AAPG EXPLORER

JULY 2011

Proving a Point

The Deep Panuke N-79 heads for Nova Scotia

See page 8

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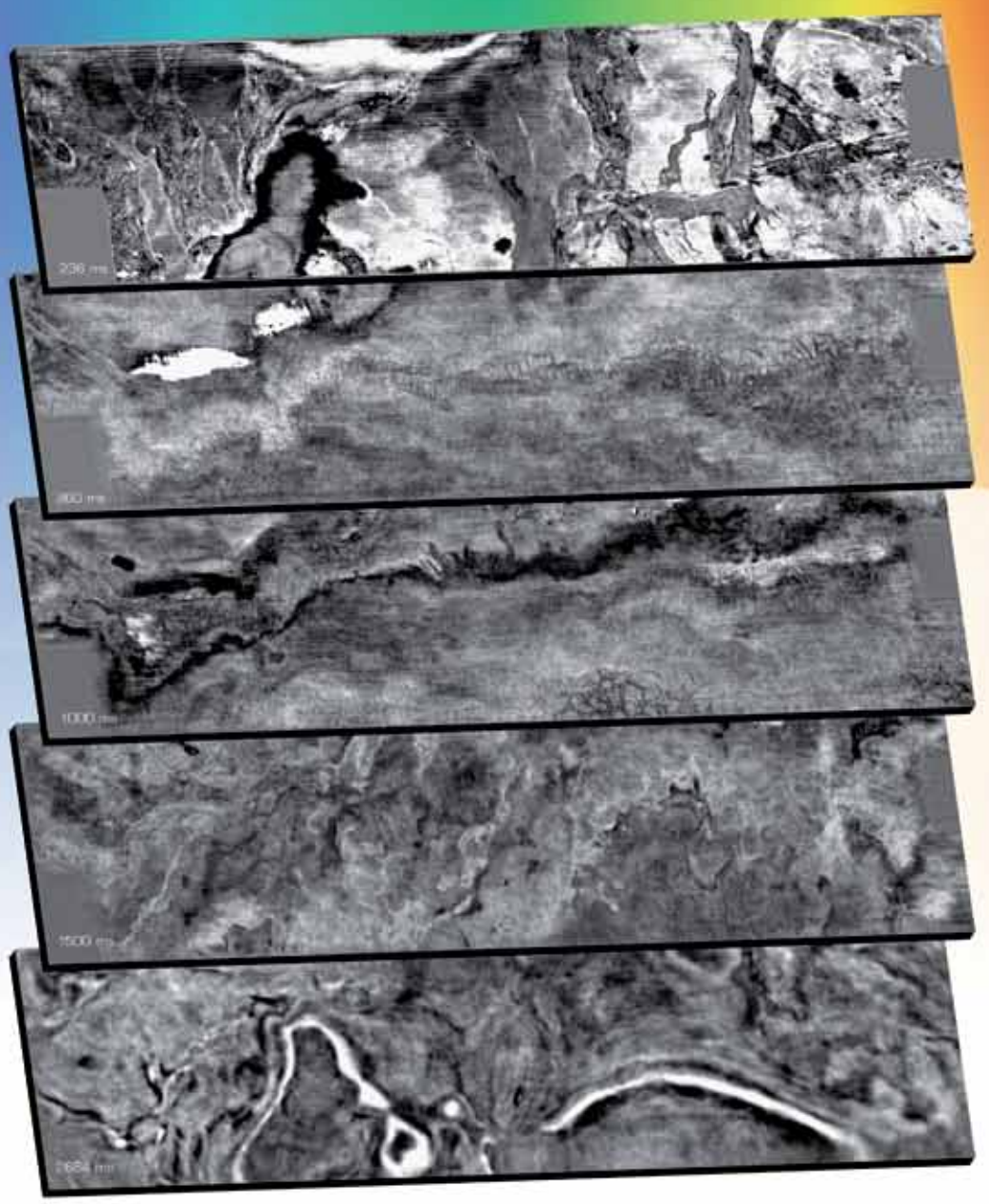

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JULY 2011

AAPG EXPLORER

PRESIDENT'S COLUMN

Demonstrating the Benefits of Membership

By PAUL WEIMER

July 2011: The ritual changing of the guard at AAPG leadership – but this year will perhaps bring more change than usual.

At this transition point, I'd first like to thank the outgoing members of the Executive Committee: David Rensink (president), David Hawk (chair-House of Delegates), Alfredo Guzmán (vice president-Regions) and Bill Houston (secretary). The continuing members of the EC also deserve praise: Marv Brittenham (vice president-Sections), Jim McGhay (treasurer) and Steve Laubach (Elected Editor).

It has truly been a privilege during the past year to work with this talented group. They have all served membership well, and they will continue to do so by working on the ad hoc Search Committee for the new executive director.

I also welcome the incoming members of the EC: Jeff Lund (chairman-House of Delegates) and newly elected officers Ted Beaumont (president-elect), Stuart Harker (vice president-Regions) and Denise Cox (secretary).

I look forward to working with all of them in the coming year.

* * *

Now we turn our thoughts to the future of AAPG and our profession in the short and long term – a topic on all of our minds as the petroleum industry makes political and environmental headlines, technology continues to accelerate and record numbers of geoscience workers retire.

At the AAPG Leadership Days Conference in August 2010, President David Rensink asked David Blanchard and me to organize a breakout session with the theme "AAPG in 2035." The ensuing conversation was most informative in hearing the group's wide range of views (about 35 people participated).


WEIMER

> **Our future is purchased through the investment we make today.**

My take-home learning from that meeting: Almost everyone agrees on where AAPG needs to be in 15 to 25 years, but people disagree widely on how that might be accomplished.

With these learnings in mind, here are some of the contributions I plan to make as AAPG president.

For the coming year, I want to expand upon the goals articulated by my predecessor, David Rensink, in terms of AAPG taking a long-term view of itself.

Our future is purchased through the investment we make today. Therefore, I have decided to invest my time by presenting a half-day short course, free-of-charge, for students and professionals around the world – "The Petroleum Industry in the Next Decade: An Overview to the Science, Technology and AAPG."

The purpose of this short course is to give students and professionals a strong sense of the spectacular technology with which we work, how much E&P concepts have changed during the past three to four years with the rapid evolution in developing unconventional resources, the future of their profession and what they can expect in their careers.

Along the way, the benefits of AAPG membership will become clear.

Specifically, this short course will address the following themes:

- Rejuvenation of old fields: conventional (and now unconventional) accumulations.
- Frontier exploration in conventional accumulations.
- Introduction to unconventional resources: tight-gas sandstones.
- The future: assumptions (supply and demand), technology (seismic, how we interpret), more on unconventional resources, why belong to AAPG.

The first three themes will be addressed via 50-minute lectures with exercises. For each exercise I will give the students some basic materials to interpret (e.g. seismic profiles, well logs). I will walk through the interpretation of the exercise with them, and then give a summary lecture.

The final lecture will be a look forward (i.e. AAPG in 2035) – where is our industry headed, how can you expect to work (e.g. evolving interpretation technologies, evolving drilling and completion techniques, new play concepts), where will you work and, most importantly, why it is critical that you join AAPG and stay a member throughout your career.

I will emphasize that I could not have given this same lecture three years ago, because industry has changed so much during that time.

See **President**, page 4

Dues Statements Mailed

AAPG dues statements for 2011-12 have been mailed, and the AAPG membership department is ready to assist you in remitting payment.

A reminder: If you are renewing by credit card you can pay immediately online, by logging-on to www.aapg.org/members_only.

Once there, select "Pay Dues" from the left navigational bar.

Credit card users also can call AAPG to make your payment – U.S. and Canadian members can call (800) 364-2274, and all others can call (918) 584-2555.

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REGULAR DEPARTMENTS

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ON THE COVER:

The Deep Panuke N-79 Production Field Center was photographed en route from the Abu Dhabi ship yards to offshore Nova Scotia, where first gas from Encana Corporation's one-Tcf Deep Panuke Field is expected to flow during the fourth quarter of 2011. Photo courtesy of SBM Offshore.

Left, geoscientists study outcrops of the Valdez Group accretionary terrain along Seward Highway just east of Anchorage, Alaska. See page 36.

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AAPG Officer Candidates Announced for 2012-13 Term

AAPG officer candidates have been announced for the 2012-13 term.

Biographies and individual information for all candidates will be available online in mid-August at www.aapg.org.

The president-elect winner will serve in that capacity for one year and will be AAPG president in 2013-14. The vice president-Sections and secretary will serve two-year terms.

Ballots will be mailed in spring 2012.

The slate is:

President-Elect

❒ **Donald D. Clarke**, geological consultant, Lakewood, Calif.

❒ **Lee Krystinik**, Fossil Creek Resources, Arlington, Texas.

Vice President-Sections

❒ **Thomas E. Ewing**, Frontera Exploration Consultants, San Antonio.

❒ **Kenneth E. Nemeth**, Schlumberger Seismic Reservoir Characterization, Houston.

Treasurer

❒ **Rebecca L. Dodge**, Midwestern State University, Wichita Falls, Texas.

❒ **Deborah K. Sacrey**, Auburn Energy, Houston.

President
from page 3

* * *

As much as I would enjoy it, I cannot travel to all countries and universities, so hard choices have to be made. My itinerary will be announced on the AAPG website and distributed to membership in each region. With this publicity, I hope that many students and professionals will be able to participate in this course.

* * *

One final note: All of this travel is possible because of the sustained support of membership. In addition, there are two individuals at the University of Colorado who also have made this possible: Lang Farmer (Chair of the Department of Geological Sciences) and Bruce Benson (President of the University of Colorado and an AAPG member since 1965).

To all, I extend my humble thanks.

As our profession continues to evolve, I embrace the opportunity to serve during this coming year. I look forward to collaborating with and learning from as many of you as possible.

Onward ...

Paul Weimer

Abstracts Sought For Long Beach

Abstracts are now being accepted online for the 2012 AAPG Annual Convention and Exhibition (ACE), which will be held April 22-25 in Long Beach, Calif.

The ACE theme is "Directing the Future of E&P – Starring Creative Ideas and New Technology," and the technical program will comprise 11 themes:

- Active Oil and Gas Fields: Development and Production – A look at state-of-the-art production and multidisciplinary studies applied to both mature and new fields worldwide.
- Emerging Frontiers – Recent discoveries, emerging exploration plays and technological breakthroughs.
- Siliclastics Reservoirs: Exploration and Characterization – Current trends and concepts.
- Carbonates and Evaporites: Exploration and Characterization – Current knowledge and research into carbonate reservoirs and evaporates.
- Unconventional Resources – What's ahead for unconventional resources.
- Basin Analysis and Petroleum Systems – Concepts and ideas that cover the broader aspects of basin-scale petroleum systems and geo-histories.
- Alternative Energy – Exploration outside conventional and unconventional oil and gas resources.
- Environmental and Energy Research – The relationship between environment and energy, safety and oil spill response.
- Structural Geology and Neotectonics – State-of-the-art research into structural geology and tectonics.
- Geophysics and Seismology – Technology and recent advances, with emphasis on integrating geology and geophysics in exploration and production.
- Geoscience Principles and Applications – A broad range of geological topics, focusing on various principles and technologies in natural resource exploration and production.
- AAPG and SEPM Student Poster sessions.

Abstracts must be received by Sept. 22.

To submit an abstract, or for more information, go to www.aapg.org/longbeach2012.

Exhibition and sposorship opportunities also are available online – or contact convene@aapg.org for more information.


WEIMER


BEAUMONT


HARKER


COX


BRITTENHAM


McGAY


LAUBACH


LUND

Weimer Assumes AAPG Presidency

Paul Weimer, geology professor at the University of Colorado, assumed the presidency of AAPG on July 1.

Weimer is Bruce D. Benson Endowed Chair, University of Colorado (Boulder) and director of the Energy and Minerals Applied Research Center. He also is a consulting geologist.

His father, Robert J. Weimer, professor emeritus at the Colorado School of Mines, was the Sidney Powers Medal recipient in 1984 and served as AAPG president in 1991-92. The Weimers are the first father-and-son to serve as president in the Association's 94-year history.

Joining Weimer on the Executive Committee is **Edward A. "Ted" Beaumont**, senior geologist with SM Energy in Tulsa, Okla., who recently was voted president-elect and will serve as AAPG president in 2012-13.

Beaumont holds a bachelor's in geology from the University of New Mexico and a master's from the University of Kansas. He served as an exploration geologist with Cities Service Oil Co. and was AAPG science director before becoming an independent consultant and later joining SM Energy.

Others elected to the 2011-12 Executive Committee are:

❒ Vice president-Regions – **Stuart D. Harker**, Circle Oil Plc., Finchampstead, England.

❒ Secretary – **Denise M. Cox**, Storm Energy, Panama City, Fla.

Both the vice president-Regions and secretary will serve for two years.

Remaining on the committee for the final year of their terms of office are:

❒ Vice president-Sections – **Marvin D. Brittenham**, EnCana Oil & Gas (USA), Denver.

❒ Treasurer – **James S. McGhay**, Mid-Con Energy, Tulsa.

❒ Elected Editor **Stephen E. Laubach**, Bureau of Economic Geology, University of Texas at Austin, is serving the second year of a three-year term in office.

Also new on the committee will be **Jeffrey W. Lund**, Corridor Resources, Houston, who has assumed the chair of the House of Delegates.

Advisory Council Members Announced for 2011-12

Members of the 2011-12 AAPG Advisory Council are:

❒ David G. Rensink (chair) Houston.

❒ John C. Lorenz, Edgewood, N.M.

❒ Scott W. Tinker, Austin, Texas.

❒ Stephen M. Testa (president-EMD), Mokelumne Hill, Calif.

❒ Douglas C. Peters (president-DEG), Golden, Colo.

❒ Martin D. Hewitt (president-DPA), Plano, Texas.

❒ David H. Hawk (immediate past chair-HoD), Boise, Idaho.

❒ Kurt E. Neher (Pacific Section), Bakersfield, Calif.

❒ Donna S. Anderson (Rocky Mountain Section), Golden, Colo.

❒ David C. Harris (Eastern Section), Lexington, Ky.

❒ Mary E. Broussard (Gulf Coast Section), Lafayette, La.

❒ Martha Lou Broussard (Gulf Coast Section), Houston.

❒ Debra P. Osborne (Southwest Section), Midland, Texas.

❒ Robert D. Cowdery (Mid-Continent Section), Wichita, Kan.

❒ Jean R. Gerard (Europe Region), Madrid, Spain.

❒ Paul J. English (Canada Region), Calgary, Canada.

❒ Peter W. Baillie (Asia/Pacific Region), Singapore.

❒ Fowzia Hussien Abdullah (Middle East Region), Safat, Kuwait.

The representatives for the Latin America and Africa Regions will be named at a later date.

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Photo courtesy of SBM Offshore

The Deep Panuke Production Field Centre in dry dock in Abu Dhabi.


Photo courtesy of RPS Energy Ltd.

In 2009, a 400-kilometer-long refraction seismic line was acquired on the Scotian Shelf, deploying 100 three-component ocean bottom seismometers (OBSs), shown above.

Interest in offshore area reignited

Study Indicates Scotia Fairway Potential

By SUSAN R. EATON, EXPLORER Correspondent

Nova Scotia's offshore energy industry has just achieved two significant milestones.

First, the Deep Panuke N-79 Production Field Center is en route from the Abu Dhabi ship yards to offshore Nova Scotia. Natural gas from Encana Corporation's one-Tcf Deep Panuke Field is expected to flow during the fourth quarter of 2011.

Second, Nova Scotia's department of energy in June released a two-year, $15 million geological and geophysical study, tripling offshore resource estimates, explaining historical dry holes and reducing exploration risk in the Scotian Basin.

In a bid to compete against other global jurisdictions and to lure the oil and gas industry back to the Scotian Basin, more than 80 international academic, governmental and industry experts contributed to the massive, state-of-the-art Play Fairway Analysis (PFA). Managed by London-based RPS Energy Ltd., this independent study calculated Nova Scotia's offshore resource potential (unrisked) at 121 Tcf of natural gas and eight billion barrels of oil.

Building upon the momentum of the study, the Canada-Nova Scotia Offshore Petroleum Board is expected to launch a call for bids before year-end.

Time for a Revival?

Despite the projected economic benefits of Deep Panuke – the production platform is designed to produce up to 300 million cubic feet of sales gas per day – Nova Scotia has seen its offshore exploration licenses shrink from 59 in the mid-2000s, to just four today. A spate of dry holes during the past decade – including some deepwater wells chasing an elusive turbidite play – turned the industry from hot to cold on the Scotian Basin.

"We'd never seen royalties higher, yet we were losing exploration licenses," said Sandy MacMullin, director of petroleum resources with Nova Scotia's department of energy and a petroleum engineer by training. "In a sense, we were burning the candle at both ends.

"We needed to know sooner rather than later whether oil and gas would continue to be part of our economic future," he added.


Photo courtesy of RPS Energy Ltd.

The crew conducts a pre-deployment check on an OBS.

Offshore Nova Scotia has proven, in-place reserves of two billion barrels of oil equivalent. From 1992 to 1999, Cohasset-Panuke, Canada's first offshore oil field, produced 44 million barrels of high gravity crude before the economic life of the field was reached.

The Sable Offshore Energy Project (SOEP) led by ExxonMobil, commenced natural gas production in 1999. Since then, Nova Scotia has collected $1.6 billion in royalties from SOEP. Producing about 300 million cubic feet of raw gas per day from five satellite fields, SOEP contains an estimated three Tcf of recoverable gas.

After onshore processing and liquids removal, sales gas is shipped via the Maritimes & Northeast Pipeline to markets in Nova Scotia, New Brunswick and the northeastern seaboard of the United States.

"What we heard from industry," MacMullin explained, "was that the risk associated with the offshore geology was undercutting the economics."

Moving quickly and decisively to address industry concerns, the government of Nova Scotia and the Halifax-based Offshore Energy Technical Research Association, initiated the industry-standard Play Fairway Analysis.

"We've addressed the geological risks, head on," MacMullin said, "and we've de-risked the front-end decision-making process for the oil and gas industry."

'World Class Petroleum System'

The study involved a trans-Atlantic team of more than 80 oil and gas specialists from Canada, Germany, France and England who met regularly in Halifax and Paris to integrate concepts and data.

"Team work was integral to the success of this multilateral project," said AAPG member Hamish Wilson, program director of the PFA study and principal adviser with RPS Energy Ltd., Henley-on-Thames, England.

Investigators carved up the Scotian Basin – comprised of the shallow water

See **Fairway**, page 14

An Unexplored Frontier

The Cohasset-Panuke Field, located 41 kilometers southwest of Sable Island, was Canada's first commercial offshore oil field. From 1992-99, 44 million barrels of high gravity crude were produced before the field's economic life was reached.

