Appalachian Region PTTC

Newsletter

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CONTENTS:

From the Director's Desk 1
Well Tender Workshops a Big Success, More to be Offered 3
3-D Seismic for the Appalachian Basin 4
Reservoir Characterization Experts Offer Solid Advice 6
AAPG-SPE 2003 Eastern Meeting on Track, Watch for Announcement 9
AAPG Announces Election Results, New Slate 9
American Gas Association: 2002 Gas Reserves Level or Slightly Down 10
Potential Gas Committee: U.S. Had 65 Year Supply in 2002 11
WV Plans Series of Energy Opportunities Workshops 12
Energy Session at NE-SE GSA Meeting 13
***Natural Resources Research* Journal Seeks Papers 13**
Interested in Carbonate Reservoirs? Check this Out. 13
Affordable, Effective Technologies are Available for Independents 14

FROM THE DIRECTOR'S DESK...

Is summer finally here? Last month I conceded that I would have to wait until the "official" date, the one in fine print on the calendar, before it warmed up, but now I find myself wondering when will it dry up? I hope that the heavy rain and flooding that we have experienced on more than one occasion in West Virginia has not had a big negative impact on your field operations. But, if it's too wet and muddy for you to work around the well sites or play golf, feel free to come indoors to one of our workshop offerings!

Last week, we held a core workshop at the Peek 'n Peak Resort near Findlay Lake, NY that was well attended. We thank Brad Gill and the folks at IOGA-NY for allowing us to be a part of their annual summer meeting. I'm sure that Taury Smith and Rich Nyahay put on a good show. In August, we are scheduling two additional **Well Safety for Well Tenders** workshops, August 26 in Bremen, Ohio and August 28 in Indiana, Pennsylvania. Matt Vavro and Roger Willis did a great job with two of these in April, and today the PTTC Board of

Directors is discussing using this model for workshops in other regions. But we were first.

On September 10 we will wrap up the historic first-of-its-kind combined AAPG-SPE Eastern Meeting in Pittsburgh with a workshop on **Subsurface Fluid Pressures and their Relation to Oil and Gas Generation, Migration and Accumulation**. Our instructor, Fred Meissner, has examples from the Trenton and Clinton plays that he will present.

Technically, I cannot sign service agreements for workshops beyond September 30, when our current PTTC contract with DOE expires, but DOE has confirmed their intent to sign a 5-year contract extension soon, so we are moving ahead with plans for additional workshops in October. One of these will be a cooperative effort with the Ohio Oil & Gas Association and the Ohio Geological Society to put on **carbonate well log interpretation and reservoir characterization of carbonates in the Appalachian basin** workshop on October 6 at the Easton Hilton in Columbus. Another will be a workshop on **oil and gas data**: how to collect, organize and use it, and how to find it a few years later when you need it again. And a third October workshop will be taught by Ron Surdam, as we have mentioned before in this newsletter. Watch our website for details.

I also would like to alert you to a combined meeting on October 29 and 30 at the Stonewall Resort & Conference Center near Roanoke, WV (that's WV, not VA). This is not an official PTTC event, but I have been working with a Steering Committee that is organizing four energy-related workshops in WV, so I want to let you know what they have planned. The one scheduled for October 29 is on **Coal Bed Natural Gas**, and will be followed the next day by the Fall meeting of the **Coal Bed Methane Forum**. Details will be available later, but for now, I refer you to a short summary below.

Finally, I want to remind you for the last time about the **AAPG-SPE 2003 Eastern Meeting**, which will be held in Pittsburgh, September 6-10 at the Hilton. The PTTC Appalachian Region has been actively involved in this effort, recruiting papers on field studies and hosting one workshop as a co-sponsor. This meeting has a solid technical component, and what should be a fun-filled social side as well, featuring a casino cruise on the Three Rivers. For details, go to the Eastern Section AAPG portion of the PTTC website, or directly to www.aapg-spe-2003.org. And, if you are looking for entry-level geologists or engineers, remember the first **AAPG Eastern Section Student Job Quest**, that has been expanded to include petroleum engineering and environmental geology students, as well. This event will begin with a reception for students and company interviewers on Saturday night, and will continue with student posters and interviews on Sunday. And, as I mentioned in my last column, I hope that those of you who teach geology, petroleum engineering or education in a northeastern college or university, will pass the word along to your students to read more on the meeting website. Again, the address is http://www.aapg-spe-2003.org.

