RESERVOIR SOLUTIONS

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More SEC subpoenas on shale gas reserves likely, attorney says at Ryder Scott conference

Weak evidence, lack of potential harm to investors and undermanned SEC staff may be factors that influence the closing of investigations, says Elkin

Elkin at Ryder Scott Reserves Conference

Attorney **Jeffrey Elkin**, a partner at Porter Hedges LLP law firm, told an audience at the Seventh Annual Ryder Scott Reserves Conference earlier this year that the fact-finding investigation by the U.S. Securities and Exchange Commission into shale gas reserves reporting practices may continue. "At the eighth annual conference, we will have this same discussion," he said. "I don't think we will have a close on the investigation soon. It will go on for a long time."

In his presentation, "SEC Subpoenas to Shale Producers," Elkin cited three *New York Times* newspaper articles published in late June as triggers for the watchdog agency's mission. He said the articles stated or implied that shale gas reserves will not be developed because the cost is far greater than the current or near-term gas price, producers are misleading investors about shale gas economics and E&P companies are attracting investor funds to finance their shale gas developments based on overly optimistic assumptions.

Elkin said that press reports indicated that the SEC sought documents related to proved developed producing shale gas wells, reserves estimates and well economics. The SEC also wants further information on the propriety of project decline curves for wells and the calculation and public disclosure of full-cycle economic margins, he said.

Elkin cited the following factors that the SEC may consider in deciding whether to close the investigations—seriousness of conduct and potential violations, staff resources to pursue the investigation, sufficiency and strength of evidence, extent of potential harm to investors if no action is taken and the date of the alleged violations.

He also discussed subpoenas issued by the New York Attorney General. The office subpoenaed three shale gas producers earlier this year to examine the methods they used to predict future production from their wells.

"The New York Attorney General can be aggressive and has a good record of getting relief," said Elkin.

His presentation is posted on the Ryder Scott website at http://www.ryderscott.com/Presentations/index.php.

Inside Reservoir Solutions

Exceptions to PUD 5-year rule narrowly construed

Attorney **Marc Folladori**, a partner at Mayer Brown law firm, told an audience at the Ryder Scott Reserves Conference that the U.S. SEC is narrowly construing exceptions to the five-year rule for developing proved undeveloped reserves. He reviewed YE09 filings to the SEC as well as SEC comment letters on the filings.

Folladori pointed out, for instance, that a shortage of hydraulic fracturing services delaying field development past five years constitutes a "known factor" at the date of estimation and therefore is not sufficient to justify a "special circumstances" exception.

