

RESERVOIR SOLUTIONS

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Canada expected to require NPVs from ROTR despite comments

When the proposed amendments to NI 51-101 are finalized late this year, expect the requirement to annually report risked net present values (NPVs) for ROTR (resources other than reserves) to be mandated. **Phillip Chan**, newly retired chief petroleum officer at the Alberta Securities Commission, said in October that "the reporting of risked NPVs for ROTR will be required. The disclosure of a volume without some expression of the economic viability of recovering those values can be misleading."

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THE RYDER SCOTT CONFERENCES



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A word from the conference director



This year, our two Ryder Scott reserves conferences in Houston and Calgary attracted almost 500 managers and technical and financial staff involved in oil and gas reserves evaluations. That is a big number for such a small sector, far surpassing all non- and for-profit events focusing on reserves.

However, numbers alone

don't tell the story. In addition to the agenda, the social aspect of the events is a magnet that helps pull in the numbers each year. More than once at the breaks and during lunch, professional colleagues greeted each other as long-lost friends once again united. Some of them attended the same university. Some worked with each other previously. Some of them were mentors to others.

The conference halls also provided impromptu places for evaluators to meet their counterparts from other companies face to face to discuss common reserves issues. It's a chance for an evaluator to meet a regulatory official to get clarifications on an issue with raising a red flag. The conferences are designed to elicit honest dialogue from all participants, which benefits the whole.

No venue provides this on the scale of the Ryder Scott conferences. Based on feedback from our audiences, we are making improvements to the conferences next year that will make them bigger and better. If you have any suggestions for agenda, speakers, venue, etc., please email them to me at larry_connor@ryderscott.com. I will seriously consider all suggestions. The conferences are not really Ryder Scott's. They are yours—the professionals who help drive the events by speaking and by attending.

Regards,

Larry Connor

Managing Senior Vice President and Conference Director

Publisher's Statement

Reservoir Solutions newsletter is published quarterly by Ryder Scott Co. LP. Established in 1937, the reservoir evaluation consulting firm performs hundreds of studies a year. Ryder Scott multidisciplinary studies incorporate geophysics, petrophysics, geology, petroleum engineering, reservoir simulation and economics. With 130 employees, including 90 engineers and geoscientists, Ryder Scott has the capability to complete the largest, most complex reservoir-evaluation projects in a timely manner.



Bazhenov development to proceed without IOCs

In the wake of the destabilization of eastern Ukraine, U.S. and European Union economic sanctions against the Russian oil industry have slowed major field development projects in the Bazhenov shale formation. On Oct. 3, Royal Dutch Shell suspended its participation in field development, partner Gazprom told the *Wall Street Journal*.

Gazprom said it started drilling its first horizontal well in the formation and will continue to develop the shale oil deposits by itself, reported *WSJ*. Meanwhile, Shell is in talks with regulators on how to continue its joint work, reported *Interfax*.

In a statement, Shell said, "We are working closely with relevant authorities and our partners to determine what the exact impact of those (sanctions) will be."

Whether the Russians have learned enough about shale oil extraction to succeed in Bazhenov without the expertise of more experienced partners is questionable.

JSC Gazprom Neft started drilling the first horizontal well in the Bazhenov complex of the Palyanovsky deposit, exploring the shale oil potential of the Krasnoleninsky field in western Siberia, according to an *Atlantic Communications Media* article. Gazprom Neft reported on Oct. 2 that the well was deeper than 3200 m and had a 300 m horizontal section.

ACM recapped the progress of Gazprom Neft: "It expects to drill four wells with longer horizontal sections and more fracing stages, including three, during 2014 to 2015. The company drilled five directional wells and used hydraulic fracturing in four, achieving commercial oil flows from wells. Gazprom Neft said this confirmed the potential of effective fracing at Bazhenov. The next step for the

company is to focus on the most effective extraction methods."

