Happy New Year

September 30th marks the end of PTTC’s fiscal year and of course the end of the federal fiscal year as well; and so ends grant funding around the nation provided under the American Recovery and Reinvestment Act of 2009 (ARRA); PTTC’s funding was provided through the Department of Energy. This ARRA funding has allowed PTTC to team with Applied Petroleum Technology Academy (APTA) and more-limitedly with AAPG to bring carbon capture, utilization and storage (CCUS) training to industry for the past four years. In concluding the project, PTTC’s Dr. Dwight Rychel led PTTC in co-hosting a workshop in Midland earlier this month that provided training to over 30 professionals, and featured a lunch speech by Chuck McConnell, former Assistant Secretary for Fossil Energy (See article on page 10). This workshop, follow-up white papers, and website enhancements will serve to summarize the project. You can learn more at the website at www.permianbasinccs.org.

More History... As PTTC turns 20 in a few months, this important CCUS project reminds us of the many organizations with whom we have partnered. In addition to the constant support of DOE’s National Energy Technology Laboratory and Independent Petroleum Association of America’s start-up support, the Gas Research Institute (now GTI), provided several years of early funding to foster technology transfer in the area of natural gas. There was a heavier weight at that time in PTTC’s funding from the oil programs within DOE, and GRI balanced our focus—which allowed our topical array to meet the industry needs more completely. Like many other organizations, GRI also sat on the PTTC Board of Directors and offered experience and organizational knowledge that was needed by the fledgling corporation. This is but one example of the many connections PTTC made with industry.

Technology transfer is accomplished through communication and the network of participants that are formed. These relationships with other organizations were early tools that PTTC used to build its services. With over 200 committed members of our voluntary Producer Advisory Groups (PAG) around the country, PTTC was a true grassroots organization. Each PAG was spearheaded by a Chairman that sat on PTTC’s Board of Directors, and brought the opinions, questions and needs to PTTC’s staff regularly.

PTTC was unique; it was a partnership with many organizations that brought together government and industry in a positive, collaborative fashion. There were not for profit industry associations, state universities and geological surveys, industry professionals, and the federal government, working closely to investigate the needs of the domestic oil and gas industry and then find solutions to offer to industry. The valuable feedback of industry needs was reported through PTTC back to the government, that could then find and fund research projects to respond to the specific needs. PTTC could also meet industry needs through its regional, focused technology workshops.

After the series of Problem Identification workshops in the mid nineteen-nineties, PTTC hit the ground running with cost effective technology transfer workshops that met the identified regional needs in the [then] ten regions. The idea was to hold inexpensive workshops directly in the region, keeping the travel cost down and allowing small producers to attend a workshop without missing valuable time on the job. Another strong aspect of the early program was the PTTC Resource Center. Resource Centers were physical spaces in either universities or geological surveys whereby industry professionals could “walk in” and get information. Much of the “walk in” traffic, was actually virtual, accessing the PTTC RLOs via email, web connections, and telephone; but the dedicated RLO professionals connected folks daily to solve problems. By the end of 2003, after 10 years of service, PTTC had made over 98,000 personal contacts through its regional and national offices, responding to assorted industry needs.

PTTC continues these traditions today, with a heavy focus on the economical workshops that are our trademark. Rather than regional centers, PTTC has web-based informational tech centers that focus on varied industry sectors. See our regional notes and updated activity calendar in this edition of Network News for more information on our upcoming events. PTTC will also be enhancing its website, so please visit us in the next quarter to see the results, www.pttc.org.

EOR Focus

Enhanced Oil Recovery is the focus of the PTTC 4th quarter newsletter. The timing is appropriate as a multi-year contract on Carbon Capture, Utilization and Storage (CCUS) is coming to an end. The major emphasis for PTTC has been to demonstrate the value that EOR technologies for Carbon Dioxide flooding can provide as a benefit to carbon capture, which was originally addressed primarily as an environmental compliance issue.
Carbon dioxide CO₂ flooding has increased significantly is the past five years. Researchers and operating companies in the Permian Basin have been saying for some time that the limiting factor in producing more oil is the lack of natural CO₂. The pipeline system connecting sources in Utah and north Texas is transporting CO₂ at capacity, and new projects or expansions in the Permian Basin are looking for new resources. Two new power plants are in the development stage. They will provide anthropogenic CO₂ to the Permian Basin, and their future production was committed before ground was broken last year.

