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NEWSLETTER

SPRING 2026

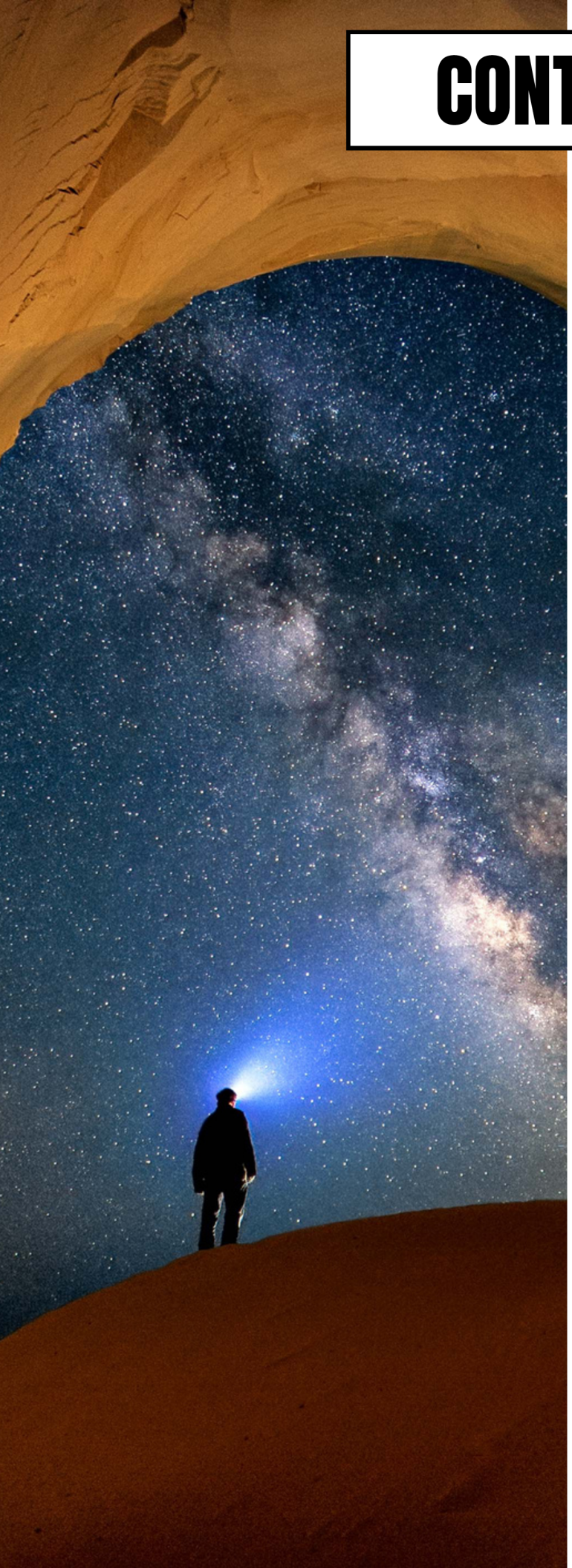
MESSAGE FROM THE DIRECTOR
MILIND DEO, PH.D.

KRISTIE MCLIN, PH.D. APPOINTED DIRECTOR OF RESEARCH AND SCIENCE OF UTAH FORGE

EGI PARTICIPATION AT UTAH ENERGY WEEK

NETL-MANAGED PROJECT UNLOCKS POTENTIAL OF UTAH'S PARADOX BASIN TO RESHAPE THE ENERGY LANDSCAPE

EGI Energy & Geoscience Institute
UNIVERSITY OF UTAH



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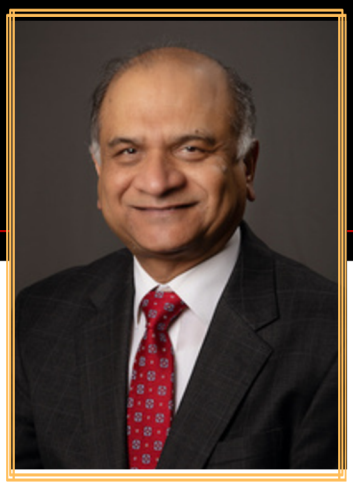
EGI MESSAGE FROM THE DIRECTOR



Dr. Milind Deo,
EGI Director and Peter D. and Catherine R. Meldrum Professor of Chemical Engineering

Greetings from the Energy & Geoscience Institute, and best wishes for a successful 2026!

EGI continues to evolve and innovate in the energy space. Our longstanding strengths in oil and gas and geothermal research are complemented by expanding efforts in energy and carbon management, critical minerals and hydrogen, and grid resilience. As energy systems become increasingly interconnected, expertise in integrating diverse energy sources with robust transmission and grid management is essential—particularly to meet both the everyday energy needs of communities and the rapidly growing demands of data centers.

Multidisciplinary research is more important than ever in today's competitive funding environment. With this in mind, EGI made the strategic decision late last year to relocate from Research Park to the University of Utah's main campus. EGI is now centrally located in the Intermountain Network and Scientific Computing Center (INSCC) building, providing new opportunities for faculty, staff, and students to collaborate with colleagues across campus on interdisciplinary projects and initiatives.

Utah FORGE (Frontier Observatory for Research in Geothermal Energy) has successfully demonstrated the circulation potential of an enhanced geothermal system capable of generating electricity at commercial scale, under the leadership of Dr. Joseph Moore. I am pleased to announce that Dr. Kristie McLin has joined EGI as Director of Research and Science. Prior to EGI, Dr. McLin served as Director of Subsurface Technology Development at ConocoPhillips. She holds a Ph.D. in geology from the University of Utah, as well as a B.S. in geology and an M.S. in geochemistry from the New Mexico Institute of Mining and Technology.