Before I end this, I would like to acknowledge that several of the articles that follow are based on contributions from Lance Cole and Cathy Calkins. I appreciate their efforts. Cathy began as a 9-month replacement for Mark Hoffman last November while Mark was on assignment as an Interim Project Director with another division at NRCCE. Cathy's appointment runs out at the end of July, and I would like to thank her for her many contributions and wish her well in the future. She certainly tried to keep me on track, which is no small task! Also, I would like to announce that Mark will return to the PTTC team this month. Many of you will see him in Pittsburgh in September at the AAPG-SPE Eastern meeting. Thanks again, Cathy, and welcome back, Mark.

WELL TENDER WORKSHOPS A BIG SUCCESS, MORE TO BE OFFERED

In an effort to step out-of-sync with the more common trend to provide technology transfer information for the professional geologists and engineers in the office, PTTC decided to host workshops that the "guys in the field" would also appreciate.

Matt Vavro, a well-known, regionally-located consultant specializing in field training, coordinated these workshops with PTTC. The workshops were so well received that more than a hundred hopeful registrants had to be turned away due to a lack of space!

The workshops began with a team presentation by Roger Willis, of Universal Well Services and Matt Vavro. Their presentation covered safety issues, hazards and other aspects of the industry, and with "hands on" guidance, demonstrated how being "safe on the job" can enhance company productivity. Lunch break! A BBQ of brisket, slaw, etc. was prepared by the vendor, Balon (How did they make that brisket so tender?).

After lunch, workshop attendees broke into smaller groups and rotated to ten different stations to see, question, discuss and learn about new equipment and technology. Vendors like: Natco, Dearing Compression, EDI and more... focused on safety issues, the proper handling of their equipment, and encouraged interactive discussions with the attendees.

Participating well tenders noted that the presentations and displays increased their understanding of the industry, and for some, howthe equipment functioned. They also expressed their appreciation for the workshops being made available to them and requested more
of the same. Some noted that even their operators and supervisors would benefit from seeing how, "it really works in the field".

A demonstration on remote or electronic tending systems was available at these workshops. With more and more operators switching to remote or automated well tending, the demonstration on this technology was appreciated.

Some workshop participants noted how remote wells could affect the communities in which those wells would be located; and if representatives from these communities also attended the workshops, perhaps communities could develop more confidence in the industry's handling of safety issues that effect all concerned.

If a workshop like this interests you, more are being planned for this summer. Keep your eye on our website calendar for more details coming soon!

- contributed by Cathy Calkins

3-D SEISMIC FOR THE APPALACHIAN BASIN

Dr. Bruce Hart, a well-known geophysicist from McGill University in Montreal, Canada came to West Virginia University on March 6th to present a workshop that focused on the use of seismic data for exploration and development of hydrocarbon resources. He began with a quick survey of various techniques currently used for acquiring, processing and interpreting seismic data, including a review of standard techniques and an update on new technologies.

Seismic processing and interpretation are used extensively by larger independents, but often are considered beyond the means of smaller companies. The recent advent of a number of low-cost seismic software programs to increase the speed and efficiency of processing and assist the operator to interpret the data is a bonus to the independents operating in the Appalachian Region. This workshop focused on learning how to plan and understand seismic data, what software applications are available and how to use them.

Dr. Hart emphasized early in the workshop that in today's rapidly expanding technology market, the key for independents to understand and interpret geology is to "Go Digital!" The number of new, improved and advanced seismic processing and interpretation methods may be bewildering to some independents, but the one clear direction is that all information will be easier to use because of advances in digital technology.

The majority of seismic surveys performed in the past have concentrated on P waves. Therefore, the workshop began with an introductory segment during which he defined and illustrated a number of seismic terms including: acoustic impedance, velocity, density, amplitude, phase, frequency and bandwidth. A series of slides was used to show how P waves reflect from different structural and stratigraphic components. A final seismic image will be a record of all of the individual reflections from a specific location.

Not all changes in lithology imaged by seismic waves are associated with a change in acoustic impedance. For example, changes in fluid content within a single lithology can cause different reflections. It is important to remember that in seismic images the changes observed are interfaces and not the direct properties of the stratigraphic layers themselves. Resolution of seismic data is proportional to the frequency content. Higher frequencies yield better resolution results, just as broader bandwidths give cleaner images.

The two fundamental controls on determining if a stratigraphic bed will be visible on seismic reflections are the bed thickness and the contrast of the acoustic impedance with the surrounding layers. The frequency content of seismic data affects both the resolution and the apparent seismic stratigraphic relationships.

The methods used for acquisition and processing have a major impact on the final seismic image. Interpretation of seismic images should start with the design of the seismic survey, because no matter how good the processing, it cannot compensate for poor acquisition of data. Survey design needs to take into account: marine versus land grids, the signal to noise characteristics associated with the surface sediment, and environmental factors such as vegetation, animal life and urban or rural buildings. Land access

and the permitting process are major factors in seismic acquisition, which often is a compromise between what is desired and what can be afforded.

