

ENERGY ENTERPRISE

WINTER/SPRING 2013



School of Energy Resources

EVENTS

Coming up

April 17

The Nexus of Water and Energy Symposia
By Invitation

April 18

*Presentation: Encana's EIS for the Moneta Divide
Natural Gas and Oil Development project*
Encana Auditorium, Energy Innovation Center

April 26

*Presentation: Power System Optimization: Getting
the Most Out of the Grid*
Encana Auditorium, Energy Innovation Center

May 11

Commencement

May 17

Energy Resources Council meeting
*Advanced Conversion Technologies Task Force
meeting*
UW Conference Center at the Hilton Garden Inn

August 22

Advanced Coal Technology Symposia
UW Conference Center at the Hilton Garden Inn

August 23

Energy Resources Council meeting
*Advanced Conversion Technologies Task Force
meeting*
UW Conference Center at the Hilton Garden Inn

October 7-9

International Wind Technology Workshop
UW Conference Center at the Hilton Garden Inn

Recent Events

March 23

Energy Resources Council meeting
*Advanced Conversion Technologies Task Force
meeting*
UW Conference Center at the Hilton Garden Inn

March 3-5

State Science Fair
Wyoming Union Ballroom

Dec. 13, 2012

*Powder River Basin Coal: Domestic Challenges
and International opportunities*
Gillette, WY



NEW SER PROGRAM OFFERS CRITICAL TRAINING IN VITAL PROFESSION

When the Professional Land Management program launches at the University of Wyoming in the fall 2013 semester, students will have a unique opportunity to build skills that are needed in the energy sector, particularly in Wyoming.

The program, part of the Energy Resource Management and Development bachelor's degree offered through the School of Energy Resources, prepares students through a well-rounded curriculum for accreditation in a profession that plays a vital role in energy development in Wyoming and the West.

"We're very pleased to have received AAPL accreditation," Don Roth, deputy director for academics in the UW School of Energy Resources, says. "It's an opportunity that's available at only a handful of other universities in the country, and it will be an important component of the academic program we offer at the School of Energy Resources."

MESSAGE FROM THE DIRECTOR

For those of you who have toured or will tour our new building, it's clear we could not have accomplished what we have in building a state-of-the-art facility that will support crucial research and learning in the energy field without the help of our partners.

As we prepare for the ribbon-cutting later this year for the Energy Innovation Center, I want to take this opportunity to recognize the contributions of both the UW Energy Resources Council and our corporate partners in what we have accomplished to date.


When the School of Energy Resources was created some seven years ago, the Wyoming State Legislature put in place an advisory board to help the school set priorities in research and outreach. The board members, appointed by the governor, come from the energy industry, state government and the university, and they bring years of knowledge and expertise to their work here on the council. Their experience helps us sharpen our focus on the education and research we do. They understand their industries' workforce requirements, and they know SER scientists and researchers are advancing critical knowledge in the energy field.

Ron Harper has served as chairman of the council since its start and his vision has guided our growth and the scope of our work. Ron came to us as the chief executive officer and general manager of Basin Electric and Basin Cooperative Services. The breadth and depth of his insight into both the challenges and the opportunities that Wyoming and its residents face has been invaluable to us all.

Ron is stepping down from the board this year, and on behalf of the School of Energy Resources, I want to thank him for his thoughtful and dedicated service.

For those of you who have toured or will tour our new building, it's clear we could not have accomplished what we have in building a state-of-the-art facility that will support crucial research and learning in the energy field without the help of our partners. Encana, Shell, BP, Peabody Energy, Arch Coal, WPX, Cordillera Energy Partners, Questar, Marathon Oil, and ConocoPhillips have made gifts of more than \$15 million combined to SER. Their facilities gifts allowed us to secure state matching funds. It's clear that without them, the Energy Innovation Center would not be what it is today.

These corporations are in good company with their interest in the work that will be done here in the months and years to come; they are joined by this university community along with others in the region, our state elected officials, regional and national policy makers and residents all across the state. They all are interested in how we're taking on the challenges of a 21st century energy economy and how we're leading the way in solving those challenges.

If you have not had a chance to see our building, stay tuned for information about our ribbon-cutting coming up later this year. We look forward to celebrating the next chapter in energy research for the University of Wyoming and the School of Energy Resources. 



Mark Northam

Mark Northam

Mark A. Northam
Director, School of Energy Resources

GIFTS HELP MOVE ENERGY VISION INTO ACTION

Three gifts in the first two months of the year will help advance research and expertise in energy programs at the University of Wyoming in the months and years to come, and they signal strong support for the university's focus on energy.

The gifts total \$8.8 million and all three will be matched by state funds; that means \$17.6 million will fuel UW's energy research into areas that are critical to Wyoming's future.