Once—almost the exclusive domain of the Permian Basin—the use of CO₂ to improve oil recovery efficiency has expanded rapidly in the eastern Gulf Coast and in the northern Rocky Mountains. One company, Denbury Resources, has been behind much of the expansion. Denbury controls the Jackson Dome in Mississippi and has been pushing the CO₂ distribution line from Mississippi, across Louisiana and into East Texas. Denbury’s pipeline system connects the Jackson dome and other natural CO₂ sources with several power plants and anthropogenic sources to a series of fields that are benefitting from CO₂ flooding. The tie-in to anthropogenic sources is a progressive move to capture carbon from these sources, reduce greenhouse gas emissions and provide a new source of CO₂ for oil field development. Denbury is also building CO₂ pipelines across northern Wyoming to supply a number of fields in Wyoming and Montana.

The Research Partnership to Secure Energy for America (RPSEA)’s Small Producer program has been involved with several research projects that address EOR technologies. Projects exploring new EOR technologies chemical flooding as well as CO₂ flooding gave presentations in Wichita, KS in June, in Houston (Sept 25) and will be presented in Long Beach, CA on October 17th. (See ad on page 3). Some of the research highlighted in these workshops involve new compression applications for wellhead production, radial-jet well stimulation, environmentally friendly EOR processes, new concepts for maximizing production from the giant East Texas field, and designs for surfactant-floods using multiple single well tests. The RPSEA Small Producer program places an emphasis on research to help independent producers with new ideas and novel strategies. It demonstrates that smaller operating companies can both develop innovative - higher risk - concepts, and look at old fields and technologies and tweak them to increase production in ways that large major corporations can’t effectively manage to do.

# Upcoming Events

PTTC’s affordable regional workshops connect independent oil & gas producers with information about various upstream solutions. For further information, check PTTC’s online calendar [www.pttc.org/national_calendar.htm](http://www.pttc.org/national_calendar.htm) frequently as changes do occur.

## OCTOBER 2013

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<td>PETRA - Intermediate Mapping -- Golden, CO.</td>
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<td>Midwest:</td>
<td>How to find bypassed pay in old wells using DST data; Including selecting tight oil zones to re-drill with horizontal wells -- Traverse City, MI.</td>
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<tr>
<td>10/17</td>
<td>PTTC HQ:</td>
<td>RPSEA Onshore Production Conference: Technological Keys to Enhance Production Operations -- Long Beach, CA.</td>
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<td>11/19</td>
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## DECEMBER 2013

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<tr>
<td>12/3-4</td>
<td>Midcontinent:</td>
<td>Mississippian Production - What have we learned? -- Wichita, KS.</td>
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<tr>
<td>12/10</td>
<td>Rocky Mountain:</td>
<td>Well Bore Integrity throughout its Life Cycle -- Golden, CO.</td>
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ONSHORE PRODUCTION CONFERENCE: Technological Keys to Enhance Production Operations

October 17, 2013 | Long Beach, CA
The Grand Long Beach Event Center

Benefits and agenda of the conference are available on the website.

ENERGY DAY: Education for the Energy City

October 19, 2013 | Houston, TX
Hermann Square, City Hall
www.energydayfestival.org

Please visit our booth to get a hands on experience with a RPSEA project.