It is important to have a clear understanding of the purpose of seismic interpretation as it changes from project to project over time. Knowledge of the capabilities of available software and how these can be applied is necessary to achieve the desired end product. Also, understanding the "big picture" of an area is useful in placing constraints on the broad-scale structural setting. Certain interpretation problems are common to particular areas, such as steeply dipping strata in mountainous regions. Complex faulting can be misleading, particularly at great depth. Digital data offer great benefits over paper seismic traces, including the ability to manipulate the data, flatten curves, change scales and color displays, integrate map data with log data and try various post-stacking processing methods.

Although 2-D seismic data are still used, and reprocessing technology has made it possible to use old data, most projects will benefit from initial 3-D seismic survey technologies, in the view of the speaker. 3-D seismic provides more complete surface and subsurface coverage and allows for better visualization. Computer analysis of 3-D seismic data allows for multiple viewing methods; cubes, slices, stacked sequences and vertical transects. Horizontal slices or amplitude maps can only be obtained from 3-D data and are useful to show lateral variations in lithology, porosity, fluid content, thickness or geological features. Modeling and reservoir simulation are dependent on 3-D data.

Seismic attributes are a derivative of basic seismic measurements of geometric, kinematic, dynamic or statistical features. Amplitude images can be used to show faulting between multiple horizons, through changes in lithology, fluid content, porosity or bed thickness. Complex trace attributes are based on reflection strength and are used to interpret instantaneous passes, which are independent of amplitude. Instantaneous phase use is valuable in looking at continuity of units, faults and picking horizons and subtle changes in waveform.

Correlation methods depend on linear, non-linear, single variable or multi-variate regression; geostatistics, including co-kriging; and artificial intelligence using neural networks and fuzzy logic. Quantitative attribute analysis may be ported directly to simulators and can give insights into geology, if the data input is high quality seismic, and the log data have reasonable correlations between well and seismic data. Inversion techniques were developed to derive rock properties (acoustic impedance, velocity, porosity) from seismic data.

Multi-component seismic uses data collected by the generation of both P and S waves. Some rock bodies are invisible to P waves but may be imaged by S waves. Multi-component seismic also can be useful in identifying fractured reservoirs.

Coherency relies on observation of events that are similar or "coherent" on each side of a fault, but where the traces are different (low coherency) from one side of the fault to the other. By quantifying the coherency, it is possible to identify faults and other structural or stratigraphic features. The coherency approach was originally developed by Amoco and then spun off as Coherence Technology Corporation.

Surface related attributes fall into three main categories: surface-associated, surface-rendered and surface-derived or horizon attributes. After the main faults and structural features have been identified, there may remain areas that cannot be

defined. Horizon attributes can be used to locate these subtle structures that may affect production. Several specific software packages are available to interpret horizon attribute curvature and illustrate relationships.

Several examples of the uses and interpretation technologies for 3-D seismic were introduced and discussed. In one case, interpretation problems in the fractured reservoirs of the Mesaverde Group included poor data quality, complex stratigraphy, lack of sonic logs, no checkshot surveys and a focus on structure. This case study showed that subtle structures can be identified using various horizon attributes.

A second case study discussed application in the Red River Formation in the Williston basin. An interval-based approach to seismic attributes was used to image the porosity relationships. Attributes were picked to overcome deficiencies in the poorly understood log-seismic ties in the middle Red River Formation, where fluid flow along fractures due to dolomitization controlled porosity. This resulted in use of seismic attributes to image diagenetic systems, something
that is new and very important to ensure that all statistical, geophysical, geological and engineering aspects are in agreement in final models.

In conclusion, the keys to success with 3-D seismic are: good quality data; an integrated and accurate database; multidisciplinary integration from acquisition planning to reservoir management; clear understanding of the capabilities and limitations of the methods and software used; and insight - asking the right questions.

- contributed by Lance Cole

RESERVOIR CHARACTERIZATION EXPERTS OFFER SOLID ADVICE

Roger Slatt, former Director of the Rocky Mountain PTTC Region, and Sandra Mark, current Director of the region, presented a two-day workshop on reservoir characterization, with special emphasis on the various environments of deposition and computer software that is available to assist independents in this exercise.

Dr. Slatt began by endorsing the definition of reservoir characterization in AAPG Memoir 71: “the process of creating an interdisciplinary high-resolution geoscience model that incorporates, interrelates and reconciles various types of geological and engineering information from pore to basin scale.” Dr. Slatt added “geophysical” between geological and engineering to complete the definition for today’s work environment.

Of all of the factors affecting recovery, reservoir architecture is considered to be the key element. Architecture includes lateral

continuity, vertical connectivity, the overall geometry, the stacking pattern of individual sandstones and the overall size of the reservoir. For these reasons, one can expect a high diversity even within reservoirs in a given depositional environment.