Dr. McLin will serve as the new Principal Investigator for the Utah FORGE research project. Dr. Moore, who guided the project from its inception to its current status as the world's only full-scale field laboratory for enhanced geothermal systems, will scale back his role while remaining actively engaged.

EGI continues to diversify and strengthen connections across the energy landscape. This is reflected in the articles featured in this issue, including assessments of unconventional oil production potential in Utah, strong participation in Utah Energy Week, offshore exploration projects, and the emergence of the Utah Center for Renewables, Efficiency, and Workforce. We are especially proud of our affiliated faculty and scientists who continue to receive well-deserved recognition for their work. Congratulations to Julie Sieving on receiving the Lifetime Achievement Award from the Utah Chapter of the Association of Energy Engineers, and to Dr. Kristine Pankow, who has been named the 2025–26 Distinguished Lecturer for the Continental Scientific Division of the Geological Society of America. Please see the newsletter for additional recognitions.

The University of Utah also offers a Resilient Energy Certificate program, coordinated by EGI. Many of the courses are available to industry professionals. We encourage you to contact us with any questions about the program.

Please stay in touch, and we look forward to welcoming you to our new campus location.

DR. KRISTIE MCLIN APPOINTED DIRECTOR OF RESEARCH AND SCIENCE AND PI OF UTAH FORGE

The Energy & Geoscience Institute (EGI) at the University of Utah announces that Dr. Kristie McLin has joined as a Director of Research and Science. She also serves as the new Principal Investigator of the Utah FORGE research project.

Dr. Joseph Moore, who has steered the project from its inception to becoming the world's only full-scale field laboratory to advance technologies and de-risk tools needed for enhanced geothermal systems (EGS) will take on an emeritus role.

"I'm delighted to be back home at the University of Utah," Dr. McLin said. "I earned my Ph.D. here under Dr. Moore, and I've benefited first-hand from his vision and dedication. The geothermal efforts he has led at EGI are advancing not just Utah FORGE but the industry in general. This is an exciting time to be so deeply involved with geothermal energy." While mentored by Dr. Moore, Dr. McLin studied fluid-rock interactions in geothermal and contact metamorphic systems. Since then, the two have collaborated on various projects, including an analysis of fluid boiling effects on scale mineralogy and geochemistry of the vapor and liquid phase at the Dixie Valley geothermal field.

Dr. Milind Deo, EGI Director, added, "We are so pleased to have Dr. McLin join our team. She is a welcome addition to our already deep bench of researchers and scientists. I'm excited to see her advance our geothermal expertise and the Utah FORGE project to the next level.

We are also grateful for everything Dr. Moore has done for EGI over the past 30 years, and wish him the best in his well-deserved retirement."

Prior to joining EGI, Dr. McLin served as Director of Subsurface Technology Development at ConocoPhillips. She holds a Ph.D. in geology from the University of Utah and both a Bachelor of Science in geology and a Master of Science in geochemistry from the New Mexico Institute of Mining and Technology. Hailing from Albuquerque, New Mexico, Dr. McLin enjoys the outdoors and is actively involved in Scouting America in her family. She currently serves as a Crew Committee Chair in the Venturing program. She credits her own outdoor adventures as a scout to sparking her desire to become a geologist.

"I cannot think of a better candidate to take over the reins of Utah FORGE," said Dr. Joseph Moore about McLin's appointment. "She was a brilliant student and has enjoyed an impressive and successful career making her exceptionally suited for this position. As I step away from the everyday activities involved with running this project, I am pleased to know it is in such good hands."

Energy & Geoscience Institute
THE UNIVERSITY OF UTAH
OVER 50 YEARS OF RESEARCH EXCELLENCE

EGI PARTICIPATION AT UTAH ENERGY WEEK:

EGI EXPERTS SHARED THEIR KNOWLEDGE WITH HYDROCARBONS, GEOTHERMAL AND ENERGY EFFICIENCY AT THE 3-DAY EVENT

EGI Director and Professor of Chemical Engineering Dr. Milind Deo spoke about the current state of the hydrocarbon energy sector at the *Traditional Energy Landscape* breakout session.
In this panel, leading scientists, industry professionals, and government experts explored the current state of the hydrocarbon energy sector, as well as the latest hydrocarbon research and technology and its potential for enhancing production, improving efficiency, reducing environmental impact, and better integrating hydrocarbons with renewable energy sources.

Principal Investigator of The Utah FORGE Project Dr. Joe Moore, spoke during the *Geothermal* breakout session. Geothermal technologies offer vital energy solutions that are available around the clock with minimal environmental impact. However, these resources currently meet only a fraction of both U.S. and global energy demands. In this panel, experts from the scientific community and industry discussed the rapid advancements in geothermal exploration and technology, including enhanced geothermal systems.

Dr. Masood Parvania, Director Utah Smart Energy Laboratory at the University of Utah, spoke on the *Electronic Transmission Resilience and Expansion* panel. The electric transmission system has served reliably for over a century. However, it is now under growing strain—threatening to hinder affordable economic growth. Addressing the rising demand for electricity will require a combination of strategies: evolving electric markets to better optimize system use, streamlining permitting processes, identifying innovative funding mechanisms for capacity expansion, while enhancing grid safety, reliability, and resilience. In this panel, experts shared their insights on the actions needed to ensure transmission remains a cornerstone of our electric future.

