character and industry experience of the applicant, (4) who have been vetted by the Board of Directors or its delegate(s), and (5) who agree to vet and sponsor other qualified candidates in the region. The founding local chapter applicants, if ultimately approved for membership, shall be released from the obligation to vet other applicants in the region: (a) upon the approval of the local chapter application by the Executive Committee pursuant to the provisions of Article XIV, or (b) three years after the approval of the first founding local chapter applicant as a Member, whichever comes first.

SECTION 3. Prior to admission to the Society, the names of the applicant and the applicant’s sponsors shall be presented to the Members of the Society. In the case of applicants admitted under Section 2 of this Article, the applicants’ non-member sponsors will be identified with a footnote identifying that the application for Membership was submitted under Section 2 of this Article. If no objection is received within thirty (30) days after mailing the names of the applicant and the applicant’s sponsors to the Society’s Members, and after approval of the Executive Committee, the applicant shall be notified of acceptance as a Member or Associate Member. If any objection is received within thirty (30) days after mailing the names of the applicant and the applicant’s sponsors to the Society’s Members, the Executive Committee after investigating the basis for such objection shall reconsider the application and shall decide either to accept or reject the applicant as a Member or Associate Member.

An objection, in order to be deemed a valid cause for the action called for in the preceding paragraph, must specifically cite one or both of the following conditions:
   a. The objecting Member believes that the applicant lacks one or more of the qualifications set out in Article III, Section 1 or Section 4.
   b. The objecting Member has knowledge of events or circumstances that would indicate that the applicant does not meet the ethical standards set out in Article VI, Section 1.

SECTION 4. An applicant, upon being notified in writing of acceptance as a Member or Associate Member of the Society, shall also be billed for the dues applicable for the current year. Admission as a Member or Associate Member will become effective when payment for such dues is received by the Society. If dues payment is not received within sixty (60) days from applicants living within the continental United States and within ninety (90) days from other applicants after notice of acceptance has been mailed to the applicant, the Executive Committee may rescind the admission of the applicant as a Member or Associate Member.

SECTION 5. Upon the recommendation of not less than three Members in good standing, the Executive Committee along with the Board of Directors may, after a review, confer an Honorary Life Membership upon a Member in good standing. The basis for conferring an Honorary Life Membership upon a Member is outstanding achievement in the profession of petroleum property evaluation and/or significant and exceptional service to the Society. An Honorary Life Member shall be exempt from annual dues, shall be presented with the form of membership certificate customary for that class of membership, and shall have his or her name included in the list of Honorary Life Members in the Directory.

Upon the recommendation of not less than three Members in good standing, the Executive Committee along with the Board of Directors may, after a review, confer a Life Membership upon a Member in good standing. The bases for conferring a Life Membership upon a Member include a critical health situation, or permanent disability, or any other special case deemed worthy by the Executive Committee and the Board of Directors. A Life Member shall be exempt from annual dues.

SECTION 6. The names of deceased Members shall be made a part of the Society’s permanent records.

ARTICLE V. QUALIFICATIONS COMMITTEE
The Executive Committee shall appoint a Qualifications Committee, the purpose of which shall be to review such applications as may be referred to it by the Executive Committee, to recommend action to be taken with respect to applications so referred, to make a continuing study of requirements for admission to the Society, and when advisable to recommend to the Executive Committee changes in qualifications requirements. The Qualifications Committee shall consist of four Members unless a different number is authorized by the Executive Committee. The Qualifications Committee chairman will send a written notice as soon as it is practical to do so to any applicant who is not accepted as a Member and will also send a copy of such notice to all three of that applicant’s sponsors.

ARTICLE VI. ETHICS
SECTION 1. Each Member shall be guided by the highest standards of business ethics, personal honor, and professional conduct, as exemplified by the Code of Ethics for Engineers as adopted by the Accreditation Board for Engineering and Technology (ABET) as shown in Appendix A, and the Principles of Acceptable Evaluation Engineering Practice as shown in Appendix B. Appendices A and B are attached hereto and incorporated herein by reference. Honesty, integrity, loyalty, fairness, impartiality, candor, fidelity to trust, and inviolability of confidence are incumbent upon every Member, not for submissive observance, but as a set of dynamic principles to guide a way of life.

SECTION 2. A Member who, after due investigation, is found guilty of violating any of the standards prescribed in Section 1 of this article may be suspended, admonished, allowed to resign, or expelled from the Society in accordance with the procedure
provided by the By-Laws.

ARTICLE VII. BOARD OF DIRECTORS, OFFICERS AND THEIR DUTIES

SECTION 1. The maximum number of elected Directors (excluding the Executive Committee described in Sections 3 and 4 of this Article) shall be nine. The Directors shall be elected for a term of three years with three Directors being elected annually. The term of each newly elected Director will begin with the first board meeting following their election, which meeting is normally scheduled to be held in January, and will end immediately before the first board meeting scheduled to be attended by his or her successor approximately three years thereafter. Three additional Directors can also be Members of the Board of Directors as specified in Sections 7 and 8 below.

SECTION 2. There shall be no more than one Member from any one company or organization elected to the Board of Directors. A vacancy occurring in the Board of Directors may be filled by an affirmative vote of a majority, though less than a quorum, of the remaining Board of Directors. A Director elected to fill a vacancy shall be elected for the unexpired term of the predecessor Director.

SECTION 3. The Board of Directors shall elect from its Members the following officers: President, Vice President, and Secretary-Treasurer.

SECTION 4. The above named officers and the immediate Past-President shall constitute the Executive Committee.

SECTION 5. A Nominating Committee, to be appointed by the Executive Committee by September 10th of each year, shall nominate as candidates two Members for each of the three director positions to be filled via election. If a Nominating Committee is not so named, then the immediate Past-President shall automatically become the Chairman of the Nominating Committee that shall be named in their sole discretion. A petition signed by at least ten (10) percent of the Members before September 30th may place a third name, or more, on the ballot for any or all of the three Director positions along with the candidates selected by the Nominating Committee. The Executive Committee shall mail ballots to Members during the first two weeks in October. The ballots received by November 10th shall determine the newly elected Directors. In those instances where there are more than two candidates for a Director’s position, the individual who obtains a plurality of the ballots received by November 10th shall become the Director.

SECTION 6. Each of the Society’s three officers will serve for a period of one year and shall not be eligible for re-election to the same office during the current term as a Director. However, should the Board of Directors so desire, and should the Secretary-Treasurer be in agreement, the Secretary-Treasurer may be re-elected for a second year as Secretary-Treasurer during the current term as a Director. Also, any Member who was previously an officer of the Society may be re-elected as an officer during any additional term served as a Director.

SECTION 7. At the first meeting of the newly elected Board of Directors, the Directors, at their discretion, may appoint up to two Directors-at-Large for a one-year term each. A Director-at-Large will be a Member of the Board and will be eligible to serve as an officer during the one-year term.

SECTION 8. The immediate Past-President shall be considered an ex-officio Director and will serve as a Member of the Board of Directors for a term of one year.

Duties of Officers

SECTION 9. The President shall be the presiding officer at all meetings of the Society, shall take cognizance of the acts of the Society, of its officers and staff, shall appoint, within the limitations prescribed by the By-Laws, such committees as are required for the purpose of the Society, and shall delegate Members to represent the Society. The President shall serve as Chairman of the Executive Committee.

SECTION 10. The Vice President shall assume the office of the President in case of a vacancy in that office and shall assume the duties of President for such period or periods as that officer may be unable to perform necessary official duties. The Vice President shall be responsible for the Annual Meeting, technical programs and shall cause to be published and distributed any and all material approved by the Executive Committee.

SECTION 11. The Secretary-Treasurer shall assume the duties of President in case the President and Vice President are unable to serve. The Secretary-Treasurer shall have charge of the financial affairs of the Society and shall annually submit reports covering the fiscal year. The Secretary-Treasurer shall have the primary responsibility for disbursing the funds of the Society, and shall receive all funds of the Society, unless the Executive Committee authorizes the Society administrator to also receive funds on behalf of the Society. The President or the Vice President may disburse funds in circumstances in which the Secretary-Treasurer is unavailable to disburse in a timely manner. In such instances, the Secretary-Treasurer shall be provided copies of all checks so disbursed on a timely basis.