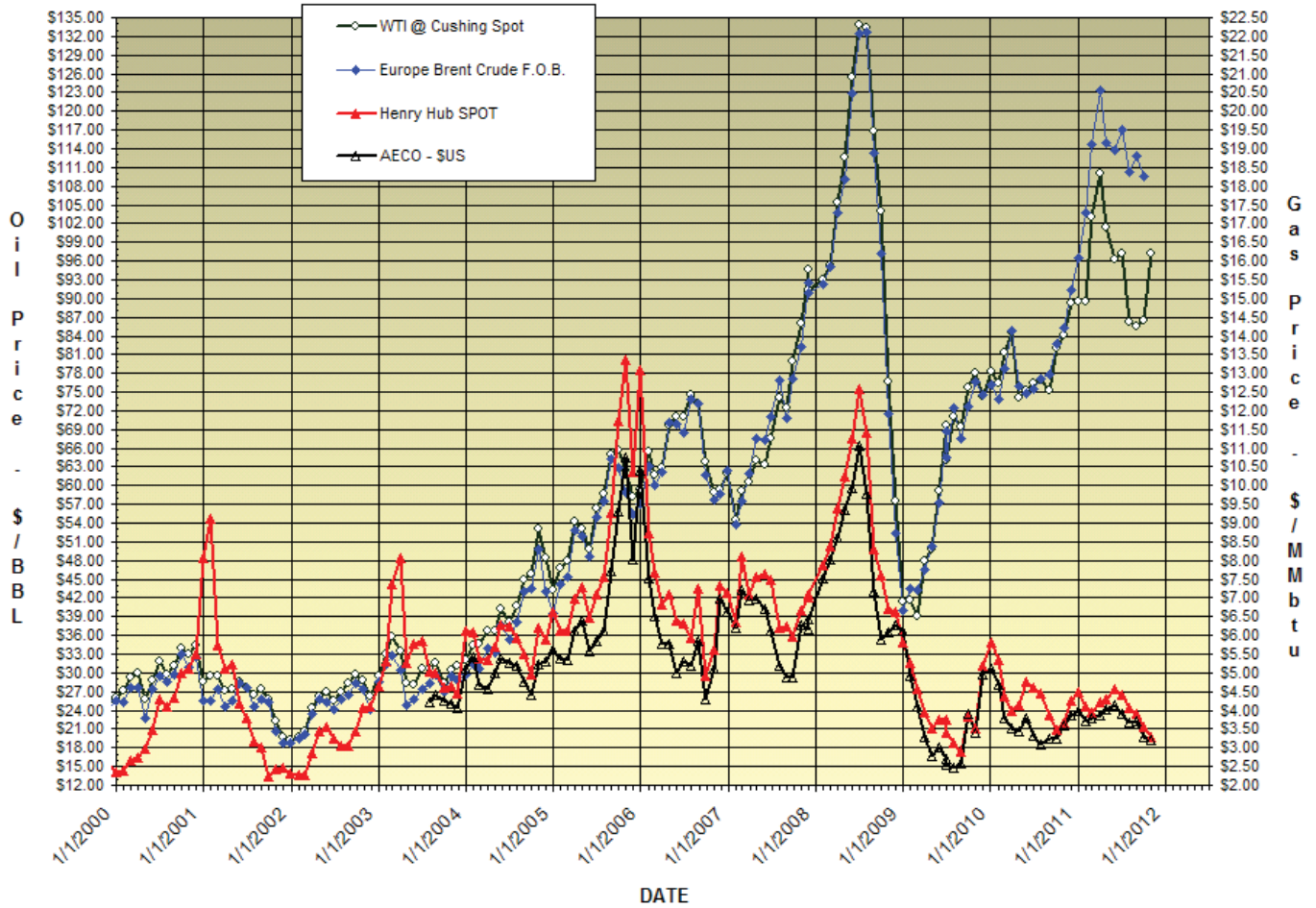
He also categorized disclosure deficiencies cited by SEC staff in comment letters as follows:

- Five-year rule
- Development of PUDs
- Reliable technology
- Reasonable certainty of production within a stated time
- Failure to disclose specific principles/standards followed in preparation of estimates
- Inconsistencies between third-party engineers' report and internal company estimates
- Qualifications of technical persons
- Significant changes in proved reserves

His presentation is posted at http://www.ryderscott.com/Presentations/index.php.


Folladori at Ryder Scott Reserves Conference

Price history of benchmark oil and gas in U.S. dollars



Published, monthly-average, cash market prices for WTI crude at Cushing (NYMEX), Brent crude and Henry Hub and AECO gas.

Focus of SEC comment letters examined

John Hodgin, president at Ryder Scott, analyzed technical and commercial issues cited in SEC comment letters to YE09 filers at the Ryder Scott Reserves Conference. He also reviewed YE10 SEC filings by the 50 largest 10-K filers receiving SEC comment letters.

Based on that information, Hodgin found that 80 percent were not on a mathematically derived pace to convert all PUD reserves in their current-year filings to developed within the next five years if their conversion rates remained the same as in the previous 12-month period. For more detail, see Page 7 of the September *Reservoir Solutions* newsletter.

Twenty-seven companies received comment letters on engineering topics other than the PUD five-year rule. The SEC queried 13 companies on the impact of reliable technology, seven companies on booking PUDs beyond one offset location, seven on rights to book reserves, six on prices and differentials, five on decline-curve analysis parameters and two on booking volumes as reserves instead of as fuel gas.

The SEC also sent comment letters on reserves disclosure issues to 53 companies with 43 receiving questions on their third party exhibit letters. Fourteen received comments on the aggregation of geographic areas and major fields. Nine were questioned on the aggregation of product volumes.