ULTRA-DEEPWATER TECHNOLOGY CONFERENCE

October 29-30, 2013 | The Woodlands, TX
Lone Star Corporate College, Star of Texas Ballroom
www.rpsea.org/en/cev/465

Presentation topics and speaker details are available on the website.
RESERVOIR & WELLBORE SCALE GEOMECHANICS LONG BEACH
October 8, 2013
The Grand in Long Beach, CA

October 10, 2013
DoubleTree Hotel in Bakersfield, CA

Presenter
Dr. Michael Bruno is President of GeoMechanics Technologies (formerly called Terralog Technologies USA), which specializes in providing advanced geomechanics analysis services from the wellbore to reservoir scale. He holds a PhD in Civil Engineering from the University of California, Los Angeles, and has more than 25 years of research and operations experience in the oil and gas industry. His areas of expertise include fundamental rock mechanics, fracture mechanics, compaction and subsidence analysis, well damage analysis, caprock integrity, and induced seismicity. Dr. Bruno is a past Distinguished Lecturer for the Society of Petroleum Engineers on compaction and well damage issues, a past Review Chairman for the SPE Reservoir Evaluation and Engineering Journal for Geomechanics and Geophysics, and a current Fellow of the American Society of Civil Engineers.

Course Description
The workshop is intended for technical personnel desiring to obtain basic knowledge on reservoir and wellbore scale geomechanics.

Course Outline

Theoretical Background
- Fundamentals of Rock Deformation and Stress
- Stresses in the Subsurface
- Stress changes and deformations induced by drilling and production operations
- 1D and 3D Earth Models with Geomechanical Properties

Reservoir Scale Geomechanics I
- Compaction, Subsidence, and Well Damage
- Faulting, fracturing, and induced seismicity

Reservoir Scale Geomechanics II
- Thermal Geomechanics
- Caprock Integrity Analysis

Wellbore Scale Geomechanics
- Wellbore Stability and Solids Production
- Hydraulic Fracture Mechanics and Simulation

Registration and Payment
The workshop fee of $160 includes workshop, materials, refreshments, and lunch. Please register online and then make payment on this site using PayPal, or made by check to “PTTC,” or you can contact us by phone with your Discover, Visa or MasterCard only. PTTC West Coast, 5100 California Ave Suite 200, Bakersfield, CA 93309-0726 Phone: PTTC West Coast at (661) 635-0556.

Sponsor
We are pleased to have Pacific Gas and Electric Company as a sponsor. To find out how PG&E’s team of energy efficiency experts can help your oilfield, pipeline or refinery meet today’s energy challenges visit, [www.pge.com/industrial](http://www.pge.com/industrial).

TENTATIVE 2014 WORKSHOPS
Cementing
BOPE Training
Advanced Cementing
Source Rock 101
Designing and Operating Waterfloods
Thermal Recovery
Drilling Engineering 101
Open Hole Logging
February
March
April
May
June
August
September
November
Colorado Operators Work to Overcome Front Range Flooding

By Mike Seal

Colorado’s Front Range was ravaged by heavy rain and flooding from September 9th to 14th, with 15 counties impacted, more than 11,000 people were evacuated. Cities like Boulder received more rain in a week than they would normally get in a year. The South Platte River had 50 times the flow than is normal for this season. The state’s northeastern plains, home to the Denver-Julesburg Basin, were inundated from rain and the flooding of rivers and irrigation ditches.

Not unexpectedly, this 500 year flood has caused incidents in the oilfields. Anadarko Petroleum reported the release of 323 barrels from a tank farm along the St. Vrain River near Platteville. The St. Vrain feeds into the South Platte which flows across north east Colorado and into Nebraska. A second Anadarko tank farm spilled an estimated 125 barrels into the South Platte River near Mil-Iiken. Absorbent booms were placed to try to contain the spillage. The EPA reported that both releases involved condensate.

State Law requires oil and gas equipment in a flood plain to be anchored to resist flotation, but according to Anadarko, strong water and heavy debris appears to have cracked pipes and manifolds, allowing condensate to escape. The Colorado Oil and Gas Commission (COGCC) stated that in the context of this historic event, these spills are not an unexpected part of many other sources of contamination associated with the flood, including very large volumes (millions of gallons) of raw, municipal sewage and other hazards associated with households, agriculture, business and industry.