The Secretary-Treasurer shall cause an audit or a financial compilation to be prepared annually by a public accountant at the expense of the Society. The Secretary-Treasurer shall give a bond, and shall cause to be bonded all individuals whom the Executive Committee has authorized to handle Society funds. The amount of such bonds shall be set by the Executive Committee and the expense shall be borne by the Society. The funds of the Society shall be disbursed by check as authorized by the Executive Committee.

SECTION 12. The election of officers shall be conducted at the first meeting of the newly elected Board of Directors and the officers shall assume the duties of their respective offices immediately.

SECTION 13. Should a vacancy occur or be anticipated to occur in the office of Vice President or Secretary-Treasurer or if either of these officers is disabled and cannot perform the functions of office, such position shall be filled by a Member receiving a majority vote of the Executive Committee, either for the remainder of the unexpired term of the office vacated, or anticipated to be vacated, or for shorter period of disability as the committee may decide. In the case of a tie vote, the President’s choice for the incoming officer shall prevail.
ARTICLE VIII. EXECUTIVE COMMITTEE

SECTION 1. As provided in Article VII Section 4, the Executive Committee shall consist of the President, Vice President, Secretary-Treasurer and the immediate Past-President. If the immediate Past-President shall for any reason be unable to serve as a Member of the Executive Committee, the President shall fill the vacancy by the appointment of the next available preceding Past-President. If no Past-Presidents are available to serve on the Executive Committee, the President shall appoint a director of the Society to serve on the Executive Committee in the place of a Past-President of the Society.

SECTION 2. The Executive Committee shall have control and management of the affairs and funds of the Society, shall determine the manner of publication and approve the material presented for publication, shall designate the place and time of the Annual Meeting, shall appoint the Nominating Committee and its chairman, shall appoint the Qualifications Committee and its chairman, and shall be in charge of the annual election of officers and decide eligibility and other questions pertaining to the election. The Executive Committee is empowered to establish a business headquarters for the Society and to employ such persons as are needed to conduct the business of the Society. It is empowered to accept, create, and maintain special funds for publication, research and other purposes. It is empowered to make investments of both general and special funds of the Society and to create trust funds, giving to the trustees appointed for such purpose such direction as to investments as seems desirable to the Executive committee to accomplish any of its objectives and purposes.

ARTICLE IX. MEETINGS

SECTION 1. The Board of Directors may hold meetings either within or outside of the State of Texas. The first meeting of each newly elected Board of Directors shall be held at such time and place following its election as shall be determined by the Executive Committee. Notice via mail, facsimile, or electronic mail (e-mail) of such meeting shall be given to each director at least five days before the date of the meeting. In the event the newly elected Board of Directors is unable to have such meeting, the officers for the ensuing year shall be elected by mail in such manner as may be determined by the President. Upon the written request to do so submitted to the President by any three Members of the Board of Directors, a special meeting of the Board of Directors will be scheduled as soon as it is practical to do so. Notice via mail, facsimile, or electronic mail (e-mail) of such special meetings of the Board of Directors shall be given to each Director at least five days before the date of the meeting. Except as may be otherwise provided by statute, or by the Articles of Incorporation, or by the By-Laws, neither the business to be transacted, nor the purpose of any special meeting, need be specified in a notice or waiver of notice. At all meetings, of the Board of Directors a majority of the Directors then in office shall constitute a quorum for the transaction of business, and the act of a majority of the Directors present at any meeting at which there is a quorum shall be the act of the Board of Directors, except as may be otherwise specifically provided by statute or by the Articles of Incorporation.

SECTION 2. The Executive Committee shall meet shortly before the Annual Meeting, and at the call of the President may hold special meetings when and where advisable to conduct the affairs of the Society. Executive Committee Members may vote by proxy on matters which require a unanimous vote. Notice via mail, facsimile, or electronic mail (e-mail) of meetings shall be given to each Member of the Executive Committee at least five days before the date of the meeting. A majority of the Members of the Executive Committee represented in person or by proxy shall constitute a quorum for the transaction of business, and the act of a majority of the Members present at any meeting at which there is a quorum shall constitute the act of the Executive Committee.

SECTION 3. Any action of the Board of Directors or of the Executive Committee may be taken without a meeting if consent in writing setting forth the action so taken shall be signed by all of the Members of the Board of Directors or the Executive Committee, as the case may be. Such consent shall have the same force and effect as a unanimous vote of such Board of Directors or Executive Committee.

SECTION 4. The Members shall hold at least one regular meeting each year, which shall be known as the Annual Meeting. The Annual Meeting shall be held at a time and place designated by the Executive Committee. The purpose of the Annual Meeting shall be to (1) serve as a means of continuing education of and for the Members of the Society, (2) provide a venue for the dissemination of pertinent information through the presentation of scientific and other papers on topics of interest and the discussion of these papers, (3) inform the membership of the current state of the Society and present plans for the future of the Society, and (4) to allow Society business to be transacted. Special meetings of the Members for any purpose or purposes, unless prescribed or otherwise provided for by statute, by the Articles of Incorporation, or these By-Laws may be called by the President or the Executive Committee. A written request for such a special meeting shall be directed to the Secretary-Treasurer of the Society and such request shall state the purpose or purposes of the proposed meeting. Business transacted at any special meeting of Members shall be limited to the purposes stated in the written request for such special meeting. Notice via mail, facsimile or electronic mail (e-mail) stating the place, day and hour of the special meeting and the purpose or purposes for which the special meeting is called, and a formal proxy form approved by the Executive Committee shall be delivered not less than ten (10) days nor more than fifty (50) days before the date of the meeting by or at the direction of the President, the Secretary-Treasurer, or the officer or person calling the meeting, to each Member in good standing of the Society.

SECTION 5. Members holding one-tenth of the votes entitled to be cast, represented in person or by authorized proxy, shall constitute a quorum at all meetings of the Members. When a quorum is present at any meeting, the vote of a majority entitled to vote, present in person or represented by proxy, shall determine the results of any proposal brought before such meeting, unless the proposal is one upon which a different vote is required by express provision of a
statute, the Articles of Incorporation or these By-Laws, in which case the relevant provision shall govern and control the manner in which such proposal is voted upon.

SECTION 6. Whenever any notice is required to be given under the provisions of a statute or of the Articles of Incorporation or of these By-Laws, a waiver thereof in writing signed by the person or persons entitled to such notice, whether before or after the time stated therein, shall be equivalent to the giving of such notice. Any such signed waiver of notice, or a signed copy thereof, shall be placed in the minutes of the corporation.

ARTICLE X. AMENDMENTS

Amendments to the By-Laws may be proposed by (1) a resolution of the Executive Committee or (2) a resolution of the Board of Directors or (3) a written proposal signed by ten percent of the then current number of Members in good standing of the Society and submitted to the Executive Committee. The legality of all proposed amendments not initiated by the Executive Committee shall be determined by the Executive Committee upon submission. All resolutions and/or proposals for amendment of the By-Laws must be submitted to the Members of the Society for approval or disapproval using the following procedure:
(a) If the proposed amendment is determined to be legal, the proposed amendment shall be printed in its entirety in the next SPEE newsletter and shall be simultaneously posted on the SPEE Website.
(b) A comment period of no less than 30 days but no more than 60 days from the date of mailing (postmark date) of the newsletter shall be allowed.
(c) At the end of the comment period the Secretary-Treasurer shall prepare a ballot requesting approval or disapproval of the proposed amendment. The ballot form shall include the full text of the proposed amendment and each ballot shall be identified by a unique number. The Secretary-Treasurer may, at their discretion, include information regarding the purpose and anticipated effects of the amendment as well as arguments for and against the amendment.
(d) The ballot shall be mailed to all Members by regular mail within 14 days of the end of the comment period. All ballots shall be mailed on the same day.
(e) A majority (50% + 1) of the ballots received within sixty (60) days from the mailing (postmark) date shall be sufficient to approve an amendment of the By-Laws.
(f) Only Members in good standing shall be eligible to (1) sponsor and/or sign proposals for amendments to the By-Laws or (2) to vote on amendments to the By-Laws.

ARTICLE XI. DUES

SECTION 1. The fiscal year of the Society shall correspond with the calendar year.