Underlying the depleted production at Cohasset-Panuke, however, is a new exploration play in the Scotian Basin, and a one-Tcf discovery called the Deep Panuke Field. The reservoir, an Upper Jurassic dolomitized carbonate reef in the Abenaki Formation, was discovered by PanCanadian Petroleum Ltd. (now Encana Corporation) in early 1998.

AAPG member David Brown, a senior geologist with the Canada-Nova Scotia Offshore Petroleum Board, waxes poetically about the hydrocarbon potential of the virtually unexplored eastern margin of North America.

"Imagine a carbonate bank fairway that extends several thousand kilometers from Nova Scotia clear to Florida, that's been tested by less than 20 exploration wells off Nova Scotia and only two wells on the U.S. Outer Continental Shelf," Brown said.

Deep Panuke represents the second natural gas field development on the Atlantic margin of North America – the other development is the Sable Offshore Energy Project, also located in the Scotian Basin.

- Design capacity of the Deep Panuke N-79 Production Field Centre is 300 million cubic feet of sales gas per day.
- Start-up production is 200 million cubic feet of sales gas per day from four wells – each well is capable of producing up to 85 million cubic feet of sales gas per day.
- Productive field life ranges from eight to 18 years, with mean risked recoverable reserves of 632 Bcf over 13 years.
- Original gas in place 1.0 Tcf.
- Hydrogen sulfide and carbon dioxide stripped from the gas at the Deep Panuke N-79 Production Field Centre, and injected in a dedicated disposal well.
- Sales-ready gas shipped from the Deep Panuke N-79 Production Field Centre via the pipeline to Nova Scotia.
- Pipeline is 175 kilometers long, including a 172-kilometer-long subsea section and a three-kilometer-long onshore section to interconnect with the Maritimes & Northeast Pipeline.
- Production from Deep Panuke being sold to Repsol YPF for the life of the field.
- Deep Panuke N-79 Production Field Centre was constructed in Abu Dhabi, and is owned by SMB Offshore.

– SUSAN R. EATON

Sparsely drilled

Scotian Basin Larger Than Gulf of Mexico

By SUSAN R. EATON, EXPLORER Correspondent

The Scotian Basin lies several hundred kilometers southwest of Newfoundland's oil producing Grand Banks. Larger than the Gulf of Mexico's oil and gas producing area, the basin is 200 kilometers wide, 800 kilometers long and 142,000 square kilometers in size. Water depths vary from less than 100 meters to 3,500 meters.

The area contains up to 16,000 meters of sediments.

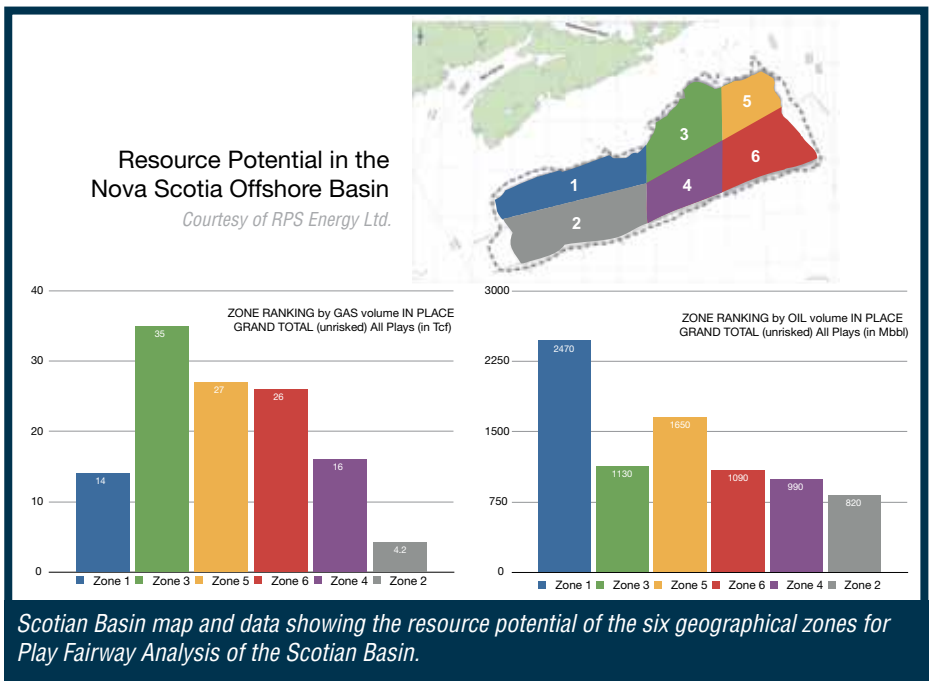
Sparsely explored to date, the Scotian Margin has been tested by just 204 wells, comprising 127 exploration wells, 28 delineation wells and 49 production wells. Most were drilled between the 1970s-90s, on regional grids of low-fold, 2-D seismic data.

Surprisingly, the area boasts 24 significant discovery licenses, with an average exploration discovery rate of about 25 percent.

The first 3-D seismic surveys were acquired during the early 2000s, but huge areas of the basin have no 3-D seismic data coverage to date.

The study's data base consisted of 70,000 kilometers of 2-D seismic data, 30,000 square kilometres of 3-D seismic data, and 20 key wells distributed across the basin. Some 7,300 kilometers of 2-D seismic trade data were reprocessed to modern-day standards.

A full biostratigraphic analysis was conducted, and, according to AAPG member Hamish Wilson, "We linked the key wells with what we call 'bible' seismic lines, creating for the first time an integrated sequence stratigraphic framework for the basin."



Scotian Basin map and data showing the resource potential of the six geographical zones for Play Fairway Analysis of the Scotian Basin.

Ten internally consistent sequence stratigraphic sequences were mapped geophysically across the basin.

Across the basin, investigators delineated the distribution of source rocks juxtaposed with reservoir rocks, and they mapped growth and strike slip fault systems, carbonate banks, deltaic systems, turbidites and authochonous salt.

Window Shopping

Wilson, program director of the PFA study, described how "forensic" geochemistry was used to unlock the story of the Lower Jurassic petroleum system in the southwest part of the Scotian Margin:

Fluid inclusion work in the deepwater Weymouth A-45 well and extensive bio-marker and isotopic analyses of sea floor oil seeps collected in piston cores suggest the syn-rift and early post-rift deposition of a Lower Jurassic source rock that's currently expelling oil today.

"There's a regional Lower Jurassic source rock system extending to Morocco," Wilson said.

Oil generation in the Lower Jurassic occurred before the Deep Panuke reservoirs were sealed. In the eastern part of the Scotian Margin – where Deep Panuke will produce gas from Upper Jurassic Abenaki Formation carbonates – these same Lower Jurassic source rocks are over mature today.

The study suggests, however, that the mostly undrilled carbonate bank, extending southwest along the Scotian Margin, could be filled with oil sourced from Lower Jurassic rocks.

Investigators also analyzed the Scotian Basin's proven source rocks – currently in the gas window today, these Upper Jurassic rocks sourced the gas in the Sable Sub-basin's productive Jurassic and Cretaceous deltaic complexes. As the basin shallows toward its margins, these Upper Jurassic source rocks move into the oil window.

Evidence for the concept of an oil rim around the Sable Delta, Wilson said, is provided by the Panuke and Penobscot oil discoveries and shows in this area.

Play Fairway study available for free

400-KM Integrated Dataset Used in Study

By SUSAN R. EATON, EXPLORER Correspondent

Aeromagnetic, gravity and reflection seismic data were integrated with refraction seismic data – on both conjugate margins of the North Atlantic – to unravel the Scotian Margin's history of rifting and drifting.

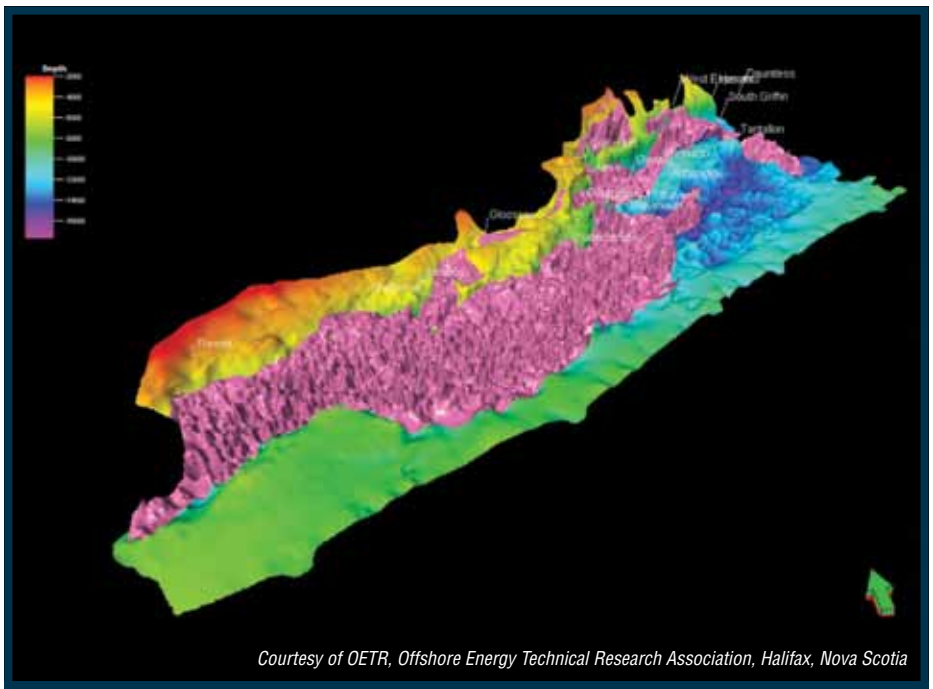

WILSON

In 2009, deploying 100 multi-component ocean bottom seismometers, the group acquired a 400-kilometer-long refraction seismic line across the Scotian Basin and the northeastern end of the East Coast Magnetic Anomaly (ECMA), a pronounced feature previously thought to delineate the northern limit of the basin's rift footprint.

The refraction line, shot in a dip orientation, imaged the Moho at an estimated depth of 40 kilometers.

Investigators noted the existence of seaward dipping seismic reflectors along the entire Scotian Margin and across the Atlantic Ocean, in Morocco, suggesting the margin's volcanic origin – and they interpreted a high velocity feature on the 2009 refraction line, pointing to the existence of a continuous, "under-plated body."

In other words, the ECMA doesn't terminate because of reduced volcanic activity – rather, its magnetic signature is masked by an increased thickness of the overlying sedimentary package.


Courtesy of OETR, Offshore Energy Technical Research Association, Halifax, Nova Scotia

An excellent 3-D image of the Autochthonous salt basin of the Scotian Basin.

But what does this tectonic analysis mean for oil and gas exploration?

Geologists say it confirms that a volcanic margin runs along the entire length of the Scotian Basin to the southern Grand Banks, setting up a broad tectonic and depositional fairway for the development of an extensive Lower Jurassic source rock.

'Bonanza' Potential

Integrating all of these diverse data sets was a monumental task undertaken by Paris-based Beicip-Franlab – the data were fed into a 3-D petroleum systems modeling package, leading to a predictive basin model for petroleum reservoir facies, source rocks and seals.

The model calculated both qualitative and quantitative hydrocarbon volumes and associated risk factors for each of the six geographical zones, tripling the yet-to-find resource estimates (121 Tcf of natural gas and eight billion barrels of oil) for offshore Nova Scotia in the process.

The study's final compilation, a Play Fairway Atlas consisting of 300-plus plates, is available for free to industry (www.novascotiaoffshore.com).

"An oil company can take the Atlas and start prospecting in the basin with the 10 horizons that are internally consistent and rigorously checked," said AAPG member Hamish Wilson, program director of the PFA study and principal advisor with RPS Energy Ltd., Henley-on-Thames, England.

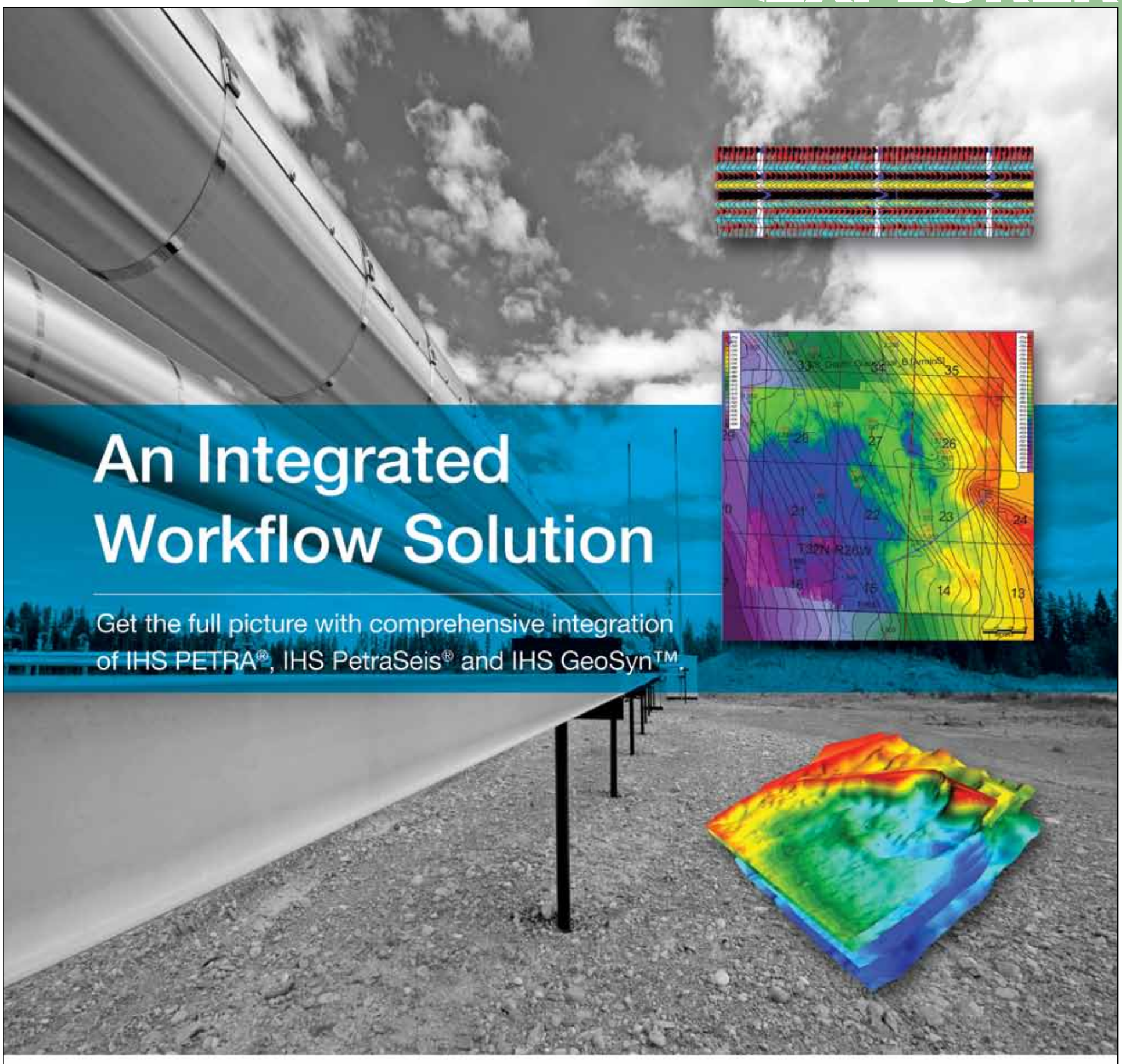
"We set out to find reasons why the oil industry should come back to Nova Scotia," Wilson continued, pointing to global competition in "hot" exploration areas on the West African conjugate margin. "We thought we might have to try to make a silk purse out of a sow's ear."

But based on the study's results, Wilson, like others, is bullish about the area's potential.

"I believe that our optimism is warranted," he said. "There's a rigorous science underpinning this Play Fairway Analysis.

"There's clearly a play risk here," he continued, "but the seismically mapped structures are big enough, and there's source rock.

"If it works, it's a bonanza for Nova Scotia."



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Fairway
from page 8

continental shelf and the adjacent deep water regions – into six geographical zones. The study involved the following themes:

- Tectonic evolution
- Sequence stratigraphy
- Geochemistry
- Basin architecture
- Depositional systems
- Petroleum systems modeling
- Yet-to-find analysis
- Common risk segment mapping

MacMullin described the multifaceted study as a geoscience gap analysis:

"We took the conjugate margins of Nova Scotia and Morocco, put them back together, and then rifted and drifted them apart over a 200-million-year period," MacMullin said. "We added in the sedimentary strata, cooked them and generated, migrated and cracked the hydrocarbons. Then, we migrated the hydrocarbons – again, both laterally and vertically.

"We've demonstrated that we've got a world class petroleum system," he continued. "The general belief, previously, was that – from a hydrocarbon perspective – we were fairly lean, with primarily Cretaceous gas."


HOBBS

> **"We've demonstrated that we've got a world class petroleum system."**

Before embarking on the Play Fairway Analysis, he explained, "We didn't fully understand that there was a deeper, Lower Jurassic petroleum system."

MacMullin's enthusiasm is echoed by Wilson.

"We've got a new tectonic story for the basin that's conducive to source rock development in the Lower Jurassic."

AAPG member David Brown is a senior geologist with the Canada-Nova Scotia Offshore Petroleum Board, one of the organizations involved in the Play Fairway Analysis.

Brown described the study's international team of investigators as "world class biostratigraphers and geoscientists.

"Whenever industry drilled into deepwater sand reservoirs having adequate porosity, they were gas charged," Brown said. "A working petroleum system was confirmed, but we had a dated understanding of our margin and basins and of the shelf to slope distribution system for sand deposition – and that was crippling.

"The findings of the Play Fairway Analysis," he added, "bring us up to a modern understanding of the Scotian Basin."

Entrepreneurs' Playground?

AAPG Honorary Member G. Warfield "Skip" Hobbs is president of Ammonite Nova Scotia Corporation, an independent E&P company that holds two of the four existing exploration licenses on the Scotian Margin.

A SOEP natural gas pipeline crosses Ammonite's Eagle Block, and Hobbs is anxious to exploit this existing infrastructure.

"The Play Fairway Analysis," he said, "represents an independent review of the offshore potential, and proves the existence of multiple working petroleum systems in Tertiary, Cretaceous and Jurassic strata.

"The perception, by the international E&P industry, is that there's nothing left to find offshore Nova Scotia, that all the discoveries have been made, and that there are just little scraps left," said Hobbs, who also is current president of American Geological Institute.

Ammonite is seeking drilling partners for Eagle and Penobscot, its shallow water exploration licenses, which contain structures with four-way dip closures mapped on 3-D seismic data and historical wells that tested oil and gas.