Ultra Petroleum has pledged \$2 million to support research into extraction of energy resources from unconventional reservoirs in the areas of reservoir geomechanics, and hydraulic fracturing, characterization and flow, drilling and completions and improved recovery. Specifically, this program focuses on increasing faculty expertise, research facilities and outreach.

This is the second gift from Ultra Petroleum. In 2009, the company committed \$1 million to fund the Ultra Petroleum Visiting Chair of Energy, the first of its kind at UW in the sciences and engineering disciplines.

Hess Corporation has pledged \$4.4 million to support acquiring state-of-the-art equipment necessary for the Nano Imaging Research Laboratory.

Through the leadership of UW Professor Mohammad Piri, the School of Energy Resources has established a program to investigate the flow of oil and gas through tight shale and sandstone at macro, micro and nano scales. The macro- and micro-scale



laboratories are now in place, and Hess's contribution supports the nano-scale laboratory with the purchase of a nano CT scanner and electron microscope, among other equipment. CT scanners, or computed tomography scanners, use X-rays to create images in cross-section.


ExxonMobil, with its gift of \$2.5 million, will provide laboratory equipment for the university's Improved Recovery Program, which is part of the newly created Center for Advanced Oil and Gas Technologies. The center is one of the School of Energy Resources' Centers of Excellence, and it focuses on oil and gas extraction from unconventional reservoirs, one of its strategic areas of concentration.

Expansion of the Improved Recovery program has

direct implications for the future of Wyoming and its residents, as the state's economy is based on natural resource extraction. Wyoming is believed to hold significant unconventional oil and gas resources. When combined with enhanced production from existing reservoirs, the potential for new and additional jobs and revenues that will benefit the state is apparent.

Executives from all three companies have cited the importance of investing in education and research in fields related to energy for the state, its residents and the energy industry.

UW has embarked on a significant fundraising initiative that also supports the construction of the Energy Engineering Research Facility (EERF), a new building that will provide the space and infrastructure to house and support large-scale research related to energy development, conversion and conservation. Space within this research-focused facility will be designed so that it can be converted to house a variety of projects. To date, \$10.9 million has been raised through corporate partnerships and those donations have been matched with state funds, bringing the total to \$21.8 million. The campaign's goal is \$30 million.

The EERF is tied to the work of the Governor's Energy, Engineering, STEM Integration Task Force, which has developed a strategy for creating a Tier 1 engineering program at the University of Wyoming. STEM is an acronym for science, technology, engineering and mathematics. 

INSIDE THE ENERGY INNOVATION CENTER

Later this year, ceremonies will officially open the Energy Innovation Center (EIC), but here's a quick look at the labs and facilities the center will host, and in some cases, where research is already underway. The completion of these facilities brings cutting-edge technology to Wyoming and puts the University of Wyoming at the forefront of discovery in energy fields.

PEABODY ENERGY ADVANCED COAL TECHNOLOGY LABORATORY

This lab is devoted to analyzing and researching coal conversion technologies. The conversion of low-value fossil resources into higher-value products – advanced conversion – is a key component of the School of Energy Resources strategic plan. The lab supports research in the conversion of natural gas and coal in manufactured products and liquid fuels.

Two early projects for the lab are studying the behavior of coal inside the reactor for better understanding and development of reactors and system designs for coal conversion; and the conversion of synthesis gas from coal to ethylene glycol, with a focus on commercializing processes.

SHELL 3-D VISUALIZATION RESEARCH LABORATORY

This is the first four-walled 3-D visualization lab in Wyoming. It complements the primary function of the center by enabling scientists

and engineers to visualize and interact with highly complex data sets. This visual information technology combines high-resolution stereoscopic projections and 3-D computer graphics to create a virtual environment where researchers can analyze, interpret and share a wide variety of spatially related data.

WPX DRILLING SIMULATOR

This teaching laboratory gives students and educators a fully visualized and interactive simulation experience of drilling rigs. They can explore, test and interact with an extensive array of drilling components. The lab is used for petroleum engineering and geoscience courses and provides students and industry personnel the opportunity to obtain professional certifications.

RESERVOIR CHARACTERIZATION LABORATORY

This facility houses the Hess Nano-imaging Research Laboratory, the world's most modern lab for experimental investigation of multi-phase fluid flow through porous media. It encompasses the most advanced high-resolution 3-D X-ray microscope available. The custom-designed equipment enables researchers to obtain ultra-high resolution nano-images of porous media. The 3-D maps generated from that information can be used to more accurately characterize and model flow and fluid occupancy in reservoir rocks.

This is the central research laboratory for the Center for Fundamentals of Subsurface Flow, one of the SER Centers of Excellence.