The U.S. Energy Information Administration estimates that Bazhenov contains more than 1.2 trillion barrels of oil and 75 billion barrels of risked, technically recoverable shale oil resources. If reliable, those estimates qualify the 1-million km² potential shale play as the biggest in the world, although untested.

The recent downturn in oil prices coupled with trade restrictions has put a temporary damper on what was to be a proving ground for large international oil companies as well as state-owned companies. In early November, oil dropped to about \$78 a barrel.

Companies in North America are exporting reliable technology, including horizontal drilling and fracing techniques, in partnerships with national oil companies, to develop various shale plays worldwide. At least temporarily, Bazhenov will take a back seat as service companies from the U.S. and EU also pull out.

The New York Times reported Oct. 30 that "a further 'Russification' of the industry seems inevitable. In October, President **Vladimir V. Putin** approved the creation of a state-owned oil services company, RBC, a Russian business newspaper reported. The intention is to duplicate, as well as possible, the services purveyed now by Halliburton, Baker Hughes and Schlumberger."

The NYT also reported that "Russia now has a 'hierarchy of procurement' placing domestic and Asian companies first, U.S. companies last."

Other JVs fall under sanctions

In 2012, Exxon Mobil Corp. agreed to develop tight oil reserves in the Bazhenov with Rosneft, which had a 51 percent interest. The joint venture planned a feasibility study across 23 license blocks spanning 10,000 km². The \$300-million pilot program was to operate through 2015 while providing technology transfer to Rosneft, the *Bismarck Tribune* reported.

In the interim, last year, Russia offered tax breaks up to \$21 per

barrel to attract outside investment and expertise to tight oil fields—a departure from the usual tough contractual terms that have discouraged oil and gas deals.

As late as last July, Rosneft still planned to work with Exxon Mobil on a \$500-billion exploration project in Bazhenov, reported *TV-Novosti*.

"Exxon Mobil and Rosneft will continue to do business as usual under new U.S. sanctions," **Igor Sechin**, CEO of Rosneft, told *Vesti*, a TV station in Russia. Sechin said that Rosneft was consulting with lawyers at Exxon Mobil and preliminarily understood that the sanctions didn't affect the implementation of future projects.

In September, Exxon Mobil announced it was suspending all 10 of its JVs with Rosneft to meet the U.S.-imposed deadline of Sept. 26 to shut down operations with its Russian partners. "Our current focus is on safely winding down operations consistent with our license with the U.S. government," the company said.

Also that month, French energy major Total announced that it had halted its JV with Lukoil in response to Western sanctions targeting the Russian energy industry. Both companies agreed in May to set up a JV to tap the Bazhenov formation.

"The Lukoil joint venture is definitely stopped," the recently deceased Total CEO Christophe de Margerie told the *Financial Times* in late September, "But it hadn't started so it doesn't have any impact."

The U.S. Department of the Treasury sanctions prohibit the exportation of goods, services, not including financial services, and technology in support of E&P for Russian deepwater, Arctic offshore and shale projects that have the potential to produce oil.

With a "presumption of denial" in its application review, the U.S. Department of Commerce Bureau of Industry and Security has imposed a license requirement for U.S. companies wanting to export shale technology to Russia. U.S. companies are prohibited from engaging in shale JVs with NOCs Gazprom OAO, Gazprom Neft, Lukoil

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"Commenters were in general agreement with the proposed amendments. Disclosure of NPVs was the only controversy,"

– Phillip Chan

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Annual disclosure of contingent and prospective resources (ROTR) will continue to be optional, except for activities described in NI 51-101F1, Part 6, which addresses significant factors or uncertainties relevant to properties with no attributed reserves. For prospectuses, ROTR that are material to issuers are required to be reported, even if the disclosures are not mandated by NI 51-101.

Chan made his remarks at the Second Annual Ryder Scott Canada Reserves Conference on Oct. 2 in Calgary. The then chief petroleum officer said that he was not speaking for the ASC and that his opinions were his own.