Understanding reservoir character can add a great deal to the bottom line. As an example, Bob Sneider's success story, as related in the May 2001 AAPG Explorer, was summarized. During the 1980s downturn, Sneider's company turned from exploration to property acquisition after deciding to purchase property based on five main traits, all involving accurate reservoir characterization. As a result, 46 mature fields were purchased, and more than 625 MMBOE were added at a cost of $2.69/BOE.

Well logs can be correlated keeping in mind either lithostratigraphic or chronostratigraphic interpretations. It is necessary to have an idea of the environment of deposition of the reservoir before you begin to enable you to predict what is happening in the interwell areas. The problem is predicting reservoir compartmentalization at the sub-seismic scale.

Geology and seismic resolution often are not at the same scale, and reservoir performance is governed by features that are often below seismic resolution or detection, i.e., at the "sub-seismic scale."

"Roger's Rules of Reservoir Characterization" were referred to throughout the day. These 7 rules are: think small; think in terms of the rocks instead of paper or screen images; think in terms of numbers; seeing is believing; computers are tools, not brains; "Where oil is first found in the minds of men (and women)" - Wallace Pratt; and "Sweat the asset" - Andrew Cullen.

Compartmentalized reservoirs are the rule, not the exception. However, compartments can be predicted for interwell areas at some level of detail if you have a knowledge of the geology. One began to get the impression that most of our maps and interpretations are too simple, too generalized to be realistic.

To understand geologic controls on porosity and permeability, one first needs to understand how measurements are made. In our own work here in the basin we have noticed what Dr. Slatt reviewed next: that permeability values from whole core, core plugs and mini-permeameters show a wide numerical range. However, certain lessons can be learned. Porosity and permeability are controlled by grain size distribution and sedimentary processes; porosity and permeability are modified by diagenesis; permeability is more sensitive to grain size variations than is poroisity; and gross interval porosity can be mapped seismically.

The determination and characterization of flow units is essential. Lessons learned in this area include reservoirs can be characterized by a combination of geological and petrophysical properties; modified Lorenze plots reduce variables and quantifies zonation for simulation; and the neural net is useful for developing permeability logs for flow unit zonation, but core is required for careful calibration.

Sequence stratigraphy can be used as a predictive tool. Recognition of condensed sections, and what they mean, is critical, and can be done in core, outcrop and the subsurface using a variety of tools, including facies analysis of outcrop and well logs, biostratigraphic analyses and seismic stratigraphy.

After taking the group through numerous examples of case studies from reservoirs indifferent depositional environments, Dr. Slatt

summarized the workshop as follows: compartmentalization is the rule, not the exception; in the real world we must be able to predict between well bores; reservoir performance is governed by factors at the sub-seismic scale; even with 3-D we still ask why; the trick is to accurately predict away from the wellbore, and to do this we need to understand reservoir architecture; Roger's Rules still rule; engineers and geologists think differently; some individuals think small, but others think in terms of team; if you are happy with what you've always done, you will always get what you've always got; and we can have a good future.

Following Dr. Slatt's portion of the workshop, Dr. Sandra Mark, a self-described reservoir geologist who now embraces computer geology for small to medium independents, gave a presentation based on her experience and questions that have been asked of her over the years. She began by saying, "To implement what Roger has been saying, I suggest you use computer technology."

If you do not currently use computers in your reservoir work, they can "open your eyes to new possibilities." Participants were promised that at the end of the afternoon they would have an appreciation of free and low-cost software and data resources that can help them use a computer for reservoir characterization work.

Four good reasons to use a computer include: ability to process a large volume of data quickly and easily; perform mathematical operations on data; accommodate changes during the interpretation process; and visualize three-dimensional features. Of these, the ability to make changes during the interpretation process is of prime importance.

Dr. Mark spent the rest of the afternoon giving examples of software options for a variety of uses. For each use, she made comparisons based on a 100-well program so that participants could compare costs equally. Those present appreciated the fact that she had personally looked at all of the software that she mentioned, and had a first hand knowledge of what it could do, how friendly it was, and the relative costs.

She particularly made a plug for the use of neural networks, stating that "it will revolutionize how we analyze things." She also gave locations of free simulators, like the Colorado Oil & Gas Conservation Commission website which has a simulator for coal bed methane reservoirs.

Dr. Mark strongly recommended producing electronic reports rather than printed reports. Clicking on a figure reference in the text will cause the figure to "pop up," so the reader only needs a browser.

In conclusion, Dr. Mark suggested investing in a PC for less than $2000 and a software "starter kit" that offers mapping and cross section capability for approximately $2100. Her studies have indicated that by using these tools, you could save as much as $19,200/year. Therefore, don't cut corners by depriving your geologists of their tools.