Reprocessing of the 3-D seismic data, to modern pre-stack time and pre-stack depth versions with amplitude attribute analyses, has revealed the existence of a deeper, previously undetected reef – similar in age and appearance to Deep Panuke – with interpreted porosity.

"Offshore Nova Scotia is a great place for entrepreneurs," Hobbs said, citing favorable provincial royalties, the existence of oil and gas infrastructure and access to digital G&G data, including wells, cores, samples, seismic, industry reports and maps.

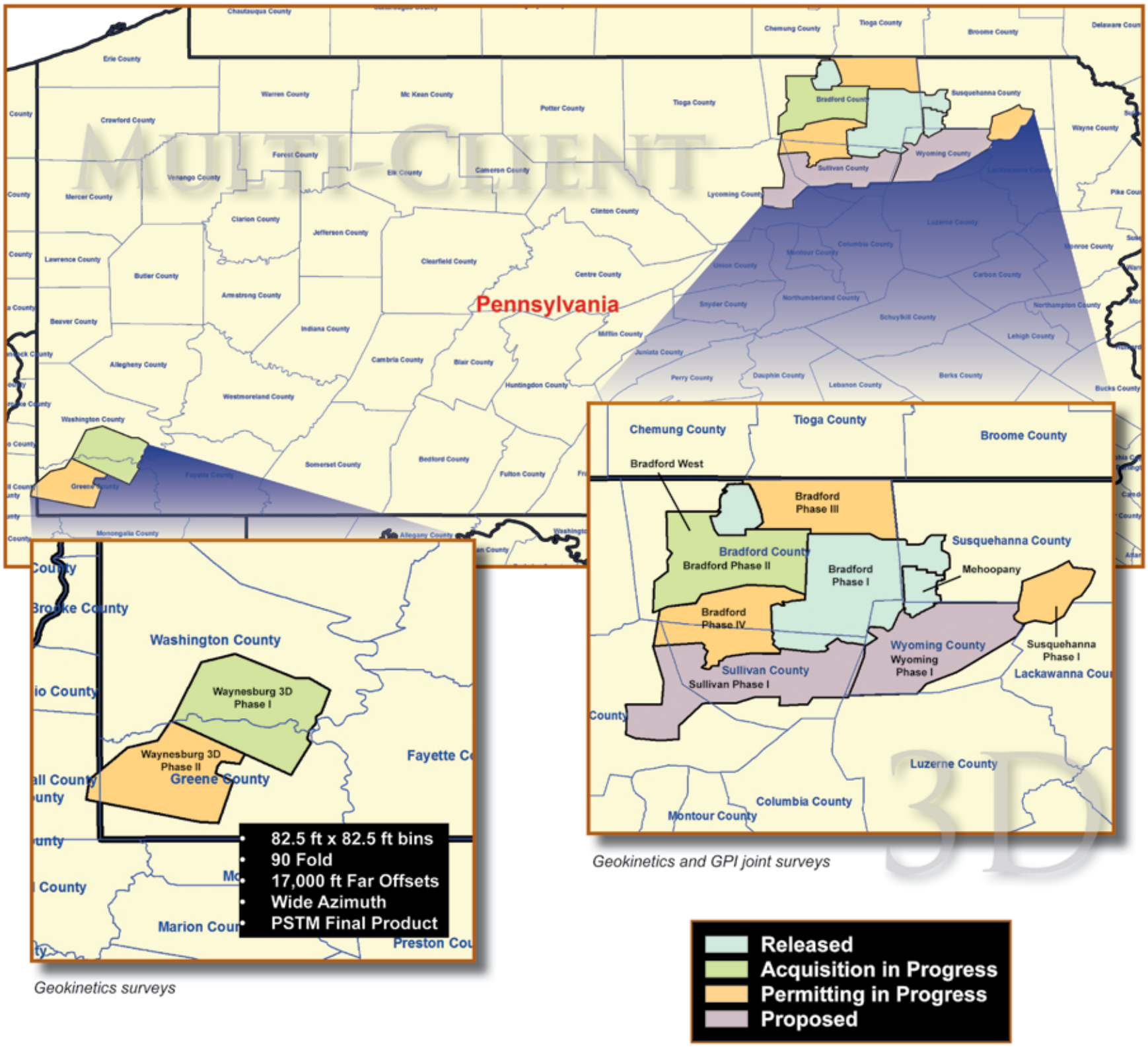
Hobbs pointed, as well, to the depth of local technical expertise in governmental agencies and at the earth sciences departments of St. Mary's and Dalhousie universities, all of whom participated in the Play Fairway Analysis study.

"It's somewhat self-serving," Hobbs said, "but we think that we've got one Tcf of natural gas at Penobscot, in a Deep Panuke look-alike.

"The scraps in the Scotian Basin, by the way, are structures (on Ammonite's licenses) with the mean risked recoverable resource potential of 200 bcf to 1.0 Tcf and 30 million barrels of oil," he said.

"How many viable prospects have been bypassed in an area (larger than the Gulf of Mexico) that only has 127 exploratory wells?"

You Need a Better Image of the Marcellus Shale!



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An independent fact gathering analysis

Study Seeks to Inject Science into Frack Debate

By LOUISE S. DURHAM, EXPLORER Correspondent

Got a shale?

You need a frack job.

Following application in tight geological formations for decades with no fanfare, fracking now has become essentially a household word – sometimes good, sometimes bad – as the shale plays continue to proliferate not only in the United States but also globally.

These dense, low permeability rocks tend to have a lock on the hydrocarbons within. Fracking, or hydraulic fracturing, via injecting fluid under pressure usually is vital to create cracks, fracture networks in the target zone to allow the trapped oil/gas molecules to move through the rock to be extracted.


GROAT

> **"Fracking has become almost the catch-all for any problem with gas production."**

This can be particularly true for relatively large oil molecules.

Even if you're counting on smaller gas molecules to move through nano-darcy matrix permeability to reach the wellbore, hunker down and put your life on hold.

Scientific research has shown gas molecule movement to be perhaps 10 feet in a well's lifetime, or maybe as much as a few feet per year.

"The implication is if you don't place a high permeability pathway close to where a gas molecule resides in the reservoir, it will never find its way to the wellbore," said Randy LaFollette, manager of shale gas technology at BJ Services in Tomball, Texas.

"There's no geological time to wait around for these things to migrate out at their own pace," he said. "Therefore we frack."

A Problem Perceived

Yet the ongoing escalation of these very necessary fracturing applications has opened up a Pandora's Box of sorts.

A plethora of complaints about alleged problems related to fracking are emanating from governing/regulatory agencies, including federal, state and local, as well as from private citizens.

Allegations include illness caused by drinking water supplies supposedly contaminated via the injected fracking water, seismic events said to be caused by the actual procedure, infrastructure impacts on land use, impacts of disposal of produced water, etc, etc.

The anti-fracking movement received further encouragement with the 2010 release of a documentary film, "Gasland," which featured commentary guaranteed to encourage fear and distrust.

Industry bears a share of blame as well.

For example, when geologists say something to the effect that frack fluid was injected in a zone 10,000 feet deep, and there's no way it can migrate through all of the overlying rock up to the surface, they overlook the fact that the public in general doesn't understand this.

Until this is proven, they will remain on the defensive.

Applying Science

Midst all of the accusations, hand-wringing, etc., there's a vital missing ingredient for the most part.

It's called science.

The Energy Institute at the University of Texas at Austin has inaugurated a project to remedy this.

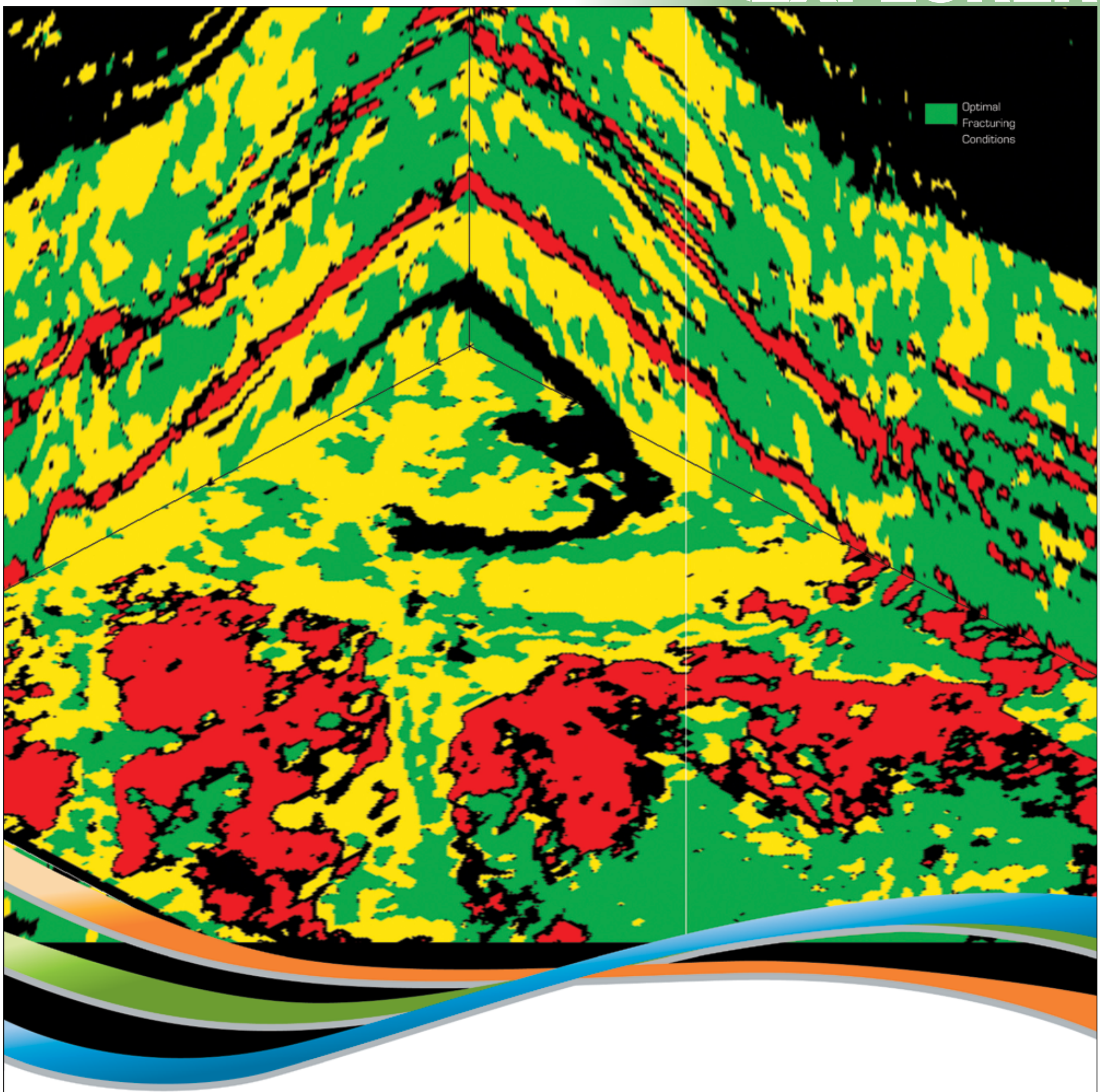
The project is described as focused on – but not limited to – fracking issues and includes information gathering, analysis and development of recommendations regarding ways to ensure that policies, regulations and public opinions reflect actual conditions and impacts.

Seismicity and air quality impacts also will be addressed.

The goal is to promote policies and regulations that are grounded in scientific understanding and to achieve effective communication of fact-based assessments of environmental impacts.

Contributing to the welcome news of the

See **Frack Study**, page 19



Mobile filter unit gets field test

Frack Water Management Studied

By LOUISE S. DURHAM, EXPLORER Correspondent

Disposal of water recovered from wells that have been hydraulically fractured has become the subject of intense scrutiny from both the public in general and regulatory agencies these days.

"The use of the large volumes of water (for injection) often stresses local fresh water supplies, and the water flowing back from the well after fracturing is a briny mixture, creating a water disposal problem," noted Paul Ziemkiewicz, director of the West Virginia Water Research Institute at West Virginia University (WVU).

Help is on the way.

Eastern Section Heads for Virginia

Paul Ziemkiewicz will present the paper "Zero Discharge Water Management for Horizontal Shale Gas Well Development" at this year's Eastern Section annual meeting, set Sept. 25-27 at the Hyatt Regency Crystal City, Arlington, Va.

The paper's specific time slot is yet to be announced.

The meeting, with a theme "A New Energy Frontier," marks the first time the Eastern Section will be holding its annual event in the Washington, D.C., area.

Two of the featured theme sessions will include Eastern Shale Gas and Carbon Sequestration.

To register and for updated information, go to the website at www.gswweb.org/aapg/aapg.html.

An ongoing project at WVU is confronting the dilemma, with participants readying to apply a technology at the well site to resolve these issues, while assuaging expressed concerns.

The WVU research team has been evaluating methods for managing frack water withdrawals and returns from large gas wells in the Marcellus shale by converting the briny wastewater into a suitable, partial replacement of the fresh water that is currently used as the fracturing fluid of choice.

"The objective of this two-year, two-phase project is to develop and demonstrate a process for treating return frack water (RFW) from Marcellus horizontal well development that will allow an increased recycle rate, while decreasing make-up water and disposal well requirements," Ziemkiewicz said. "It will be applicable in other places as well."

Ziemkiewicz is principal investigator of the program, dubbed "Zero Discharge Water Management for Horizontal Shale Gas Well Development." The effort is being funded by the U.S. Department of Energy NETL as a result of WVU's response to an RFP issued by the agency.

The WVU research team submitted a proposal with the support of McLean, Va.-based FilterSure Inc. They had prior experience working with the principals there.

First Phase Results

During Phase I of the project, which was awarded in 2009, treatment options were evaluated for recycling RFW using actual Marcellus shale RFW.

That phase concluded with a decision to construct a prototype mobile unit based on the patented FilterSure modular multi-media technology.

"We're tweaking it and adjusting the media to its multi-media filter," Ziemkiewicz said. "We're at the stage now of constructing the field unit to go out on site next month (July).

The oil and gas industry requires a treatment system with minimal operation and maintenance, occupies a small footprint and can easily be moved from site to site.

The mobile filter unit meets these criteria and will be moved to a well site in West Virginia in July; testing will proceed for three months.

Water from similar wells was used to test the FilterSure unit in the laboratory.

"A lot of people are focusing on taking out dissolved solids," Ziemkiewicz said. "When we started looking at frack water, produced water returns from the oil and gas industry, we came up with the need to take out suspended solids – to recycle the water, the most important thing is to take out the solid particles.

"The FilterSure unit captures all particles larger than three microns; at that point there's no problem with plugging," he noted. "You can run it at a high volume, low maintenance mode at the well site.

"Only about 20 percent of the water comes back out after injection, so you're diluting the next cycle by a factor of five," he continued.

"The dilution factor takes down a lot of the dissolved solids to acceptable levels

Continued on next page

Frack Study
from page 16

program is UT's reputation for credibility in oil and gas. On the other hand, there will be opponents who will make accusations they're doing it as part of the oil industry.

AAPG member and geologist Charles "Chip" Groat, associate director of the Energy Institute and faculty member at the Jackson School of Geosciences at UT, Austin, is spearheading the initiative and is straightforward about the group's independence.

"The question most everyone asks is who's paying for this," Groat commented.

He emphasized that the program is self-funded by the Energy Institute via regular university funds. Participants include representatives from:

- Jackson School of Geosciences.
- Lyndon B. Johnson School of Public Affairs.
- UT College of Communications.
- UT School of Law.
- Environmental Defense Fund.

The cross disciplinary team is comprised of faculty members and research scientists who are conducting state-of-the-art research in their respective fields.

"The initiative came about as a result of some conversations about the fact that there's so much uncertainty surrounding this whole 'blame it on fracking' environment that somebody should look at the claims made about environmental problems and figure out if they're real," Groat said.

"If something happened, what was the cause? As opposed to just saying fracking did it," he said. "That's the part we're doing now."

Groat's résumé suggests he's the right man at the right time to head an initiative that requires scientific precision and political tact.

His long career as an educator and researcher is punctuated by stints as the director and state geologist for the Louisiana Geological Survey; executive director of the American Geological Institute; executive director at the Center for Coastal, Energy and Environmental Resources at Louisiana State University; and former director of the U.S. Geological Survey.

For AAPG he has served as president of both the Energy Minerals Division and the Division of Environmental Geosciences.

Identifying the Cause

"The second part of the program is much more expensive and more difficult, and we're not doing it now," he noted. "In cooperation with the companies, we'd like to see sophisticated sampling of frack fluids, samples of units above and below, looking to see if some of the frack fluids are moving into the surrounding rock – we're still discussing this with the majors in particular."

One of the efforts the initiative will undertake is to look at what has been cited, and what the penalties were assessed for.

"If something gets penalized, maybe it's just one of the normal operational things the industry works hard to avoid and regulators work hard to penalize, like pollution, a broken liner, a mud tank," Groat noted.

"Fracking has become almost the catch-all for any problem with gas production, which is to blame it on the fracking process," he continued.

"It may turn out that most of the problems that have been cited don't have anything to do with putting pressurized water at 10,000 feet and propping up the fracture you create," he said. "It may have something to do with casing problems or blowback water problems that are operating issues, not fracking.

"Our goal is to inject more science into the fracking debate, so the policymakers have a sound foundation upon which to develop appropriate rules and regulations," he added.

Spreading the Word

One of the areas the scientists will investigate centers on gathering information on what the public knows, and doesn't know.

"A lot of people think there is something evil in their backyards," Groat noted.

Regulatory and scientific reviews along with information gathering and analysis are at the heart of the initiative, but so is a communications strategy. No chance that this dedicated effort will culminate in a report gathering dust on the shelf.

The Energy Institute has stated that findings and recommendations will be communicated to key stakeholders. The communications strategy is focused on the regulators responsible for hydraulic fracking and residents in areas of shale gas resource potential and ongoing activity.

The strategy is being developed based on a shale gas literacy assessment, which is being conducted in the potentially impacted communities, and media recommendations for communication diffusion.

"Review of local and national popular media coverage of shale gas development, as well as interviews of local stakeholders, will be critical sources for preparing the communications strategy," Groat emphasized. "The Environmental Defense Fund will preview our findings and figure out how best to get the information out."

He noted the ongoing phase of the initiative, which officially kicked off May 1, is scheduled to be complete by the end of the year.

Continued from previous page

for recycling, while the filter takes out things left in suspension, such as clays and silt particles for example."

Benefits?

The prototype unit, which will be taken to the well, is a full-scale field unit. It can be run at 150 gallons per minute in low maintenance mode at the well site.