Dr. Kody Powell, Associate Professor at the University of Utah, spoke on local energy needs during the *Efficiency, Affordability, Access, & Reliability* breakout session. Meeting local energy needs necessitates satisfying the following criteria: efficiency, affordability, access, and reliability. This panel discussed practical solutions, with an emphasis on timelines, resource availability, challenges, and opportunities. The goal was to ensure that attendees leave the event equipped with actionable insights and recommendations that will move Utah forward in advancing its energy initiatives.

NETL-MANAGED PROJECT UNLOCKS POTENTIAL OF UTAH'S PARADOX BASIN TO RESHAPE THE ENERGY LANDSCAPE

A research and development project managed by NETL with the University of Utah and industry partner Zephyr Energy plc has unlocked the potential to produce significant volumes of natural gas and oil in eastern Utah's Paradox Basin, providing the nation with a new source of plentiful energy from a region rich in hydrocarbon resources but challenging to develop.

"In the oil and gas industry, the Marcellus shale formation in the Appalachian Basin and the Permian Basin in the Southwest are among the top U.S. producers," said NETL's Stephen Henry, project manager. "This project, near the community of Green River, may reshape the energy landscape because it addresses challenges that have stood in the way of developing the northern Paradox Basin, which is a significant but largely untapped source of oil and gas."

To unravel the structural complexities of the basin, the project team began work in 2019 to complete an extensive characterization campaign. The work called for drilling, coring and logging of a dedicated characterization well to collect data and study subsurface conditions.
The foundational work provided a wealth of information that built on existing data provided by Zephyr Energy and other sources that was ultimately combined and assessed to inform well optimization in the Paradox Basin.

Exploration efforts were funded with an $8 million research award under the U.S. Department of Energy (DOE) Office of Fossil Energy and Carbon Management Resource Sustainability, Advanced Remediation Technology program area and a $2 million contribution from project partners.

The project extended beyond the targeted Cane Creek reservoir of the Paradox Basin and revealed the presence of hydrocarbons in previously overlooked stacked play intervals.

The University of Utah, the prime performer under the award, and other team members employed advanced 3D geophysical analysis, enabling improved horizontal drilling strategies, especially in salt-laden zones. Hydraulic fracturing in these zones is challenging because water dissolves the salt, which can result in well instabilities and lead to salt migration and scaling, thereby hindering production.

“Due to such difficulties, only 4% of the total Cane Creek resource has been produced from 37 wells, 26 of which are still active producers,” said NETL’s John Rogers, technology manager, Science and Technology Strategic Plans and Programs.

As part of the project, a comprehensive geological characterization of the Cane Creek reservoir was also conducted, which involved detailed studies of core material and assessments of key properties such as rock porosity, permeability, fluid saturations and source rock potential.

In addition, advanced machine learning models were developed to predict the occurrence of natural fractures and faults and forecast the effectiveness of novel stimulation approaches. The primary objective is to use natural fractures as much as possible as pathways for facilitating the migration and flow of hydrocarbons to the well. From there, tactical stimulation strategies can be used to improve well productivity.

The team used the results of the studies to design two horizontal wells (State 16-2 and State 36-2R).

Building on earlier successes with the State 16-2 well, the more recently developed State 36-2R well is projected to have an estimated ultimate recovery of up to 6 billion cubic feet of gas and 160,000 to 240,000 barrels of condensate (a very light oil primarily used to make fuels such as gasoline).
The well is producing from all three reservoir zones of the Cane Creek reservoir, with forecasts suggesting potential well performance that is comparable to the top 6% of hydraulically stimulated horizontal gas wells across key lower 48 onshore U.S. plays.

The U.S. Geological Survey estimates mean undiscovered recoverable oil and gas resources from the Cane Creek play of more than 1 billion barrels of oil equivalents, making the development of these sizable resources an important step to maintain U.S. energy dominance and independence.