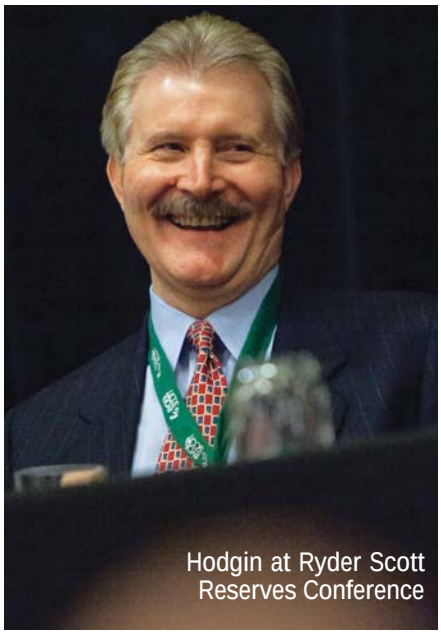
"We note that you have grouped together your proved reserves related to crude oil, condensate and NGLs. Please explain why you do not believe it necessary to disclose separately these three products," the SEC comment letters read.

While Hodgin pointed out that the comment letters are not legally binding, "they do provide insight into how the SEC staff may view the application of the regulations to certain reserves-related matters," he said.

The decision to review the filings of a company is based on a preliminary review. The SEC does not publicly disclose its preliminary review criteria.

"The subject company is generally unaware of the review until it receives SEC comments," said Hodgin. "The SEC staff completes many filing reviews without issuing any comments."

His presentation is posted at http://www.ryderscott.com/Presentations/index.php.


Hodgin at Ryder Scott Reserves Conference

With more than 280 attendees at the Seventh Annual Ryder Scott Reserves Conference, this year's participation eclipsed last year's once again making it the single largest gathering of senior reserves evaluators.

Ryder Scott unveils SEC document search system


Sepolio at Ryder Scott Reserves Conference

At its annual reserves conference, Ryder Scott introduced a demo of its yet-to-be released SEC Seeker freeware. The robust program will enable a user to perform automatic searches of publicly available oil and gas company filings and SEC comment letters stored in the agency's Edgar database.

With SEC Seeker, Ryder Scott has provided an easy interface through which a user will be able to quickly and efficiently view and retrieve multiple records and perform customized searches by filtering several relevant criteria at one time. Advanced text searches will also be available.

Jennifer Fitzgerald, vice president, and **Eric Sepolio**, reservoir engineer, introduced SEC Seeker at the conference. Fitzgerald said that long-term functionality will include the capability to save searches for later retrieval. Also, the database will be evergreen with new searchable documents to be added regularly.

SEC Seeker will search through filings and comment letters filed in Edgar on or after Dec. 31, 2009. Public release is scheduled for the first quarter 2012. Searchable documents will include 10-K, 20-F and 40-F annual filings as well as amended filings 10-Ka and 20-Fa. Comment letters that reference those filings will also be searchable. Quarterly filings, registration

Please see SEC Seeker on Next Page

Lee cites successful exceptions to 5-year SEC rule

Dr. **John Lee**, professor at the University of Houston, said that the U.S. SEC in 2010 comment letters, accepted exceptions to its five-year limit on PUD development after reviewing arguments that delays were based on infrastructure limits, especially in remote locations. He made his remarks at the Ryder Scott Reserves Conference.

For instance, Chevron Corp. responded to the SEC stating that it had large scale projects in remote locations with challenging operating environments and delayed by external physical factors. The company claimed it did not shift resources to higher priority projects.

Chevron also stated that in general its major projects include infrastructure- and well-dominated assets. The infrastructure investments cannot change scale without potential significant potential loss of capital whereas the drilling programs can be accelerated or delayed without loss of invested capital or return on capital. The SEC had no further objections to the exception.

Marathon claimed that facilities-limited production in remote Equatorial Guinea justified an exception to the five-year rule. The SEC did not object.

Lee said, "The SEC does not accept multi-well drilling programs in resource plays as single projects or as qualifying for exemption to five-year rule."

His presentation is posted on the Ryder Scott website at http://www.ryderscott.com/Presentations/index.php.