The successful development of a technology for treatment and reuse of RFW is slated to advance shale gas development via improved economics and resolution of environmental impacts, according to Ziemkiewicz.

"Improved economics will be achieved principally by reducing the amount of trucking and disposal of RFW and costs associated with these activities," he said. "By reusing the RFW for subsequent fractures, the need for fresh water will be reduced.

"The better you treat the RFW, the higher the blend ratio with fresh water, the less dependence and strain on local water resources," he emphasized, "and the less impact on local infrastructure and surrounding environment."

Mobile filter unit gets field test

Putting the 'Clean' in Coal Technology

By BARRY FRIEDMAN, EXPLORER Correspondent

Clean coal technology is one of those concepts that in theory work for everyone: environmentalists, the industry at large, coal producing states, American consumers.

It also is, however, an illusive and expensive concept, often argued about.

How clean is clean? How much clean can we afford? Does it even exist?

The devil really is in the details – in this case, in the coal. Literally.

Simply put, the dirtier the coal, the tougher it is to clean; the more it's cleaned, the more expensive the energy derived from it becomes.


AMBROSE

> **"Carbon capture and storage isn't cheap and isn't easy, but is worth it."**

AAPG member William Ambrose, who presented a paper on clean coal technology at the recent AAPG Annual Convention and Exhibition, admits that "CCS" (the catchall phrase for "carbon capture and storage") isn't cheap and isn't easy, but is worth it.

"Coal-gasification technology can achieve reductions in mercury, arsenic and sulfur up to 80 percent, as well as CO_2 capture at levels of as much as 90 percent."

More importantly, says Ambrose, who is a research scientist for the Bureau of Economic Geology at the University of Texas, Austin, as well as a past president of AAPG's Energy Minerals Division, there's so much coal available, we owe it to ourselves to use it.

"The United States has a superabundance of coal, with almost six quintillion BTU of energy-equivalent resources," he said, "more than Eastern Europe and the former Soviet Union (FSU) combined."

The Price Is Right?

Cleaning coal involves stripping of minerals and other impurities via high-temperature and high-pressure gasification with capture of CO_2 and hydrogen. Minerals and impurities that are stripped from coal are oxides of nitrogen and sulfur (referred to as NOx and SOx), mercury, sulfur, arsenic, metals such as lead and cadmium, and ash.

Here's the catch, though. It comes, as Ambrose admits, with an "appreciable price tag."

The costs of capture, transport and storage of CO_2 range, he estimates, from $25 to more than $50 per metric ton. This depends on a variety of factors, including:

- Pre- versus post-combustion carbon capture.
- New plant versus retrofitted plant.
- Type of gasifier feedstock.
- Distance of new plants from user electric load.

Operational costs, too, will increase the cost $15 per metric ton.

The net result is that the overall energy penalty of installing CO_2-capture equipment could reduce plant efficiency by as much as 40 percent.

"And when one figures in the additional costs on new construction of new CO_2 pipelines or pumping costs associated with CO_2 sequestration in deep, brine-bearing formations, the cost of electricity could go up by 25 to 50 percent or more," Ambrose said.

To put those cost increases in perspective, he added, while $50 per metric ton may not seem like a great amount, the state of Texas, for instance, accounted for 152 million metric tons (Mt) from coal-fired power plants in 2008. To capture and sequester all this CO_2 would cost $7.6 billion per year.

So why bother?

Ambrose is clear.

"Harnessing these vast resources could help the U.S. to lessen its dependence on foreign energy sources."

Clean, Right Now

And it's not like it isn't already being done effectively.

"Actually, clean coal processes have been under way in the United

Continued on next page

ACE Students Recognized

Student winners have been announced for oral presentations at the recent AAPG Annual Convention and Exhibition in Houston, with the top prize going to an AAPG Student member from the University of Texas at Austin.

The top Student paper prize went to **Anjali Fernandes**, for the paper "A Three-Dimensional Geometric Analysis of Bank-Attached Bar-Forms in Sinuous Submarine Channels: A Tool for Inferring the Relative Importance of Bedload and Suspended Load Sedimentation."

Other awards went to:

- Second place – AAPG Student member **Danica Dralus**, of Stanford University, for "Kinetics of the Opal-CT to Quartz Phase Transition Control Diagentic Traps in Siliceous Shale Source Rock from the San Joaquin Basin and Hokkaido."
- Third place – AAPG Student member **Xavier Refunjol**, of the University of Oklahoma, for "Predicting Hydraulically Induced Fractures Using Acoustic Impedance Inversion Volumes: A Barnett Shale Formation Example."
- Fourth place – AAPG Student member **Justin MacDonald**, of the Australian School of Petroleum, for "Application of Critical-Taper Wedge Mechanics to Structural Style in Fossilized and Active Late Cretaceous-Tertiary Delta – Deepwater Fold-Thrust Belts."

Continued from previous page

States for more than 40 years since the Environmental Protection Agency began operations in December 1970," Ambrose said.

For example, from 1970 through 2003, particulate emissions from coal-fired power plants declined by 87 percent and SOx emissions fell by 35 percent, although electricity from coal increased by almost 180 percent.

Successful CCT operations are occurring in:

- Cranfield, Miss.
- Hastings, Texas.
- Decatur, Ill.
- The Barry Generating Plant near Mount Vernon, Ala.
- The Weyburn Field in Saskatchewan, Canada.

"These CCS projects are already demonstrating the technical feasibility of carbon capture and sequestration," Ambrose said.

And these projects, like the coal itself, are embedded in the lives of a number of states, including their politics.

"States such as Illinois, West Virginia and Wyoming, with significant coal resources, tend to lobby for coal regardless of local party constituencies," Ambrose noted.

The feds, too, have a part to play, and here Ambrose talks of FutureGen, a $1 billion government challenge to the states to build a clean coal re-powering program and carbon dioxide (CO_2) storage network.

"These included Illinois (which was awarded the prize), Texas, Kentucky, North Dakota, Ohio, West Virginia and Indiana," he said.

And though the FutureGen initiative was associated with the George W. Bush administration," Ambrose admits other administrations also have shown interest in clean coal – like the present one, which actually awarded the prize.

The Competition

Whether they should be so active, though, or how much, is open to some debate, for there are many who believe that natural gas, rather than coal, is where the nation's focus should be. Ambrose understands the attraction.

"Natural gas continues to make inroads at the expense of coal as a source of electrical power generation, owing to low gas prices," he said. "Moreover, natural gas is an extremely versatile fuel, used in residential, commercial, industrial and transport sectors of the economy.

"Another advantage that natural gas has over coal," he added, "is that the latter is the most carbon-intensive of the fossil fuels."

And that is, and always has been, coal's Achilles' heel. It's dirtier than everything else out (or under) there.

Economically, though, the plus side for coal is that these traditional coal-fired power plants (referred to as pulverized coal or "PC" plants) in Texas, for example, are still economically competitive with gas, he noted.

"This is because the capital investment in most PC plants is paid off, and lignite plus Powder River Basin coal is still cheaper on a BTU basis," he said.

Ultimately, though, Ambrose, who is chair of the EMD Coal Committee, knows there has to be a reconciliation of sorts among not only the future energy options of the country, but among those fighting on behalf of them.

Specifically, as for where CCT and CCS stand right now, Ambrose says, "CCT is struggling to move ahead in today's harsh project-financing climate and in the context of current low gas prices."

He added both he and BEG Director Scott Tinker understand the dynamic of energy policy, which includes, " … what's possible, the science and technology; what's doable, the regulatory and legal concerns; and most importantly, what's sensible, the economic and climate impact in time frame needed."

When it comes to supply America's future energy needs, the devil, it seems, is everywhere.

Houseknecht Awarded Levorsen

David W. Houseknecht, a frequent news source for the EXPLORER on a variety of stories involving Alaska geology, has won the A.I. Levorsen Award for presenting the best paper at the recent Pacific Section meeting in Anchorage, Alaska.

Houseknecht is a research geologist with the U.S. Geological Survey in Reston, Va.

His winning paper was titled "Tectonic Influences on Thermal Maturation History of Arctic Alaska and the Canada Basin."

AAPG member Peter Newman is a retired petroleum geologist who worked five years in Indonesia (Sinclair then ARCO, 1968-73) as well as Pakistan and Algeria, plus various U.S. assignments.

HISTORICALHIGHLIGHTS

Todd Went Where the Oil Was

By PETER NEWMAN

"Historical Highlights" profiles individuals who have enjoyed substantial success in petroleum exploration. One such person is Don Todd, a geologist and small independent who virtually single-handedly initiated the process that opened offshore oil production in Indonesia.

Todd faced serious hurdles, both political and technical, but his boldness and persistence finally won the day.

A friend once told Don Todd that Indonesia had a lot of oil – and that conversation alone sparked the first chapter in the story of Indonesia's contemporary energy history.

'Where the Oil Is!'

This epic story begins in the mid-1960s, with Todd consulting in Billings, Mont. At the time, he'd had his share of dry holes and a few modest successes and was just getting by.

But one day a friend's comment changed his life: A landman buddy had read that, prior to World War II, Indonesia had produced 2 percent of the world's oil.

"Dammit, Todd, that's where the oil is!" the friend said. "Let's go to Indonesia!"

Having just plugged a well and not knowing what else to do, the venturesome Todd said what the hell and began researching the Indonesian oil patch. (Note: oil was $3/bbl at the time, $1.20 in Indonesia).

Todd identified four areas of interest, with the western Java Sea being his number one pick, because:

- This area had a geologic edge – it lay on the projected trend of the depocenters of the Sumatran oil basins, which held some giant fields.
- It was logistically superior, being the closest to Jakarta, which had an international airport and major seaport.
- Offshore seismic would be far cheaper than onshore, where you would face jungles and rice paddies. And the Java Sea was shallow, calm and storm-free, making for benign operating conditions.
- Indonesia's politics were unsettled, and offshore operations should be out of reach of disruptive elements.

This combination of factors seemed to offer good potential – even though it looked unlikely that the known onshore basin in West Java might continue offshore. According to "The Geology of Indonesia," R.W. Van Bemmelen's monumental study and the "bible" of the time, beginning just five miles offshore you would find only a thin veneer of sea-bottom mud covering shallow basement.

Todd could see no good reason why Van Bemmelen should be right – it didn't make much sense to him that the Java Sea, a topographic low, would be superposed over a basement high. But he hoped to learn more in Jakarta.

Catch-22

Todd needed partners to fund his initial expenses, and he brought in two small independent companies to join his Independent Indonesian American Petroleum Company (IIAPCO). In June 1964 he made his first of many trips to Indonesia, which, under President Sukarno at the time, was very left-leaning and anti-business. His first job would be to check the government files for information about that adjacent onshore basin.

However, it was a classic Catch-22: Todd needed the files to help him decide which area to focus on, but the files would be closed until he had selected an area and signed a contract.

It was time to take a taxi out to the onshore area.

There he found a small shut-in field from pre-war days – and when he got someone to open a well it flowed some 40 BOPH of sweet, waxy, 40-degree oil. That proved the possibility of good source rocks near his offshore focus area but said little about reservoirs.

Later he would learn from a university geologist that the sands in this coastal area were dirty because of their proximity

Continued on next page

Indonesia President Suharto (hard hat), Don Todd (center) and Ibnu Sutowo at the on-site valve-turning ceremony of Indonesia's first offshore production.

Continued from previous page

to the volcano belt. That might seem disappointing, but to the optimistic Todd it demonstrated a certain parallel to the Sumatran oil basins, where the proximal sands were dirty but which then cleaned up distally.

Back in Jakarta, Todd learned that Navy bathymetric charts were freely available. Using these he contoured the bottom of the Java Sea, finding in the western portion a large closed depression that he presciently identified as the surface expression of an actively subsiding basin.

Bingo! Now he could outline exactly his prospective area.

Political Maneuvers

Meanwhile, he was the only oilman in town – there was simply no competition in sight!

On the one hand that was encouraging, for majors or large independents easily could have outbid him on bonus and work program.

But it also meant that he was bucking another bit of conventional wisdom: the idea that Indonesian politics were impossible to navigate. That may have been near-correct at that moment but would not remain so for long. After the Communists' failed coup of September 1965, Sukarno was out and the government turned strongly pro-West.

Now was the right time for the oil companies to make their move, but Don Todd was still the only one there.

Under the new government, the head of the Petroleum Ministry was General Ibnu Sutowo, a strong and savvy, honest, pro-business administrator. Sutowo met with Todd immediately and outlined his concept of a new type of agreement; borrowing elements from some existing agreements (Refican, Asamera) and from an unsigned Sukarno-era contract proposal by Union Oil, Sutowo had developed what he called a "Production Sharing Contract" (PSC).

If Todd liked the concept, the general said, they could begin discussions in 30 minutes.

Things were starting out positively, in part because Sutowo had gotten favorable reports about Todd from some of Todd's earlier contacts. The general loaned Todd a young lawyer and, working together, the small team readied a contract proposal in only six days.

IIAPCO was the first outside company seeking to invest after the abortive coup, and with Indonesia wanting to show the world that they were open for business, negotiations proceeded rapidly. The contract was signed in August 1966, with a 65/35 production split, no bonus, for an area about the size of Costa Rica.

In a quiet office in remote Indonesia, a major precedent had been set – the world's first-enacted PSC was now in force.

Sutowo and Todd had put something in motion that before long would have global effects.

Historical Highlights is an ongoing EXPLORER series that celebrates the "eureka" moments of petroleum geology, the rise of key concepts and stories about important discoveries and creative, persistent and successful people.

If you have such a story you'd like to share, contact series editor Hans Krause at aapg.hopg@yahoo.com.

Let's Make a Deal

The majors now started waking up and, fearing that production sharing and a 65/35 split (the previous standard being 50/50) might change their own game, they put heavy pressure on the U.S. embassy and the Indonesian government, trying to get the contract cancelled.

Although IIAPCO still needed presidium approval of their contract, this pressure only delayed final approval for a time.

To finance their work program, IIAPCO now had to turn their acreage to a larger company. They could afford a single seismic line, and they shot one across their block to prove the basin concept.

When this line showed a very nice sedimentary section, Sinclair Oil – unique amongst the majors – showed interest. Now the companies that had tried to kill the deal earlier by pressuring the government tried the same tactic on Sinclair. But you don't take strategic advice from your competitors, and Sinclair went on to make the deal.

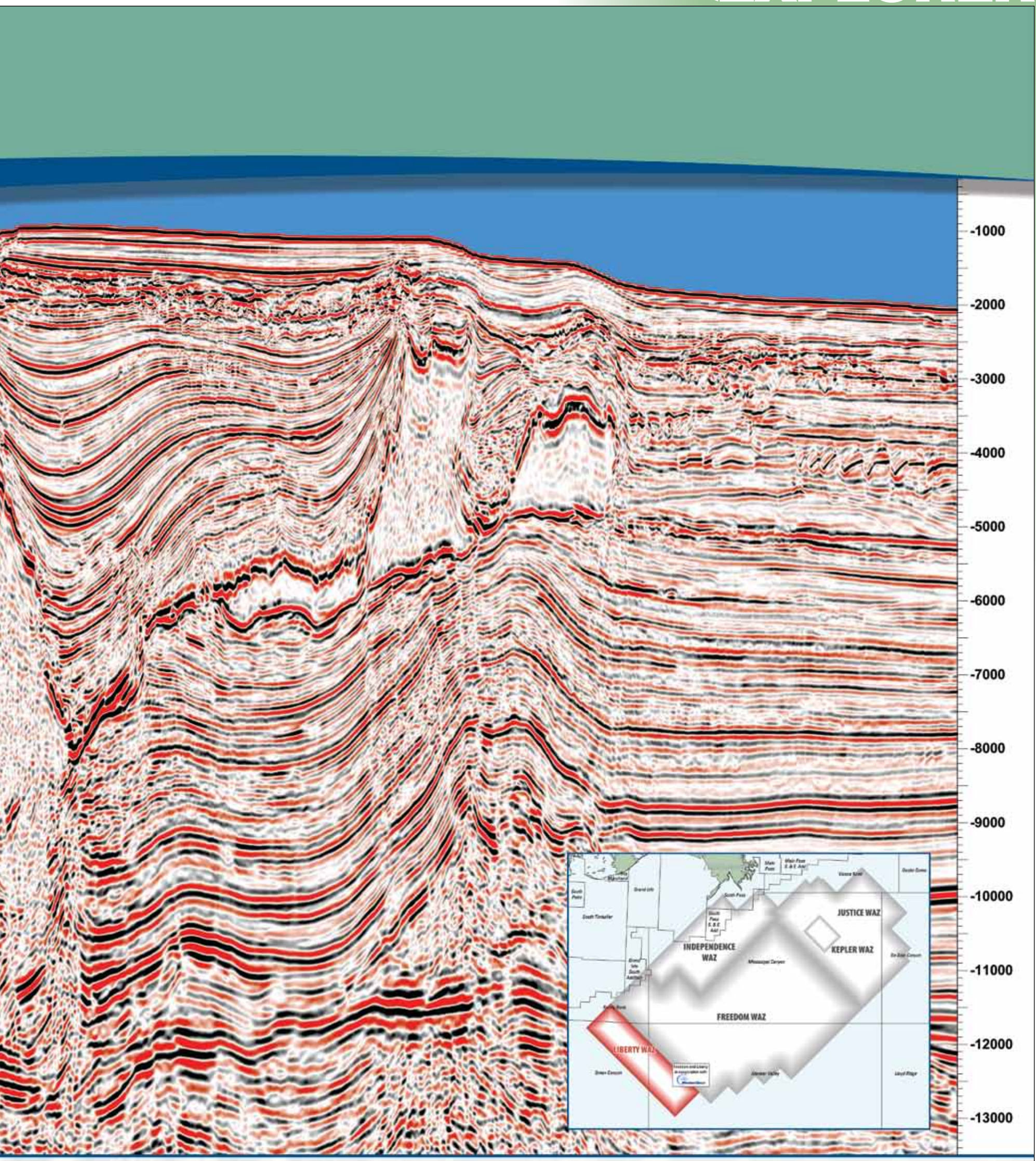
This opened the door, and within 18 months, 22 foreign companies had production sharing contracts – a nice testament to Todd's efforts.

Early in 1969, the Sinclair-IIAPCO partnership had Indonesia's first offshore discovery. Two formations proved productive – a lower deltaic unit and an upper group of shelf sands, with the discovery well flowing 2,600 BOPD. Follow-up discoveries were soon made and then, with the potential of the area becoming obvious, ARCO bought Sinclair, largely to acquire the Indonesian reserves.

Fruits of His Labor

But as it turned out, it was IIAPCO on its own, without Sinclair's participation, that recorded Indonesia's first commercial oil flow offshore. This occurred in a second contract area Todd had acquired, one

See **Todd**, page 27



The Geophysical Corner is a regular column in the EXPLORER, edited by Bob A. Hardage, senior research scientist at the Bureau of Economic Geology, the University of Texas at Austin. This month's column is the fourth in a five-part series dealing with S waves and fractures.