The experimental research and complex data generated in this laboratory can be viewed and analyzed in the Shell 3-D Visualizations Laboratory using the computational abilities of UW's Advanced Research Computing Center as well as the NCAR-Wyoming Supercomputing Center.

UW and visiting researchers will gain tremendous advantages in performing multi-scale, multi-phase fluid flow in porous media with applications in oil and gas recovery from conventional and unconventional reservoirs where they may encounter extremely complicated displacement physics.

ENHANCED OIL RECOVERY RESEARCH LABORATORY

Research in this lab will help producers recover more resources from Wyoming fields, particularly mature fields where more than half of the state's oil remains stranded. A suite of state-of-the-art high pressure, high temperature equipment, such as phase behavior apparatus and gas chromatographs has been installed. The high-pressure, high-temperature coreflood lines along with a visual cell system allow researchers to test and observe the feasibility and stability of various enhanced oil recovery methods with reservoir rocks and fluids.



The work planned for the laboratories and the simulator is being supported by other spaces throughout the Energy Innovation Center.

The Cordillera Energy Partners Reception Area serves as a sitting room, study area and gathering space for visitors, students and in-house professionals. The area is equipped with an interactive 80-inch flat panel digital monitor that shows the EIC's real-time energy efficiency dashboard, virtual building tours, building way-finding information, and a schedule of EIC and university events. It also offers a view into the EIC's computing environment.

The building includes facilities for visiting professionals and researchers from other universities and industry. The Arch Coal Research offices allow visiting scientists to stay long term – anywhere from a couple of weeks to a couple of years – and work with UW researchers, students, and academic professionals. These facilities help fulfill the plans for

collaboration and partnering with experts outside UW.


Recognizing that collaboration is critical to discovery, the EIC includes the BP Collaboration Center, which offers reconfigurable space that provides real-time research and knowledge exchange capabilities to connect UW researchers, academics and industry stakeholders to associates anywhere in the world. Among the features are video-conferencing capabilities, reconfigurable tile walls, audio-visual capabilities, and a large conference room.

The Ultra Petroleum Corporation Student Area offers students a space to study and interact with the EIC. The space is easily reconfigurable to meet a wide range of needs.

The Encana Auditorium can be linked in real time to all the EIC's technical laboratories so students can participate in research efforts conducted in areas of the EIC that are restricted. With its wide range of

audio-visual equipment, the auditorium offers the ability to show 2-D version of images generated in the adjacent Shell 3-D Visualization lab, along with facilities that support multimedia presentations.

The EIC also hosts the Reservoir Characterization Suite, which contains both the Marathon Oil Research Offices and the ConocoPhillips Collaboration Room. The offices give visiting professionals and researchers facilities for short-term and long-term stays, allowing them to work with UW faculty, students and professionals. The collaboration space gives them an opportunity to coordinate and discuss the research projects conducted in the Reservoir Characterization Laboratory.

The Questar Conference Room offers a long conference table, cameras and audio for video teleconferencing and equipment to easily view presentations from computers or laptops. 

TWO UW RESEARCHERS SECURE IN-SITU RECOVERY OF URANIUM RESEARCH PROGRAM AWARDS

Two members of the University of Wyoming faculty and a Colorado State University faculty member have been awarded research grants by the School of Energy Resources through the In-Situ Recovery of Uranium (ISRU) research program.

“The research supported by SER is helping the uranium industry in Wyoming with economic recovery of uranium, groundwater management and treatment, and aquifer restoration. This research helps to ensure safe and efficient uranium recovery that is beneficial to Wyoming,” SER Deputy Director of Research Diana Hulme, says.

The projects, which were awarded a combined \$578,614, will investigate issues related to water management, treatment and disposal; uranium recovery and ore body characterization; and aquifer restoration. The two UW projects are:

- A column Study for Enhanced Bioremediation of In-situ Uranium Aquifers with Varying Levels of Total Dissolved Solids, John Willford, a UW professor in the Department of Molecular Biology, principle investigator
- A Novel One-step Process for Uranium Production Bleed Water to Filter Trace Metals Using Cupric Oxide Nanoparticles, KJ Reddy, a UW professor in the Department of Ecosystem System Science and Management, principle investigator



KJ Reddy



John Willford


SER previously released a similar request for proposals in March 2011, soliciting research on exploration and ore body delineation; ore body characterization and uranium recovery; water management, treatment, and disposal; aquifer restoration; and regulation. In 2011, SER awarded \$826,829 to four proposals, three of which are led by UW faculty.

These projects, as well as those identified in the 2011 proposal process, are expected to be complete by 2015.

The goal of the ISRU research program is to stimulate research and development of technologies for economic recovery of uranium, groundwater restoration, and wastewater management.