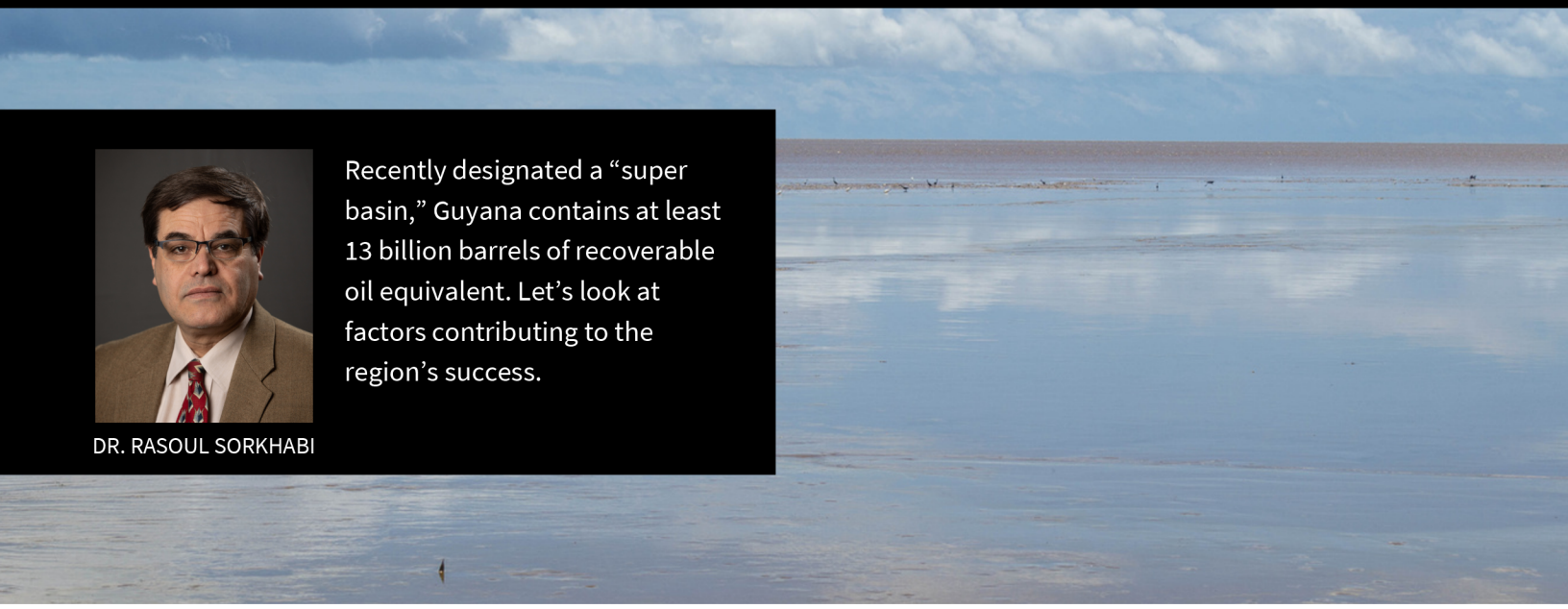
The success of the project and the State 36-2R well marks an important step forward in unlocking the potential of the Paradox Basin and offers a model for approaching the development of other complex, unconventional resource plays.

NETL is a DOE national laboratory dedicated to advancing the nation’s energy future by creating innovative solutions that strengthen the security, affordability and reliability of energy systems and natural resources. With laboratories in Albany, Oregon; Morgantown, West Virginia; and Pittsburgh, Pennsylvania, NETL creates advanced energy technologies that support DOE’s mission while fostering collaborations that will lead to a resilient and abundant energy future for the nation.

A huge thank you to our outstanding partners— Zephyr Energy plc, Utah Geological Survey, University of Arizona, Brigham Young University —and to project leaders Gregor Maxwell, Brian McPherson, Michael Vanden Berg, Amanda Hughes and Scott Ritter for their vision, expertise, and commitment as we close out this project.

THE RISE OF THE GUYANA SUPER BASIN

Rasoul Sorkhabi, Ph.D., Professor, Research Scientist



DR. RASOUL SORKHABI

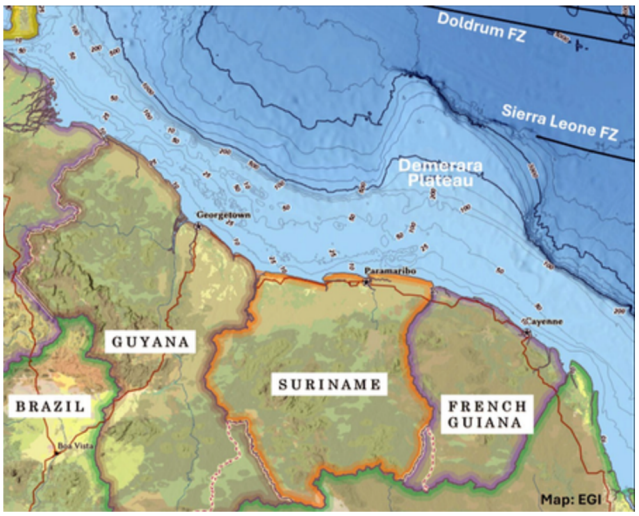
Recently designated a "super basin," Guyana contains at least 13 billion barrels of recoverable oil equivalent. Let's look at factors contributing to the region's success.

This article originally appeared in *AAPG Explorer*

Over the past decade, the Guyana and Suriname basins in the Equatorial Atlantic Margin of South America have witnessed the largest increases in offshore oil reserves growth and production worldwide. Guyana is now on par with established deepwater super basins such as the Nile Delta, the North Sea and Brazil's Santos basins.

TWO RECENT EVENTS HAVE PUT GUYANA IN THE SPOTLIGHT:

- ExxonMobil began producing from its Yellowtail Field using the One Guyana floating storage and offloading vessel in the offshore Stabroek Block. ExxonMobil produces roughly 900,000 barrels of oil per day from the Stabroek Block. The company forecasts it will produce 1.7 million barrels of oil equivalent per day by 2030 from eight developments in offshore Guyana.



- After a year-long legal battle, Chevron completed its acquisition of Hess, which holds a 30-percent interest in the Stabroek Block alongside ExxonMobil (45-percent share) and CNOOC (25-percent share). ExxonMobil and China National Offshore Oil Co. filed arbitration disputes for having pre-emptive rights to purchase Hess' share in the block, but the International Chamber of Commerce sided with Chevron. With its purchase of Hess for $53 billion, Chevron is now a partner with its former rivals in offshore Guyana.