GEOPHYSICALCORNER

Measuring Fractures – Quality and Quantity

By BOB HARDAGE

As has been emphasized in the three preceding articles of this series, when a shear (S) wave propagates through a rock unit that has aligned vertical fractures, it splits into two S waves – a fast-S (S_1) mode and a slow-S (S_2) mode.

The S_1 mode is polarized in the same direction as the fracture orientation; the S_2 mode is polarized in a direction orthogonal to the fracture planes.


HARDAGE

This month we translate the principles established by laboratory experiments discussed in the preceding articles of this series into exploration practice.

* * *

Figure 1 displays examples of S_1 and S_2 images along a profile that crosses an Austin Chalk play in central Texas.

The Austin Chalk reflection in the S_2 image occurs later in time than it does in the S_1 image because of the velocity differences between the S_1 and S_2 modes that propagate through the overburden above the chalk. Subsurface control indicated fractures were present where the S_2 chalk reflection dimmed but the S_1

Continued on next page

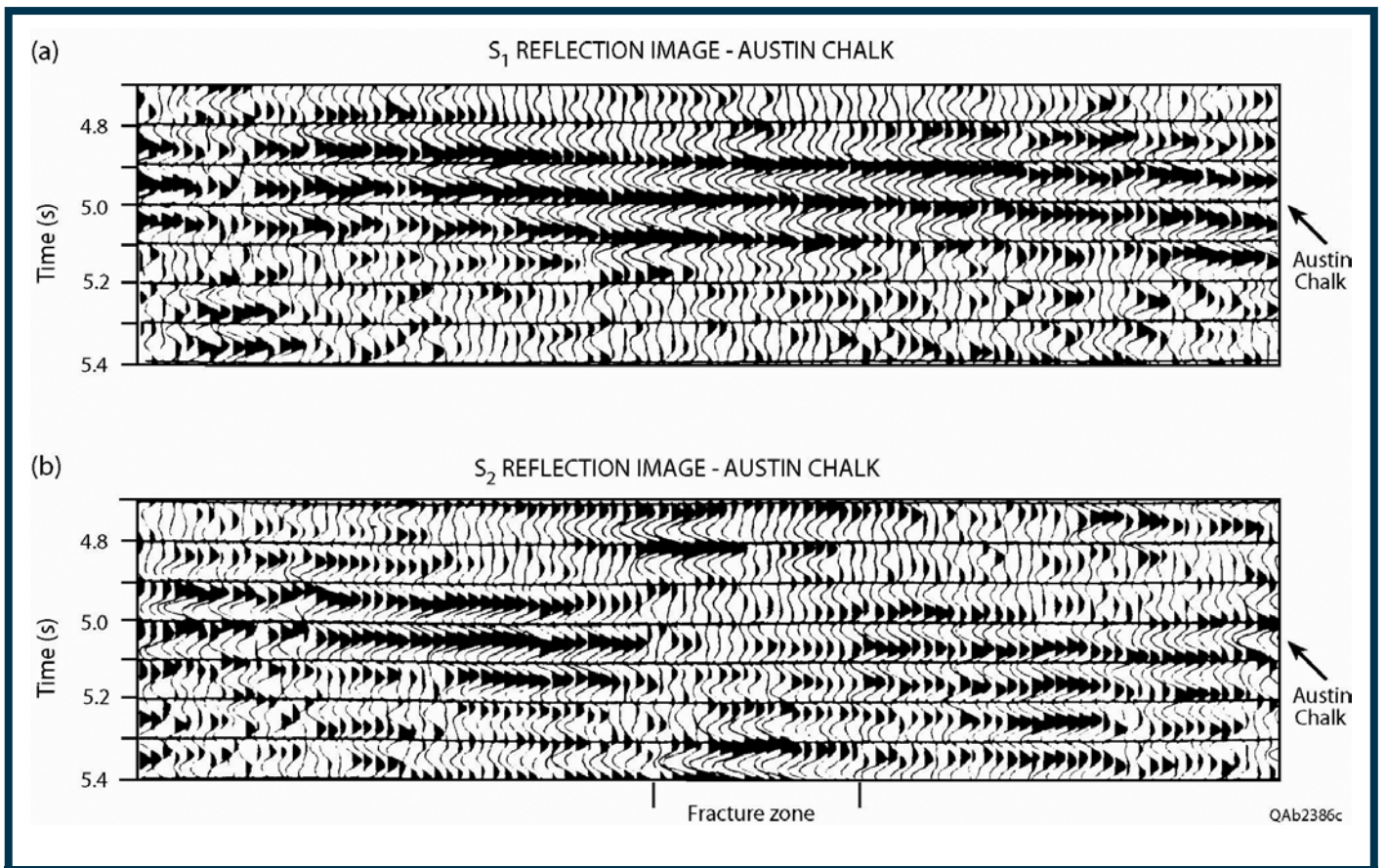


Figure 1 – S_1 and S_2 images along a profile that traverses an Austin Chalk play. The S_2 chalk reflection (b) is delayed by about 50 ms relative to the S_1 reflection (a) because of the difference in S_1 and S_2 propagation velocities through the overburden above the chalk. From well control, it was determined that fracture zones occur where the S_2 chalk reflection dims but the S_1 reflection does not. Such S_2 dimming is expected across fracture trends because S_2 velocity in a zone of higher fracture density slows to almost equal the S-wave velocity in the top seal above the chalk. See discussion in last month's (June) article. Data published by Mueller (1992).

Todd
from page 23

located immediately north and west of the original and picked up two years later.

To explore and develop this block, Todd had changed his strategy. Having seen Sinclair's early seismic work on the first block and knowing, therefore, that risk levels were much reduced, he wanted IIAPCO to retain a significant working interest as well as operatorship of the new block.

So instead of bringing in an oil company as the major money partner, he had merged IIAPCO with a NYSE-listed shipping company (Natomas), a company that would be happy to leave Todd in charge of oil affairs while they paid the bills.

As Todd had surmised, a portion of the new block proved to be on the fairway of productive basins, and a 7,700 BOPD discovery was soon in hand.

Todd and Sutowo both wanted to move quickly into production mode so, by using smaller production facilities fabricated in nearby Singapore, IIAPCO brought this block on stream in a very short period of time. This event was commemorated on-site with a ceremony attended not only by Todd, his wife and Sutowo, but also by the U.S. ambassador and by Suharto.

Sinclair, meanwhile, looking at a large multi-field development program, was proceeding at a major company's more measured pace – logical, but not generating any president-to-president photo ops for company publications.

Total production from the two blocks is now over 3.5 billion barrels of low-sulfur, high gravity crude, along with additional significant quantities of C3 to C5 LPG. As well, C1/C2 is piped ashore for domestic use.

Don Todd went halfway around the world to deal with political turmoil and entrenched but incorrect geologic ideas. His success stands as an object lesson: One way to beat your competition is to have a vision that's far enough off the beaten path that the others just don't "get it."

It's called being a visionary.

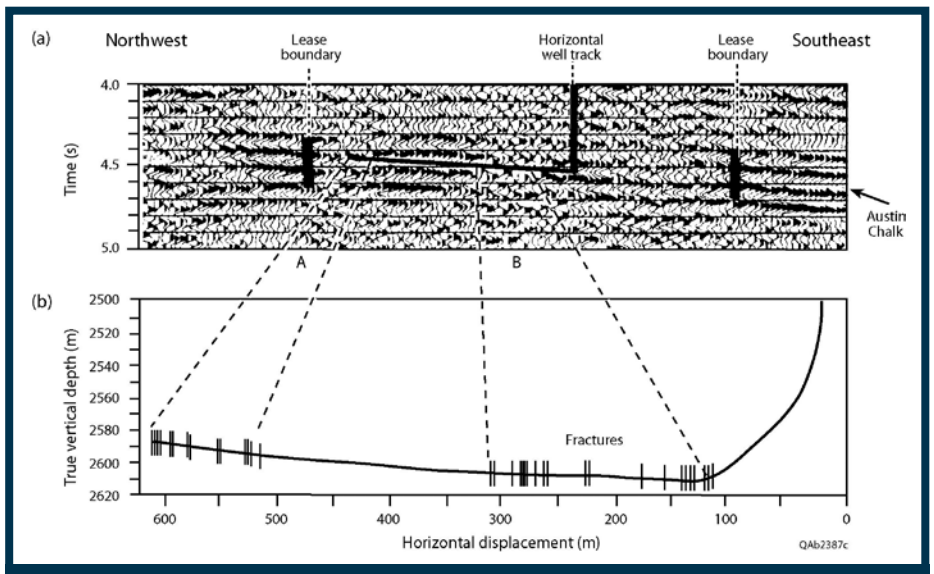


Figure 2 – (a) S_2 reflection profile across an Austin Chalk lease. The coordinates followed by the vertical and horizontal legs of an exploration well are superimposed on the seismic image, as are the locations of the lease boundaries. (b) Fractures found along the horizontal leg of the well were concentrated in the two zones, A and B, where the S_2 reflection dimmed. Laboratory data discussed in preceding articles infer S_2 velocity lowers (and thus S_2 reflectivity decreases) when fracture density increases. That principle is now put into exploration practice. Data published by Mueller (1992).

Continued from previous page

* * *

reflection did not.

This difference in reflectivity strength of the S_1 and S_2 modes occurs because, as shown last month (June EXPLORER), when fracture density increases, the velocity of the slow-S mode becomes even slower. In this case, the S_2 velocity in the high-fracture-density chalk zone reduces to almost equal the S-wave velocity of the chalk seal, which creates a small reflection coefficient at the chalk/seal boundary.

When fracture density is small, S_2 velocity in the chalk is significantly faster than the S-wave velocity in the sealing unit, and there are large reflection coefficients on both the S_1 and S_2 data profiles.

Using this S-wave reflectivity behavior as a fracture-predicting tool, a horizontal well was sited to follow the track of a second S_2 profile that exhibited similar dimming behavior for the Austin Chalk.

The S_2 seismic data and the drilling results are summarized on figure 2.

Data acquired in this exploration well confirmed fractures occurred across the two zones A and B where the S_2 reflection dimmed and were essentially absent elsewhere.

The seismic story summarized here is important whenever a rigorous fracture analysis has to be done across a prospect.

If fractures are a critical component to the development of a reservoir, more and more evidence like that presented here is appearing that emphasizes the need to do prospect evaluation with elastic-wavefield seismic data that allow geology to be imaged with both P waves and S waves.

The value of S-wave data is that the polarization direction of the S_1 mode defines the azimuth of the dominant set of vertical fractures in a fracture population, and the reflection strength of the S_2 mode, which is a qualitative indicator of S_2 velocity, infers fracture density.

The Earth fracture model assumed here is a rather simple one in which there is only one set of constant-azimuth vertical fractures.

What do you do if there are two sets of fractures with the fracture sets oriented at different azimuths?

That situation will be discussed in next month's article.

David Curtiss, head of AAPG's Geoscience and Energy Office in Washington, D.C., can be contacted at dcurtiss@aapg.org; or by telephone at 1-202-684-8225.

WASHINGTONWATCH

Climate, Coal and CCS Stir Debate

By DAVID CURTISS, GEO-DC Director

One casualty of the November 2010 elections was climate change legislation.

The House had passed the Waxman-Markey climate bill, a far-reaching piece of legislation that set a significant marker for the Senate – but Senate Democrats were unable to muster the votes necessary to vote on that bill, or one of their own design, as the clock ran out on the 111th Congress.

With Republicans in control of the House and a trimmed Democrat majority in the Senate, the odds for climate change legislation in the 112th Congress are slim.

This reality was best demonstrated by former West Virginia Governor Joe Manchin (D) in his run for the late Sen. Robert Byrd's (D) seat. Manchin aired a campaign commercial of him shouldering a rifle and firing a bullet through a copy of the Waxman-Markey bill. Upon winning election to the Senate he then reportedly secured a commitment from Senate Majority Leader Harry Reid (D-Nevada) that the Senate would not take up climate legislation.


CURTISS

AAPG's statement on geologic carbon storage clearly expresses the Association's view on the practice.

Manchin's opposition is rooted in the fact that the climate proposals that Congress has considered would have a significant negative impact on the use of coal in the United States. And coal is an important economic driver for West Virginia.

* * *

Actually, it's important to the entire nation – especially its role providing affordable base-load electricity for American consumers. According to the U.S. Energy Information Administration, in 2010 coal supplied 22 percent of our nation's energy. It projects that in 2035 that contribution will be 21 percent.

But finding ways to use coal more efficiently and cleanly has been a major focus of federal research and development (R&D) spending at the Department of Energy (DOE) for many years, across many administrations. In fact, under the president's most recent budget request, the DOE's fossil energy program would be entirely focused on "clean coal" technologies. (See related story on page 20.)

And one of the technologies that has received considerable attention is carbon capture and sequestration (CCS). CCS is a process whereby carbon dioxide is separated from combustion exhaust, such as the flue gas of a coal-fired power plant, and then injected into geologic formations for long-term storage. The idea is to prevent discharge of this carbon dioxide, a greenhouse gas, to the atmosphere.

It is no surprise to readers of this column that the very idea of CCS stirs up significant controversy, with vocal detractors on both sides of the climate debate. People who believe that the effects of anthropogenic emissions on climate change are miniscule think it's a big waste of time and money. Fossil fuel opponents object to any technology that would perpetuate the use of coal.

Meanwhile, the good people of West Virginia, among others, see CCS as a means to preserve a way of life and sustain economic growth.

* * *

But side-stepping the climate debate for a moment, we're already injecting CO_2 into the subsurface for enhanced oil recovery (EOR). Are there experiences from CO_2 flooding operations that could benefit an emerging CCS sector, while simultaneously boosting domestic oil production?

The Role of Enhanced Oil Recovery in Accelerating the Deployment of Carbon Capture and Sequestration symposium, convened last summer by the Massachusetts Institute of Technology Energy Initiative and the Bureau of Economic Geology at University of Texas Austin, considered that question. It was chaired by MIT professor Ernest Moniz of MIT and past AAPG president Scott Tinker of UT-Austin, and included more than 60 representatives from industry, government, NGOs and academia.

The recently released symposium proceedings reveal the complexity of this enterprise with numerous findings that include:

Continued on next page

Milan registration opens

Be Early, Save Money

Online registration is available for this year's AAPG International Conference and Exhibition (ICE) – and registering now can help you save hundreds of dollars in fees.

This year's conference will be held Oct. 23-26 in Milan, Italy.

Members who register before the first "early bird" deadline of Aug. 3 can save up to $280 off registration fees, and non-members can see a $330 savings.

Also available online are housing details and complete information on this year's technical program, which is built on the theme "Following Da Vinci's Footsteps to Future Energy Resources: Innovations From Outcrops to Assets."

General chair Jonathan Craig said the meeting will celebrate and aspire to the creative vision and spirit of innovation historically associated with Milan and the region.

The technical program focuses on seven specific technical themes:

- Carbonate Reservoirs: From Pores to Production – Aspects covered will include the stratigraphic analysis and sedimentology of carbonate sequences; the role of diagenesis, karst, faulting and fracturing in carbonate reservoir performance and the latest developments in the seismic imaging and modeling of carbonate reservoirs and sequences.
- Where Africa Meets Eurasia: Exploration and Production in the Alpine-Himalaya Fold Belt and Foreland Basins – The tectonic evolution of the Alpine-Himalayan chain, its influence on sedimentation, diagenesis and reservoir and source development at a basin to prospect scale; the objective is to identify the factors that control prospectivity in different parts of the belt from the Appennines, Alps and Zagros through the mountains of central Asia to the Himalaya, using a variety of technologies, outcrop analogs and case studies.
- Rifts and Deltas – Focus will be on rift to drift tectonics, crustal stretching and heat flow, pre-salt plays, continental and lacustrine reservoirs and delta systems from shelf to basin floor.
- Advances in Integrated Geoscience Applications – A session on all aspects of geoscience and reservoir engineering as applied to conventional and unconventional resource plays with emphasis on the value of integration of disciplines.
- Reservoir Management: From Outcrops to Assets – New technologies and work models will be discussed, along with world-class reservoirs.
- Dynamic World of "Uncooperative Reservoirs:" The Geoscience of Unconventional Resources – New technologies have made viable tight gas, oil shale, shale gas, coal-bed methane and geothermal resources providing fuel supply closer to consumers in Europe, India, Asia and the Far East. What makes these reservoirs special?
- Leading-Edge Technologies and the Future of E&P – The challenges of carbon management, new and leading-edge technologies in geoscience and reservoir engineering and future technological developments in the E&P industry.

To register or for more ICE details go online to aapg.org/milan2011.

Continued from previous page

- The need to distinguish between CO_2 flooding and EOR-based CCS.

In the former, CO_2 is recycled as part of EOR operations; in the latter, long-term storage of CO_2 in the formation is a prime objective.

- The volumetric storage potential of existing and potential petroleum reservoirs suitable for CO_2 EOR is larger than expected, especially if residual oil zones are included.

- The incremental oil produced during an EOR-CCS operation provides an important economic return, but is insufficient on its own to spur large-scale adoption. There must be a commercial incentive to store the CO_2.

- Transportation of CO_2 from where it is captured to where it is used remains a challenge, and will require new business models to manage supply/demand.

- Long-term liability and pore space ownership for EOR-CCS are just two of many regulatory hurdles that need to be overcome.

- The Permian Basin of west Texas, where CO_2-based EOR began, is a logical laboratory to test and develop new concepts.

- A significant and integrated federal research, development and demonstration program is necessary to realize the potential of EOR-CCS.

AAPG's statement on geologic carbon storage clearly expresses the Association's view on the practice:

"Geologic CO_2 storage represents an important technology for mitigating increased atmospheric CO_2.

"Just as industry experience in CO_2 EOR and EGR (enhanced gas recovery) benefits geologic carbon storage activities, research and technology development for carbon storage will also increase understanding of subsurface processes occurring in CO_2 EOR and EGR operations. This should result in increased efficiency and broader opportunities for the production of incremental oil and gas.

"Therefore, AAPG urges the expansion of funding for scientific research on permanent carbon storage and for the scientific research related to reservoir performance."

* * *

The Society of Independent Professional Earth Scientists (SIPES) Houston chapter is hosting a "Top Secrets of Successful Independents" seminar on July 15. Dan Smith, a past AAPG president and past chair of the GEO-DC Governance Board, and I will be there co-presenting a session titled, "Navigating the Policy Issues Facing the Independent."

Betsy Bagley, principal consult for NLC Strategies, consults with companies and universities on issues involving women and dual-career employees.

