

# E&P DAILY NEWS

## 2011 SEG Annual Meeting

OFFICIAL SHOW DAILY PUBLISHER OF THE SEG INTERNATIONAL EXPOSITION AND 81ST ANNUAL MEETING

## Examining the Road (or Two) Ahead

Monday afternoon's special session included reviews of E&P in the Arctic and the potential for international unconventional shale development. Both pursuits involve challenges but none are showstoppers.

By Jerry Greenberg, Contributing Editor

Industry experts discussed disparate regions during the Recent Advances and the Road Ahead special session on Monday afternoon. Joe Gagliardi, director, Arctic Solutions and Technology, ION Geophysical Corp., described the future of Arctic seismic acquisition. Chris Hopkins with Schlumberger discussed the international potential and associated hurdles for unconventional reservoir development. Both presenters, among others in the session, noted their respective regions have challenges but they are not insurmountable.

Gagliardi described marine Arctic geophysical exploration from the late 1960s to the 2000s as periods of frantic effort followed by periods of activity lulls, although the past five to seven years have seen a prolonged period of Arctic exploration driven by two main forces. "One is the United Nations Convention of the Law of the Sea Article 76 (UNCLOS) research," he said, "and the other is hydrocarbon exploration due to increasing scarcity of world-class E&P opportunities in less challenging sedimentary basins."

The main driver of Arctic hydrocarbon exploration is US Geological Society (USGS) estimates that place 25% of all remaining

undiscovered reserves in the Arctic, Gagliardi noted. As large field discoveries have become rarer, long-term development focus turned to the Arctic, he said. "We also have commodity price support that has allowed us to do some long-range planning for Arctic elephant hunting, and thinner polar ice never hurts," Gagliardi noted.

However, there are potentially limiting factors for Arctic exploration, he said, one of which is the lack of high-quality seismic data due to the presence of marine sea ice. Another is the prevalence of geopo-

litical roadblocks. That and the lack of permits also affect appraisal and development, while roadblocks for trying to get fields into production usually are transportation or development related, such as lack of a pipeline.

"We are trying to solve the one hurdle related to providing high-quality seismic data in the Arctic environment," he said. "We focus on near ice operations, in which crews work as close to the ice as pos-

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## Ceremony Gets New Time, Snazzier Feel

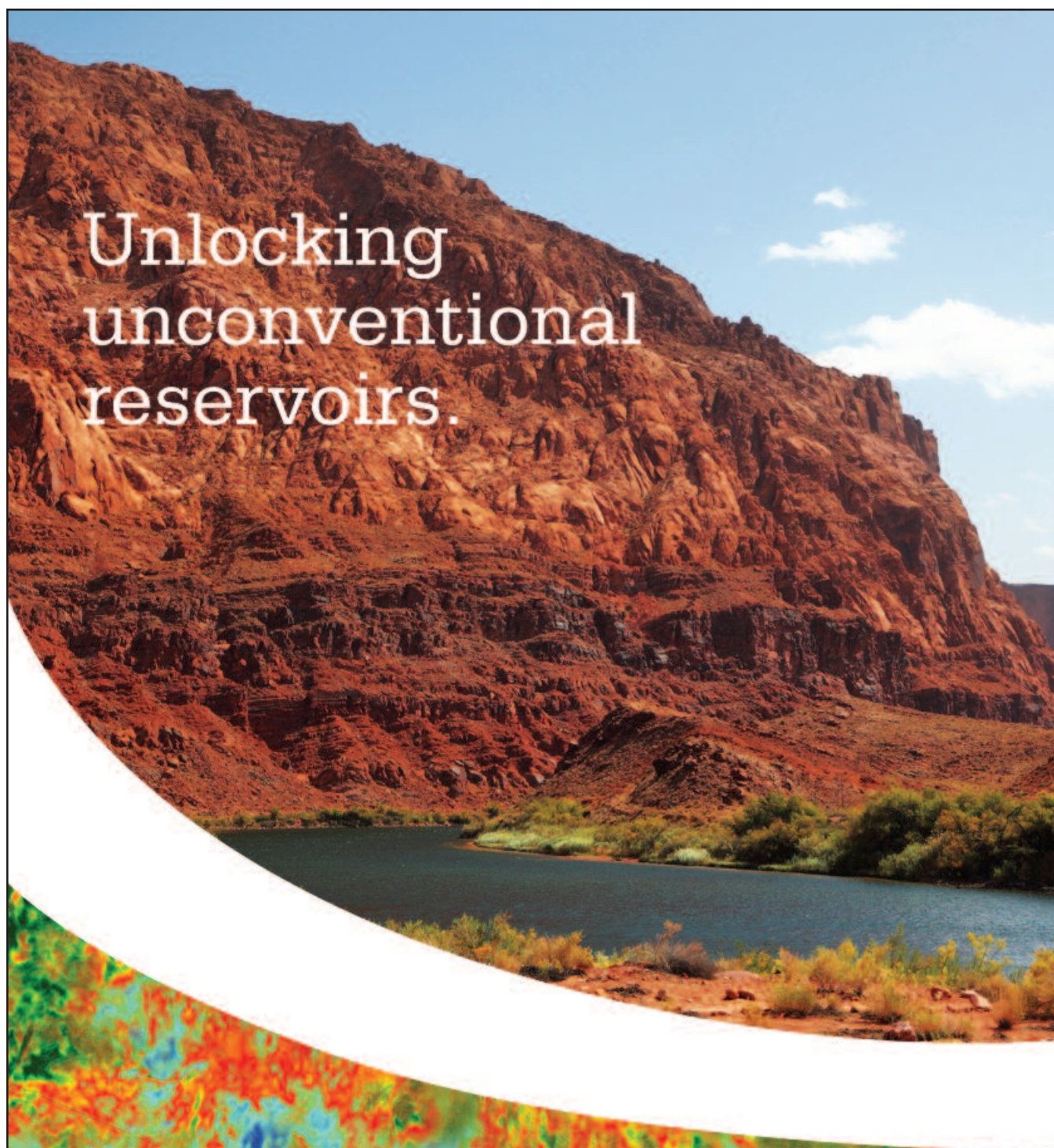
The Honors and Awards program moved to Tuesday evening to add some panache to the event.