A report in the Oil and Gas Journal on September 17th stated that PDC Energy which operates 2,300 vertical and 80 horizontal wells in the Wattenberg Field will suspend gas production operations on September 13 for a limited number of wells, but full production was expected to resume later that week. A spokesman for the company said “As our first concern was for the safety of the employees in the field and to minimize any impact on the environment, we elected to shut-in production sites before they become inaccessible due to road closures and flood conditions.”

The Colorado Oil and Gas Association (COGA) announced that Noble Energy, a leading player in the Niobrara play and the basin’s largest producer, has pledged $500,000 to the American Red Cross Colorado Relief Fund and challenges other COGA members to match it. Interested parties should contact COGA at: match@coga.org Details of the industry’s response to this disaster can be found on COGA’s website at: www.coga.org Houston-based Noble said that two of its wells that were releasing natural gas have been shut down and a third would be shut down once it was safe to access. The company estimates that it has shut down from 5-10% of its wells, and has been monitoring them from the air and ground.

As of September 20th, COGA reported the following: 1500 wells were still shut-in, with hundreds of personnel inspecting and repairing affected sites; no rigs had been impacted in the flood areas and no hydraulic fracturing operations were being conducted at the time of the flood, thus no hydraulic fracturing chemicals were stored on any sites impacted by flood waters. To date, the COGCC is tracking 10 oil releases – two notable, totaling 18,725 gallons of oil have entered into flood waters. Companies are actively completing or have completed remediation of the impacted sites (18,725 gallons represents approximately 4.75 minutes of daily production in this area.)

The COGCC found that some tanks had shifted or moved off pads, but most tanks and well pads were intact. As of September 20th, they reported that nearly 1,900 wells were shut down by the deluge out of 51,000 statewide, but about 300 have since been brought online.

According to the EIA, Colorado’s natural gas production topped 1.6 trillion cubic feet in 2011, about 6% of the nation’s total. 
KU TORP Anytime Talks Offer Technology on Your Terms

KU TORP Anytime Talks offer access to emerging technology and best practices online for your review anytime day or night. Several years ago the KU TORP Technology Transfer division began to explore additional ways in which it could provide independent operators with access to technology and best practices in a non-workshop format. From this process came TORP Anytime Talks.

Virtually every speaker who provides a talk for the KU TORP is recorded and streamed live online. Additionally these talks are edited and made available for purchase to anyone with an internet connection.

The process is simple. Simply visit www.torp.ku.edu and select Store. This link will take you to the front page of the store. Scroll down to TORP anytime talks and you will see every speaker with few exceptions KU TORP has had in the last three years. Topics include Horizontal Drilling and Completion, Production Geology, and Innovations in the use and disposal of Produced Water. Once you select the videos you want you simply add to your cart, check out and within 24 hours you will receive links to the digital video files where you can view the content anytime day or night.

For more information about online video content visit www.torp.ku.edu or call 785-864-7398.

KU TORP and RPSEA Provided Three-Days of content aimed at the Small Producer

Recently KU TORP and the Research Partnership to Secure Energy for America (RPSEA) hosted a three-day event in Wichita Kansas to provide operators with a fresh perspective on existing technology as well as access to technology coming fresh off the research line. The first day’s event address reservoir characterization. Day two focused on waterflood technology. While much of the techniques and technology around waterflooding has not changed over the years, KU TORP industry contacts had been asking for information about this process for their young engineers. Day three of the workshop was conducted in partnership with the RPSEA who provided speakers as part of its small producer program.

Overall the three day event was well received by the regional industry and initial feedback from the event is very positive. Visit www.torp.ku.edu for more information about upcoming events like these in your area.

Mississippi Lime Update

Production, technology, where we are today, what we have learned, where are we headed? In what has been one of the most exciting plays in recent memory the Mississippi Lime has been the talk of southern Kansas and Northern Oklahoma for much of the last two years. While activity in the region is still high there is a debate about whether or not the play is producing they way it originally was predicted, the best way to produce the play, and the future potential of the play. Join KU TORP on December 3-4 at Hyatt Regency in Wichita, Kansas as we bring together the active players working in the Mississippian to present production data, technology, tips and techniques being used today to make the most of this significant discovery. Registration is $500 and includes program manual, certificate of attendance, daily food and beverage, and parking at the Hyatt. To register go to www.torp.ku.edu.