Effectively making contacts

Not All Networking Approaches are Equal

By COURTNEY CHADNEY, EXPLORER Correspondent

You could see it everywhere at the recent AAPG Annual Convention and Exhibition in Houston:

Women were confidently exchanging business cards – with both men and women – as important business connections were made.


BAGLEY

It was, to many observers, inspiring.

And yet, paradoxically, one of the hottest topics at the conference's PROWESS forum was the *lack* of network support women in the geosciences professions felt – especially those in leadership positions.

The forum was titled "You've Come A Long Way Baby – Evolution of the Work Environment in the Oil and Gas Industry," and it featured six women with upper management positions in the energy industry.

Those attending shared their feelings of isolation and voiced their need for more women mentors and sponsors, and more communication with women in their same positions to trade ideas and ask advice.

"Women are getting very good at this card exchange, and it is becoming the norm at conferences and networking events," said Betsy Bagley, principal consult for NLC Strategies who attended the forum – but, she added, it's not enough.

Top Tips for Networking

Betsy Bagley's top tips for networking:

- Choose where to invest your energy, both within your organization and externally.

"Attend events that connect you with important men and women in your company and industry."

- Treat everyone with respect.

"You never know who will be in a position to support you in the future."

- Figure out the difference between socializing and networking. It is not enough to just be pleasant and interesting; get professional.

"Just showing up at a networking event is not enough. Talk about your work and careers. Follow up where appropriate."

- Networking should also be reciprocal.

"Give before you get."

"Trading business cards is a means, not an end," she said. "The end goal of networking is to be able to leverage established relationships at key points in your career.

"It is essential to build and maintain these relationships before you need them," she said. "People hire people, not résumés."

Statistically Speaking

A study from the *Journal of Organizational Behavior* supports Bagley's claim by concluding, "People with strong networks and good mentors enjoy more promotions, higher pay and greater career satisfaction."

Not all women have got the message. A McKinsey & Company's 2011 report, "Unlocking the Full Potential of Women in the U.S. Economy," showed that:

- Women represent about 53 percent of new hires in the energy industry.
- At the next managerial promotion level, the number of women drops to 37 percent.
- At the vice president level, 26 percent were women.
- At the executive level only 14 percent were women.
- For the top level (CEO), the number of women was 2-3 percent.

The same study interviewed women in an effort to explain these numbers, and found the "lack of access to informal networks where they can make important connections, a lack of female role models higher up in the organization, and a lack of sponsors to provide opportunities, which many male colleagues have" were the main factors.

Quality Control

However, as displayed and discussed at the ACE in Houston, resources and technology now available to women are providing the chance for change.

Bagley recommends going to conferences, trading business cards, following with emails, phone calls or even face-to-face meetings.

There also are dozens of professional networking sites available, like Linked-In, the Association for Women Geoscientists, Society of Women Engineers, Women's Energy Network, GeoNetworx and Catalyst.

"Men's clubs and golf outings were some traditional ways men built professional relationships," Bagley said. "It took women a little while to realize they were missing something more than golf when they opted out."

According to a September 2010 article in GSA Today, even something as simple as blogging is proving to benefit women. GSA found that those women who read and wrote blogs about their work benefitted over others, because they experienced less feeling of isolation.

Companies are catching on, as well, finding that they also benefit by helping their women employees to network.

See **Networking**, page 32

SPOTLIGHTON ...

Crisis Creates Shared Ethical Responsibilities

By KEN MILAM, EXPLORER Correspondent

When BP responded to a massive oil spill in the Gulf of Mexico last year, the topic of ethics was among the things bubbling up in discussions.

Rusty Riese, this year's AAPG Distinguished Ethics lecturer, had a backstage seat during the crisis as a BP geoscience adviser in alternate energy.

"I thought they (BP) did a wonderful job of explaining and being transparent," said Riese, who retired from BP and now is an adjunct professor at Rice University in Houston.

The company met its basic responsibilities to clean up the spill and compensate those damaged by the event, he said.

The rancorous public debate surrounding the spill raises other ethical questions, Riese said.

Many parties have ethical responsibilities in times of crisis, he said.

"It's more than just corporations," he said. "Regulatory agencies, the public, the courts, legislators and the media all have roles to play."

Responsibilities

In the Deepwater Horizon case, Riese said the media and elected officials seemed especially prone to bending ethical standards and using the situation to their own ends.

For example, the media's doomsday reporting with pictures of threatened beaches and swamps probably did more to hurt Gulf Coast tourism than the spill itself, he said.

"The horrible wash-over of oil into those areas feared in the beginning never really happened," Riese said.

Photos of cleanup efforts consistently referred to "devastated" beaches, while interviews with experts invariably focused on worst-case scenarios, he said.

Generating headlines "to suit a 24-hour news cycle ... the media weren't performing in a really ethical manner," Riese said.

Lawmakers and other officials likewise "used hyperbole to make points with their constituents," he said – which meant some legislators "did as much damage as the media" to local tourism.

The public also has responsibilities, if ethical behavior is to be expected from the other parties involved, he said.

"People don't do a good job of getting themselves informed or analyzing the information they get," he said.

"They see the petroleum industry as an isolated, stand-alone component of the economy. They fail to see petroleum is just one piece ... of a much broader energy-producing industry," he said.

"The public doesn't realize the importance of energy to the lifestyle we enjoy," he said, "or the scale of the alternatives."

Natural gas, for example, "is explored for in the same way and by the same people as oil," he said; wind farms take up huge swathes of countryside, and opponents contend they may endanger birds, mar scenic vistas, interfere with recreation areas and the like.

Needed: More Data

Geologists frequently deal with ethical questions, he said, adding that the most common situation may arise when presenting prospects when there is competition for funding.

"The scientific community does a poor job of providing data for the public," he said.

Scientists, Riese continued, should inform themselves about the various issues before such crises arise, and should share that information with others.


RIESE

Setting aside the deliberate torching of Kuwaiti oilfields in the first Gulf War, Deepwater Horizon is stacking up as the worst oil spill on record, he said.

The 1989 Exxon Valdez spill in Alaska isn't even in the top 10, but was headlined at the time as a pending ecological disaster of epic proportions.

"I was at Prince William Sound (site of the spill) two days ago and the wildlife warden looked happy," Riese said.

One of the worst spills, the 1978 Amoco Cadiz off France, ultimately dissipated with little intervention and relatively slight impact on the coastal environment, Riese said.

Riese said most of the top 10 spills "self-remediated" or were remediated with some human intervention, and "none seemed to have long-term impact."

Riese's traveling presentation, which kicked off at the recent Pacific Section meeting in Anchorage, Alaska, includes a wealth of data that is available for the asking, he said.

Riese hopes to make the information available through AAPG's website.

After his inaugural ethics talk several people in the audience took away copies of the data on flash drives or by downloads.

"That's what I would like people to do."

FOUNDATIONUPDATE

Gifts, Pledges Boost Foundation Projects

BY NATALIE ADAMS, AAPG Foundation Manager

Nearly $500,000 in donations and pledges came into the AAPG Foundation in May as individuals and corporations join together to show their support.

Highlights for the month included:

Paul and **Deana Strunk** contributed $51,000 to the Paul and Deana Strunk Geology Fellowship Fund. This fund provides assistance to grad students in the Geology Department of Kansas State University.

Devon Energy Corp. showed its support with a donation of $50,000 to the AAPG Imperial Barrel Award program, and to establish a university research grants program.

AAPG's IBA, the world's largest and most prestigious competition in petroleum geosciences, is a global event in which university teams analyze datasets and present their findings in 25-minute sessions to a panel of industry experts. The judges then select the winning team on the basis of the technical quality, clarity and originality of its presentation.

The top prize at the recent IBA finals in Houston was claimed by the team from the University of Texas at Austin, which earned $20,000 for their AAPG student chapter. (See June EXPLORER.)

Stuart and **Barbara Strife**, passionate believers in strengthening K-12 education, contributed $15,000 to the K-12 Education Fund.

* * *

The Foundation would like to express appreciation to the members of the

See **Foundation**, page 34

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Paul and Deana Strunk Geology Fellowship Fund
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Networking
from page 30

"Effective women's networks are helping companies achieve initiatives in the recruitment, retention and advancement of women," Bagley said, "and also in the development of business with and through women."

One success story includes the Dain Rauscher Corp., which found that as a result of its networking mentor program, career development opportunities and annual conference sales for its women's network members increased 19.2 percent – 5 percent more than the rest of the firm. The firm's recruitment and retention rates also went up.

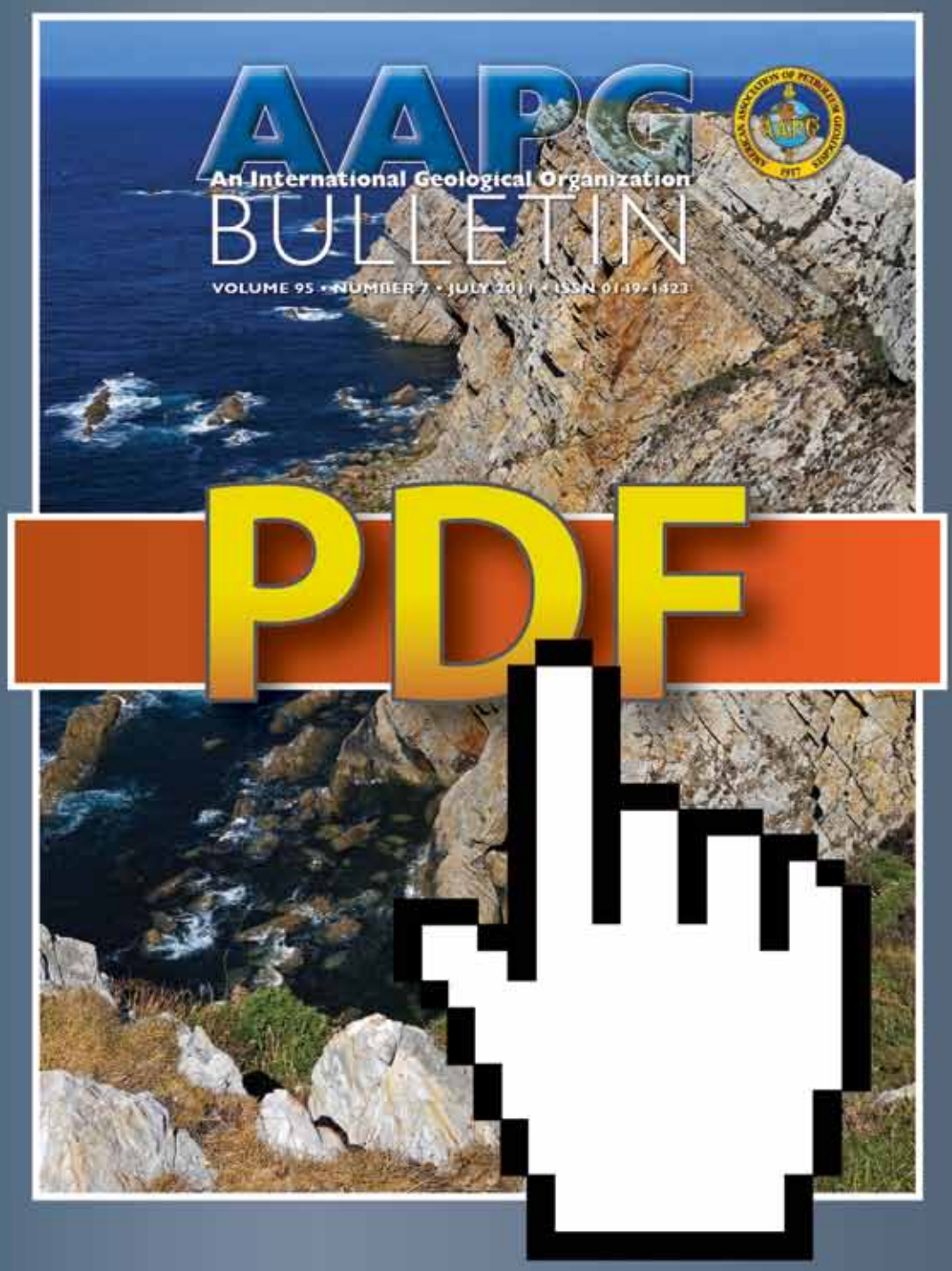
It is important to remember that networking, if not done correctly, can leave a bad taste in people's mouths.

"Effective networking is disciplined, reciprocal, and strategic," Bagley said.

Also, networking is useless if one's work does not live up to their reputation.

"Build network relations and establish credibility through hard work and excellent performance," Bagley said. "Then, when it's time to ask for something significant at work, you can find an advocate to set the stage, pave the way for you, or speak on your behalf."

DOWNLOAD Your NEW July 2011 Bulletin Now!



The AAPG Bulletin is a technical journal that is recognized in the industry as the leading peer-reviewed publication for information on geoscience and the associated technology of the energy industry.

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Article highlights include:

Adopting a disciplined methodology

John W. Snedden and Chengjie Liu

A chronostratigraphic designation system using more uniform and robust sequence stratigraphic designations provides a method to reduce unnecessary variation and confusion. This scheme will permit more meaningful correlation with less uncertainty.

Fluvial seismic geomorphology

Stephen M. Hubbard, Derald G. Smith, Haley Nielsen, Dale A. Leckie, Milovan Fustic, Ronald J. Spencer, and Lorraine Bloorn

Three-dimensional seismic and well data are used to develop a high-resolution depositional model for point bar deposits in the McMurray Formation of Alberta. This study provides insight into the deposits of tidally influenced rivers, an important yet often overlooked depositional setting.

Evaluating fractures and faults

Christopher E. Wilson, Atilla Aydin, Louis J. Durlofsky, Alexandre Boucher, and Darrell T. Brownlow

The potential impacts of faults and fractures on the secondary migration of hydrocarbons through the Anacacho Limestone, Uvalde, Texas, are investigated in this paper. Normal faults provided vertical flow paths through the Anacacho while strata-bound fractures enhanced lateral permeability along strike.

Effective permeabilities in heterogenous reservoirs

Damin Burton and Lesli J. Wood

Shales in tidally influenced deposits are rarely long enough to be correlated from well to well, making them difficult to include in reservoir-scale geologic models. A simple sand-shale model is used to quantify the effective vertical permeability as an outcrop analog to these deposits.

Editor's note: "Professional News Briefs" includes items about members' career moves and the honors they receive. To be included, please send information in the above format to Professional News Briefs, c/o AAPG EXPLORER, P.O. Box 979, Tulsa, Okla. 74101; or fax, 918-560-2636; or e-mail, smoore@aapg.org; or submit directly from the AAPG website, www.aapg.org/explorer/pnb_forms.cfm.

Foundation
from page 32

Corporate Advisory Board, which advises AAPG leadership on matters of strategy and direction when it comes to AAPG's activities and plans for the future.

CAB comprises senior members of the industry representing AAPG's membership via major oil companies, independents, service companies, internationally based and national oil companies.

* * *

The 34th Annual Trustee Associates meeting will be held Sept. 7-11 in Lake Tahoe, Calif., with the theme "Reaching New Heights."

For information on the meeting or on joining the Trustee Associates, visit foundation.aapg.org/trusteeassociates.cfm.

* * *

The Foundation's "Meeting Challenges … Assuring Success" campaign has raised $34,166,986 to date, and will continue through 2011 with a goal of raising $35 million.

When you pay your AAPG dues, please consider adding a contribution to the AAPG Foundation in your payment.

Help the AAPG Foundation reach the next generation.

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Be looking in the mail for an informational brochure on bequest possibilities through the AAPG Foundation.

Correction

One of the universities to receive the Newly Released Publication subscriptions is the College of Wooster in Ohio. Last month's column inaccurately reported Worchester (Massachusetts) as the recipient.

PROFESSIONAL newsBRIEFS

Chris Armistead, to geologist, Stone Energy, Morgantown, W.Va. Previously senior geologist, Linn Energy, Tulsa.

Mark Bauer, to region vice president-Gulf of Mexico shelf, Apache Corp., Houston. Previously reservoir engineering manager, Gulf Coast region, Apache Corp., Houston.

Weldon Beauchamp, to vice president exploration, LNG Energy, Vancouver, Canada. Previously new venture manager, TransAtlantic Petroleum, Turkey, Morocco and Romania.

Justin Bellamy, to general manager-geosciences, HighMount E&P, Oklahoma City. Previously reservoir characterization manager, Pioneer Natural Resources, Irving, Texas.

Eleazar J. Benedetto-Padron, to senior petroleum geologist, Ryder Scott Co., Houston. Previously petroleum geologist, Ryder Scott Co., Houston.

Bob Blackmur, to senior geologist-unconventional resources, Venoco, Carpinteria, Calif. Previously senior staff geologist-Texas shelf offshore exploitation, Apache, Houston.

Jack Breig, to chief petrophysicist, Whiting Petroleum, Denver. Previously petrophysicist, Newfield Exploration, Tulsa.

R. Glenn Dawson, to president-Williston Basin division, Magnum Hunter, Denver. Previously president and chief executive officer, NuLoch Resources, Calgary, Canada.

William D. DeMis, to technical specialist-geology, Southwestern Energy, Houston. Previously senior staff geologist, Southwestern Energy, Houston.

H.C. "Kip" Ferguson III, to president-Eagle Ford division, Magnum Hunter, Houston. Previously president, Sharon Resources, Houston.

Ewa A. Ginal, to international marketing manager, Fugro Multi Client Services, Perth, Australia. Previously business development manager, Fugro Robertson, Llandudno, Wales.

Guy Grossman, to Houston manager/senior geologist, ESA Consulting, Houston. Previously district director, Texas Railroad Commission, Houston.

Syed Tariq Hasany, to exploration geology specialist, Petronas Carigali Sdn Bhd, Kuala Lumpur, Malaysia. Previously senior geologist, Schlumberger, Almaty, Kazakhstan.

Lee Higgins, to senior geoscience adviser, Broad Oak Energy, Dallas. Previously vice president of exploration and development, Lynx Production, Dallas.

Dan A. Hughes is a recipient of the 2011 Distinguished Alumnus Award by Texas A&M University and the school's Association of Former Students. Hughes is chief executive officer of Dan A. Hughes Co., Beeville, Texas.

Jon Jeppeson, to executive vice president-Gulf of Mexico shelf, deepwater and Gulf Coast onshore regions, Apache Corp., Houston. Previously executive vice president, senior vice president and regional vice president for the Gulf Coast region, Apache Corp., Houston.

See **PNBs**, page 37

Denise M. Stone is an AAPG member and geological consultant in Houston. She is editing an AAPG publication in progress, "Oil and Gas Fields of the Cook Inlet of Alaska," which should be available in 2012.

Looking at outcrops of the Valdez Group accretionary terrain along the Seward Highway just east of Anchorage, Alaska. Waters of Turnagain Arm and snow covered peaks of the Chugach Mountains on the Kenai Peninsula are in the distance.