Currently, Canada regulators are amending the instrument in response to public comments. "Commenters were in general agreement with the proposed amendments. Disclosure of NPVs was the only controversy," said Chan. A summary of the comments was published in an article, "CSA plans to respond on comments on proposed NI 51-101 later this year," on Page 2 of the July-September *Reservoir Solutions* newsletter.

The Canadian Oil & Gas Evaluation Handbook (COGEH), Volume 2, has outlined an expected monetary value (EMV), which is one form of a risked NPV. Commenters suggested using EMVs, which are not projections of revenues. EMVs factor in the chances of discovery and development to calculate chances of commerciality.

"Estimates of contingent resources have not been adjusted for risk based on the chance of development," said Chan. "We need better disclosure."

He added that deficiencies in current ROTR disclosures are as follows:

- Not clear whether lease gross, gross, company interest or net volumes are disclosed and whether they are risked.
- Discussion of significant positive and negative factors in estimating ROTR quantities is missing or insufficiently disclosed.
- Non-standard product types and metrics are cited.

- Not always clear what project is being evaluated or how it is intended to progress.
- Discussion of risks and uncertainties is missing or inadequate. Boilerplate language is not always adequate.
- Contingencies and the steps to remove them are often poorly described.
- ROTR are disclosed one year but not the next without explanation.

The main proposed amendments to NI 51-101, published for public comments on Oct 17, 2013, are as follows:

- Supplementary disclosure of resources estimates under an alternative resources disclosure standard
- Changes to product types and removal of production groups
- Mandating NPV disclosures if ROTR are disclosed in the annual statement of reserves data
- Requiring additional descriptive disclosures when oil and gas metrics are disclosed

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SPEE accepting comments on Monograph 4

The Society of Petroleum Evaluation Engineers is scheduled to release Monograph 4, “Estimating Developed Reserves in Unconventional Reservoirs,” next year, said **John Seidle**, a member of the monograph committee. He made his remarks at the 10th annual Ryder Scott Reserves Conference in Houston on Sept. 17.

In unconventional reservoirs, the adage that no two wells are the same is proving to be true. Using the Eagle Ford shale play as an example, Seidle showed the areal variability of fluids between two single-well production tests about 30 miles from each other. Data showed the fluids varied from 38 degrees API to 75 degrees with a gas-oil ratio of 15,000 scf/stb vs. 5,000 scf/stb. Dew points varied four fold from 12,540 psia to 2,926 psia and the surface yields plotted against well pressures had different signatures.

To better assess fluid characteristics, Seidle suggested the following:

1. Work closely with the PVT lab.
2. Use well conditioning procedures so fluid samples from the well match those from the reservoir.
3. Evaluate advantages and disadvantages of fluid samples from the subsurface and surface.
4. Perform a suite of lab tests, including compositional analysis, constant-composition expansion, differential liberation, separator tests and constant-volume depletion.

Seidle showed diagnostic plots to identify flow regimes, a workflow from data validation to reservoir simulation and a “real life” workflow to evaluate 800 wells a week primarily through decline-curve analysis. His presentation is posted with others from the conference on the Ryder Scott website at ryderscott.com/presentations.

“The Monograph 4 committee is interested in your comments,” Seidle told the audience. His email is jseidle@mhausa.com.



“The committee is interested in your comments.”

— John Seidle



SEG calls for papers on “reliable technology”

The Society of Exploration Geophysicists plans to publish a collection of papers Nov. 15, 2015, that will focus on the use of “reliable technology” to justify the reporting of petroleum reserves and resources. In late 2008, the U.S. Securities and Exchange Commission updated its reserves regulations and introduced the term “reliable technology.” Since then, industry’s interpretation of reliability has not always been in line with the SEC interpretation. As a result, the SEC has issued numerous comment letters to public issuers on this matter.

The SEC defines reliable technology as “a grouping of one or more technologies, including computational methods, that has been field tested and has been demonstrated to provide reasonably certain results with consistency and repeatability in the formation being evaluated or in an analogous formation.”