Dr. John Lee, left, and Ron Harrell, chairman emeritus at Ryder Scott, at Reserves Conference

SEC Seeker—Cont. from Page 4

statements, miscellaneous documents, older documents, press releases, annual reports and investor presentations will not be indexed for searching.

Sepolio presented the basic workings of SEC Seeker in a live demo. He illustrated the use of search filters for company name, filing year, and document type. Text searches may also be performed to return records that include specified words or phrases. In addition to basic text searches, SEC Seeker has advanced search routines detailed in a help option.

Search results are displayed as records in a grid detailing information such as company name, filing year, filing period, document type and filing date. The user may select a record to view the PDF file.

Through SEC Seeker's interface, users will also be able to download documents that meet their search criteria. The program has the capability to display documents related to the filings and comment letters of the search results. Ryder Scott plans to announce the public release of the program in the March *Reservoir Solutions* newsletter.

Fitzgerald at Ryder Scott Reserves Conference

Nano proppants work best, says Rice professor

Nano-engineered proppants are increasing production about 45 percent in west Texas, said Dr. **Andrew R. Barron**, a professor at Rice University. Proppants are used to prop open fractures made in shale formations to release gas and oil. Nanotechnology is the study of manipulating matter on an atomic or molecular scale to develop materials, devices and other minute structures.

Barron at Ryder Scott Reserves Conference

Barron's research is focused on the application of nanotechnology to fundamental problems in energy and health research. In addition to his involvement in nanoscale proppants, he has worked on nanofiltration to separate produced water and hydrocarbons and unique tracers that identify producers of frac water.

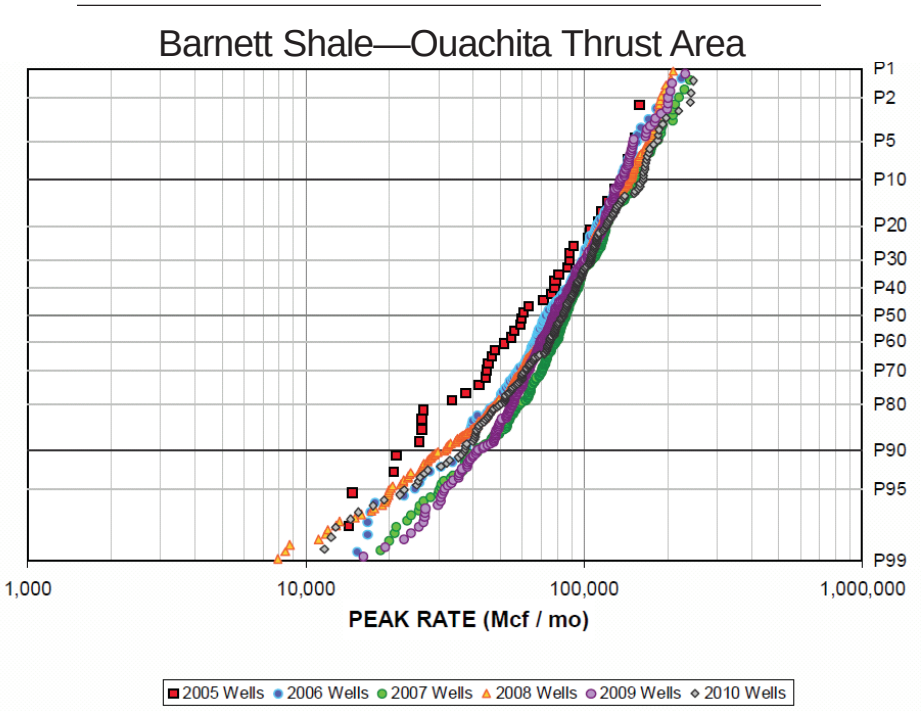
Barron said that proppants work best if they are hard and light. However, those types of proppants have been difficult to manufacture because typically, the harder a proppant, the heavier it is. "Strength is the enemy of distance," he said. Heavier proppants are more difficult to transport into the full length of the frac, making them less effective.

Using nanotechnology applications, Rice researchers developed non-toxic, light-weight (buoyant), high-strength ceramic spheres that are uniform in shape and size for enhanced flow. The venture purchased the manufacturing plant in 2009, production started in 2010 and sales began this year.