AAPG-SPE 2003 MEETING ON TRACK, WATCH FOR ANNOUNCEMENT

The Planning Committee for the AAPG-SPE 2003 Eastern Meeting has finalized all technical and social arrangements for their September 6-10 meeting at the Hilton Towers in Pittsburgh. At least three concurrent technical sessions, plus a poster session, will be available at all times on Monday and Tuesday, with 75 total talks to be presented. In addition, a student poster session will be held on Sunday prior to the Opening Session & Awards Ceremony, as part of the first ever Eastern Meeting Student Job Quest.

Field trips will be run on Sunday and Wednesday, and five workshops will be held on Saturday, Sunday and Wednesday, including one sponsored by PTTC on Wednesday.

Social events include the traditional Icebreaker on Sunday night, a mini-breaker late Monday afternoon, and the Casino Cruise on the three rivers that follows. The cruise will feature dinner, music, a magician and casino-style gambling leading to drawings for prizes.

During the Sunday afternoon Opening Session & Awards Ceremony, the Eastern Section of AAPG will honor members who have distinguished themselves through service, technical presentations, or contributions to the science of geology.

George Eynon, Chairman of the AAPG House of Delegates will host an HOD breakfast on Monday, and ES President Hannes Leetaru will chair the annual ES business meeting and luncheon, also on Monday. SPE will host a similar business luncheon the same day.

The traditional AAPG All-Division luncheon will be replaced this year by an All-Convention luncheon, during which SPE will honor their members with their annual awards. The luncheon speaker will be David Houseknecht, who will discuss Alaskan North Slope basin analysis and resource assessments.

Opportunities still exist for potential exhibitors and sponsors to be part of this meeting.

Registration has begun, and early registration ends August 15th. For further details, and to register on-line, go to www.aapg-spe-2003.org.

AAPG ANNOUNCES ELECTION RESULTS, NEW SLATE

AAPG Executive Director Rick Fritz has announced the new Executive Committee for 2003-2004. President Stephen Sonnenberg, Treasurer Paul Weimer, HOD Chairman George Eynon and Editor John Lorenze will be joined by three newly- elected officers: President-Elect Pat Gratton from Dallas, TX; Vice President Erik Mason from Houston, TX; and Secretary Bob Countryman from Tupman, CA.

AAPG also announced eight candidates for national office. These candidates will visit the various section meetings from now until the election ends on May 15, 2004, so look for them in Pittsburgh this September. They are: for President-elect, Peter Rose, Austin, TX and Alfredo Guzman, Veracruz, Mexico; for Vice President, Ben Hare, Houston, TX and Neil Hurley, Golden, CO; for Treasurer, Pierce Pratt, New Port Richey, FL and Kay Pitts, Bakersfield, CA; and for Editor, James Handschy, Houston, TX and Ernie Mancini, Northport, AL. Mancini is the Regional Lead Organization Director for PTTC's Eastern Gulf Region.

AMERICAN GAS ASSOCIATION: 2002 GAS RESERVES LEVEL OR SLIGHTLY DOWN

The AGA has developed estimates of reserve additions and replacement of annual production for 15 years. These estimates are made by examining the reserves activity of 30 large reserve holders in the United States, including several (Dominion, Devon, Equitable, Nisource, Cabot) that operate, at least to some extent, in the Appalachian basin.

Natural gas reserve additions are composed of new gas from extensions and discoveries and revisions of previous estimates, including improved recovery through application of new technology. For 2002, new gas additions, from extensions and discoveries, were 7.3 Tcf among the 30 companies, which is less than the 10.0 and 9.4 Tcf reported in 2001 and 2000, respectively. If the 2002 performance of the 30 largest reserve holders is indicative of the nation as a whole, then additions will probably be less than 2002 production.

The 30 companies used in this survey generally account for about 50% of all domestic gas production in a given year. In 2002, natural gas production for these companies was 9.4 Tcf, and overall production was estimated at 19.0 Tcf. Since 1990, production has increased 10.5%, from 17.2 Tcf in 1990 to 19.0 Tcf in 2002. Two companies (BP and ExxonMobil) produced more than 1 Tcf, with BP's share 7% of U.S. production.

Reserves are replaced when additions to reserves on an annual basis equals or exceeds annual production. In the U.S., reserves replacement was more than 100% from 1994 through 1997, and again from 1999 through 2001. Thus, our reserves increased in each of those years. However, for 2002, if the 30 companies used in this sample are a good indication, then reserves replacement remained level or decreased slightly.