APPLIED RESERVOIR GEOLOGY FOR THE NON-GEOLIGIST

November 1, 2013 | Houston, Texas

Instructed by Ken Wolgemuth

This course covers the essential elements of reservoir geology for anyone involved with managing and producing oil and gas fields.

This one day discussion includes key focus on the depositional environment impact on the size and shape of a reservoir, where the better quality reservoir rock is located, the origin and complexity of barriers to flow, what influences the variations to porosity, permeability, and irreducible water saturation, and the pore system that affects recovery factor.

Register http://appliedresgeology-eorg.eventbrite.com

COZ RESERVOIR SIMULATION SOFTWARE - DESIGNED WITH SMALL OPERATORS IN MIND

November 19, 2013 | Tulsa, Oklahoma

Instructed by Bill Savage

DOE-NETL has recently funded development of a new PC-based reservoir simulator by Denver based reservoir engineering firm, NITEC LLC. The user focus was on small to mid-size operators who may have limited simulation expertise in-house or who may not wish to deal with the cost of commercial simulation software. The simulator was to also focus on application to CO2-EOR field problems in a timely manner. The software (COZ) was released to the public, free of charge in February 2013 and can be downloaded from NITEC's website (www.nitecllc.com).

Register https://cozsoftware.eventbrite.com
Plans for upcoming PTTC workshops in the Illinois Basin focus on a drilling engineering workshop late this fall or early in 2014, and on a Mississippian limestone play workshop for early March 2014. Dates and venues have not yet been established, so watch the PTTC web calendar, or, to add your name to the Midwest’s direct contact list, send an email to Joan Crockett at joan.crocket@illinois.edu.

Most of the recent highlights in drilling activity in the Illinois Basin have focused on horizontal drilling in more conventional reservoirs. In Indiana’s Griffin area, near the bottomlands of the Wabash River in Posey County, vertical and horizontal wells in the middle to lower Mississippian have been drawing attention. Check out Indiana Geological Survey’s interactive petroleum mapping site for details at http://igs.indiana.edu/OilGas. In Illinois, White County is the focus of several new wells. Deep Cambrian tests underway in White County are drawing attention, and vertical and horizontal discoveries and developments in White County in the lower Mississippian Fort Payne have drawn interest. Check out the ISGS’s revamped interactive “ILOIL” maps for more details at www.isgs.uiuc.edu/?q=iloil.

If you have suggestions for programs and speakers you would like to have Midwest PTTC bring to you, we are always open to suggestions. If your area of interest lies in the Midwest PTTC region, and you would like to explore hosting some venues in your area, please contact Joan Crockett at (217) 333-6630 or joan.crocket@illinois.edu.

Howard Bypassed Pay in Old Wells Using DST Data: Including Selecting Tight Oil Zones to Re-drill with Horizontal Wells

October 15-17, 2013 | Traverse City, Michigan

Instructed by Hugh Reid

Who would benefit by attending:

• Geologists, engineers or technologists with at least a year of experience in the oil industry. No prior knowledge of DSTs is required.
• More experienced staff who have looked at DSTs for years but never had a formal course in DST chart interpretation.

Content

A key emphasis of the course is to show how to identify missed (damaged) pay in competitor’s ‘dry’ wells and additional pay in your own producing wells. This is an important skill to complement log skills. This information has proved invaluable in selecting tight or damaged oil zones which will benefit from horizontal re-drills.

Approach

We will use simple practical techniques which can be done without a computer at the well-site or in the office. A step-by-step approach is taken. We are concentrating on pattern recognition, not mathematics. Case histories are provided of wells which have been re-drilled or re-perforated after examining the old DSTs. The completion results and production histories are provided to compare to the old DST results.

The course manual contains over 40 examples of DST charts which can be used for trouble shooting problem DST’s later. It is a permanent reference source.