FROM DISCOVERY TO SUCCESS

ExxonMobil's 2015 discovery of the Liza Oil Field in Upper Cretaceous turbidite fans opened a new chapter in the history of oil in Guyana and Suriname. This discovery was made against a backdrop of offshore drills in the 1960 and 1970s. Prior to the Liza discovery, 13 wells were drilled in offshore Guyana, of which 10 had oil and gas shows, and one well, Abary-1 drilled by Shell in 1975, had light crude flow. Nine wells were drilled in offshore Suriname at that time, three of which had oil shows. In 2003, Ocean Drilling Project Leg 207 drilled five sites on the northern edge of Demerara Plateau and encountered Cenomanian-Turonian-age Canje Formation – an organic-rich petroleum source rock deposited under anoxic conditions.

The Stabroek Block has seen 45 discoveries as of January 2025 and has emerged as the most prolific region in Guyana. The success has extended to Block 58 in offshore Suriname where TotalEnergies and Apache discovered the Maka Central, Kwaskwasi and GranMorgu (formerly Sapakara South-Krabdagu) fields. Last year, Total and Apache made a $10.5-billion final investment decision on GranMorgu with recoverable 760 million barrels of oil equivalent. GranMorgu is expected to come onstream in 2028.

In Suriname Block 52, Petronas has made three successful discoveries: Solaenea-1 (2020), Roystonea-1 (2023), and Fusaea-1 (2024). Block 52 is estimated to contain more than 500 million barrels of oil equivalent.

TECTONOSTRATIGRAPHIC TEMPLATE

The Guyana, Suriname and French Guiana basins formed at a triple junction related to the separation of Guyana Craton (South American plate), West African Craton (African plate) and Florida Platform (North American plate) in the Late Jurassic. A failed rift arm, represented by the onshore Takutu Basin on the Guyana-Brazil border and the subsequent Berbice and Maroni paleo-river courses, focused sediment transportation from the quartz-rich Guyana craton into the offshore basins.

The submerged Demerara Plateau – a Precambrian Guyana continental crust capped by Late Jurassic rift-related flood basalts (probably associated with the magmatic activity of the Sierra Leone hotspot 180–170 million years ago) – lies at the base of thick post-Jurassic sediments. Pelagic black shales, notably Canje Formation (equivalent of La Luna source rock in Venezuela), were deposited 100–86 million years ago. Steep continental slopes and associated canyons provided space for massive turbidite sediments and slope-lobe sandstone complexes in Late Cretaceous and Tertiary times.

Currently, most of the oil and gas discoveries are in Upper Cretaceous submarine fans. The Ranger-1 discovery in a Lower Cretaceous carbonate atop a relic volcano in the Stabroek Block indicates deeper plays. Jurassic-age lacustrine or restricted marine plays also probably exist but have not been drilled.

In 2019, Tullow Oil drilled the Joe-1 and Jethro-1 wells in Paleogene slope channel sandstones. The wells encountered heavy oil (10 to 15-degree API), similar to the onshore Tambaredjo and Calcutta fields in Suriname discovered in 1960s.

BRIGHT HORIZONS

Guyana, Suriname and French Guiana have a combined population of just 1.8 million. Oil boom will significantly contribute to their economic development. The submerged Guinea volcanic platform and surrounding basins in West Africa represent the conjugate margin of the Guyana-Suriname basins across the equatorial Atlantic.

SUCCESS FACTORS

Several factors have contributed to discovery successes in Guyana:
Even after the Liza discovery, several dry or uncommercial wells were drilled in Guyana and Suriname. However, this has not discouraged wildcatters and, instead, companies utilized information from the dry wells to better characterize promising prospects.

Turbidite stratigraphic traps are usually subtle and difficult prospects to drill. Companies used advanced seismic stratigraphy to distinguish between water-saturated and hydrocarbon-saturated reservoirs.

The Guyana Basin offers a relatively low cost for oil production. Breakeven costs for oil from the Liza and Payara fields are $25–32 a barrel, compared to $36 a barrel for Brent.

AN INTEGRATED APPROACH TO DERIVE RELATIVE PERMEABILITY FROM CAPILLARY PRESSURE

CARBON MANAGEMENT GROUP

Dr. Nate Moodie sitting at the Civil and Environmental Engineering Booth on the 2nd day of the BIOT conference.

Dr. Nate Moodie, Research Assistant Professor at The University of Utah, recently had the opportunity to present his work on the Pc-to-RP method at this year's BIOT conference held at the University of Utah, titled "An Integrated Approach to Derive Relative Permeability from Capillary Pressure". "It was a great event that brought together so many great minds working on pore-scale and multiphase flow processes", says Dr. Moodie.

The discussions around surface tension, relative permeability, and multiphase flow modeling were inspiring and reinforced how much exciting progress is happening in this field. Dr. Moodie was able to meet new colleagues, reconnect with familiar faces, and exchange ideas about the challenges and opportunities ahead.

Abstract

Surface tension plays a critical role in controlling fluid flow in porous media. By measuring surface tension interactions under multiphase conditions, relative permeability curves, which describe how multiple fluids interact within a porous media, can be derived. These curves are essential for modeling multiphase flow in subsurface systems, including carbon sequestration, hydrocarbon recovery, and groundwater remediation. Accurate characterization of the distribution of relative permeability in the subsurface is therefore vital.

While empirical formulas for estimating relative permeability from capillary pressure are well established, they often lack the flexibility needed to match laboratory measured data. By expanding on existing methods, we show that both two-phase and three-phase relative permeability curves can be generated directly from capillary pressure data.