Uranium extraction is expected to increase in Wyoming in response to increased value of yellow cake

– the product of uranium solution mining that is used for nuclear energy production. Surface mining of uranium grew steadily in Wyoming from the 1950s to the 1980s, when it dropped precipitously. In the early 1990s in-situ mining of uranium replaced conventional mining, and it has increased in recent years.

The program was created by the Wyoming State Legislature in 2009. It is part of a broader legislative initiative for development of in-situ recovery of uranium in the state. SER has used the legislatively appropriated \$1.6 million to fund both research proposals and outreach efforts. In addition to funding research, SER held a uranium extraction workshop in 2009 and hosted a conference on the technological, scientific, and regulatory issues surrounding uranium production in Wyoming in 2011. 

NEW SER PROGRAM *(continued from page 1)*

To date, the American Association of Professional Landmen has accredited only six other universities in this course of study.

The four-year program's range of study includes mathematics, science, business ethics, problem solving, management, composition and public speaking, economics, risk analysis and negotiation analysis, among other courses. It also emphasizes direct industry experience through internships, collaborations with people already working in the field, and field trips.

The addition of this program at UW is important for several reasons.

It gives students enrolled in the Energy Resource Management and Development degree an additional area of academic concentration to pursue in a state that's the center for U.S. energy development across all industry sectors. At the same time, it will train students for a type of occupation that's in high demand.

Developed with the help of the Wyoming Association of Professional Landmen, the program helps expand educational opportunities at the University of Wyoming in the energy field and helps fulfill the workforce development mission for the School of Energy Resources. In addition to pursuing energy research that addresses the challenges of a 21st century energy economy, SER is preparing students for careers in areas critical to energy development, particularly in Wyoming.




Because the goal is providing the comprehensive type of training and skills that distinguish UW graduates in the workforce, the program has enlisted the guidance of an external advisory board of professionals in energy land administration to strengthen the focus of the requirements of the industry.

"We're very proud of the work done in collaboration with the University of Wyoming, and we feel this new program will fill a continued need for creating an educated workforce in the profession throughout the greater Rocky Mountain Region and across the country," Marc Strahn, president of the Wyoming Association of Professional Landmen, says.

Professional land managers have a vital role in maintaining sound

stewardship of energy and mineral resources. They are able to take on a number of tasks necessary for energy development. They can determine ownership and title of surface and subsurface rights, negotiate leases with landowners and develop and administer mutually beneficial contracts and royalties with the help of corporate legal staff to allow exploration and production. They can also coordinate activities connecting landowners and exploration and production companies, ensure compliance with government regulations, and collaborate with project stakeholders.

This particular program will give students a comparative advantage in Western energy issues such as split estate questions, the interface of public-private domains and Native American concerns. 

AS A VISITING PROFESSOR, ANDRIKOPOULOS TEACHES AND LEARNS

When Shaun Andrikopoulos started his term as the Ultra Petroleum Visiting Chair in Energy Management at the University of Wyoming College of Business, his workplace was unlike any he'd had to date.

"It's very different from the corporate world – the culture, the environment and the pace at which things get done," Andrikopoulos says. "You can take your time and think about things."

Andrikopoulos has spent more than two decades assembling a career portfolio that includes senior executive and entrepreneurial positions in the oil and gas, manufacturing and investment banking industries.

As a member of the College of Business's advisory board and most recently as the chairman of its Strategy and Governance Committee, Andrikopoulos advocated for developing and launching an energy MBA program at the university as a core area of distinction.

"A university can't be all things to all people," he says. "It should

develop core areas of competency."

His time is divided between teaching second-year MBA capstone strategy course in the College of Business; working with Brent Hathaway, dean of the College of Business, the Wyoming Business Council and the Wyoming Business Alliance to establish a Wyoming Business Hall of Fame to recognize Wyoming business leaders, both living and historical; and exploring how to expand energy management programs. That could include creating an energy executive MBA program to accommodate the schedules of working executives who want to continue their educations without stepping away from their careers.

With his unique skills Andrikopoulos brings to his students a good understanding of the skills they need to be successful in their careers, including how to evaluate information and present it in a useful and practical way.

But while he's teaching, he's also learning.



Shaun Andrikopoulos

"I have found that many students are resourceful in how they approach their education and their career," he says. "They have learned how to be good critical thinkers. They come back with solutions or insights that I and case study authors had not considered."

Andrikopoulos says he's surprised at how much he enjoys teaching students at this level. "I have been very fortunate to take this time out to do this. I have begun to encourage my industry peers and friends to do the same thing when the time is right in their careers."



STAY TUNED

Plans are under way for celebrating the opening of the Energy Innovation Center. For information, please visit www.uwyo.edu/ser.