Register

www.pttc.org/calex_posts/midwest_101513.pdf
Another Shale Play for the Appalachian Basin

A third shale play is being developed in the Appalachian basin, according to a recent announcement by Consol Energy Inc. Consol's first exploratory well in Greene County, PA tested 3 million cubic feet per day from what the company has referred to as the “Upper Devonian,” a black shale a few hundred feet above the more widely-developed Marcellus Shale. Consol joined Rex Energy and Range Resources, two companies who previously had announced success in testing this particular black shale.

Range has drilled four exploratory wells in Washington County, and according to a company release, the wells tested in the range of 4 million cubic feet per day plus another 1000 barrels of liquids. Rex tested approximately 3 million cubic feet per day from their first well, in Butler County, PA.

Other media reports have referred to this new play as the “Devonian Shale play,” but regardless if you call it the Upper Devonian, or Devonian Shale, it actually is the Geneseo or Burkett Shale, black shales that overlie the Tully Limestone in much of the Appalachian basin. The Geneseo Shale is the basal unit in the much thicker Genesee Formation of New York, and is named for exposures in the vicinity of the town of Geneseo in the western part of the Finger Lakes Region. From the type locality, the Geneseo thickens eastward to more than 100 feet in the gorge at Taughannock Falls State Park near Ithaca, NY, and then thins and interfingers with gray shales and siltstones further east. The Geneseo also thins westward, to less than 50 feet near Canandaigua, NY and to a feather edge near Lake Erie.

The black Burkett Shale Member of the Harrell Shale is named for exposures in Virginia and has been traced into surface exposures in eastern West Virginia and central Pennsylvania, where it conformably overlies the Tully Limestone, or eastern equivalents.

From the east-west outcrop trend in New York, the Genesee Shale thins to the southwest in the subsurface, and can be traced on gamma-ray and density logs through Pennsylvania into north central West Virginia. Although the shale is present in southeastern Ohio wells, its subsurface extent is much more restricted than the Marcellus Shale, and in general it is less than 50 feet thick in the developing play area.

Recent PTTC Workshops

The Appalachian Region of PTTC recently hosted three workshops, one on “Innovative Water Management” in Morgantown on August 22, and two in Canonsburg, PA September 4 and 5, featuring talks on “Wellbore Integrity” and “Natural Gas Power for Shale Development.” The first workshop was designed to present the final results of four DOE-funded research projects on using acid mine drainage to fracture Marcellus Shale wells; constructing wetland treatment systems to reduce the environmental impacts of produced water; basin hydrology and water management in coalbed methane wells in the Black Warrior basin; and integrating water resource models with Fayette Shale decision and support systems. Unfortunately, due to a family emergency, the final speaker had to leave before his talk.

PTTC partnered with the Environmentally Friendly Drilling Systems Program managed by the Houston Advanced Research Center to develop and host the two Canonsburg workshops. The wellbore integrity workshops was organized to begin with presentations by state regulatory agencies regarding casing and cement requirements, STRONGER (State Review of Oil and Natural Gas Environmental Regulations), DOE’s National Energy Technology Lab, and the National Park Service, and then move to talks by consultants and service companies dealing with stray gas migration issues, wellbore isolation, proper cement placement practices and well integrity analysis. In the afternoon, speakers presented the results of research on lowering cost and improving operational safety and environmental impact through zonal isolation improvement; developing methods to prohibit and remediate loss of annular isolation in shale wells; well integrity and fracture containment in wells to be fractured; and systematic assessment of wellbore integrity using regulatory and industry information. The workshop ended with a 90-minute panel discussion featuring all 13 speakers and written questions from the audience of approximately 60.

The workshop on Natural Gas Power for Shale Development was designed to present the current thinking on using natural gas to drill and fracture shale wells. The workshop began with several speakers who described the challenge of meeting air quality standards in shale areas, and how converting from diesel to natural gas in the field could assist this effort. The rest of the day featured industry speakers who described recent advances in high horsepower dual-dual technology; LNG fueling systems and logistics; cost-effective well-site management support of energy, environmental and regulatory issues; natural gas fueling solutions for drilling and pressure pumping applications; using natural gas for fracturing operations; reducing the shale development site footprint by using natural gas; LNG adaptation and process change; and drilling rig natural gas technology. Again, this workshop ended with a panel discussing featuring all 13 speakers.