The 2007 Society of Petroleum Engineers Petroleum Resources Management System, which was endorsed by the SEG and other organizations, does not directly address the

reliable technology issue. However, the project-based system has enough flexibility for the reliable technology justification to be used.

The deadline for online manuscript submission is Feb. 1. The SEG plans to publish the papers in a special, peer-reviewed journal, *Interpretation*, on Nov. 15, 2015. The SEG and American Association of Petroleum Geologists co-publishes the journal.

Subject matter of the papers can include, but are not limited to, the following:

- Case studies illustrating how reliable technology, e.g., seismic, pressure data, simulation, etc., has been used to estimate reserves and resources
- Methods used to prove technologies to be reliable for reserves and resources estimation
- Establishing continuity and improved recovery volumes for reserves estimation before response

- Reserves estimation using an integrated or non-standard approach

The online submission system for *Interpretation* is at <https://mc.manuscriptcentral.com/interpretation>.

Miles Palke, managing senior vice president at Ryder Scott and an editor for the special journal, said, “The industry is at an early stage in understanding what technology is reliable and what is not, especially given the wide variety and variability of reservoir characteristics. Reliable technology still calls for clearer understanding in the industry.”

Palke also is manager of the reservoir simulation group.

AAPG forum to focus on reserves reporting five years after the SEC rules change

The 2015 American Association of Petroleum Geologists reserves forum, to be held Feb. 26 to 27 in Houston, will focus on changes over the past five years since the U.S. Securities and Exchange Commission published its reserves reporting rules. “The rules gave companies more flexibility and options for reserves and resources estimation. In that same period, unconventional activity has skyrocketed, resulting in new challenges for applying SEC guidelines,” said the AAPG.

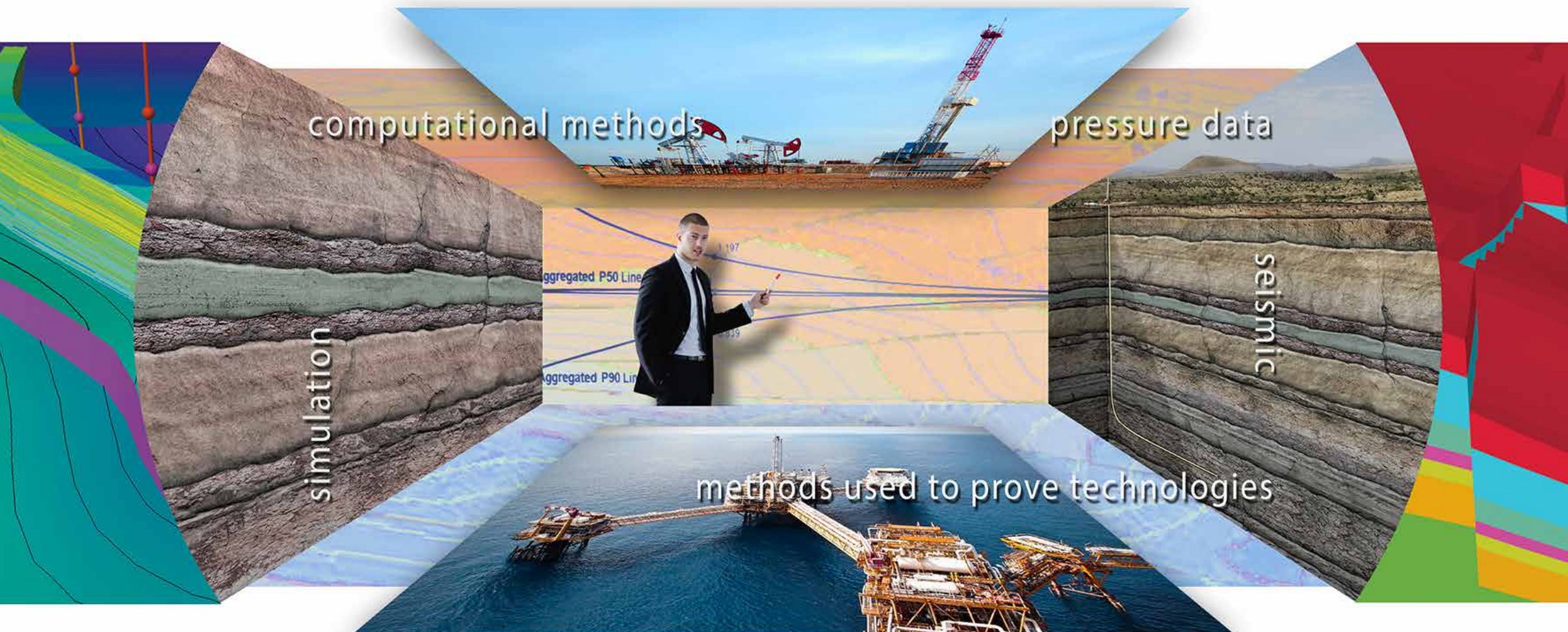
Ryder Scott professionals are contributors to the forum. **Eleazar Benedetto-Padron**, vice president at Ryder Scott, will present, “Volume Classification in Resource Play Evaluations.” He will also close the forum with a summary and conclusions. **Dan Olds**, managing senior vice president at Ryder Scott, will compare SEC rules and SPE-PRMS guidelines.