Field trip gets close to the rocks

Cook Inlet Outcrops Exceptional

By DENISE M. STONE

STONE

Exploration interest in Alaska's Cook Inlet Basin is on the rebound – or so it seemed from the mood of the recent AAPG Pacific Section annual meeting held in Anchorage.

The oral session on "Oil and Gas Fields of the Cook Inlet, Alaska" was standing-room-only for several of the talks – and the post-meeting field trip "Sedimentology, Reservoir Quality and Tectonic Setting of Late Miocene-Early Pliocene Gas-Bearing Formations, Upper Cook Inlet, Alaska" was a sellout.

The trip was led by David LePain, sedimentologist at the Alaska Department of Natural Resources, Division of Geological and Geophysical Surveys in Fairbanks. He showcased the effects of compressional tectonics in a forearc basin with a fascinating tour of the Seward and Sterling highways and Kenai Peninsula geology.

There was excellent weather (unusual for spring in south-central Alaska) and the rocks didn't disappoint.

* * *

With clear blue skies and temps in the 50s, the group of 25 started in Anchorage en route to Homer, 220 miles away near the southern end of the Kenai Peninsula. Mesozoic and Tertiary outcrops on the eastern side of the Cook Inlet were the focus of three days in the field.

Although the trip's main objective was outcrop examination of the onshore equivalent of Miocene-Pliocene reservoirs productive in the basin, the clear skies enabled long distance visibility (50-plus miles) and appreciation of surrounding terrain.

Clearly visible were the mountains of the Aleutian-Alaska Range, home to Mount McKinley (Denali), which mark the northern extent of the Aleutian Island Arc. All four snow-covered active volcanoes along the western basin margin and within the Alaska Range were visible. From north to south, they are Mount Spur, Mount Redoubt, Mount Illiamna and Mount Augustine.

Located at the compressional boundary between the down-going Pacific Plate and the North American Plate, the Cook Inlet is a tectonically active forearc basin. It trends NE-SW parallel to the trend of the inlet and is bounded by regional faults on both sides that extend for hundreds of miles.

Since 1957, 23 gas fields and eight oil fields have been discovered in the basin. These have provided energy to fuel the local economy and growth of south-central Alaska, the most populated part of the state.

In 1968, Prudhoe Bay field was discovered on Alaska's North Slope, and as a result the exploration program slowed considerably – exploration dollars were diverted from the Cook Inlet to exploration and production on the North Slope.

Since then large areas of the Cook Inlet basin have remained unexplored. Approximately 95 percent of the existing fields in the basin were found pre-1970.

The 2004 South Central Alaska Natural Gas Study concluded that the resources found to date are less than half of what may actually be there. An estimated ultimate recovery (EUR) of approximately 8.5 TCF has been produced with, as of 2004, 1.8 TCF proven and remaining.

They conclude that a total Cook Inlet resource endowment of 25-30 TCF OGIP might be more reasonable. The EUR for oil is reported to be 1.4 BBO.

Many in the industry think these numbers are conservative.

* * *

Exceptional exposures of the Mesozoic-age Chucagh terrain accretionary complex were visited on the first day. Bright sunshine and snow-covered peaks highlighted the dramatic relief along the Seward Highway, which follows the north shore of Turnagain Arm, just outside Anchorage.

(Turnagain is named after the action of Captain James Cook in 1778. He was not successful at finding a Northwest Passage back to Europe through the inlet waters and had to "turn again.")

Seward Highway exposures included highly sheared conglomerate and greywacke of the McHugh Complex and near vertical, highly compressed and sheared turbidite beds of the Valdez Group.

Continued on next page

Continued from previous page

The turbidites are interpreted as proximal channel deposits that occur near the base of slope.

Spectacular deformed beds were visible in outcrops of the trench-filling Valdez Group, including slaty cleavage in shales, smeared shale beds and intensely fractured tabular sandstone beds. These deposits, believed to be Maastrictian to Campanian in age, were scraped off the seafloor as the Pacific Plate subducted, and uplifted as if on a regional conveyer-belt.

Both the McHugh Complex and the Valdez Group comprise the most impressive Chugach terrain.

* * *

The stratigraphic record of the Cook Inlet Basin includes a thick Mesozoic succession overlain by nearly 26,000 feet of Tertiary section. All significant petroleum production to date has come from Tertiary age reservoirs in upper Cook Inlet.

The stratigraphy of the Sterling Formation reservoirs are exposed in shoreline bluffs several hundred feet thick near Clam Gulch and the town of Ninilchik. They contain tabular sand bodies with conglomeratic lags deposited in braided channels, lignite beds and abundant sedimentary features.

Broadly lenticular sand bodies of the Beluga Formation are exposed in the bluff northwest of the town of Homer.

The sands in both formations are largely well-sorted and unconsolidated with abundant sedimentary structures. Dewatering features such as disturbed bedding and flame structures are particularly abundant, raising the question of their origin – they may have been generated by natural fluvial depositional processes or perhaps generated by regional seismicity common to this tectonic setting.

* * *

Overall the Cook Inlet Basin oral session and field trip left many with a greater appreciation of this tectonically active basin, its oil and gas potential and the quality of future potential reservoirs.

Thanks to the Alaska Geological Society and Apache Corporation for their sponsorship of these efforts.

Sands of the Sterling Formation along the east shore of Cook Inlet, near Clam Gulch, exhibit sedimentary structures within braided fluvial channels. Extensive dewatering features may be due to natural stream processes during deposition and/or local seismic events. These sands are gas productive reservoirs offshore. They are laminated, cross-bedded and friable.

PNBs
from page 34

Mohit Khanna, to chief development geologist, Salamander Energy, Jakarta, Indonesia. Previously Mukta subsurface manager, BG Group, Mumbai, India.

Thomas S. Liberatore, to partner, executive vice president and chief executive officer, Eclipse Resources, State College, Pa. Previously vice president and Appalachian regional manager, Cabot Oil & Gas, Pittsburgh.

Brian C. Mahood, to vice president-geology, Las Vegas, Nev. Previously consultant, Kerrisdale Consulting, Calgary, Canada.

Brian Panetta, to vice president-geology, Eclipse Resources, State College, Pa. Previously geologist, Waco Oil & Gas, Glenville, W.Va.

Chris Peltonen, to geoscience manger, southern California operations, Venoco, Carpinteria, Calif. Previously development geologist, Venoco, Carpinteria, Calif.

Ray Podany, to manager of geology-Permian Basin, Yates Petroleum, Artesia, N.M. Previously senior geologist, Yates Petroleum, Artesia, N.M.

Spencer Quam, to head of exploration operations, Qatar Petroleum, Doha, Qatar. Previously asset manager, Sasol Petroleum, Johannesburg, South Africa.

Stephen M. Testa, president of the AAPG Energy Minerals Division and executive officer of the California State Mining and Geology Board, has written a book, "One Man's Planet" and is available through the American Geological Institute.

John R. Wheeler, to vice president, Lee Keeling and Associates, Tulsa. Previously senior geologist, Lee Keeling and Associates, Tulsa.

Editor's note: Regions and Sections is a regular column in the EXPLORER offering news for and about AAPG's six international Regions and six domestic Sections. AAPG's Asia/Pacific Section programs manager is Adrienne Pereira, who is based in Singapore and can be reached at apereira@aapg.org.

REGIONS&SECTIONS

PNG Gas Finds Push LNG Plans

By MICHAEL McWALTER

It is a little over 25 years since the Iagifu 2-X well drilled by Niugini Gulf Oil discovered Papua New Guinea's first commercial oil field – the Kutubu field, which was put into production in 1992 by Chevron Niugini Pty Ltd. after they acquired the assets of Gulf Oil.

The field is located some 555 kilometers northwest of the nation's capital of Port Moresby, on the southern edge of the Papuan Fold Belt in the remote Southern Highlands Province.

The discovery well was drilled on the Iagifu anticline, one of many large surface-defined structural features in the Papuan Fold Belt.

McWALTER

The Kutubu area is characterized by a series of southwest verging thrust folds, which create dramatic relief of over 1,000 meters between the valley floors and ridge crests. The surface geology is dominated by the Upper Oligocene to Late Miocene Darai Limestone, which is intensely weathered, forming a rugged karst terrain.

The entire area is covered in thick tropical rain forest, which makes access for exploration drilling incredibly difficult.

At the time of discovery, the field could only be reached by helicopter, but now an extension to the Highland Highway links the field to the coastal city of Lae – about 425 kilometers to the east of Kutubu as the crow flies, but a tortuous truck journey of more than 700 kilometers, as the highway snakes its way through high passes from valley to valley.

The weather was (and is) a major determinant for petroleum operations, when all the drilling supplies came to the drilling rigs by helicopter.

It was not uncommon to see a dozen helicopters circling around a drilling rig to drop off their supply loads in the late afternoon when the clouds had lifted off the rainforest canopy, after days of heavy and relentless rain.

* * *

The main reservoir in the Kutubu field is the Early Cretaceous, Berriasian Toro Sandstone, thought to be a transgressive marginal marine and shoreface sand, which has excellent lateral continuity, splendid reservoir quality and is generally about 100 meters or more thick.

After the Kutubu oil discovery, many international petroleum companies scrambled to drill more of these surface-defined anticlines, but only a few more (Gobe, Moran and South East Mananda) were found to contain any oil – and often only in separate fault compartments of these complex over-thrusted structures and with limited volumes. Many of the structures seemed to contain natural gas.

In 1987, British Petroleum discovered the large Hides gas field some 75 kilometers east of Kutubu. The Hides and adjacent Karius mountains form a pronounced pair of surface-defined anticlines 38 kilometers long by 8.5 kilometers wide, with a topographic relief of more than 1,500 meters above the adjacent Nogoli valley floor.

The Hides' field gas is contained in the same Toro reservoir as at Kutubu, though delineation drilling has shown that the reservoir is likely to be considerably less faulted, based on communication between wells more than 12.5 kilometers apart.

Unfortunately, the Karius anticline does not involve the Toro reservoir in the hanging wall at depth, and though there may be a sub-thrust footwall Toro trap, it is well below the regional water level.

The Hides gas field contains somewhere between 5.5 to 12.5 trillion standard cubic feet (TCF) of original-gas-in-place, with a most likely volume of 7.1 TCF. It is the largest gas field discovered in Papua New Guinea to date.

Other structurally similar features that turned out to contain gas were the Juha, P'nyang and Angore fields – all located among the frontal features of the Papuan Fold Belt.

* * *

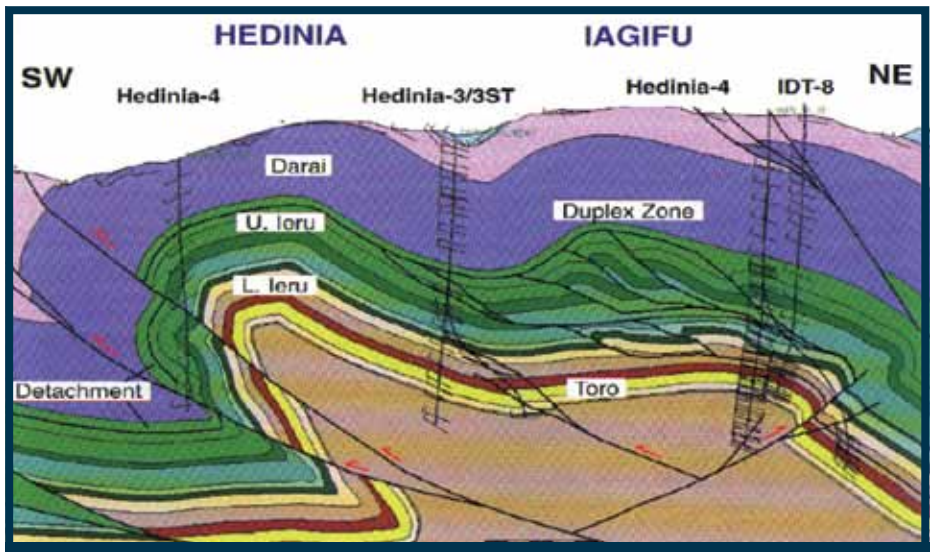
Faced with an abundance of gas discoveries in the late 1980s and early 1990s, the Petroleum Division of Papua New Guinea's Department of Minerals and Energy (now the Department of Petroleum and Energy) commissioned a comprehensive study of its discovered petroleum reserves in 1992. The study concluded that if the gas from the fields could be aggregated there were adequate resources to underpin their development for supply to a coastally located LNG plant, from which LNG could then be exported to regional markets.

In 1995, after considerable consultation with the industry, the government devised a Natural Gas Policy, which set out revised fiscal and administrative plans for natural gas development.

These provisions were subsequently legislated and gave rise to the ability for companies to obtain petroleum retention licenses over discovered gas fields while

Continued on next page

Michael McWalter is a director of the Board of the Transparency International-Papua New Guinea and of the Circum-Pacific Council for Energy and Mineral Resources. He also is treasurer of AAPG's Asia-Pacific Regional Council and an alternate delegate to the AAPG House of Delgates. He has worked in Papua New Guinea since1976.



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Continued from previous page

they promoted and matured their plans for gas development and marketing, and a reduction in the petroleum taxation rate applicable to gas developments.

This stimulated development planning, and BP and Esso led a scheme to develop the Hides gas field for supply to a LNG plant at Madang on Papua New Guinea's north coast, but the 1997 Asian financial crisis and consequent uncertainties about East Asian LNG import growth – and a terrible tsunami at Aitape to the west of Madang, highlighting the tremendous seismic risk of a north coast LNG plant location – put a temporary end to LNG plans.

For several years the gas field licensees, led by Chevron, examined the idea of developing the gas fields for supply to east coast Australian markets by an export pipeline, but that notion failed due to competition with Australian domestic gas supply, low gas prices and high infrastructure costs to build the gas export and delivery systems.

Meantime, the government continued to promote gas development by whatever means might be commercial. To support its plans, a seismic hazard study was commissioned by the Petroleum Division, which clearly showed that evacuation of the gas from the fields within the Papua New Guinea Highlands would best be done through the use of a southerly route down to the Gulf of Papua.

In August 2007, LNG development was again picked as the best method of monetizing the gas fields after the concept of transporting gas to Australia was abandoned. This time Esso Highlands Ltd. is leading a large consortium of gas field licenses and the state.

Plans are being turned into reality and construction is under way for a 6.9 million tons per annum LNG plant for the sale of LNG to Japan, China and Taiwan.

* * *

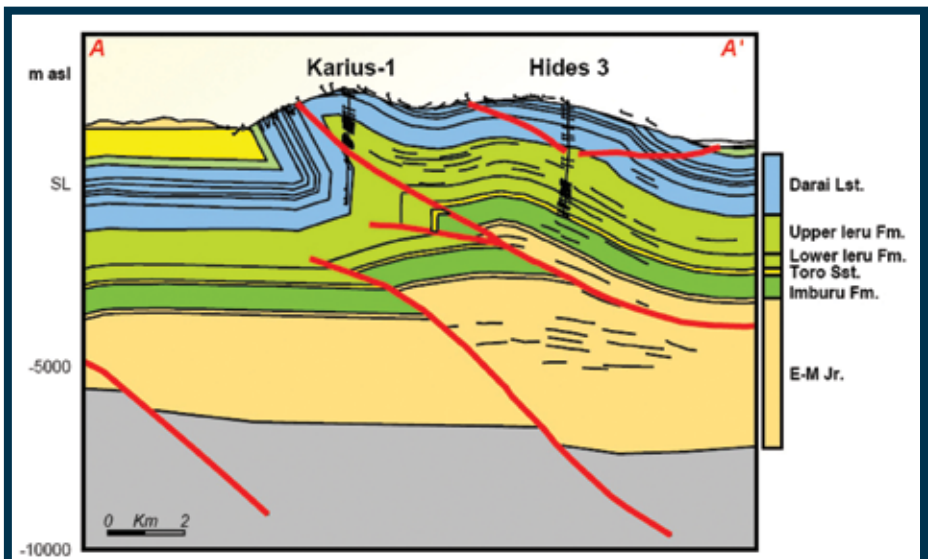
Hitherto these natural gas accumulations were distressed, but now they gave value.

Now that the government has been seen to negotiate and approve gas agreements and grant the various licenses for the field developments and pipeline and facility construction and operations, natural gas in Papua New Guinea has become a sought-after outcome from exploration drilling.

A small Canadian independent company, InterOil Inc., has in recent years discovered a large onshore Miocene reef in the eastern Papuan Fold and Thrust Belt. This is the Elk-Antelope gas field, which may have enough recoverable gas to support a separate LNG project.

In the Western Province, adjacent to the border with the Indonesian Province of West Papua, another consortium of licensees led by Talisman Energy of Canada are planning to aggregate gas from a series of small gas fields within the Papuan Foreland.

If these new plans mature, Papua New Guinea will have the capacity to establish 20 million tons per annum of LNG export by 2020, which would make it a significant regional LNG supplier – and enable it to strengthen its economy and pursue its many development needs.



The Hides gas field contains somewhere between 5.5 to 12.5 trillion standard cubic feet (TCF) of original-gas-in-place, with a most likely volume of 7.1 TCF.

Student Member Status Expanded

A reminder: AAPG Student members who graduated this fiscal year (between July 1, 2010 and June 30, 2011) now can choose to retain "Student" status for an additional 24 months after graduation – and take advantage of the lower Student dues rate of $10.

Those with a non-North America mailing address must also pay the $10 mail surcharge.

This new option is being offered due to a bylaw change approved by the AAPG House of Delegates to help recent graduates with their transition to employment – and Active status.

Recent graduates taking advantage of this opportunity to extend their current Student status will be reclassified as a "Student YP" (student/young professional).

An important note: All recent graduates choosing to continue as a Student member are personally responsible for remittance of the $10 dues and mail surcharge. These dues cannot be paid by the Corporate Sponsorship program (currently funded by Chevron), because those funds are available only for those actively/remain enrolled in school.

AAPG's goal remains for all qualified Student (and new Associate) members to apply for advancement to Active status as soon as they meet the experience requirement.

For more information go to the website at aapg.org, or contact Member Services – at members@aapg.org, or (918) 584-2555 – to request a form.

MAPG - AAPG 2nd International Conference and Exhibition

held at the Palais des Congres at the Grand Mansour Eddahbi Hotel in Marrakech, Morocco

Call for Abstracts - Deadline: 17 JULY 2011

Following the successful first convention in 2007, the Morocco Association of Petroleum Geologists has teamed up with the American Association of Petroleum Geologists to present its 2nd International Convention, Conference and Exhibition.

Exploration activity in Northwest Africa has gathered pace since the first convention, with acquisition of seismic data and exploration drilling taking place in both onshore and offshore areas. New exploration concepts have been developed as a result of which there have been some notable gas discoveries in Morocco and Mauritania, and exploration activity in this area continues apace.