SECTION 2. The annual dues of Members shall be determined by the majority vote of the Board of Directors. The annual dues are payable in advance on the first day of each calendar year. A bill shall be mailed or included in the Newsletter mailed to each Member at least a month prior to such date stating the amount of dues and the penalties and conditions applicable to a default in payment. The Board of Directors may, by majority vote, establish a late fee to be paid in addition to the annual dues if the dues are not paid prior to January 31st. Additional late fees may be established in the same manner for dues payments received after March 31st, June 30th, and September 30th. The late fee amount will be established by the postmark date, or the date the payment is rendered if not rendered by check.

The Executive Committee may at its discretion suspend or waive annual dues to Members serving in the armed forces of the United States, or any allied country, without otherwise affecting their status in the Society.

ARTICLE XII. MEMBERSHIP STATUS

SECTION 1. Any Member may resign from the Society at any time. Such resignation shall be in writing and shall be accepted by the Executive Committee.

SECTION 2. Any Member who owes a late fee in connection with payment of annual dues as specified in Article XI shall not be considered to be in good standing. Members not in good standing will not receive the benefits of membership, and they will pay Non-Member fees for all SPEE activities, services, and publications. Any Member who is more than one year in arrears in payment of dues shall be suspended from the Society. The administrator will mail a "Notice of Suspension" letter by November 10th using certified mail, return receipt requested, to inform such members of pending suspension effective February 1st if all dues and penalty amounts are not received or postmarked by January 31st.

SECTION 3. Any Member who resigns, is suspended, or is expelled under the provision of this article ceases to have any rights in the Society and ceases to incur further indebtedness to the Society.

SECTION 4. Any person who has ceased to be a Member under Section 1 or Section 2 of this article can be reinstated only with the unanimous approval to do so by the Executive Committee, the payment of any outstanding dues and other indebtedness to the Society on the date when they ceased to be a Member, and the submittal of a new application in accordance with the provisions of Article IV.

SECTION 5. Charges of misconduct in violation of Article VI or the Principles of Acceptable Evaluation Engineering Practice hereof shall first be submitted in writing to the President of the Society by a Member in good standing, with a full statement of the evidence on which the charges are based. If the President determines that the charges merit further consideration, the matter will be referred to the Grievance Committee for review. If the Grievance Committee determines that the facts warrant further action, it shall prepare and submit to the Executive Committee formal written charges against the accused Member. After the receipt of such formal charges, the Executive Committee shall set a date and place for a hearing thereon, and shall give to the accused person notice thereof in writing, sent by registered mail to that person’s last known address not less than thirty (30) days before the hearing date scheduled, accompanied by a copy of the formal charges and a copy of this article.

SECTION 6. On the day fixed for the hearing, the accused person may appear and/or be represented by
counsel before the Executive Committee, hear any witness called in support of the charges, cross-examine any witness called in support of the charges, present witnesses, and submit oral or written statements. The Executive Committee may likewise present witnesses and have the right of cross-examination. The accused person may, by giving notice via certified mail to the President at the Society headquarters, which notice is postmarked not less than ten (10) days prior to the date of the hearing, waive personal appearance and request the Executive Committee to adjudge the matter on the basis of a written defense statement accompanying such letter. After the conclusion of the hearing or the study of the written defense submitted in lieu thereof, the Executive Committee shall vote to either sustain or dismiss the charges. The charges will be dismissed unless the Executive Committee votes unanimously to declare the charges sustained, and so doing the Executive Committee may suspend as a Member the accused person for a stated period of time, admonish the Member, allow the Member to resign, or expel the Member from the Society. Failure of the accused person to appear, or to submit a waiver letter and a written defense as in this section provided, shall not prevent the Executive Committee from rendering final judgment and taking action on the basis of the evidence available on the hearing date. The attendance of all four Members of the Executive Committee shall be required in order to conduct the hearing provided for in this section.

SECTION 7. Resignation of the accused person from the Society at any stage of the foregoing prescribed proceedings shall automatically terminate the proceedings.

SECTION 8. The decision of the Executive Committee in all matters pertaining to the interpretation and execution of the provisions of Section 5 and 6 of this article shall be final.

ARTICLE XIII. GRIEVANCE COMMITTEE

SECTION 1. The Executive Committee shall appoint a Grievance Committee, the purpose of which shall be to examine charges of misconduct that are referred to it under Article XII. The committee shall consist of three Members, one each from the banking, consulting and industry segments of the Society. The Members shall serve three-year staggered terms.

SECTION 2. The Executive Committee may alternatively appoint a Grievance Committee Chairman, who will solely represent the Grievance Committee until such time as a grievance matter is brought before it. At such time, the Chairman of the Grievance Committee, along with the Executive Committee, shall appoint two other Grievance Committee members such that the full Grievance Committee so formed meets the requirements established in Section 1 of this Article.

ARTICLE XIV. LOCAL CHAPTERS

Any ten (10) or more Members of the Society may form a local chapter of the Society in an area approved by the Executive Committee in order to conduct meetings and further the objectives and purposes of the Society. Applications for the formation of such local chapters shall be submitted in writing to the Executive Committee for approval. Local chapters shall elect their own Chairman, Vice Chairman and Secretary-Treasurer. Local chapters must conduct their business under the same guidelines as set forth in the By-Laws of the Society. All funds of the local chapter shall be maintained in accounts separate from those of the Society. Each local chapter shall submit a financial report annually to the Board of Directors. The funds of each local chapter shall be included in the consolidated report submitted by the Society in its annual federal income tax report. Local chapters may be dissolved by proper action of the Executive Committee. The Executive Committee may direct that up to ten (10) percent of the annual membership dues paid by the Members of a local chapter to the Society be returned to that local chapter upon receipt of a written request to do so submitted with adequate justification documentation of need signed by two chapter officers.

ARTICLE XV. COUNCIL OF PAST-PRESIDENTS

The Council of Past-Presidents will provide counsel to the President on matters under consideration by the Executive Committee and Board of Directors which may affect more than one administration. The Council will also advise the Executive Committee regarding the SPEE Long Range Plan and priorities for its objectives and implementation.

SECTION 1. All SPEE Past-Presidents, in good standing, are eligible to volunteer and serve on the Council.

SECTION 2. The Chair of the Council shall be chosen annually by the Members of the Council. Only the five (5) most recent Past-Presidents serving, excluding the current Past-President, shall be eligible to be Chair of the Council. The current Past-President may serve as a Member of the Council but is not eligible to be the Chair.

SECTION 3. At least one Member of the Council will be present at each meeting of the SPEE Board of Directors. The Executive Committee may request that a Council representative attend any of its meetings.

SECTION 4. The Council shall form any sub-committees necessary to carry out their responsibilities.

SECTION 5. The Board and Executive Committee may make additional assignments to the Council.

SECTION 6. The Council shall submit at least one report annually to the Board of Directors on the Society’s progress and the status of implementation of the SPEE Long Range Plan.

ARTICLE XVI. INDEMNIFICATION

Each person who serves as an Officer, Director, Member of the Executive Committee, or any Member of the Society serving as part of any Committee designated and formed by the President and/or Board of Directors of the Society shall be indemnified by the Society against any costs, expenses, or liabilities which may be imposed upon or reasonably incurred by such person in connection with any civil or criminal action, lawsuit or proceeding in which such person may be named as a party or defendant by reason of having served the Society in one of the above capacities or by reason of any action alleged to have been taken or omitted by such person in one of the above capacities. It is provided, however, that the right to indemnification herein provided shall not extend to any costs, expenses,
or liabilities imposed upon or incurred by any Indemnified Person in relation to matters as to which such person shall be finally adjudged to be liable for negligence or misconduct in the performance of duties as an Indemnified Person or to any sum paid by such person in settlement of any action, lawsuit, or proceeding based on alleged dereliction of duty.

The right of indemnification provided by this Article shall inure to each of the Indemnified Persons while acting in the designated capacities, whether or not the respective Indemnified Person is acting in such capacity at the time that such costs, expenses, or liabilities are imposed or incurred and whether or not the claim asserted is based on matters which precede the adoption of this Article. In the event of the death of an Indemnified Person, the indemnification shall extend to the legal representatives of the Indemnified Person.

ARTICLE XVII. POSITION STATEMENTS

Members of the Society, whether acting as individuals, as an officer or Director of the Society, as a committee, or as a Chapter of the Society, shall not issue any position statements on behalf of or in the name of the Society without first receiving the approval of the Board of Directors. Approval requires an affirmative vote by two-thirds of all eligible Members of the Board of Directors. For the purpose of this Article, a “position statement” shall mean (a) any letter, publication, professional paper, or any other written document and (b) any verbal communication, speech, or exchange that separately or collectively refers to, indicates or otherwise suggests that statements contained in the document or communication, in whole or in part, are approved or endorsed as the policy of SPEE. This definition shall not extend to the use of or quotation from any official publication of the Society.