Ron Harrell, chairman emeritus at Ryder Scott and an advisor and chairman of the forum’s technical committee, will kick off the event by introducing the history of the guidelines. He also chairs the session on unconventional reservoirs and plans to speak at the certified evaluator training classes of the Joint Committee on Reserves Evaluator Training, which was tentatively scheduled but not confirmed at press time.

Others will address the following:

- Rock and fluid properties for commerciality and the enhancement of recovery efficiencies
- What the financial side looks for in a reserves report
- Estimating reserves in unconventional reservoirs
- Reliable numeric methods in unconventional reservoirs
- Reserves estimation in offshore horizontal wells
- SEC reserves reporting standards
- Updates on the United Nations and SPE-PRMS
- SPE-PRMS future challenges and updates

For more information, go to <http://www.aapg.org/career/training>.



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OAO, Rosneft and Surgutneftegas.

Just as Gazprom Neft vows to carry on its field operations in the Bazhenov without a Western partner so does Rosneft, which along with Exxon Mobil, have tested proven U.S. technology in the shale formation since 2012.

Sanctions were put in place after Russia's annexation of Crimea and support of pro-Russian separatists. The ban is designed to make it difficult for Russia to develop long-term, technically challenging future projects.

Russia plans to restrict reserves data exportation, reliance on foreign auditors

At press time, Russia had not publicly commented further on its plan to limit or fully ban "the taking of primary geological information on petroleum reserves out of Russia" for it to be analyzed by U.S. petroleum reserves consultants, as reported by the *Tass* Russian news agency in August.

Tass, which based its announcement from an article in national newspaper *Izvestia*, stated that Russia "intends to save national users of mineral resources from dependence on foreign (reserves) auditors through establishing a national system for auditing the reserves of oil

and gas." *Tass* also reported that large Russian oil companies provide data to Western reserves consultants without "participation" by state organizations.

"The inter-agency commission on ecological safety of the Security Council of the Russian Federation, *Izvestia* reports, has assigned respective agencies and special services to work out measures to ensure information security to prevent an unsanctioned transfer of primary geological data beyond the country," *Tass* published.

The announcement comes amid tensions between the U.S. and Russia over its annexation of Crimea in March and backing of pro-Russian separatists in eastern Ukraine. The U.S. and European Union established economic sanctions against Russia earlier this year. See article on Page 2.

Gazprom, Rosneft OAO, Rosgeologia and Russian petroleum service organizations reportedly attended the commission's session where the announcement was made.