The 30 companies used in this AGA report increased their natural gas reserve holdings slightly from 96.6 Tcf in 2001 to 97.2 Tcf in 2002. However, the total domestic reserves estimate inventory based on the 30 large reserve holders may decrease slightly from the current level of 183.5 Tcf, according to the AGA.

POTENTIAL GAS COMMITTEE: U.S. HAD 65 YEAR SUPPLY IN 2002

The Potential Gas Committee recently released their report on the "Potential Supply of Natural Gas in the United States" with resource estimates through December 31, 2002. Whereas the AGA report referenced above deals only with reserve estimates, the stated objective of the PGC is to "provide estimates, based on expert knowledge, of the potential supply of natural gas, which, together with estimates of proved reserves of natural gas, make possible an appraisal of the nation's long-range gas supply."

The report's bottom line is that the domestic natural gas resource base, including proved reserves, was 1,311 trillion cubic feet (Tcf) at the end of 2002. If all of those resources were developed, according to the committee it would equal 65 years of supply at current rates of production.

Excluding proved reserves, estimated to be 183 Tcf by the USGS, leaves 1,127 Tcf of gas resource, which includes 169 Tcf in potential coal bed reservoirs. Compared to year-end 2000 figures in the last report, the traditional resources increased 2.4% and the coal bed natural gas resource increased 8.8%. Both resource values increased even while approximately 39 Tcf of domestic gas were produced during the two years.

Discussions of the natural gas potential for each of 89 geologic provinces in the U.S., including Alaska, are presented. For the Appalachian basin, as well as all other basins, resource estimates are reported in three categories of decreasing uncertainty: *Probable*, *Possible* and *Speculative*. For each category, a "minimum," "most likely" and "maximum" resource volume is estimated, expressed in billion cubic feet of gas.

The Appalachian basin is assigned a most likely total resource value of 41,050 Bcf, of which 19,750 Bcf is termed *Probable*, 7,300 Bcf is listed as *Possible*, and the remaining 14,000 Bcf is *Speculative*.

Coal bed natural gas resource estimates also are included in the report, with separate estimates for the Central and Northern portions of the basin that currently have established production. The Central portion of the basin is assigned a most likely value of 2,375 Bcf, whereas the Northern area, including the Pennsylvania anthracite fields, is assigned a value of 10,570 Bcf.

Current coal bed methane and Trenton-Black River play areas are shown on the map of the Appalachian basin and other Atlantic region basins.

The PGC consists of 140 volunteer members from the natural gas industry, government agencies and academic institutions. The functions independently, but with the guidance and technical assistance of the Potential Gas Agency of the Colorado School of Mines. The PGA is partially funded by the American Gas Association and the Gas Technology Institute, and depends on industry and private donations for the remainder of their funding.

The PGC report is now available and may be ordered from the Potential Gas Agency, Colorado School of Mnes, Golden, CO 80401-1887.

Additional information on historical production trends and a forecast for the lower 48 states is available on a companion CD.

WV PLANS SERIES OF ENERGY OPPORTUNITY WORKSHOPS

Those interested in the future of the power, natural gas, wind and related energy industries in West Virginia will have the opportunity to help assess the state's leadership role in a series of workshops recently announced by the National Research Center for Coal and Energy at West Virginia University and the WVU College of Business and Economics, commissioned by the West Virginia Development Office.

The workshops, that will be conducted on behalf of Governor Bob Wise, are an outgrowth of the Governor's Energy Roadmap developed by the Governor's Energy Task Force. In announcing the workshop series, David Satterfield, Executive Director of the West Virginia Development Office said, "We congratulate the Governor's Energy Task Force and its leader, Pat Esposito, for the progress they are making. We are ready to move ahead with recommendations made by the Task Force for workshops focusing on in-depth assessments of renewable energy, coal bed natural gas, hydrogen and our state's energy infrastructure.

Workshop details are being handled by technical program committees comprised of respected leaders in energy including: **Douglas Patchen** of the Petroleum Technology Transfer Council at West Virginia University; **John F. Herholdt, Jr.** from the West Virginia Development Office Energy Efficiency Office; **Tom Lane** of Bowles Rice McDavid Graff & Love; **Clint Hurt** of Clint Hurt and Associates; **Charles Bryer, Randall Harris** and **Curt Nakaishi** from the National Energy Technology Laboratory; **Patrick Esposito, Sr.** of Augusta Systems; **Richard A. Bajura** and **Trina Karolchik Wafle** of the National Research Center for Coal & Energy at WVU; **Calvin Kent** of the Marshall University Lewis College of Business; **Mark Burton**, also of Marshall University; **Tom Witt** and **Patrick Mann** of the College of Business and Economics at WVU; **Corky DeMarko** of the West Virginia Oil and Natural Gas Association; and **George Blankenship** of Allegheny Power.