Members of the Society wishing to make a position statement must submit a written request to the President of the Society. The request must include (1) the full text of the proposed statement, (2) the intended recipient(s), (3) the purpose of the statement, and (4) the time period within which approval of the request is requested. The President will present the request to the Board of Directors for review and shall request that the Board render a timely decision. If a Member of the Board does not vote on the proposal within a reasonable time, his vote shall be considered an affirmative vote.

It is not the intent of SPEE to enter into or to take partisan positions in legal, regulatory or governmental issues and proceedings. It is recognized that in any issue before a court, regulatory, or governmental agency there may be the possibility that (1) an SPEE Member, (2) the Member’s employer or firm, or (3) a client of the Member or the Member’s employer would be beneficially or adversely affected by the outcome of the issue. In such instances, the SPEE Member should not make a request to submit a position statement. If a Member of the Board of Directors has a potential conflict of interest, as described above, on a proposed position statement, he must notify the Board and be excluded from the voting on the proposed position statement.

By-Laws Approved July 16, 2007
Proper Reservoir Integration (Volumetrics)

By Dick Banks

Presented at the Forty Sixth Annual Meeting of
The Society of Petroleum Evaluation Engineers
The Homestead Resort, Virginia
June 9-10, 2008

Introduction

One of the basic tools of reservoir engineering is to integrate reservoirs to estimate the volumes of oil and gas in place. The procedure involves contouring and planimetering the pertinent variables which is "mechanical" integration. Computers and numerical integration can bypass the limitations of planimetering.

Typically:

\[ R \text{ (Reserves/unit area)} = \text{Thickness} \times \text{Net-to-gross} \times \text{Porosity} \times (1 - \text{Water Saturation}) \]

Numerical Integration

If the reservoir area were divided into a large number of cells, and if \( R \) were known for each cell, then total reservoir hydrocarbon volume could be obtained by multiplying each \( R \) by its unit or cell area and adding them up. This would be an example of numerical integration.

Interpolation/Extrapolation

Interpolation/extrapolation is the mathematical process of making estimates. This process is used in contouring and in integration since both require estimating values for the variable \( R \) at locations where it is not known. Algorithms for making estimates typically present the following problem: If 1) variables are used to obtain a product, and the product (the combined variable) is used to obtain interpolated values at unknown locations, the result is not the same as 2) when the variables are first interpolated/extrapolated at these unknown locations and then the product is made. The issue is whether to use option 1) or option 2).

Before processing became available, many engineers and geologists were using option 1) to simplify the process of integration, i.e., they were contouring combined variables.

- Net Pay
- Porosity x Thickness
- Net Pore Volumes
- Hydrocarbon pore volume

While this simplification may save time, its justification needs to be reassessed, for with computers time is no longer an issue but quality and consistency of results are. It can be shown that by choosing option 2), all of the integrals mentioned above are automatically consistent with each other, whereas option 1) does not guarantee that.

Furthermore, proper trends are identified when mapping individual variables compared to mapping combined variables. A comparison between option 1) and option 2) for calculating net pay when the edge of the reservoir is involved is shown graphically (Fig. 1).

In this linear example, there are two wells. Gross thickness is trending toward zero. Net-to-gross ratio is increasing as gross thickness is decreasing. The interpolation/extrapolation of gross thickness goes to zero and defines the edge of the field. The interpolation/extrapolation of net-to-gross ratio does not go to zero.

Calculating net pay by multiplying net-to-gross ratio and thickness at each well and mapping the product (option 1) shows that the product extends beyond the edge of the field. Mapping gross thickness and net-to-gross ratio separately and then calculating the product (option 2), show that the product properly goes to zero at the edge of the field. Mathematically, the reason for the difference is as follows: The integral of the products is not equal to the product of the integrals:

\[ \Sigma A \times B \neq \Sigma A \times \Sigma B \]

A simple example of mapping a channel sand can illustrate these concepts. The figures below show the sand is absent at the dry holes with values of A (Absent). The computer uses an algorithm, i.e., a procedure, to select a probable location for the zero isopach on the gross sand map (Fig. 2).

Gross Sand Thickness

Gross sand thickness (Fig. 2) is greatest in the middle of the channel and it diminishes toward the edge of the channel. Gross thickness is an Extensive surface, i.e., it influences integration based on its extent. Formation tops and bottoms, oil and water contacts and faults also are Extensive surfaces.

Net-to-Gross Ratio

Net-to-Gross Ratio (Fig 3) is lower on the north side of the channel and increases to the south. Net-to-gross ratio is not limited by the zero isopach of gross sand. Net-to-Gross Ratio is an Intensive surface, i.e., it influences integration based on its Intensity. Porosity and oil and gas saturation also are Intensive surfaces.

The value for net pay at each well is correct, but when these values are contoured, they have no relationship with the edge of the channel (Fig. 4).

Values for net pay at each well are the same, but now net pay properly goes to zero at the edge of the channel (Fig. 5).
There are no differences in net pay between Option 1) and Option 2) values calculated at the wells, but there are differences in net pay values everywhere else, both on interpolation and on extrapolation (Fig. 6).

This North-South cross section (Fig. 7) shows Gross Thickness (blue), Combined Net Pay (Option 1, green) and Net Pay as the product of Gross Thickness and Net/Gross Ratio (Option 2, red). Note that in Option 2, Net Pay goes to zero at the edge of the field. Option 1, Combined Net Pay, does not go to zero at the edge of the field, i.e., where Gross Thickness goes to zero, although both options are the same at well data points.

**Proper Integration When Contacts and Other Surfaces are Involved**

In Figure 8, integration is complicated when delimiting (extensive) surfaces are involved, i.e. oil and water contacts and faults. It is essentially impossible to contour combined variables and get the correct integral, i.e., net volume, net porous volume, hydrocarbon pore volume. Hence it is particularly important to contour each independent variable independently and to take the product at integration time, i.e. Option 2.

**Conclusions**

If you contour and integrate net pay, porosity-thickness, net porous thickness, hydrocarbon pore volume, etc., remember CAVEAT EMPTOR—let the buyer beware! Always contour independent variables independently and take the product at integration time.
Fig. 1 - Net pay comparison between Option 1 and Option 2.

Fig. 2 - Gross sand thickness.
Fig. 3 - Net-To-Gross ratio.

Fig. 4 - Option 1 contouring net pay.
Fig. 5 - Option 2 contouring net pay as the product of gross sand and net-to-gross ratio.

Fig. 6 - Difference map between Option 1 and Option 2.
Fig. 7 - N-S cross-section.

Fig. 8 - Example of contacts and other surfaces.
Summary

- A reservoir is a creature of capillary forces.
- Capillary forces must be broken down one pore throat at a time.
- This process is performed by a wave that restricts the areas and volumes being drained as surely as sealing boundaries until it reaches the sealing boundaries.
- The wave propagates as a function of hydraulic diffusivity and the time of initiation. It is predictable.
- The passage of this wave is distinct and easily recognizable but it does not look like the picture in the textbook.
- The capillary wave can be used to make money in spite of the SEC but could best be used to reduce uncertainty in reservoir continuity thereby increasing the accuracy of reserve reports.

Introduction

Reservoir continuity is one of the most critical aspects of property evaluation that Evaluation Engineers encounter. Interference testing is a simple procedure to establish reservoir continuity. Traditionally this has been underutilized because the application of the technique and test results have been inconclusive. The difficulty in the application of interference testing has to do with knowing what to look for in pressure data and when to look for it.

Capillary Forces

There are physical reasons that account for historical frustrations with the method. First, the evaluator is seeking information about the propagation of pressure depletion in a reservoir that is composed of billions and trillions of pores that represent physical containers of the fluids that are produced. These fluids are locked in place by formidable electronic forces that manifest themselves as true physical barriers to fluid movement. These are generally referred to as capillary forces. This is the same mechanism that produces wetting of surfaces by water and oil or produces the strength of thin films such as soap bubbles. These are associated with phase changes because the affects of electronic forces at the interface surfaces can be seen. Whether their influences can be seen or not, these forces exist.