These workshops show how the regional organizations are working with PTTC headquarters to plan and execute technology transfer events. The Innovative Water Management workshop was designed to fulfill DOE requests to highlight environmental projects. PTTC HQ made the speaker arrangements, and the Eastern Region made all the location arrangements and hosted the event. Registration for all three workshops was also handled by PTTC HQ and the workshops were announced on the PTTC National calendar and Tech Alerts to help promote the events. The EFD workshops represent a partnership with the Eastern Region, PTTC HQ, RPSEA and EFD.
$100 million Awarded for Energy Research

On September 30, Secretary of Energy, Ernest Moniz announced that the Department of Energy have proposed $100 million in the FY2014 budget for Energy Frontier Research Centers. The goal of the Centers is “to accelerate the scientific breakthroughs needed to build a new 21st-century energy economy. Research supported by this initiative will enable fundamental advances in energy production and use.”

Currently DOE funds 46 Energy Frontier Research Centers (EFRC’s) under a five year contract funded in 2009, which will expire in July 2014. The FY2014 proposal will open the proposal to existing EFRC’s and extend the opportunity to universities, national laboratories, nonprofit organizations and private companies. The proposal encourages applicants to form multi-disciplinary research teams to apply for the awards. Individual awards will be from $2 to $4 million per year per center for a period of five years. Congress is expected to appropriate $100 million to fund the five year Energy Frontier Research Center program.

Mandatory Letters of Intent to apply are due on Nov. 13, 2013, with full applications due on Jan. 9, 2014. Award selection is expected by June 2014. For full Funding Opportunity Announcement information go to www.fedconnect.net/FedConnect/?doc=DE-FOA-0001010&agency=DOE.

Excerpted from “Energy Department to Award $100 Million for Energy Frontier Research Centers,” http://energy.gov/articles/energy-department-award-100-million-energy-frontier-research-centers

EOR Focus at NETL

Currently the National Energy Technology Laboratory has twenty-seven funded projects conducting research on enhanced oil recovery related topics. The range of research covers all EOR aspects from new fracturing technologies to innovative surfactants and polymers to CO₂ flooding in residual oil zones. New research on nanoparticles and characterization of reservoirs in Texas, Utah, Alabama, Pennsylvania, Illinois and Kansas all are demonstrating new technologies and strategies to enhance oil production from carbonate and clastic reservoirs. Highlights are summarized from a selection of the funded projects.

The University of Texas at Austin is developing a “new generation” hydraulic fracturing model that will, for the first time, provide an operator with the ability to model the simultaneous propagation of non-planar hydraulic fractures from multiple perforation clusters and create a realistic picture of the stimulated rock volume (SRV) around horizontal wells. The model will be used to simulate the performance of different fracturing fluids and fracture designs to maximize the effectiveness of the SRV to increase well productivity, improve estimated ultimate recovery determinations, and reduce overall horizontal well costs.”

The University of Pittsburgh is working on small molecular associative carbon dioxide thickeners “to test the effectiveness of a compound (CO₂ thickener) that can induce very large changes in CO₂ viscosity at typical injection and reservoir conditions associated with Carbon Dioxide Enhanced Oil Recovery (CO₂-EOR).”

NITEC, LLC of Denver is developing a “full-featured, user friendly, carbon dioxide (CO₂) enhanced oil recovery (EOR) and sequestration planning software system that will allow small- to mid-sized field operators to design and optimize CO₂ EOR and sequestration operations in a short time frame.”

White River Technologies, Oregon is designing and developing “a real-time, semi-autonomous geophysical data acquisition and processing system using electromagnetic technology to monitor carbon-dioxide (CO₂) flood performance.”