Partial funding for the series is being provided by the U.S. Department of Energy. For more information, or to register, visit the workshop series website http://www.WVEnergyRoadmapWorkshops.org.

- contributed by Trina Karolchik Wafle

ENERGY SESSION AT NE-SE GSA MEETING

The PTTC Appalachian Region has been contacted by the Technical Program Committee for the combined Northeast-Southeast Geological Society of America meeting to assist them in developing an energy session as part of their program. The combined sectional meeting will be held March 25-27, 2004 in Washington, DC. This is an opportunity to expose geology students and professors throughout the eastern U.S. from Maine to Georgia with the energy industry in eastern basins.

It also is an opportunity for independents in the eastern seaboard to attend a meeting they usually would not consider attending.

NATURAL RESOURCES RESEARCH JOURNAL SEEKS PAPERS

Dan Merriam, Editor-in-Chief of the joint IAMG-EMD (International Association of Mathematical Geologists-Energy Minerals Division of AAPG) journal, *Natural Resources Research*, is in need of high-quality, scientific papers on any aspect of natural resources. If this publication is to continue as a viable journal, topnotch papers by leading experts in their field and at the "cutting edge" of science are needed. Of particular interest to EMD are papers in the various "commodity" areas, i.e., coal, coal-bed methane, gas hydrates, gas shales, tar sands, geothermal, etc.

If any of you, especially those of you who work for state surveys, universities or the USGS, have a paper to contribute, contact Dan Merriam at dmerriam@kgs.ku.edu. Let's all try to keep this technology-focused journal alive.

INTERESTED IN CARBONATE RESERVOIRS? CHECK THIS OUT.

The Ohio Geological Society and the Ohio Oil & Gas Association, in conjunction with the PTTC, will present a workshop on October 6 for those of you who have an interest or are currently involved in oil and gas production from carbonate reservoirs. Dan Hartman, from DJH Enery Consulting, will present a one-day workshop on "Carbonate Well Log Interpretation and Reservoir Characterization in the Appalachian Basin."

The workshop instructor will lead participants through an investigation of carbonate pore systems and their porosity-permeability characteristics; investigate carbonate well log interpretation techniques to characterize lithology; and integrate pore systems information with well log interpretation with actual production.

For the more engineering oriented, the course will cover the determination of lithology from density-neutron plots and mud logs; understanding Archie Sw for carbonates, suing proper Rw, and adjusting for cementation exponents for pore types; and using Sw depth plots to identify rock quality and net pay by flow units.

Dan Hartman received his B.S. degree in geology from New Mexico Tech in 1963, and then joined Pan American (now BP) where he worked in various capacities in the western united States and Alaska. From 1981 to 1985 he served as Vice President/General Manager for Mitchell Energy, before forming DJH Consulting. His company specializes in exploration/exploitation consultation and education for the oil industry.

AFFORDABLE, EFFECTIVE TECHNOLOGIES ARE AVAILABLE FOR INDEPENDENTS

PTTC's West Coast Region developed two sessions titled "Independent's Day" for the recent combined meeting of the AAPG Pacific Section and the SPE Western Region in Long Beach. RLO Directors from several regions teamed with Independents to present examples of technology applications that are working across the country.

The focus of the sessions was on encouraging participants to learn from the experience of their counterparts in other parts of the United States. Dr. Iraj Ershagi, PTTC's West Coast Region Director, challenged independents to become familiar with and apply available "smart well" technologies. However, to do this, it may be necessary for operators to change their mindsets about how they have been doing business.

Major operators in large fields have employed smart well systems, and in doing so, they have reduced well costs and improved recovery. Technology improvements are bringing the cost and complexity down. The goal is to change from episodic or reactive management to continual, real time, proactive management. This requires monitoring parameters soon enough, and frequently enough, so that early warning signs are seen and changes can be made to prevent failures.

Mark Reedy, Global Energy Partners, presented examples form a recent study about reducing power consumption in old oil wells. The study found that nearly 50% of the wells could benefit from optimization. However, for changes to occur, old mindsets about continuing to operate "as is" versus investing for efficiency must be changed.

Opportunities for power cost reduction falls into electrical and mechanical categories. Key steps include examining motor efficiency, installing pump-off controllers, combating gas interference, monitoring performance and reducing water production.

Bob Kiker, PTTC's Permian Basin Director who recently taught a workshop for us in Ohio, described how operators in West Texas are changing their wellbore management programs to reduce well failures by as much as a factor of 10. Supported by several case studies, operators have found that structured programs requiring all those involved to work closely in teams with defined accountability can have dramatic results. Open

sharing of preferred practices, or "what is working" is quite common in the Permian basin, which only aids these structured programs.

