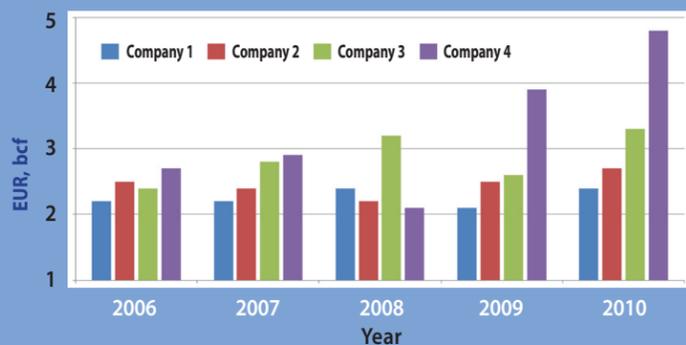


High-side forecasts – Cont. from page 5

- Completion technique
- Well location and spacing
- Operational practices
- Operator
- Vintage

Lee cited a study that examined EURs in the Barnett shale that varied by operator and by vintage over five years. “The study makes the case that ‘binning’ using those parameters is a good approach. Technology has improved recoveries over time and operators have found better drilling locations,” he said.

EURs in the Barnett Shale that Varied by Operator and Vintage more than 5 Years



– SPE-158867, see full citation on technical paper at end of article.

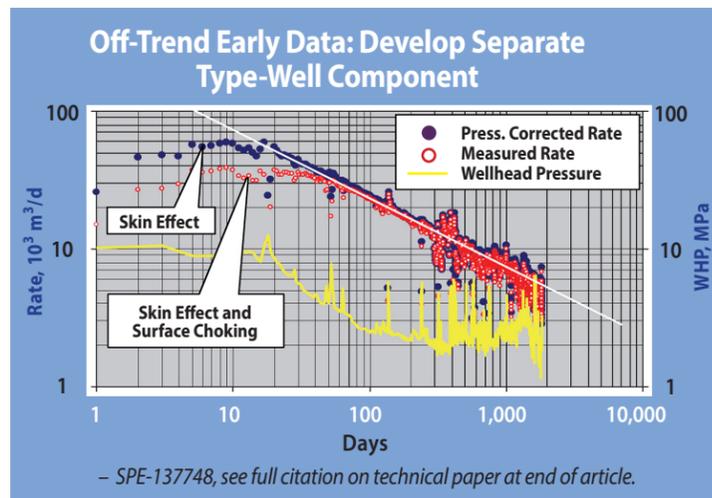
Lee said that to check whether a bin has wells with similar characteristics, plot the EURs and initial potential on a probit chart.

“That should yield a straight line. If you don’t find a straight line, you may have mixed apples and oranges in the bin,” he remarked.

Next, the evaluator prepares log-log rate-time diagnostic plots for each well in the sample set vs. grouping the wells. “It’s not a lot of extra work but it’s important,” Lee said.

Identifying flow regimes in those plots ensures that the forecast honors fluid-flow physics.

Lee also recommended that evaluators develop a separate type-well component or add-on segment for early, off-trend well data. “Exclude off-trend data from the fit, but don’t discard it,” he said. Causes for off-trend data can be early wellbore cleanup, skin effects that reduce permeability near the wellbore or surface choking causing pressure drawdown.



– SPE-137748, see full citation on technical paper at end of article.

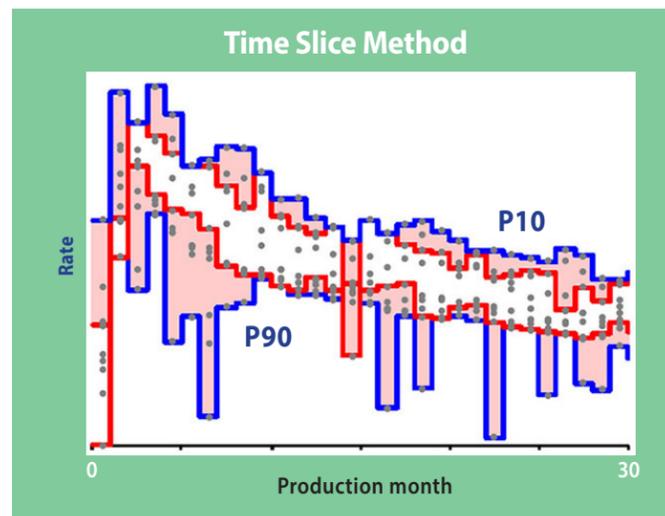
Lee said it’s important to scale data as needed with the goal of minimizing the number of separate bins and maximizing the number of wells in each bin. “You could sort by lateral length, but that practice could lead to an excessive number of bins,” he remarked.

Scaling for completed well lengths is not a linear relationship. “It’s not a straight line because we lose effectiveness, for instance, from pressure drops in the well casing along the wellbore,” said Lee.

He recommended sorting wells based on permeability-thickness, number of fracture stages and drawdown — all factors that affect post-peak rate well performance.