Seven years ago, Russia accused a third-party consultant and its Western client of exporting unlicensed geological data on petroleum reserves without approval from the Economic Ministry. Then deputy head of Russia's Natural Resources Ministry, Oleg Mitvol, was quoted by the *Bloomberg news agency*, saying that "geological information on oil and gas reserves must be licensed by the ministry with the environmental inspectorate's approval before it's shipped abroad."

Western observers do not believe Russia will make good on its current threat because large Russian oil and gas companies, which are listed on stock exchanges around the world, report their reserves to regulators and rely on third-party consultants to examine those reserves for compliance.

NP NAEN postpones joint training session

The National Association for Subsoil Examination (NP NAEN) in Russia has postponed a training session on international petroleum reserves standards originally slated for Wednesday, Oct. 29, in Moscow. Ryder Scott was scheduled to be the co-host and other presenter in the joint session.

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Other amendments include the following:

- Disclosure of the resources at the first point of sale or at an alternate reference point
- Revised disclosure requirements around abandonment and reclamation costs
- Amended reserves presentation requirements
- Removal of independent qualified reserves evaluator consent requirement on additional disclosures
- Change in Form 51-101F2 from preparation date to effective date

Regulators are aiming to amend the national instrument to be compatible with the recently published ROTR and bitumen guidelines of COGEH. With necessary approvals, they plan to require compliance with the final amendments on July 1, 2015, the planned implementation date.

RTA, well groupings result in improved production forecasting, says Filler

Stuart Filler, senior petroleum engineer at Ryder Scott, said that rate-transient analysis (RTA) used on low-, mid- and high-case groups of wells has been shown to improve production forecasts in ultra-low permeability reservoirs. He made his remarks at Ryder Scott reserves conferences in Houston and Calgary this year.

RTA encompasses several methods of analysis, but more data and time are required than for standard decline-curve analysis. Conducting RTA on one well can take a day so it is not practical if hundreds or thousands of wells are in the data set, Filler said. However, by grouping similar wells, RTA can be done on a few wells in each set and good parameters can be estimated. "This is possible with modern software," he remarked.

In his test case, he analyzed 265 older vertical wells in the Newark East field in the Barnett shale play. Filler said he downloaded the production data and uploaded it to an economics program with autofitting capabilities to give a first pass at grouping the wells by estimated ultimate recoveries (EURs).

"Since we generally look for low, mid, and high cases, I used division by thirds. At this stage, the autofit does not have to be excellent or even very good," said Filler. Autofitting uses historical decline curves from wells and creates hyperbolic type curves that honor selected parameters

The event announcement was published on Page 2 of the June 2014 *Reservoir Solutions* newsletter in the article, "NP NAEN, RS to co-host training session in Moscow."

The NP NAEN announcement of Oct. 9 stated that the training session "has been postponed until the first quarter of 2015 due to a large number of events taking place during these months in this sphere: MINEX Russia 2014, National Oil and Gas Forum 2014, KIOGE 2014 Conference, ROOGD-2014, OSEA 2014, West Siberia Oil and Gas Forum 2014, ITE East Africa Oil and Gas, etc."

NP NAEN said it will announce any changes in the timetable for the training session.

for subject low-perm reservoirs.

Filler selected two wells from each of the three groups. He prepared diagnostic log-log plots and fit the data to Fetkovich type curves to estimate the duration of transient flow. Filler then estimated the hyperbolic b exponent and initial decline rate (Di) and used the resulting values for the other wells in the group.

"Fetkovich type curve analysis is one of the methods considered as advanced decline-curve analysis (DCA). It is an analytical method and does not generate type wells and curve shapes from averaging well production histories," said Filler.

The study's results were acceptable and improved the overall



"...by grouping similar wells, RTA can be done on a few wells in each set and good parameters can be estimated."