By Rhonda Duey, Senior Editor, E&P

While the Honors and Awards program is always a chance to celebrate, this year SEG put the celebration first and foremost by holding the awards in an elegant setting Tuesday evening. Historically the awards, as well as the president's address, have been held Sunday afternoons before the ice breaker. This year the society decided to give the awards ceremony a more "premier" treatment, allowing more people to attend, according to Steve Emery, senior manager, meetings and expositions for SEG. The idea, he added, is to give the ceremony more visibility and recognition.

This year the achievement awards were given during Sunday's council meeting. That meeting kicked off with kudos to those SEG members whose contributions to the 2010 SEG Annual Meeting were exceptional. Best Poster Paper presentation went to Sergey Fomel, Lexing Ying, and Xiaolei Song for "Seismic Wave Extrapolation

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# Seismic Interpretation Toolkits: Better Resources for the Most Demanding Exploration Requirements

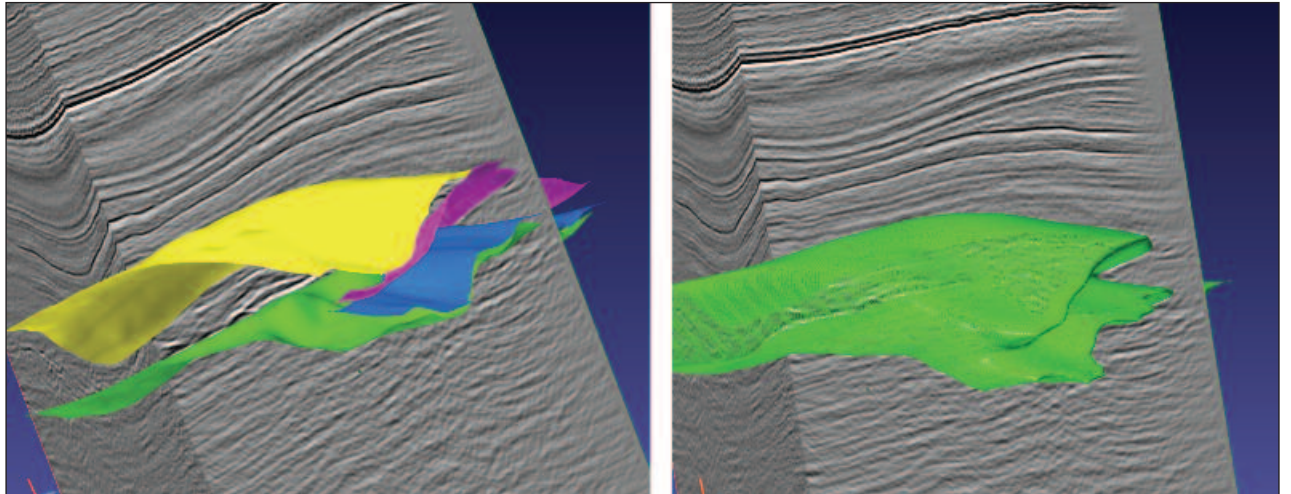
New interpretation toolkits address difficult exploration challenges.

By Mark Whittier, TerraSpark Geosciences LLC

For decades, seismic interpreters have struggled to find newer, better ways to engage the most pressing geophysical and geological interpretation problems. The most tedious and riskiest engagements are well known to veteran explorationists; these include understanding and visualizing shale resource environments, identifying and capturing complex geobodies – particularly salt bodies – and navigating complex, highly faulted subsurface regions.

The limits of 2-D seismic interpretation in these areas of exploration have been articulated by many and are well understood. Additionally, 3-D visualization, while offering definite improvements in terms of generating superior visual outcomes, also has limitations when it comes to revealing deeply complex geophysical conditions.