In this study, mercury intrusion capillary pressure (MICP) data from multiple lithologies, combined with interfacial tension and contact angle measurements, were used to generate relative permeability curves. These model-derived curves were calibrated against a limited set of laboratory-measured data to identify common fitting parameters. These parameters were then applied to the method to create relative permeability curves from MICP datasets lacking laboratory-derived counterparts, enabling characterization of multiphase flow behavior in a broad range of formations.

NO PAINITE, NO GAIN: ALMOST THE WORLD'S RAREST MINERAL

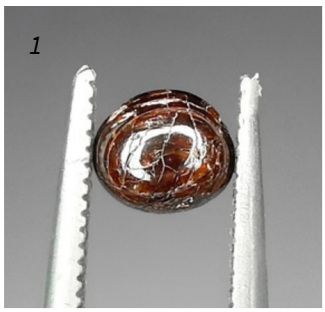
Bryony Richards, Ph.D., Senior Research Scientist

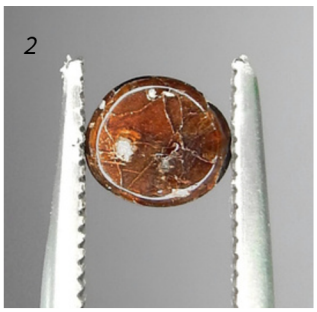
If minerals could file for emotional damage, painite would already be in therapy. Once crowned the world's rarest gem, it now spends its days questioning its worth. A geological case study in imposter syndrome. But at least it's still the world's most expensive lump of "ew, are you sure that's dirt!?"

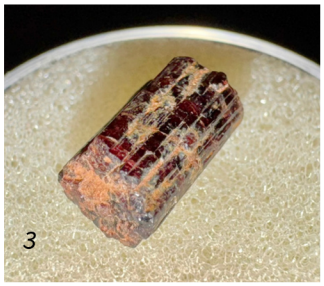
In the 1950s, British gemologist Arthur C.D. Pain was wandering around Myanmar's gem-rich Mogok region, the kind of place where the ground occasionally sparkles just to Mogok, I mean, mock you, when he stumbled on a brownish-red crystal that didn't match anything in the books. It took scientists several years to confirm it as a new species, and in 1957 it was officially named painite, because the universe apparently enjoys wordplay too. For nearly fifty years, only two crystals were known to exist. That's right, two. By 2001, the count had crawled up to a few dozen. Then, like every good plot twist, Myanmar surprised everyone: miners in the early 2000s discovered new deposits, sending gemologists into an existential crisis. After half a century of heartbreak, painite wasn't quite the rarest anymore, just emotionally expensive.

Painite's ($CaZrAl_9O_{15}(BO_3)$) is a borate mineral containing calcium, zirconium, and aluminum, and at around 8 on the Mohs hardness scale, painite is harder than most gemstones, which means it would be perfect for jewelry if it wasn't so unattractive. It's optically complex, refractory, and perfectly capable of resisting even the most aggressive polishing, meaning that gem-quality stones are exceptionally rare.

In fact, before 2005, when the first decent-sized deposits were uncovered, gem-quality painite fetched up to $60,000 per carat, about the cost of an Audi R8, and arguably less fun. The value has since dropped as more material entered the market, but even now, a faceted painite can cost enough to make you cry a little.







Images 1 and 2: painite cabochon 0.9 cts

Image 3: Striated, euhedral painite crystal (size: 0.9×0.6×0.5 cm)

The type locality, Ongaing near Mogok, sits in one of Earth's most mineralogically blessed, and also, apparently cursed, regions. Mogok is where rubies, spinels, and sapphires grow up together in a metamorphic free-for-all. Finding painite there is like discovering a perfectly preserved espresso bean in a volcano. The crystals are typically dark reddish-brown to almost black, their luster hovering somewhere between "polished mahogany" and "burnt umber existential dread." Under cross-polarized light, they show internal zoning patterns that make thin-section lovers sigh audibly. And to make this ugly geological wonder even more fascinating, geologists still don't fully agree on how painite forms. The mineral seems to crystallize in boron-rich fluids infiltrating metamorphic host rocks rich in zirconium and aluminum, a fairly unlikely combination, with theories also revolving around late-stage hydrothermal processes that squeeze boron into high-temperature environments.

Even with new discoveries, painite remains astonishingly rare, only a few hundred well-crystallized specimens exist worldwide, and most are underwhelming fragments which unfortunately, look like poop (fig. 1).

RESILIENT ENERGY GEOSCIENCE & ENGINEERING COURSES

A new education and workforce development initiative offered by the University of Utah.

As the energy transition unfolds, geoscience and engineering students and the existing workforce will need to be trained in the science and technology of newer energy extraction and carbon management concepts.

These concepts will be developed through five modularized courses at the graduate levels.

Renewable Energy
This course will cover all aspects of renewables including hydrogen, wind, solar, bio-gas, geothermal, and next-generation nuclear. This recognizes Utah's Renewable Energy corridor and highlights the University of Utah's leadership in high and low-temperature geothermal energy. For example, EGI's FORGE project is a one-of-a-kind research project. It also provides an unmatched teaching and training opportunity.

Carbon Capture, Utilization, and Sequestration
CCUS is encompassed by carbon management. Carbon management is becoming an important skillset for all. This course will provide a background in technical, environmental, and policy issues relevant to carbon capture, as well as CO2 utilization technologies and sequestration.

Power and Energy Systems
Complementary to exposure to carbon management concepts, the workforce should appreciate managing energy. This course will focus on energy optimization, alternative energy usage, and smart grid technologies. Studies will be introduced to cyber security considerations relevant to the grid and energy security.