The act of initiating production is to apply enough pressure differential to serially break down the structural barrier imposed at each pore throat. The flow of oil or gas is produced by breaking the electronic barrier at each pore throat and maintaining the opening with continuous flow from pore to pore. The process is one of serial opening followed by production from pore to pore until reaching the wellbore. At each pore throat, the entry pressure must be broken and enough depletion of that pore passed out of the pore to open the next pore throat. This is a slow and tortuous process that requires substantial time.

Cone of Influence

The cone of influence is a pressure depletion region around each well that is surrounded by an advancing wall of static capillary forces. As the pores open serially to allow flow to the wellbore, the volume of the cone of influence slowly begins to expand the volume of the reservoir being drained. Think of these as small magnetic doors to each pore. This is manifested to a pressure gauge as the passage of a step drop in capillary pressure. It will appear in time sequence to a remote pressure gauge as a step drop in pressure followed a rapid decay of pressure. Figure 1 is such a pressure step viewed by a gauge in an offset well to the only producing well in a new reservoir that was at initial pressure. Note that the pressure is stable at initial pressure before the wave arrival. The bounding capillary shockwave is represented by the apparent gap in the data as pointed out by the red arrow in Figure 1.

It should be noted that had the recording of pressure been stopped at 24 hours, the test would have indicated no communication. This would have been the case if the system had been modeled by a traditional potential flow diffusion simulator. Most interference tests are terminated before the capillary interference wave has had time to reach the static offset well. This capillary wave represents the pressure boundary of the cone of influence. The blue arrows point to higher order capillary waves that were produced earlier by the primary wave reaching boundaries. In other words, this is the transient history of the offset producing well from a remote location. For the purposes of this technical note, focus on the bounding wave alone.

Figure 2 shows a simple image of the radial flow system with an element that represents the breakdown of capillary entry pressure and the bundle of capillary elements that connect it to the wellbore. Think of the element as PacMan® literally eating his way through the formation. This is his first nephew PoreBoy™. PoreBoy™ exists between the initial capillary pressure and the cone of influence. He must reduce the pressure at his front face sufficiently to rupture the static pore entry shear stresses, then pass enough fluid through his body length of ΔX before he can advance to the next collection of pore throats.

At this juncture, to make this a technical note one must produce a derivation. Figure 3 shows an element on which an energy balance needs to be performed and
related to the stream of capillaries reaching back to the wellbore of the producing well.

The model involves balancing Darcy flow through the element with the pressure depletion of the element then performing an energy balance between the trailing capillary stream bundle and the element to calculate the velocity of the element.

- Constant Pressure on Leading Edge Face of Element
- Darcy Flow From Element
- Energy Balance Between Shockwave Element, and its Capillary Stream Tube Volume
- Addition of Expanding Fluid Mass and Its Elastic Energy to the Cone of Influence

Fluid Growth of Cone

The next step is to create an equation and work to eliminate the $\Delta p/\Delta x$ term from the energy balance and rearrange to calculate the speed of the element as $U_{wp}$. Wave velocity is reduced with time, it is not constant. The location of the element, or simply stated, the length of the capillary trail from the well, is what is of interest. The last step is to integrate the velocity over time to achieve the effective length of the trail of capillaries. These equations are shown in Table 1.

**HOLD IT. ATTENTION!** Note that the equation in Table 1 is the classic radius of investigation equation or drainage radius. The radius of investigation is the location of a diffusion wave that is passing through the reservoir and acting as a means for connecting the reservoir pore by pore to the well. This equation also indicates how long one must wait to see interference. This wave moves at a very slow pace. If one does not wait long enough, interference will not be detected in an offset well. Note also that the distance is solely a function of hydraulic diffusivity and time from initiation. Flowing a well at a higher rate will not speed up the process. The capillary shockwave is the physical phenomenon that exists at the radius of investigation. One cannot detect any boundaries that exist beyond the radius of investigation.

In few cases is there an undisturbed reservoir to begin the test. What does one look for?

Note the changing scales until the tell-tale peak is exposed. During the buildup, fluid is flowing toward the well that is building up. There is a stable period where static capillary forces re-establish. Then the interfering well cone of influence begins to pass through the observation well breaking the static pressure, and initiating flow in the opposite direction. These are completely separate events! This is the signature of interference. Note that it takes a quality pressure gauge to see all of the detail. The difference between the stair-steps of points is the resolution of the pressure gauge. This was a dual quartz gauge capable of 0.01 psi resolution. The preceding example is a Permian basin well with an offset well 1440 feet away. The following example was off the Coast of Africa and proved interference from a well 8500 feet away. The third example represents two other wells sequentially interfering with the well being tested.

All of the well tests in Figures 4 and 5 received bearing the same question “What in the $#%@* is this?” When two wells are interfering and one is shut in, the producing well’s cone of influence begins approximately half way in between. The time required for interference to appear in the shut-in well will be approximately 3/4ths of the wave transit time because of the “head start.” This rule applies to a homogeneous reservoir, but changes in thickness and permeability can be handled as well.

It should be noted that if the first test is questioned, one could do this process again and again and expect to see the same detail in the results.

Two Well Testing

If two wells begin producing at the same time, the shockwave fronts will meet at the same time. This method requires only 1/4th the time. That is an advantage if you have control of both wells and do not have to see the wave passage. The response in both wells would be a doubling of natural log pressure derivative at the same point in time. It is my opinion that the wave passage is a more compelling case when presenting evidence to outside parties.

The beauty of interference testing is that you can calculate the permeability and hence hydraulic diffusivity at each well during the early part of the flow, then measure the effective or mean hydraulic diffusivity by the time of the wave passage from the well of generation to the well of observation. Rate changes are not going to affect the arrival time but will be seen in the pressure profile behind the wave. The wave moves as a function of the properties at the wave front. All that this testing requires is a recording pressure gauge with an accurate clock. Please note that the hydraulic diffusivity is the coefficient of the diffusivity equation used in all reservoir modeling. This is a critical piece of information that can be developed directly from the test with a simple calculation.

The method of execution can go something like this: Gauges are placed in each of two suspected interfering wells. Each well is opened on a fixed choke to create a short drawdown and buildup. Next one well is turned on. The other well is observed for arrival of the capillary shockwave front. While waiting, the short tests are analyzed for permeability and the hydraulic diffusivity for each well is computed. The average of these values is used to estimate the transit time of the wave. If the wave arrives on schedule or within a reasonable tolerance of say + or – 10%, it is reasonable to assume that the wave passed through the reservoir unabated. Hence there appears to be a clear path between wells. At issue is how many locations are located on that clear path.

Drill and perform interference tests with two more wells. How many PUD locations are added using the same logic?
It would appear that these PUD locations have many other undeveloped locations completely surrounded. Each of the interference tests will produce a transient from the perspective of each of the wells. That information can be turned into a single well transient analysis of the reservoir limits from four points of perspective, but stay with the current case.

Could one make a more compelling case for proving undeveloped locations?

When there is a predictable and singularly observable wave why not use it?

Future Steps
It would appear that a sound approach to get this accepted by the SEC would be to present a case to them that involves an actual test with ample prior warning as to the intentions of the operator and the physics of the technique to be used. Develop a case for interference PUDs by testing; then prove it by drilling an interior location. This could reduce the number of drilled holes to produce PUD locations in the future. Acceptance generally derives from use. Use involves the willing participation of all parties. Acceptance is also based upon consistently making money with the technique by avoiding unnecessary or dry holes.

This is a necessary first step in the rehabilitation of interference testing as a means for evaluating reservoirs. The next and intermediate step is recognition of the clear radius method for dealing with water down-dip. Only then can the SEC be approached on the more sophisticated method of single well energy mapping to confirm seismic images.
Fig. 1 - Capillary Shockwave Passing the Static Observation Well Initiated by Opening a Well 2000 Feet Away 27 Hours Earlier.
Fig. 2 - The Radial Capillary Structure of the Cone of Influence and the Bounding Capillary Shockwave Element.