Modern reservoir simulation technology is user-friendly, PC-based, powerful and robust. This enables companies to get results quickly, resulting in more reservoirs being modeled and simulation results being used to aid in near-time decisions.

Jim Erdle, Computer Modeling Group, made the point that even for majors, the historical practice has been only to perform reservoir simulation in "core" assets. But, that practice is changing. He noted that one engineer with a major had, in just one year, simulated 25% of the profit center's reservoirs. Over a two-year period, an estimated 7 million BOE of reserves had been added. In another example, Erdle noted how simulation helped an independent make a timely decision about the level of steam injection during California's energy crisis in the winter of 2000-2001. A proven simulation model was on hand, so the operator's consultant could quickly perform "what if" scenarios. The operator cut back steam injection, saving $6.7 million within six months, and changes were made with the confidence that long-term adverse impacts had been minimized.

Old plays can have new life with new technologies. Rodney Reynolds, PTTC's North Midcontinent Region Director, who also taught the recent Ohio workshop on produced water problems, described how larger volume gel polymer treatments using MARCITsm technology and Gas Gunsm solid propellant stimulation treatments are increasing production in Kansas's very mature Arbuckle producing areas.

Reynolds noted that, since early 2001, more than 150 producing wells had received large gel polymer treatments. Similarly, more than 50 operators had stimulated nearly 150 separate wells with GasGunsm treatments with about one-third of those being in the Arbuckle. Overall results with both technologies have been very positive.

New plays, like the Trenton-Black River in the Appalachian basin, thrive on new information and data. Doug Patchen, PTTC's Appalachian Region Director, has organized several workshops, drawing more than 600 attendees. Free flow of information and interplay among participants has favorably influenced the evolution of exploration, drilling and completion concepts. There is consensus on future R&D and technology needs and a multidisciplinary study involving several regional organizations and multiple industry partners has been proposed to DOE.

DOE's oil and gas R&D program through the National Energy Technology Laboratory often plays a role in development and demonstration of technology, as they would be if the above Trenton-Black River proposal materializes. (Editor's note: DOE has chosen this proposal for funding.) Providing evidence of the impact of DOE support, Gary Walker from NETL's National Petroleum Technology Office in Tulsa shared case studies from recent programs, primarily the Class Program. As a point of interest, DOE also was involved in one way or another in the immediately following examples about through-casing resistivity logging and horizontal drilling in Michigan.

Through-casing resistivity logging took a long time to develop, but once commercialized by Schlumberger with its Cased Hole Formation Resistivity log (CHFR), usage has increased rapidly in California with more than 250 jobs. In the California geological environment, with alternating zones of oil and water or zones where current oil saturations may be different than

original, having current resistivity data is critical.

Bill Harrison and Robb Gillespie, who represented the Michigan Satellite of PTTC's Midwest Region, presented a timeline of Michigan basin horizontal drilling activity. From the 1st horizontal well in 1982 through 1994, only 66 horizontal wells were drilled. Beginning in 1995, and at least partially fueled by a DOE-supported demonstration project, activity increased significantly and the reservoir targets/applications expanded. Activity, although fluctuating, has remained high and early 2003 data indicate that current levels are remaining very strong.

Fifty percent of Michigan horizontal wells have been for redevelopment in known oil and gas fields. Exploration and gas storage account for another 20% each. The Niagaran reef is by far the most common target, representing 59% of all horizontal wells. Other prominent reservoirs include the Antrim Shale and "Michigan Stray" sandstone. Follow up conversations with those attending PTTC horizontal drilling workshops (2001-2003) indicate the presented technology insights and data resources of the Michigan Basin Core Research Laboratory have helped maintain the strong momentum.

The session ended with a presentation by Sada Joshi, Joshi Technologies, Inc., who summarized overall experience with horizontal wells in the U.S.(SPE 82621). Through December 2002, there were about 17,300 horizontal wells, with 43% of them in the Austin Chalk, followed by the Red River Formation in North Dakota. Overall, Joshi outlined nine application environments. The majority of U.S. wells are in carbonate reservoirs, contrasted with international experience where use in clastic reservoirs is most common. His assessment is that the current commercial success rate for U.S> horizontals is 65%, although he did note that success rate generally improves as more wells are drilled in a given formation in a given area. Horizontal drilling costs might be 1.5 to 2.5 times higher than vertical wells, but finding costs for many horizontal projects are 25% to 50% below costs of buying proved reserves. With higher productivity, operating costs on a $/bbl basis for horizontals can be half or less than that experienced by vertical wells.

Presentations from this session can be viewed on-line at www.westcoastpttc.org/presentations/02-03/52203/afternoonindex.htm.

- article submitted by Lance Cole