New Mexico Institute of Mining and Technology/Petroleum Recovery Research Center, Socorro, NM are performing core flood tests and using nanoparticle-stabilized CO₂ foam to improve CO₂ sweep efficiency and minimize particle retention in the reservoir.

Researchers at the University of Texas at Austin are also working with nanoparticles. The “goal of this project is to develop a new CO₂ injection enhanced oil recovery (CO₂-EOR) process using engineered nanoparticles with optimized surface coatings that has better volumetric sweep efficiency and a wider application range than conventional CO₂-EOR processes. The objectives are to (1) identify the characteristics of the optimal nanoparticles that generate extremely stable CO₂ foams in situ in reservoir regions without oil; (2) develop a novel method of mobility control using “self-guiding” foams with smart nanoparticles; and (3) extend the applicability of the new method to reservoirs having a wide range of salinity, temperatures, and heterogeneity.”

The University of Texas at Austin is developing an advanced reservoir simulation and visualization tool for compositional flow and transport coupled with geomechanical deformation in porous media, with advanced mobility control methods such as foam, to better model and predict oil production during carbon dioxide (CO₂) flooding and improve predictions of oil production from residual oil zones.

Two projects at The University of Texas Permian Basis are focused on understanding residual oil zones (ROZ). The goal is “to optimize the technical and economical performance of a residual oil zone (ROZ) carbon dioxide (CO₂) flood and transfer the knowledge to other operators. The objectives are to (1) characterize the main pay zone (MPZ) and ROZ within the ROZ pilot area; (2) conduct laboratory analyses and reservoir simulations to evaluate the performance of the ROZ pilot flood; and (3) provide recommendations for an optimum field wide expansion of the CO₂ flood in the ROZ and MPZ at the Goldsmith Field.”

University of Alabama at Birmingham is studying Carbon Dioxide-Enhanced Oil Production from the Citronelle Oil Field in the Rodessa Formation to “introduce CO₂-enhanced oil recovery (CO₂-EOR) for tertiary recovery from Alabama’s uniquely structured sandstone reservoirs.”

The University of Texas, Austin is developing “mobility control agents using surfactants injected with carbon dioxide (CO₂) rather than with water for CO₂ enhanced oil recovery (CO₂-EOR) in heterogeneous carbonate and sandstone reservoirs.”

For additional information go to the project summaries posted on NETL website www.netl.doe.gov/technologies/oil-gas/Projects/oil-projectsummaries.html.
Overview of the Elements of CO2 Enhanced Oil Recovery (EOR) and the Carbon Capture, Utilization and Storage Workshop held in Midland

The Permian Basin Carbon Capture, Utilization and Storage (CCUS) Training Center, a collaboration of PTTC and Midland-based Applied Petroleum Technology Academy (APTA), conducted a high level one day workshop on September 18th in Midland, Texas. The topic “Overview of the Elements of CO₂ Enhanced Oil Recovery (EOR) and the Carbon Capture, Utilization and Storage” was designed for the audience, the Permian Basin SPE Young Professional and AAPG Young professional groups, many of whom are engaged in Permian CO₂ projects. The presenters were Steve Melzer, Bob Kiker and Bob Trentham of APTA; Dwight Rychel of PTTC; and Ron Wackowski of Wackowski Consulting.

Topics included:

- EOR, CCUS and the Permian Basin Industry Overview
- CO₂ Sources and Properties of CO₂
- Transportation and Metering
- Reservoir Response to CO₂
- Key Elements of Reservoir Geology
- Downhole and Production Equipment Needs
- Fundamentals of CO₂ Recycling, Plants and Processing
- Convergence of Carbon Management and the Business of CO₂ EOR

A special luncheon guest, former Assistant Secretary of Fossil Energy (U.S. Department of Energy) Charles “Chuck” McConnell spoke on a wide range of topics. They included the obvious economics of utilizing CO₂ EOR, as opposed to saline aquifers, as a means of permanently storing CO₂, which reduces imports, generates revenue for industry and government and provides thousands of jobs; the need for industry to take the lead in expanding CCUS technology and application, versus relying on Washington; and the promise of the industry young professionals to take the lead in that effort.