Fig. 3 - The Bounding Capillary Shockwave Element.

\[ \text{Pressure} = \pi \]

\[ \text{Pressure} = \pi - dP_{\text{cap}}. \]

\[ \text{Pressure} = \pi - dP_{\text{cap}}. \]

\[ \text{Gradient} = -\frac{dP_{\text{cap}}}{dx} \]

\[ U_{\text{bulk}} = \text{Fluid Flow into Active Capillary Bundle} \]

\[ U_{\text{bulk}} = \phi^* (U_{\text{wf}}) = \frac{q}{(dy*dz)} \]
Table 1 - Equating Fluid Growth of Cone in Terms of Bulk Fluid Velocity.

\[ q / \text{Tube Area} = U_{\text{Bulk}} = \phi U_{\text{Wave Front}} \]

**Fluid Continuity... Darcy’s Law... Energy Equation**

\[ \phi U_{\text{wf}} = -(k/\mu) \frac{dP_c}{dx} = -(k/\mu)(-1/(t\cdot C_t U_{\text{wf}})) \]

\[ U_{\text{wf}} = \sqrt{k/(\phi \cdot \mu \cdot t \cdot C_t)} = \sqrt{\eta/t} \]

\[ L = \int_0^t U_{\text{wf}} \, dt = \int_0^t \sqrt{\eta/t} \, dt = 2 \sqrt{\eta \cdot t} \]
Fig. 4 - Sequential Zoom and Magnification of the Data at the Peak
Fig. 5 - Second Buildup with Interference Above and a Buildup with Two Interfering Wells in Sequence
Fig. 6 - Repeated Tests Bear the Same Fingerprints to a Surprising Level of Detail.
Fig. 7 - Two Well Test Configuration Requires Two Gauges

D-1 Responds to the Opening of B-13 at 590 Hours. Wells Appear to be Joined at the Hip.
Fig. 8 - SEC PUD Locations Newly Discovered Reservoir Two Delineation Wells

Fig. 9 - Proposed PUD Locations Based Upon Direct Passage of Capillary Shockwave Between Wells.
Fig. 10 - Proposed PUD Locations Based Upon Direct Passage of Capillary Shockwave Passed From Two More Delineation Wells.
Implementation of the Two Distinct Deterministic Evaluation Philosophies
By Rawdon J.H. Seager, Projects Director, Gaffney, Cline & Associates
Presented at the Forty Sixth Annual Meeting of
The Society of Petroleum Evaluation Engineers
The Homestead Resort, Virginia
June 9-10, 2008

Statement of the Issue
This paper discusses the implementation of the two deterministic evaluation methodologies that are recognized in the Petroleum Resources Management System (PRMS), outlined as follows.

Incremental
The Incremental approach requires the separate estimation of each Reserve category; i.e. Proved, Probable, and Possible reserves are assessed as discrete volumes, each without reference to the others. One key point (refer to the 2001 Guidelines) is that there is no uncertainty assigned to Probable or Possible – the concomitant “risk” that volumes are not present or recovered is inherent in the category designation. “Under the deterministic incremental (risk-based) approach, quantities at each level of uncertainty are estimated discretely and separately. The associated incremental quantities [for Reserves] are termed Proved, Probable, and Possible”.

Scenario
The scenario approach typically involves the derivation of a “best estimate” case Proved+Probable (2P), with appropriate downside Proved (1P) and upside Proved+Probable+Possible (3P) cases to reflect the range of expected volume outcomes. According to the PRMS, “such estimates are based on qualitative assessments of relative uncertainty using consistent interpretation guidelines”. “For Reserves, the general cumulative terms low/best/high estimates are denoted as 1P/2P/3P, respectively”.

It is postulated that the Incremental and Scenario approaches are mutually exclusive; however, there are circumstances in which this distinction becomes blurred.

For the sake of brevity, this review does not discuss the use of the probabilistic methodology, which, although the calculation method used is different, is philosophically similar to the scenario approach. Note that there is no intent to endorse any one methodology above another. Also this paper does not address the quite separate requirements of the US Securities and Exchange Commission (SEC).

Key Sources of Uncertainty
Recoverable volume uncertainty can be due to:

- Areal uncertainty of the reservoir away from well control (for instance, across a fault)
- Vertical uncertainty of the location of the fluid contact(s)
- Well performance and recovery uncertainty

Each of these sources of uncertainty can be addressed by either the incremental or the scenario methodology. I will not discuss the sometimes murky area of what has really been discovered; for instance, a fault compartment two or three blocks away from an oil or gas well.

Scenario Method
The identification of separate “Low”, “Best” and “High” estimates for the asset can be accomplished in a number of ways, but these typically involve a combination of the following:

- Prepare one or more separate maps consistent with the degree of confidence away from well control, including structure, and reservoir development
- Identify fluid contacts, or a range of possible contacts
- Establish a range of recovery estimates to be applied, based on the defined project

A Simple Example – Scenario Method
An accumulation is defined by two oil wells with two dry holes. The Lowest Known Oil (LKO) is derived from well #2 and the oil-water contact (OWC) estimated from Modular Formation Dynamic Tester (MDT) gradients. The operator has confidence in the current mapping.

The project is to develop the field with 18 new wells (20 in total).

Assume that there is no variation across the field (e.g. for net pay) in this example (Fig. 1).

Estimates are made for in-place and recoverable volumes based on the defined development plan (“Project”). Assume an in-place volume of 100 MMstb (total area) with a range of recovery factors from 14% - 20% - 26% at the 1P - 2P - 3P levels. Per well recoveries are therefore 0.7 - 1.0 - 1.3 MMstb on average and reserves are estimated to be:

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<tr>
<th></th>
<th>1P</th>
<th>2P</th>
<th>3P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reserves</td>
<td>14.0</td>
<td>20.0</td>
<td>26.0</td>
</tr>
</tbody>
</table>

A Simple Example – Incremental Method
Use of this approach involves the separate assessment of Proved, Probable and Possible volumes, which can be accomplished in a number of ways, but, typically one map is prepared in which areas of the field are designated as one or other category based on available subsurface information. Individual well locations are
assigned to the categories according to their placement with respect to existing wells and known or inferred fluid contacts. Volumes can be categorized according to uncertainty in areal extent, vertical contacts, or recovery (or any or all of these).

**Incremental Method - Reserve Categories**
Continuing from the example above, now consider reserve categories based on distance from well control (Fig. 2).

- 10 wells are in the Proved area
- 4 wells in the Probable area
- 6 wells in the Possible area

To each well we could therefore assign either the low, best or high recovery estimate. So how do we now assign volumes? Does each well require a range of potential recovery and if so, what is it? Should we use the “low” estimate for all Proved wells?

**Incremental Method - 1**
All wells given the Best estimate volume.

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<tr>
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<th>Low</th>
<th>Best</th>
<th>High</th>
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<tbody>
<tr>
<td>Proved</td>
<td>7.0</td>
<td>10.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Probable</td>
<td>2.8</td>
<td>4.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Possible</td>
<td>4.2</td>
<td>6.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Reserves</td>
<td>10.0</td>
<td>14.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

**Incremental Method - 2**
We assign the Low estimate for Proved, Best for Probable and High for Possible.

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Best</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proved</td>
<td>7.0</td>
<td>10.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Probable</td>
<td>2.8</td>
<td>4.0</td>
<td>5.2</td>
</tr>
<tr>
<td>Possible</td>
<td>4.2</td>
<td>6.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Reserves</td>
<td>10.0</td>
<td>14.0</td>
<td>20.0</td>
</tr>
</tbody>
</table>

**Incremental Method - 3**
Allocate volumes as follows:
- 1P - Proved uses the Low estimate
- 2P - Proved and Probable, uses the Best estimate
- 3P - Proved, Probable, and Possible, uses the High estimate

<table>
<thead>
<tr>
<th></th>
<th>Low</th>
<th>Best</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proved</td>
<td>7.0</td>
<td>10.0</td>
<td>13.0</td>
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<tr>
<td>Probable</td>
<td>2.8</td>
<td>4.0</td>
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</tr>
<tr>
<td>Possible</td>
<td>4.2</td>
<td>6.0</td>
<td>7.8</td>
</tr>
<tr>
<td>Reserves</td>
<td>10.0</td>
<td>14.0</td>
<td>18.8</td>
</tr>
</tbody>
</table>

**Summary**
A summary of volumes derived by each method is presented in Table 1.

**Which Method is “Best”?**
For evaluators using the Incremental Method, the most commonly applied approach seems to be Method 1 (although there will always be exceptions), use of the “best estimate” of recovery for each well. This is statistically reasonable if there are several wells.

For instance, with 10 wells:
- One well range: 0.7 – 1.0 – 1.3 MMstb
- Ten well average: 0.9 – 1.0 – 1.1 MMstb

However, selection of a different philosophy will result in notably different total volumes.