The sedimentary basins of Northwest Africa are generally under-explored and further potential exists for both conventional and unconventional resources. This convention will cover a wide variety of themes covering, not only Northwest Africa hydrocarbon systems, but also the more global exploration challenges the extractive industry faces.

Join us in Marrakech and learn more about recent exploration activity, new plays and concepts, and the future potential of this fascinating area. The Organising Committee has developed a comprehensive and high quality programme of oral and poster sessions together with an exciting selection of field trips to classic localities. Whether or not you are involved with the geology of Northwest Africa this convention is for you.

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Send abstracts via the website: *www.aapg.org/mapg2011/*

MEMBERSHIP&CERTIFICATION

The following **candidates** have submitted applications for membership in the Association and, below, certification by the Division of Professional Affairs. This does not constitute election nor certification, but places the names before the membership at large.

Any information bearing on the qualifications of these candidates should be sent promptly to the Executive Committee, P.O. Box 979, Tulsa, Okla. 74101.

Information included here comes from the AAPG membership department.

(Names of sponsors are placed in parentheses. Reinstatements indicated do not require sponsors.)

Membership applications are available at www.aapg.org, or by contacting headquarters in Tulsa.

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See **Membership**, page 42

Certification

The following are **candidates** for certification by the Division of Professional Affairs.

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Timothy Robert Klett, U.S. Geological Survey, Denver (R. Bishop, R. Riese, P. Stark); **Terrence C. Blair**, consultant, Boulder (M. Silverman, R. Cluff, R. Webster)

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Pennsylvania
Jeffrey Bruce, consultant, Venetia (B. Fossum, F. Gagliardi, C. Wylie)

Texas
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Membership
from page 40

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Israel
Kahn, Aaron M., Zion Oil and Gas, Zichron Yaakov (Y. Druckman, S.E. Pierce, V.G. Carrillo)

Kazakhstan
Abugaliyev, Kulsharip K., JSCOOC "KazMunayTeniz," Astana (H. Darman, Z.S. Al-Rawahi, A.S. Van Der Molen)

Korea
Shin, Kook-sun, Korea National Oil Corp., Anyang City (J.H. Han, I. Kang, H.E. Rowlett Jr.)

New Zealand
Burns, Fiona Elizabeth, Firmground Pty Ltd. Australia, Nelson (A.D. George, R.L. Gawthorpe, C. Stark)

Nigeria
Obilaja, Olusegun Tubosun, Shell Petroleum Development, Port Harcourt (C.A. Bakare, K.O. Ladipo, J.U. Agbo); Zorasi, Collins Baribor, Rivers State Polytechnic Bori, Port Harcourt (A.R. Ojelabi, I.O. Ogun, E.G. Odior)

Norway
Rebora, Lisa J., Statoil ASA, Stavanger (R.M. Wilhelmsen, P.H. Nadeau, B. Bonnier)

Portugal
Reis, Rui Pena, University of Coimbra, Coimbra (N. Pimentel, H.C. Matias, R. Pereira)

Russia
Kovalenko, Kazimir V., Gubkin Russian State University of Oil and Gas, Moscow (D.R. Cook, V. Dvorakova, I.S. Deshenenkov); Murashka, Andrey, Fugro-Jason, Moscow (B.J. Fossum, N.A. Tkacheva, H. Poludetkina)

Saudi Arabia
Alotaibi, Ahmed, Saudi Aramco, Dhahran (reinstate)

Scotland
Desmares, Delphine, Universite Pierre et Marie Curie, Aberdeen (I. Cojan, M.F. Floquet, A. Hurst)

Thailand
Kluengputsa, Teenarat, Chevron Thailand E&P, Bangkok (S. Pantpong, R.C. Griffith, Y.J. Partono)

IN MEMORY

Robert Garvin Berry Jr., 85
Tulsa, April 17, 2011
Harold Allen Brown, 80
Wichita, Kan., Oct. 26, 2010
Theodore "Ted" Coughran, 82
Argyle, Texas, May 9, 2011
Max Holmes Durham Jr., 81
Hammond, La., April 18, 2011
Charles B. Godfrey, 81
Midland, Texas, April 25, 2011
R. Michael Lloyd, 80
Houston, Feb. 23, 2010
Virginia Phipps Monaghan, 77
Midland, Texas, April 11, 2011
James A. Noel, 88
Ashland, Ohio, May 5, 2011
Hyman Seiden, 96
Bakersfield, Calif., March 6, 2011
Ronald Keith Zimmerman, 75
Baton Rouge, La., Nov. 13, 2010

Editor's note: "In Memory" listings are based on information received from the AAPG membership department.

Letters to the editor should include your name and address and should be mailed to Readers' Forum, c/o AAPG EXPLORER, P.O. Box 979, Tulsa, Okla. 74101, or fax (918) 560-2636; or e-mail to forum@aapg.org. Letters may be edited or held due to space restrictions.

READERS' FORUM

What's In a Name?

A decade or more ago the topic of renaming our Association was considered, and at that time it was decided then to keep our name as now qualified.

It is timely that we revisit that topic in the light of the many non-American members and their technical contributions. In addition, many of our events are held outside of the Americas.

I believe that our Association would be better received with a title like "IAPG" (International Association of Petroleum Geologists) or some such.

I also believe that it would improve our growth potential.

John Treckman
(50-plus-year member)
Kingwood, Texas

BANANA Syndrome

Regarding your story (June EXPLORER) on BANANA syndrome (Build Absolutely Nothing Anywhere Near Anything): I certainly agree that a cure should involve "invest in education for our future problem solvers."

However, at universities such as Lamar, where only a bachelor's degree is offered – and many students cannot attend graduate school – people in the petroleum industry are rarely heard from, except for a few of our alumni.

I realize that 10 or fewer geology graduates per year is not a large number, but a number of universities of this size amounts to a lot of geologists available for work.

Donald E. Owen
Beaumont, Texas

(Editor's note: Owen is a geology professor with the Department of Earth and Space Science at Lamar University.)

Critical Resource Shortages

Dianne Freeman's short article on resource depletion (June EXPLORER) is most timely – though I fear it may be largely unappreciated except by some visionaries like Vince Matthews.

Having been in the oil patch for most of my 40-year career, I understand the omnipresent chant of find more, drill more, produce more. But the stark truth is that there is a limit, both physically and economically, to all natural resources.

By a strange twist of fate, my petroleum career took a wild turn and I ended up performing terrorism risk analysis for the Department of Homeland Security. That conjunction of careers has required me to see energy and other natural resources in an entirely different light – and not a particularly favorable one.

The dawn of cheap energy at the dawn of the 20th century allowed the 19th century's colonialism to be replaced by the 20th century's globalization. Resources, through cheap energy, can come from anywhere and go to anywhere. But that day is coming to an end in the face of $100+/bbl oil; globalization will also give way to localization.

For readers interested in other's insights into some of the macro-scale societal, economic and national security issues related to this topic need look no further than Michael Klare's book *Natural Resource Wars*, Peter Maass' book *Crude World* or for a somewhat more strident (but nonetheless very informative) point of view, Michael Ruppert's *Collapse*. All of them go a step or two further than Matt Simmons' *Twilight in the Desert*.

The solutions to the problems presented are knotty at best, and it will require all of our professional ability, knowledge and creativity to help educate the public and our too-often uninformed lawmakers on what needs to be done to keep the nation and the world in balance with all the resources we use and cannot replace.

Applause to the EXPLORER for publishing this article, and please consider doing more in this vein.

David M. Weinberg
Rio Rancho, N.M.

DPA
from page 46

membership is aging. DPA requires a boost in its membership, from eligible professionals at all stages of their careers.

▸ Outreach and Education – Strong DPA programs are planned at AAPG Section meetings (Eastern Section in Washington, D.C., Sept. 25-27, and the Mid-Continent Section in Oklahoma City, Oct. 1-4) as well as at the next ICE and ACE meetings (AAPG ICE in Milan, Italy, Oct. 23-26 and AAPG ACE April 22-25 in Long Beach, Calif.).

These programs of technical sessions, short courses and luncheons are critical to our membership and also are vehicles to attract new members to the Division.

I will be appointing a chair to our Conventions Committee early in my term to work with Section/Region councilors to plan these important programs well in advance of each meeting.

▸ Washington Advocacy – There has never been a more important time for representation of our science and industry in Washington. GEO-DC's mission over its five-plus years has been "to inform policy making with science."

▸ Budget Challenges – With declining membership, DPA's annual budget continues to run a deficit. There will be continued budget pressure on our current programs if our membership continues to decline and our revenue stream does not change.

With these objectives and challenges in mind, I would like to address these and other areas of concern to DPA members at a DPA Summit, early in my presidency. Details on this will follow in the coming months.

If you are a DPA member, please let me know your thoughts and concerns.

I also would like to challenge you to recruit one new member in the 2011-12 term – and if you are not a member, I would encourage you to join over 3,000 of your colleagues within AAPG who have achieved "gold standard" certification, which transcends local, state, national and international borders.

* * *

In closing, I would like to thank my employer, Nexen Petroleum USA Inc., who has been fully supportive of my three-year-term serving the DPA and AAPG (president-elect, president and past president).

I also would like to thank our outgoing Executive Committee, led by Dan Tearpock, for a job well done in 2010-11.

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HEADQUARTERS' UPDATE

It Takes Money to Advance the Science

By DAVID LANGE, Chief Financial Officer and Acting Executive Director

The collective hurrah you may have heard coming from northeast Oklahoma around mid-April was the AAPG staff thankful that another successful annual meeting was behind them. The collective sigh you may have heard from the same location the following week was that same staff digging into the details of the FY 2012 AAPG budget.

It's been said that a budget is a method of worrying before you spend money, as well as afterwards.

The primary worry in the AAPG budget process is finding the funding for all the great programs and activities AAPG conducts each year – and the significant number of new ones.

The budgeting process at AAPG is an arduous affair that spares no AAPG manager or director. Considerable thought and evaluation goes into reviewing the financial requirements of each of the multitude of global programs and activities AAPG will be engaged in the coming year.

Even foreign currency expectations have become an important aspect of the budgeting process.

* * *

It's a very bottom up process in which every program and activity planned and proposed gets a number or set of numbers assigned to them. The value and benefits of each are reviewed and evaluated.

Not all programs survive.


LANGE

Unfortunately, AAPG does not have the luxury of operating with an unlimited budget.

In budgeting parlance it's referred to as zero based budgeting, and when it's all said and done, the AAPG annual budget provides a guide for how the next fiscal year will be managed – and a template for the financial resources available to AAPG leadership, staff and volunteers to advance the science of petroleum geology.

Edward Bennett Williams, former president of the Washington Redskins professional football team, was reported to have said that he gave head coach George Allen an unlimited budget – and he exceeded it.

Unfortunately, AAPG does not have the luxury of operating with an unlimited budget. The allocation of financial resources is one of the most difficult tasks an Executive Committee must tackle each year. AAPG's growing global reach and increasing programs ensures there will be more demands for funding than revenue available to support them.

As you would expect, the stewardship of the member's money is serious business at AAPG. The overseeing of the annual budgeting process is done by the Budget Review Committee, which includes the president-elect and treasurer. Several drafts of the budget are completed and reviewed before a final version of the budget is presented to the Executive Committee for approval.

During the year the Executive Committee is provided with quarterly financial updates, which allows it to keep track of actual results versus budget.

Additionally, AAPG has an Audit Committee and independent financial audit firm, both of which help to ensure AAPG's accounts and financial records are proper and reflect accurately the financial condition of AAPG.

This is not to say that AAPG is not on solid financial footing at this time. It is. The organization has been around since 1917, and has been blessed with support and leadership that has made it this way.

Nevertheless, to continue to advance the science of petroleum geology for the next hundred years, AAPG will require continued financial diligence as well as the financial support the organizations and members it has received the past 94 years.

* * *

At the time of this writing, the FY2012 budget remains under development. Much progress has been made – however, a few tweaks here and a few minor modifications there are still under review as the new fiscal year closes in.

Sometime around July 1 please listen carefully as you might hear another collective hurrah from headquarters. This means AAPG's FY2012 budget has been reviewed and approved by the Executive Committee.

Please keep listening as the hurrah may be shortly followed by a collective sigh. This means the EC recognizes it can't afford to do all it would like to this next year. Some programs and activities may have to wait until next year or beyond.

Nevertheless, as members of AAPG, you can be proud the organization has the leadership necessary to make the required budget decisions.

You also can be comforted that AAPG has the proper oversight structure and processes in place to ensure that AAPG will have the financial capability to continue the advancement of petroleum geology well into the next century.

DIVISIONS' REPORT

Objectives, challenges ahead

Ethics, Professionalism are Constants

By MARTY HEWITT, DPA President

Ethics and professionalism are relevant – regardless of your career stage or geography.

Think back, if you can, to 1965, the year the Division of Professional Affairs was formed. What did our industry and profession look like? Certainly nothing like today. What is constant, however, is ethics and professionalism, the foundation of the DPA.

It's my honor to take over the presidency of the Division for the 2011-12 term and to serve our 3,000-plus members.

Serving with me this year are vice president **Rick Nagy** (Gulf Coast Section), president-elect **Charles Sternbach** (Gulf Coast Section), secretary **Mark Gallagher** (Southwest Section), treasurer **Dan Billman** (Eastern Section) and past-president **Dan Tearpock** (Gulf Coast Section). I look forward to working with this dedicated team of professionals.

Joining our executive team are 15 councilors from around the globe, representing DPA members in almost every Section and Region. In the U.S. Sections, I would like to welcome **Greg Hebertson**, **Jim Grubb** and **Ralph Baird** as new councilors for the 2011-14 term.


HEWITT

Ethics and professionalism are relevant regardless of geography.

They join **Stewart Chuber** and **William Meaney** to represent the Gulf Coast Section.

I also would like to welcome **Debra Osborne**, who joins **Gregg Norman** to represent the Southwest Section. **David Morse** (Eastern Section), **Joel Alberts** and **David Tschopp** (Mid-Continent Section), **Bob Countryman** (Pacific Section) and **Jeff Brame** (Rocky Mountain Section) round out our domestic councilors.

Please note that we are still seeking nominees to fill an additional vacant council chair in the Rocky Mountain Section.

Internationally, we have councilors representing all Regions with the exception of Latin America. International councilors are **Bob Shoup** (Asia Pacific Region), **Bill Haskett** (Canada Region), **John Brooks** (European Region), **Adebayo Oladele Akinpelu** (Africa Region) and **Jim Tucker** (Middle East Region).

We look forward to filling the vacant Latin America Council chair within the next year.

Get to know your councilors. They are your elected representatives and I expect them to be fully engaged in the affairs of the DPA. Give them your ideas and feedback.

* * *

Looking ahead to the 2011-12 term, I would like to continue to build on last year's business plan, which focused on the following theme areas:

- **International Growth** – We are well on our way to having full global representation on the DPA Council, and I am the first "international" president in the Division's history. The challenge is relevancy to our international membership.

Personally, I feel ethics and professionalism are relevant regardless of geography, but international growth does present a unique problem. If you are an International member of AAPG, please let me or your Regional councilor know your thoughts on this.

- **Declining Membership** – Our

See **DPA**, page 44

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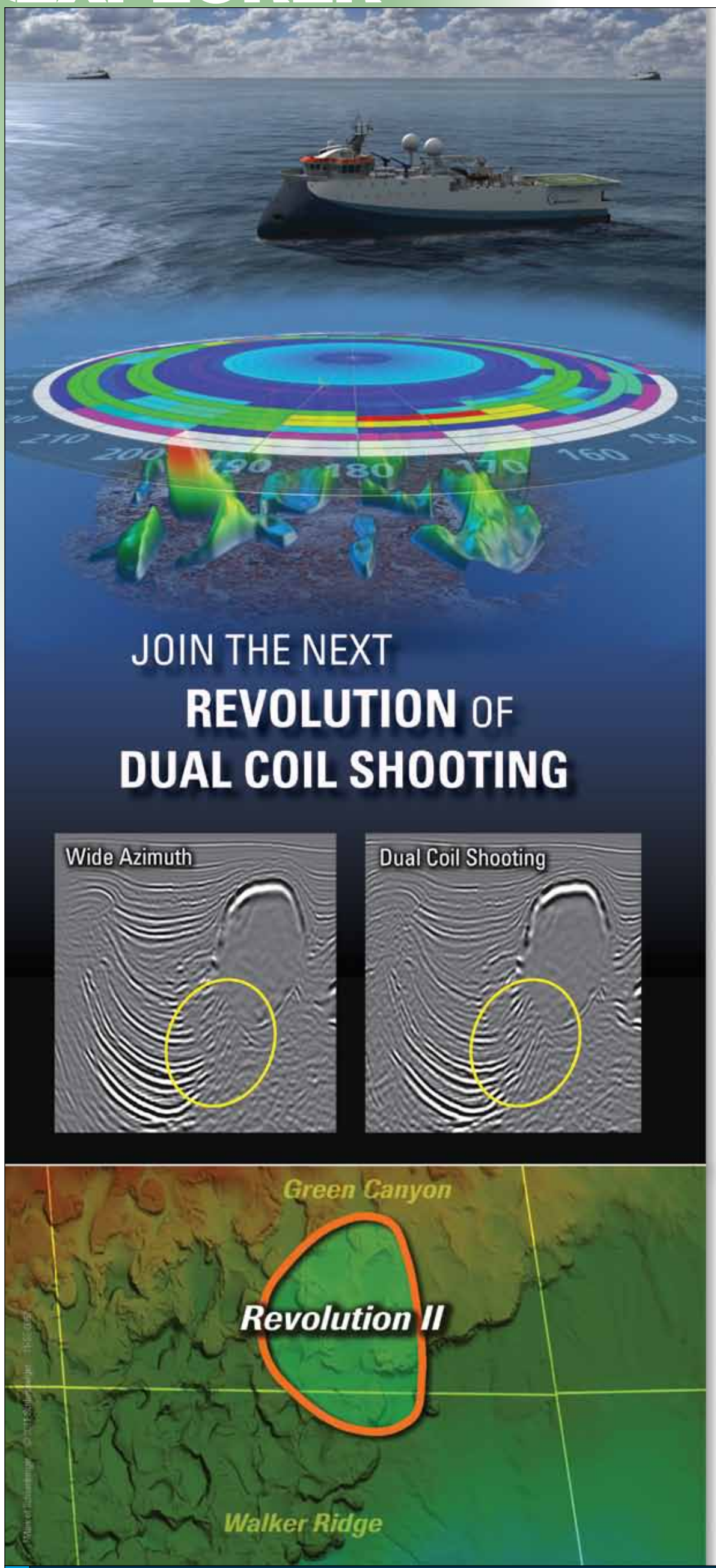

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