“You can sort wells by one of more of these factors, but keep in mind the need to limit the number of bins,” Lee said. “From peak rate to end of linear flow, permeability and fracture spacing will dominate well performance.”

Lee recommended that evaluators avoid the widely used time-slice method, which involves reordering monthly production of wells from largest to smallest. That causes individual well histories to cross each other on a rate-time plot, P90s to be too low and P10s to be too high.



EUR from Type Wells

	Time Slice	Target EUR	Error
P 10	2174	2189	-1%
P25	1649	1832	-10%
P50	1190	1431	-17%
P75	887	1129	-21%
P90	588	909	-35%

– SPE-167215, see full citation on technical paper at end of article.

At the Ryder Scott Canada Reserves Conference in May, Lee showed various charts and graphs. His presentation is posted at ryderscott.com/presentations/.

Lee cited the following SPE technical papers in his presentation:

- “A Practical Guide to Unconventional Petroleum Evaluation,” B. Russell and R. Freeborn, Energy Navigator Inc., SPE 158867, 2012

Geologist joins RS, seven employees promoted

Senior petroleum geologist **Luisa Rolon** joined the Ryder Scott Houston office earlier this year. She has more than 18 years of international and U.S. experience in the oil and gas industry, including extensive knowledge of geology and petroleum systems in a broad variety of geographic areas.

Rolon most recently worked at ENI Petroleum Co. Inc. where she was a senior exploration geologist/geophysicist for properties in the Gulf of Mexico and Mexico. She appraised discoveries, generated prospects in the eastern GOM and added prospective resources to the exploration portfolio.

Before that, she worked at Hess Corp. starting in 2011 for two years as a senior geologist/geophysicist. Rolon was lead development geologist for the Bakken play and technical lead in a Three Forks fluid system project.

She was also a geologist, seismic interpreter and prospect generator for offshore Peru and the Guyana-Suriname area, and prepared reservoir maps for plays in Brazil, Peru and Guyana-Suriname.



Luisa Rolon

- “How To Apply Stretched Exponential Equations to Reserve Evaluation,” R. Freeborn and B. Russell, Energy Navigator Inc., SPE-162631, 2012
- “An Unconventional Rate Decline Approach for Tight and Fracture-Dominated Gas Wells,” A. Duong, ConocoPhillips Canada, SPE-137748, 2010
- “Creating More Representative Type Wells,” R. Freeborn and B. Russell, Energy Navigator Inc., SPE-175967, 2015
- “Creating Analogs, Fact and Fiction,” R. Freeborn and B. Russell, W. Keinick, Energy Navigator Inc., SPE-162630, 2012
- “A Practical Guide to Unconventional Petroleum Evaluation Part 2,” B. Russell, R. Freeborn, Energy Navigator Inc., SPE-167215, 2013

Those papers are available for purchase through OnePetro at www.onepetro.org.

Rolon was a geophysicist, geologist and reservoir engineer at Chevron Corp. during 2004-2010. She was a lead geoscientist for exploration-and-development G&G for an offshore exploration project in the Campos and Santos basins in Brazil.

Rolon evaluated the complex geology of the Atlanta and Oliva fields in BS-4 block offshore Brazil and her estimate added significant potential upside resources, resulting in a successful divestiture. She was also development and lead geologist for an east Texas asset. Rolon identified new uphole recompletion zones for tight-gas development. Rolon was also a reservoir engineer and generated well production forecasts for a south Texas asset.

She was a regional stratigrapher/sedimentologist at Ecopetrol SA in Colombia for four years starting in 1997. Rolon was a technical leader for stratigraphic and sedimentological analysis in the Middle Magdalena/Eastern Cordillera basins in Colombia. She developed new reservoir and paleo-environmental maps at the basin level and prepared risk mapping.

Rolon founded Geosurvey Ltda in Colombia in 1995 to 1997 and served as the managing director. She led a team of as many as seven geologists in surface geology campaigns. Rolon performed seismic analysis, stratigraphic mapping and rock sampling to generate exploration leads.

Rolon has a BS degree in geology and geophysics from Colombian National University and MS degrees in petroleum engineering and geology from West Virginia University. She is fluent in several languages.

Please see *Geologist joins RS* on page 12

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Geologist joins RS – Cont. from page 7

Promotions and awards

The following employees at Ryder Scott were promoted as follows:

- **Marylena Garcia** to senior vice president-group coordinator
- **Gabby Morrow** to senior vice president-group coordinator
- **Ali Porbandarwala** to senior vice president-group coordinator
- **Adam Cagle** to senior petroleum engineer
- **Gilly Rosen** to senior petroleum geoscientist
- **Beau Utley** to senior petroleum engineer
- **D.J. Jeong** to senior engineering technician

Scott Wilson, senior vice president at the Denver office of Ryder Scott, won the **SPE Rocky Mountain Regional Award for Reservoir Description and Dynamics**. He received the award from the SPE Denver section in May.

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 oil and gas reserves studies a year. Ryder Scott multi-disciplinary 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.

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