**References**
Petroleum Resources Management System. 2007. SPE/AAPG/WPC/SPEE.

Guidelines for the Evaluation of Petroleum Reserves and Resources. 2001. SPE/WPC/AAPG.
Table 1

Volumes in Million Barrels

<table>
<thead>
<tr>
<th>Reserves</th>
<th>Scenario</th>
<th>Incremental 1</th>
<th>Incremental 2</th>
<th>Incremental 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Scenario considers the entire field development</td>
<td>Best estimate well recovery applied to each Reserve category</td>
<td>Low for Proved, Best for Probable and High for Possible</td>
<td>Low for Proved, Best for Proved &amp; Probable and High for Proved, Probable &amp; Possible</td>
</tr>
<tr>
<td>1P</td>
<td>14</td>
<td>10</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>2P</td>
<td>20</td>
<td>14</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>3P</td>
<td>26</td>
<td>20</td>
<td>18.8</td>
<td>26</td>
</tr>
</tbody>
</table>
The Value of Oil and Gas Reserves Information


Presented at the Forty Sixth Annual Meeting of
The Society of Petroleum Evaluation Engineers
The Homestead Resort, Virginia
June 9-10, 2008

Introduction

Over the past few years, the subject of oil and gas "reserves" and the definition(s) thereof have been the focus of a significant effort by SPEE, SPE, AAPG, and other organizations, along with interested individuals, from within and outside the petroleum evaluation profession. One of the explanations for the effort to standardize oil and gas "reserves" definitions and application rules under the Petroleum Resource Management System ("PRMS") was that - "...investors need this information..." and, therefore, the definitions and rules of application should be made uniform and consistent. While the PRMS does not provide an indication of the intended purpose of the new definitions, the body language and context of the long-term discussion strongly suggests an intent for use in regulatory reporting of "reserves" under FASB 69 and/or the international equivalent.

More recently the Securities Exchange Commission ("SEC") has shown an interest in updating the "reserves" definitions that have applied to SEC filings since 1978 and has issued proposed new definitions that could go into effect in 2009. The development of the PRMS and the SEC concern about oil and gas reserves reporting criteria are not coincidental. The SEC has described "reserves" as the oil industry's biggest asset and has embarked on a wide ranging study of possible revisions to reporting rules. The recent PRMS was predicated on the need to codify "reserves" definitions to allow more consistent reporting; with one of the goals being to encourage the SEC to accept the new definitions. At least one school of thought suggests that the SEC should adopt PRMS in lieu of the current SEC definitions and reporting criteria. The purpose of such a revision of SEC policy would presumably be to assist "investors" in oil and gas companies by providing "improved" information. Whether this is actually the case is a subject for another debate. SEC has asked for and received comments from SPEE among others regarding the concept of changing definitions.

While most of the attention has focused on the definition(s) of reserves and the possible inclusion of risk classes beyond Proved, one aspect of the issue, the utility to investors of the reserves and "standard measure" of future income, has not been addressed, at least not publicly. Before expending time and effort to revise the SEC reserves reporting rules, perhaps it might be useful for the SEC, reporting companies, and energy company investors to consider this question:

Does the effort to report oil and gas reserves under the current or revised definitions provide information that is useful to investors? Put another way; is the oil and gas reserves information reported in SEC Form 10-K and 10-Q of real value to investors and, if so, what is the value of that information?

Does the effort to report oil and gas reserves under the current or revised definitions provide information that is useful to investors? Put another way; Is the oil and gas reserves information reported in SEC Form 10-K and 10-Q of real value to investors and, if so, what is the value of that information?

It is important to put this question in context by remembering that the SEC was directed by Congress in the 1970's to collect "reserves" information from energy companies but not because SEC was particularly qualified to do so; the USGS would have been a better choice. Neither had the SEC determined that the "reserves" data was necessary for financial reporting purposes. Apparently, the SEC was given the job because oil and gas companies were already sending information to the SEC for financial purposes and the "reserves" data was thought to be a relatively easy add-on. Like any good government bureaucracy, the SEC shouldered the burden and did not relinquish it even though the DOE and EIA would later become much more effective data collection vehicles for reserves and all manner of other data. Fortunately, the SEC was dissuaded from trying to convert the reserves data into a balance sheet asset so that the information is now only provided as part of the notes to the Form 10-K. The continuing justification for reporting of oil and gas reserves is that the information is necessary and useful to "investors".

Premise

The premise of this study, derived from the circumstances discussed above, is that information regarding the "reserves" of oil and gas attributed to a company, as reported to investors in SEC filings, has value to those investors in assisting them in making decisions regarding investments in petroleum companies. The "reserves" information is included in SEC filings ostensibly because it allows investors to have data which theoretically influences the value of the company as an investment option.

Objective of Study

Can the value of reserves information be determined and, if so, what is the value of that information?

This objective can be approached in several ways.

(1) How is the value of the company related to the volume and/or value of reserves as measured by SEC reporting requirements?
(2) Do changes in reserves reported to SEC result in changes in company value?

(3) To what extent do investors rely upon reserves information in making judgments about a company?

(4) Is the reserves information provided reliable and useful for making equity value decisions?

Finally, as an ancillary objective, would “investors” be better served by a different reporting format for production, operations, and reserves data?

**Boundary Conditions**
This study sets two boundary conditions: First, “value” is determined by the market value of the traded common stock. The value relation being considered is that of an investor, not a lender. Second, an “investor” is defined as any person or institution that might purchase or own equity in a publicly traded oil and gas company.

**Sources of Equity Value**
Generally, the value of equity in a company is measured by the market value of the stock in that company. The stock value is, according to financial theory and absent emotional interest, predicated on a combination of anticipated future dividend payments and appreciation in share price. Both dividends and share price appreciation are derived from, among other things, the anticipated earnings from company operations. There are numerous financial indicators of stock value that are related to the balance sheet and income statement and significant or “material” changes in financial condition can certainly influence the value of an individual stock or even the stocks of an entire industry. But the most common indicator of future value is projected earnings per share relative to the price earnings ratio. The SEC has referred to oil and gas “reserves” as the primary asset of energy companies and, while those assets are not reported on the balance sheet with other assets at current value, it is also true that a material change in those assets could be expected to have an influence, by whatever means measured, on stock price.

Given that data for changes in share price and trading volume are readily available in several forms from a number of sources, it was decided that a part of the study would attempt to measure the value of reserves information by observing (a) increases and/or decreases in share price and (b) changes in the volume of shares traded resulting from, or appearing to result from, information about company “reserves” becoming available. To test the relevance of the reserves-related observations, the influence on share price and trading volumes resulting from the availability of other company information was also examined.

**Database for Study**
For this study, a database of 32 publicly-traded domestic U.S. oil and gas companies was created. The database includes major integrated companies, large independent producers, and regional companies. Many of these companies have been included in prior studies of cost-of-capital and other financial parameters conducted by this firm and others. Given the volume of information, it was decided to create a smaller set of six companies were that were randomly selected from the larger database for detailed analysis. These companies and their NYSE stock symbols are:

- Anadarko Petroleum [APC]
- Berry Petroleum [BRY]
- ConocoPhillips Corporation [COP]
- Newfield Exploration [NFX]
- Plains Exploration & Production [PXP]
- Stone Energy [SGY]

In addition, the period of observation was restricted to January 1, 1998 through April 30, 2008.

Data for the study was collected from a number of sources and included:

- Annual Reports and SEC Form 10-K and 10-Q
- Press Releases and Other Publicly Available Information.
- Investor Presentations made by the Company.
- Opinions about the Company issued by Equity Analysts.

While Annual Reports are issued only once each year and SEC 10-K/10-Q filings only occur periodically and must conform to SEC rules, company-issued information, primarily in the form of press releases, tend to be much more frequent and provide ongoing insight into the circumstances of the company. The information provided from this source includes announcements of quarterly and year-end financial results, time and place of investor conferences, acquisitions and/or divestitures, management changes, stock splits and repurchase programs, changes in and/or payment of dividends, new discoveries and/or developments, and changes to production/operations and reserve data. While many of the announcements were primarily of a public relations nature, many other announcements, such as earnings reports and dividend declarations, could reasonably be expected to have some measurable, if not material, effect on stock price.