The newest trend in 3-D seismic interpretation lies with developing well targeted, specifically designed interpretation toolkits that address these uniquely difficult exploration zones. The idea behind the toolkit approach is to integrate particular interpretation tools with distinct applications, apply refined capabilities at various points of functional overlap or intersection, and then deploy for use in the most demanding exploration conditions. Some of these tools are intuitively compatible, while others typically stand alone in the context of conventional workflows. When integrated to solve a particular geologic problem, however, they can be optimized to work together in a way that provides better, more



This figure shows surface-wrapped salt bodies with editable mesh. (Image courtesy of TerraSpark)

refined interpretation outputs. Classic examples of interpretation problems that can be addressed by the toolkit approach are shale resource plays, salt bodies, and highly faulted structures.

## Shale resource plays

The key obstacle with shale resource environments lies in the core depositional makeup – to an observer, the source and reservoir (hydrocarbon system) are essentially the same rock unit or formation. Not only is it very difficult to locate areas of sub-seismic enhanced fracture density to optimize well path planning, but it can seem almost impossible to identify facies change in shale during fracturing.

Using a toolkit approach, with specific software

tools and algorithms aligned to optimize shale complexities, interpreters can, in fact, improve understanding of facies-change boundaries and reduce drilling risk. This is achieved by:

- Using an automated fault extraction tool in conjunction with voxel density regional highlighting to directly reveal areas of increased fracturing for enhanced production potential;
- More accurately interpreting trends in injection and production using an attribute property calculator; and
- Unraveling facies state-change boundaries using a stratal domain transformation tool.

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sible, but we didn't have the equipment that would allow us to work in the polar pack ice. In 2008, ION decided to re-engineer traditional seismic acquisition equipment to allow it to acquire seismic data inside the polar pack ice."

Gagliardi noted several new Arctic technologies, including 3-D seismic under ice, which he said is possible although unproven. He also believes the industry will begin to adapt non-seismic geophysical techniques for the Arctic environment. This could be site survey work in ice covered conditions, which currently is possible, or adapting 3-D gravity gradiometry to novel applications of marine-controlled source electromagnetic surveying to alter the workflow.

## Barriers to international unconventional development

Hopkins' presentation was non-geophysical oriented because, he said, "quite frankly, geophysics is not the only hurdle to unconventional development. Some of the other hurdles are more challenging than geophysics."

North American shale development is driven by the drill bit, he said, while international development will be different. Among the key constraints for growth outside North America are fiscal/regulatory regimes, the slow pace of exploration, pipelines and other infrastructure, environmental concerns, and lack of available expertise. On the other hand, Hopkins said, key attributes for growth include government involvement and support, a large resource base, and a strong gas market.

Eastern Europe has a number of positive attributes that are required for potential successful unconventional development but well costs could be prohibitive. "It is probably three times more expensive to drill the same well in Europe than it is in the United States. This is one of the challenges to the economics.



Chris Hopkins



Joe Gagliardi

"But the main thing in Europe is fear," Hopkins said, "fear of what unconventional development actually looks like, and a lot of that fear is from graphs and slides they have seen from the United States.

"Internationally it is going to take an integrated approach across the entire life cycle of the development," he said, "and it going to be through the application of technology and producing more with less.

"In evaluating, it is using more knowledge and having less uncertainty, using seismic to find the sweet spot, advanced modeling techniques, and trying to define reservoir and completion quality earlier in the exploration and appraisal stage. In drilling, it is less rig time and less footprint on the surface and enhancing longer laterals. When completing it is about more reservoir contact and less environmental impact. When we produce, how do we recycle our waste in order to maximize recovery?"

International unconventional reservoir development will require a technology and collaboration approach, Hopkins concluded, including measurements for reservoir and completion quality, and the technology to drive operational, completion, and production efficiency. ■

## INDUSTRY NEWS (cont'd from page 4)

### Bolt Technology Announces Joint Development With WesternGeco of Marine Seismic Energy Source

Bolt Technology Corp. has commenced joint efforts with WesternGeco, a product line of Schlumberger, to develop the E-Source air gun, an environmentally sensitive energy source for marine seismic surveys.

The E-Source air gun is a bandwidth-controlled source of acoustic waves designed to reduce the potential impact of seismic signals on marine life. The new source optimizes output in the seismic band, suppressing the high-frequency components that contribute to acoustic impact, while retaining the low-frequency components that are critical to seismic exploration.

Raymond M. Soto, Bolt's president and CEO, said, "In the early 1960s, we invented the marine seismic air gun and today our air guns are the most widely used marine seismic energy source in the world. By combining our unique air gun design and manufacturing experience with WesternGeco knowledge and research in the area of marine acoustics, we believe the new E-Source air gun could represent a significant new development in the geophysical industry. Once fully developed, the E-Source technology will be universally available to the industry."

Bolt Technology Corp. is a leading worldwide developer and manufacturer of marine seismic data acquisition equipment used for offshore oil and natural gas exploration. ■

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