Barron's presentation is posted on the Ryder Scott website at http://www.ryderscott.com/Presentations/index.php.

SPEE defines resource play based on empirical data


Hall at Ryder Scott Reserves Conference



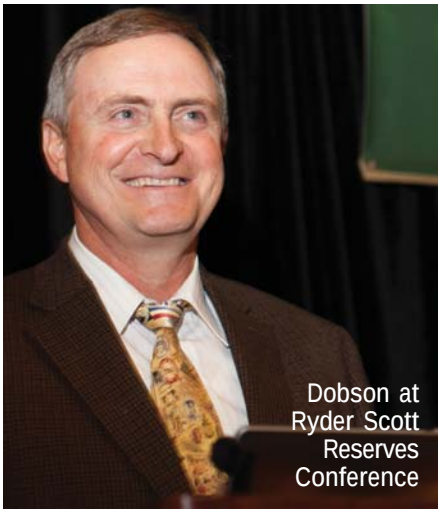
Over the past decade, the term, "resource play" has grown to become a widely used, everyday reference. Sometimes misused, the term recently was defined by the Society of Petroleum Evaluation Engineers in Chapter 1 of its SPEE Monograph 3, "Guidelines For The Practical Evaluation of Undeveloped Reserves in Resource Plays."

At the Ryder Scott Reserves Conference, **Russell K. Hall**, chairman of the SPEE Resource Play Evaluation Committee, said that defining the term was the group's most important goal.

SPEE established Tier 1 criteria that are always observed in resource plays. They are as follows:

- Exhibits a repeatable statistical distribution of EURs.
- Offset well performance is not a reliable indicator of PUD performance.
- Continuous hydrocarbon system is regional in extent.
- Hydrocarbons are not held in place by hydrodynamics.

Hall showed a statistical distribution with a probability scale (P1 to P99) vs. peak monthly rates from gas wells within an area of the Barnett shale for each of five years. See chart. Each of the five plotted lines trend together thus exhibiting repeatability each year for each population of wells. His slides are at http://www.ryderscott.com/Presentations/index.php.


Dobson at Ryder Scott Reserves Conference

Dobson presents lesson on statistics

Martin Dobson, manager—stochastic reserves at Chesapeake Energy Corp., gave a brief lesson on statistics with material from Chapter 2 of the SPEE Monograph 3. He covered basics on independent distributions, normal and lognormal distributions, cumulative probability plots, probit scales and plotting conventions.

Dobson used an example to show how the statistical principle of aggregation impacts the value that can be booked with reasonable certainty for various sample sizes. If the average EUR of 100 offset wells is 3.5 Bcf/well, then a reasonably certain prediction for the next drilled well will be 1.4 Bcf. When 50 or more wells are planned, the reasonable certainty prediction jumps to more than 3.1 Bcf/well because of the effect of aggregation on the sample size.

When the ratio of P10 EUR divided by P90 EUR of the 100 offset wells used for the basis of the forecast is greater than four, then the variance of the sample set is considered to be too large to use those simplified techniques.

His presentation is at http://www.ryderscott.com/Presentations/index.php.

Geology, well count determine proved area in play

At the Ryder Scott Reserves Conference, **Paul Lupardus**, director of corporate reserves at Chesapeake Energy Corp., said that to determine proved areas in a resource play, keep in mind the following:

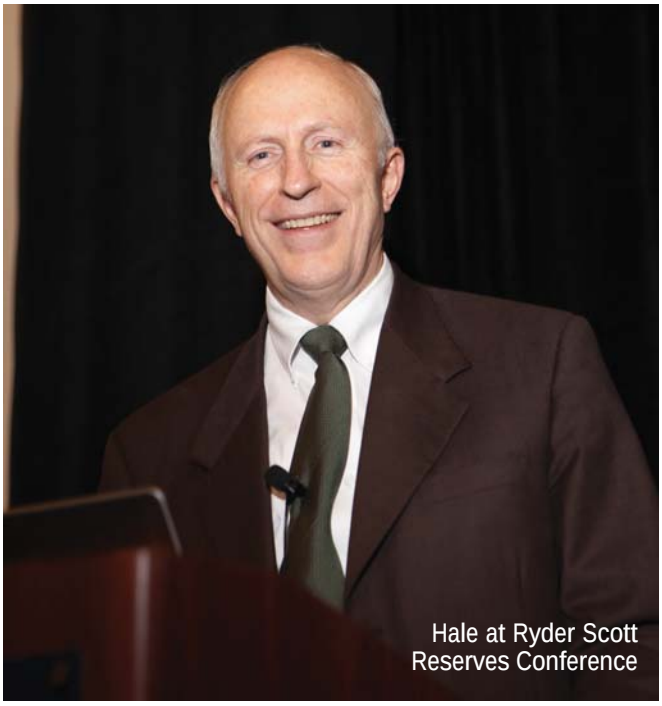
- To make an accurate assessment, you must understand the geology first. The observed geologic subset is most likely not sufficient to characterize the entire resource play. Make sure you collect enough data and drill enough wells to define the subset.
- Establishing a proved undeveloped area under SEC guidelines more than one location offsetting a PDP well requires a significant well database. The method does not apply to new/emerging fields. Don't "jump the gun" and claim reasonable certainty and reliable technology that isn't empirically supported, he said.

Lupardus based his presentation on material in Chapter 3 of SPEE Monograph 3. His presentation is at http://www.ryderscott.com/Presentations/index.php.

Lupardus at Ryder Scott Reserves Conference

Steps to estimate reserves in resource plays presented

Brent W. Hale, senior engineering advisor at William M. Cobb & Associates, discussed the estimation of undeveloped reserves in resource plays at the Ryder Scott Reserves Conference. He covered material in the SPEE Monograph 3, Chapter 4 on that subject.



Hale at Ryder Scott Reserves Conference

Hale cited the five steps for evaluating undeveloped reserves from the monograph as follows:

1. Identify analogous wells.
2. Create a statistical distribution to validate analogy.
3. Determine future drilling opportunities.
4. Prepare a Monte Carlo simulation to aggregate analogy well EUR to project EUR.
5. Calculate proved, probable, and possible reserves using appropriate definitions.

He said that to identify analogs, the evaluator must consider timing, geology and technology, including vertical vs. horizontal wells, placement of horizontal laterals, fracture stimulation rates and distance between perforation clusters.

Hale showed a play in the Oklahoma Woodford shale in which new completion techniques increased production resulting in a decline curve similar to wells drilled in 1996.

He also discussed preparing a statistical distribution using applicable empirical values for EURs, EUR/ft and peak gas rate. In graphing EURs vs. cumulative probability, P10/P90 ratios higher than 10 in a Johnson County, Texas, Barnett shale play indicated poor analogies that should be questioned, he said.

His presentation is at http://www.ryderscott.com/Presentations/index.php.

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Industry has obligation to educate public, says Riese

At the Ryder Scott Reserves Conference, **W. C. Rusty Riese**, geoscientist and AAPG Distinguished Ethics Lecturer, presented "Oil Spills, Ethics, and Society: How They Intersect and Where the Responsibilities Reside." He asserted that the public has a misperception about the environmental effects of spills and carbon emission rates. Riese also said that the public has unrealistic expectations of supply and demand.

Considering the infeasibility of some emission-stabilization proposals at a time of increasing energy demands, industry's ethical obligation should be to inform the public of the negative consequences of demanding cheaper energy and environmental preservation, said Riese.

For instance, to replace coal-based electricity by doubling current nuclear capacity requires 700 more plants than the 400 that exist globally. To increase

Riese at Ryder Scott Reserves Conference

wind capacity by 50 times to 2-million windmills requires 372,000 square miles of acreage equivalent to North and South Dakota, Nebraska, Kansas and Oklahoma. Stabilization through solar panels is similarly not feasible.

Sensationalized news and attempts by the press to advocate rather than report is a disservice, said Riese. "Misunderstanding is partly due to media sensationalism and can also be blamed on political and regulatory mishandling," he remarked. His presentation is at http://www.ryderscott.com/Presentations/index.php.

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