Geoscience for Energy Transition
Energy, mineral, water, soil and food resources are generated through complex, interacting sets of materials and processes operating at the Earth's subsurface, land surface, oceans and the atmosphere. This course presents an in-depth understanding of Earth's dynamic systems and substances, how geoscience techniques are employed for energy and mineral exploration and extraction, and how geoscience skillsets are essential to energy transition to low-carbon economies with environment-friendly and secure energy supplies.

Energy Entrepreneurship
The energy business landscape is changing. Startups, entrepreneurial ventures, and social consciousness are transforming as well. This course will cover the growing world of energy startups and monetization of energy technologies including policy and societal issues.

UTAH GET READY FOR THIS GLOW-UP: AURORA BOREALIS LIGHTS UP SALT LAKE CITY IN RARE SOLAR STORM

Bryony Richards, Ph.D., Senior Research Scientist

Salt Lake City, Nov. 11, 2025 - Residents near Emigration Canyon were treated to a rare celestial spectacle as the northern lights danced across the Utah sky on Tuesday night. A vivid aurora borealis, typically seen only in far northern latitudes, became visible from Emigration canyon's dark heights, painting the atmosphere in shades of emerald green and pinkish-red. This unexpected light show resulted from an intense geomagnetic storm that swept over Earth, briefly turning Utah's night sky into a natural neon panorama.

Tips for Photographing the Aurora

Capturing the aurora on camera, isn't difficult, here are some practical tips for photographing the northern lights:

Use a sturdy tripod: Because aurora photography involves long exposures of several seconds, a stable tripod is imperative to keep the camera still. You want to avoid any shake or movement during the shot. Set up on solid ground and shield your tripod from wind gusts if possible.

Camera and lens settings: A DSLR or mirrorless camera with manual controls is ideal. Choose a wide-angle lens (in the 14–24 mm range) with a fast aperture (f/2.8 or lower) to capture as much light as possible. In manual mode, open your aperture to f/2.8 (or the widest your lens allows) and set a to your native ISO sensitivity, typically ISO800 for Sony cameras, ISO640 for Nikon. Use a shutter speed of a few seconds: about 5-10 seconds is a good first guess but adjust on the fly. If the aurora is bright and moving quickly, a shorter exposure (1-3 seconds) will prevent the patterns from blurring, while very dim auroras might require 10–15 seconds. It is a balancing act: you need a long enough exposure to light up the scene, but not so long that the aurora smears out.

Focus and shooting techniques: Switch to manual focus and pre-focus your lens at infinity (on a distant city light or star), the dark sky will confuse auto-focus. To avoid bumping the camera, use a remote shutter release or the camera's 2-second timer when taking shots. This prevents any jostle when you press the button. Also, shoot in RAW format if available, as it gives more flexibility in post-processing to bring out the aurora's colors. Take a few test shots and check your exposure and focus by reviewing the images and histogram, then fine-tune settings as needed.

Be prepared for conditions: Aurora hunting often means long hours outside at night, so dress warmly! In colder months, remember that batteries drain faster in cold temperatures, it is wise to bring a spare battery or two in a warm pocket. Choose a dark viewing spot (Emigration Canyon's higher elevations are great for this) away from city glow. Including some foreground interest (like trees, mountains, or the Salt Lake City skyline in the distance) can make your photos more compelling but be sure to scout your composition in daylight or early evening. Patience is key, auroras can brighten or fade unpredictably, so keep watching the sky and be ready to adjust your settings if the intensity changes.

FROM RESEARCH PARK TO CAMPUS: A MOVE 30 YEARS IN THE MAKING

For many of us, Research Park wasn't just an address; it was a way of life. A quiet, contemplative ecosystem where experiments thrived, ideas matured, and it was entirely possible to go an entire day without accidentally running into an undergraduate. Leaving after 30 years was always going to be bittersweet, but science, like tectonic plates, is never static.

Being on campus marks a shift toward a more connected, collaborative future. At the end of the day, proximity matters. Engineers, scientists, students, and collaborators are now just down the hall (or at least a short walk), making spontaneous conversations, interdisciplinary problem-solving, and shared caffeine sources far more likely. The hope is simple: more collisions of ideas, fewer excuses for "we should really meet sometime."

Of course, none of this came easily.

While offices are finding their new rhythms, the labs are still very much in the process of moving, a careful, phased operation involving sensitive equipment, precise logistics, and a healthy respect for things labeled "FRAGILE," "DO NOT TILT," or "WHY DO WE HAVE THIS?" The move itself was, and continues to be, a massive undertaking.

A huge shout-out goes to Baileys Movers, who have been nothing short of amazing. Calm under pressure, endlessly patient (including moving Denis the Cactus), and seemingly immune to the collective anxiety of scientists and engineers watching decades of research get wheeled down hallways, they have been absolute pros throughout.

Many staff members have contributed time, energy, and heroic levels of adaptability to make this transition happen, but special recognition goes to Carol and Rob, our Grand Marshals of the Great Relocation. Equal parts logistics masterminds, morale officers, and institutional memory, they kept the move progressing when the rest of us were still negotiating with our filing cabinets.

There are still boxes to unpack, labs to calibrate, and many cups of coffee to share with our new friends on campus, but we are firmly on our way.