— Stuart Filler

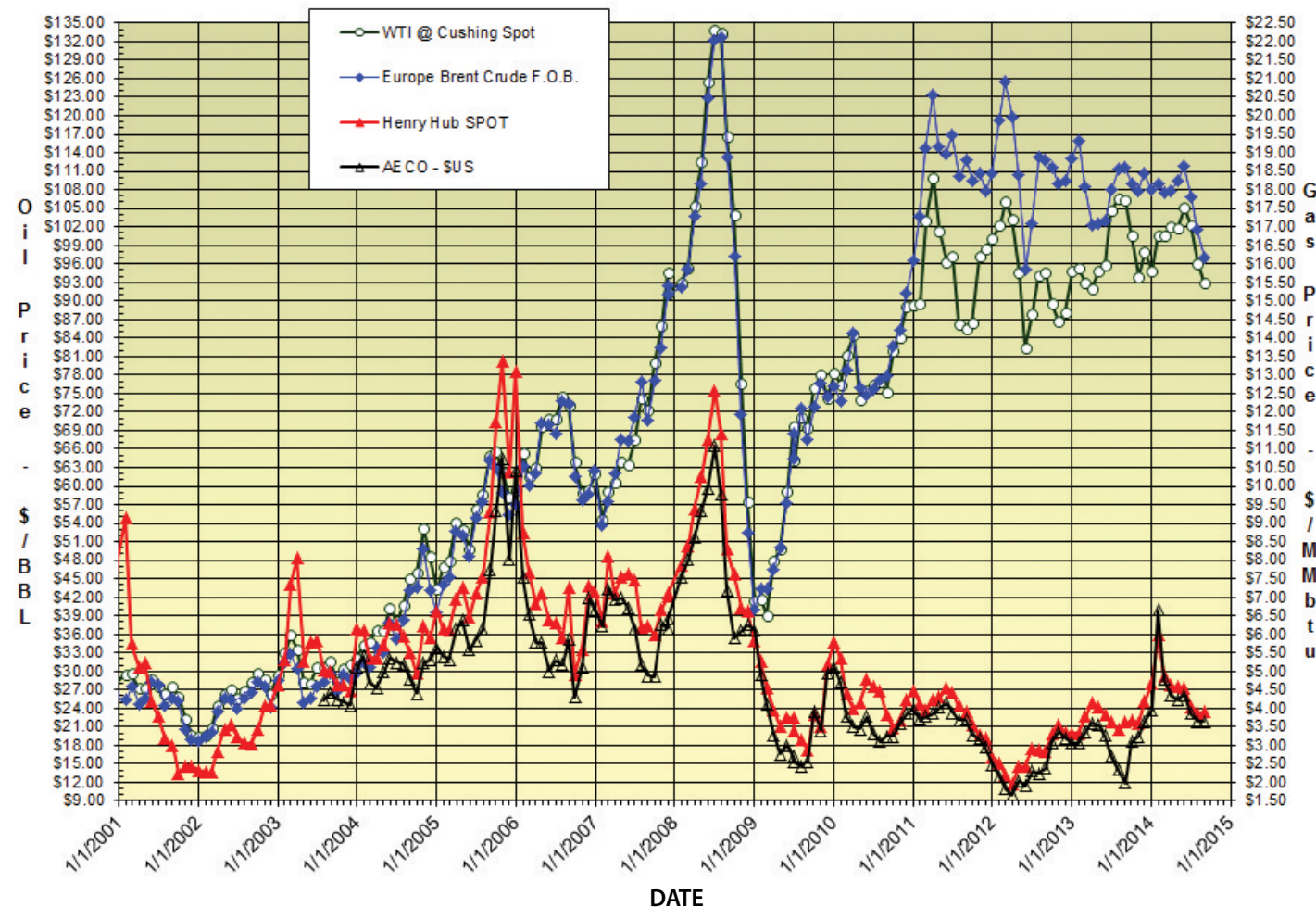
production forecasting in the well set. "The shapes of the type wells were distorted because many of the wells were re-stimulated," said Filler. "This is a work in progress. A more comprehensive analysis will be done in the future to refine the process."