The historical daily stock prices and trading volumes for each company were tabulated for the observation period. The subject of the company-issued information was then compared to the closing stock price and trading volume as of the date the information was made available. In a similar manner, the dates of issuance of (1) Annual Reports, SEC 10-K/10-Q, and (2) changes in analysts Buy/Sell opinions were recorded in comparison to stock price and trading volume. Analysts opinions in the form of upgrades or downgrades of the stock are treated as significant events because they could be expected to have direct and immediate effect on the market for stock. The results of this data compilation are shown graphically for each company in Figures 1 through 6.
Using the stock price, trading volume, and information announcements about the company, tabulated on a daily basis, it is possible to observe any changes in price and/or trading volume that occurs coincident with reported information of any kind. While a positive cause and effect relation is difficult to define or measure, presumably the degree or amount of price change in response to any piece of information, absent any other influences, would be a reasonable measure of the value of that information. Each of these information sources was compared to the closing stock price and the trading volume on the date that information became available and the 2-3 business days following. In addition, the change in stock price from day-to-day was calculated as the ratio of the closing price on Day 1 to the closing price on Day 2.

An examination of the database for each company from January 1, 1998 through April 1, 2008 provided some interesting and useful observations. However, to further test the influence of the reporting of reserves information, the company databases were sorted to provide three additional views of the data.

Largest increase to largest decline in day-to-day change in closing stock price.
Largest decline to largest increase in day-to-day change in closing stock price.
Largest to smallest daily stock trading volume.

Observations
The observations from the sorted and unsorted data arrays were divided into two groups:

(1) Changes in stock price and/or volume related to reserves information.

(2) Changes in stock price and/or volume related to other information.

Using this data it was found that the largest day-to-day increases in stock price, and thereby company equity value, were most commonly associated with (a) announcements of quarterly and year-end financial results, (b) analyst’s “Buy” recommendations, and (c) dividend payments. However, other events could also be associated with increases in stock price. Conversely, large declines in stock prices were often associated with (a) analyst’s “Sell” recommendations, and (b) earnings reports and other information. Large increases or declines were only rarely associated with announcements dealing only with reserves information or with the issuance of Annual Reports and SEC 10-K filings. Such announcements tend to be associated with relatively neutral price performance.

Conclusion
Reported “reserves” information, in and of itself, appears to have little or no influence on the performance of the equity value of a company. There is no suggestion from the observable market place that information about “reserves” has very much, if anything, to do with equity value. The obvious corollary is that investors attach little if any value to reserves information, at least in so far as the information is reported under SEC rules and format.

While not unexpected, this result is nonetheless puzzling considering the amount of effort expended on providing the information. To examine the issue further, it was decided to dig a bit deeper into the “investor” community to find an answer.

Survey of Oil and Gas Analysts
It is very difficult to gauge the utility of SEC “reserves” information to individual investors. Some individuals or groups of investors may be sufficiently sophisticated to make use of the standard measure and Proved reserves data presented in an annual report or 10-K; but aside from monitoring market activity within a time frame around the date of issue, as described above, quantifying the influence of that information on investors actions is not possible. However, it can be assumed that many investors rely upon professional advisors who are knowledgeable about reserves and standard measure data. To assess the use of the SEC-reported information, a survey was taken of oil and gas analysts at major firms to attempt to determine:

(1) The extent to which they rely upon SEC 10K reserve data to form an opinion regarding the investment quality of a company.

(2) The extent to which data from either the company or from third-party sources is used in reaching their value opinions, and

(3) The methodology used in estimating the investment potential of the company as related to “reserves”.

A survey was sent to 40 individuals at various firms who are designated as oil and gas specialists. Responses were received from 10 (25%) of the analysts. The questions are shown in Figure 7. The responses varied in some details but the general conclusion is that, while the standard measure data reported in SEC Form 10-K may be used as a reference, analysts attempting to determine the investment value of a company rely upon (a) information from company presentations outside of the 10-K restrictions, (b) estimates of future production from the company’s (larger) properties, and (c) internal evaluation by the analyst using variations in product pricing, capital expenditures, and risk assessments. The objective of the analysts’ evaluation is to estimate future earnings which are a function of production and price, not reserves. In that context, Buy or Sell recommendations issued by analysts represent expectations that go far beyond the data contained in SEC reserve measures.

Recent Activity Analysis
Because some data sources, such as company presentations, are not available for more than a few months (or a year at most), a concentrated review of the period from November, 2007 through March, 2008 was also conducted. Company Annual Reports and 10-K filings were collected for year-end 2007. In addition,
copies of presentations made by each company at one or more investors forums were obtained from company web sites. The presentation data was collated with the Annual Reports/10-K data to determine the degree of overlap and the extent of additional information provided in the presentations. It is apparent that these presentations provide more information than is contained in the Annual Report/10-K. However, these presentations are still constrained by SEC rules and rarely provide production or pricing guidance.

Comparison to Commodity Prices
All oil and gas producers are in the commodities business. They explore for, develop, produce, and sell crude oil, natural gas and, in some cases, other commodities such as gasoline and propane. The market for commodities, particularly oil and gas, is a function of (a) supply and demand, and (b) commodity prices.

As a final point of comparison, the changing company equity value, as measured by stock price, was reviewed relative to the price of crude oil on a daily basis over the period from January 1, 1998 through April 1, 2008. Crude oil price data was obtained from EIA for wellhead price and NYMEX futures price (nearest contract close). No attempt was made to define a mathematical or statistical relation between stock price and oil price, however, the empirical observation is that stock price and oil price are directionally related.

Conclusions of the Study
(1) A change in the value of the equity in an oil and gas producing company is directionally related to the change in the price(s) for crude oil, natural gas and other products; and secondarily by anticipated future production of those commodities.

(2) The reserves and standard measure information reported by companies in annual reports and/or SEC 10-K filing appears to have no relation to the value of the company as perceived by “investors”.

(3) The reserves and standard measure data provided and the format of presentation of that data in SEC filings is inadequate for a rational evaluation of future earnings and/or equity value of the company and is, to a large degree, misleading.

(4) Surveys of knowledgeable analysts of oil and gas companies indicate that information that reflects the future performance expected by the company, as incorporated into the company’s capital budgeting decision process, would be more useful and credible to “investors” than the current SEC format and disclosure rules.
Fig. 1 - Anadarko stock price and trading volume.

Fig. 2 - Berry Petroleum stock price and trading volume.
Fig. 3 - ConocoPhillips stock price and trading volume.

Fig. 4 - Newfield Exploration stock price and trading volume.
Figure 7 - Survey sent to oil and gas specialists.

This firm is in the process of conducting a study to be presented to and used by the Society of Petroleum Evaluation Engineers at the Annual Meeting of SPEE in June, 2008. The purpose of this study is examine the role of projections of future production, product pricing and reserves in the estimation of value of equity interests in oil and gas producing companies. Members of SPEE are professional engineers whose primary area of interest is in the evaluation of oil and gas properties and projects. As you know the Securities and Exchange Commission is reviewing the rules and standards for the reporting of oil and gas reserves by public companies. SPEE as an organization and individual members are participating in this effort with other groups. This study is directed toward determining the utility and application to investors in oil and gas companies of the reserves data reported to the SEC in the Form 10-K and other filings.

As a recognized analyst covering energy companies we thought you might be willing to provide some information about this subject. The following are several questions which we hope you will consider and answer in as much detail as is convenient. Your response will be kept confidential as part of a blind pool of data.

1. In your analysis of a given company, do you examine and make use of the oil and gas reserves information provided in the Form 10-K for year end reporting? How do you incorporate this information into your analysis?

2. Many companies make presentations to investors and analysts at various venues during the year but particularly around year end or at about the time that their annual reports are published. Do you attend one or more of these presentations? How do you incorporate the information in these presentations into your analysis of the company?

3. As a professional analyst, do you augment the information provided by the company with (a) your internal data collection and/or (b) third party studies and analysis of the company’s future oil and gas production, income potential, and reserves?

4. In making your determination regarding the investment potential of a given company how much weight would you assign to (a) Form 10-K reserves data, (b) data from company presentations, and (c) internal and third party evaluation of production, income potential and reserves?

5. Many reports from analysts (and others) refer to “pricing in” the future production potential and/or reserves into a company’s stock price. From your experience, how is this done? What are the sources of data used for such pricing and how would they be applied?

Thank you for taking time to help us with this project.