The curves include a curve fit in an economics program, Fetkovich type-curve plot from RTA and an Excel plot showing half slope (transient linear flow model) for much of the second flow period. The Excel plot used first-order material balance time as defined by Blasingame (cumulative divided by rate).

Filler also presented problems with using the modified hyperbolic Arps method with b factors greater than 1 and a minimum decline (Dmin). He cited historical references on DCA, RTA and other proposed type-curve analyses, a general workflow for the RTA technique, normal practice for type wells and its perils and various plots to illustrate his points.

His presentation and others from the reserves conferences are posted at ryderscott.com/presentations.

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.

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Two senior petroleum engineers join Ryder Scott's Houston office



Deji A. Adeyeye joined the Houston office as a senior petroleum engineer. He has been involved in project management and economics, integrated oil and gas field development, planning, budgeting, reservoir management, technical and economic due diligence for property acquisitions and divestitures. Adeyeye worked at Murphy Oil Corp. for four years as a subsurface team leader where he planned and managed non-operated offshore assets and budgeted for subsurface teams. He also led a team examining subsurface and commercial

aspects of proposed field development projects leading, in some cases, to final development plans.

Before that, Adeyeye was a senior reservoir engineer at Devon Energy Corp. where he evaluated assets in the Gulf of Mexico for divestitures. He also provided technical justification for proved reserves and managed regulatory year-end reserves and resources processes.

Adeyeye worked at BP America Inc. for five years starting in 2004 as a petroleum engineer. He prepared commercial and subsurface requirements for recompletions and side-track options and designed deepwater depletion plans. Adeyeye also conducted reservoir simulation and performed pressure-transient analyses for a subsurface assessment of near wellbore damage, permeability and reservoir size.

He began his petroleum engineering career at Addax Petroleum Corp. where he started in 1999 as a production engineer trainee. After that, he was a teaching assistant at Texas A&M University before joining BP.

Adeyeye has a BS degree in chemical engineering from the University of Lagos, MS degree in petroleum engineering from Texas A&M University and an MBA degree from Rice University. He is a member of the Society of Petroleum Engineers and a licensed professional engineer in Texas.



John McLaughlin joined Ryder Scott's Houston office as a senior petroleum engineer. He previously worked at Macquarie Energy Capital as associate director and reservoir engineer for six years where he created deal structures and terms to mitigate technical risks. McLaughlin performed technical and financial surveillance on portfolio companies in the U.S. and Russia and conducted in-depth analyses of more than 100 investment opportunities on six continents.

He also focused on evaluating projects in the Eagle Ford, Marcellus, Bakken and Woodford shale plays, studying completion methods and lateral-placement impacts on production rate and recovery. At Macquarie, McLaughlin also evaluated offshore field-rejuvenation projects, EOR projects, conventional reservoirs and regional hydrocarbon supplies feeding pipeline and midstream projects.

McLaughlin was a reservoir evaluation lead for assets in Angola, Mexico, Kazakhstan, and the onshore U.S. He developed valuations for oil and gas fields with deepwater facilities, waterfloods, pressure maintenance, CO₂ injection, tight gas, LNG commercialization and coalbed methane. McLaughlin conducted field studies and certified reserves. He also performed audit reviews focusing on compliant methodology and results of projects in Nigeria, Yemen, Angola and Germany.

Before that, McLaughlin worked at Exxon Mobil Corp., as a reservoir engineer. He managed reserves bookings, planning and budgeting, and technical endorsements for all Exxon Mobil non-operated West African fields, including two deepwater Angola blocks.

He began his career at Exxon Mobil as a reservoir surveillance engineer in 2001. McLaughlin has a BS degree in petroleum engineering from the Colorado School of Mines and a master's degree in petroleum engineering from the University of Houston. He is also a member of the Society of Petroleum Engineers and is a licensed professional engineer in Texas.

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