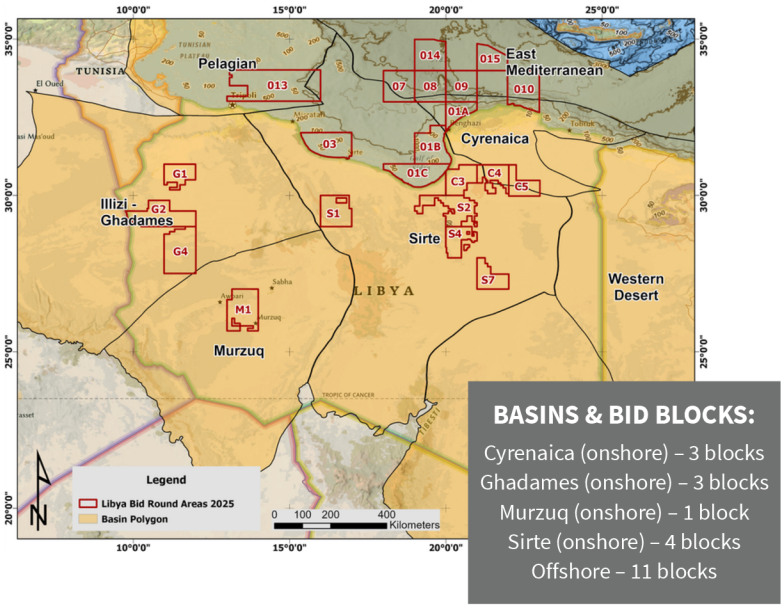
After 30 years in Research Park, this move feels less like a relocation and more like a transformation. Welcome to INSCC; the next chapter is officially underway, boxes, bubble-wrap, and all.

(Pete and Dennis): When your office plant has a passport. This Papua New Guinea cactus 'Dennis' required bubble wrap, engineering, courage, and Pete's expert wrapping skills. It fought valiantly, but Bailey's Movers accepted the challenge and emerged against victorious spines intact; dignity mostly preserved. Moving day: 1. Cactus: 0.

INSCC building

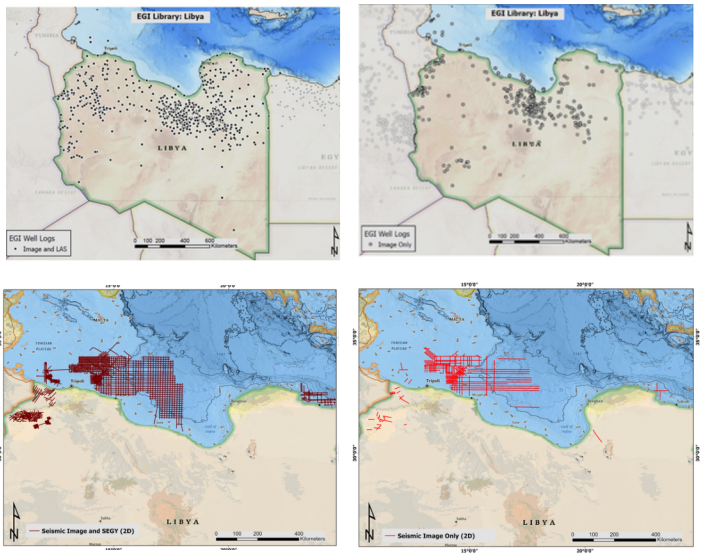
LIBYA DATA PACKAGE

Structural & Paleofacies Maps **Geochemical Data** **Isopachs & Formation tops** **Seismic Lines** **Well Logs**



BASINS & BID BLOCKS:

Cyrenaica (onshore) – 3 blocks
Ghadames (onshore) – 3 blocks
Murzuq (onshore) – 1 block
Sirte (onshore) – 4 blocks
Offshore – 11 blocks



With the largest proved oil reserves on the continent of Africa, Libya offers a significant resource base and exploration and production potential. For the first time in nearly two decades Libya has launched a new bid round in 2025, offering for lease a total of 22 blocks including 11 offshore blocks with a total area of 128,714 square kilometers, and 11 onshore blocks with a total area of 106,553 square kilometers. Libya is also offering a new fiscal regime, including Production Sharing Agreements.

EGI – YOUR SOURCE FOR DATA & INSIGHTS ON LIBYA

Building on a nearly 55-year legacy of studying the geology and hydrocarbon potential of Libya, EGI is your source for data and analysis to support your analysis of the bid round blocks on offer.

EGI DATAPACKAGE 1: WELL LOGS AND SEISMIC LINES

EGI has unique sets of well logs and seismic lines that are delivered as part of EGI Libya Data Package. These are listed below and depicted on the maps.

- Well logs (reprocessed) LAS files: 736 logs
- Well logs (image only) TIFF files: 668 logs
- Seismic lines (reprocessed) SEGY files: 575 lines
- Seismic lines (image only) TIFF files: 175 lines

EGI DATA PACKAGE 2: EXPLORATION GEOLOGIC DATA

Data Package 2 is a set of data files from various EGI studies created on ArcGIS Pro for easy access.

Data types:

- Basin-scale summary data
- Paleofacies maps for 11 stratigraphic horizons from the Cambrian through the Neogene
- Isopach contour maps for 24 stratigraphic horizons from the Cambrian through the Neogene
- Source-rock information from 438 wells
- Formation top data (>2000) for 194 onshore wells
- Chrono-biostratigraphic charts and Wheeler correlation files for 28 wells (Sirte Basin)
- Structural transects (81)
- Two-way travel time structural contour maps (Cretaceous-Oligocene horizons) for offshore NE Libya
- Structural and outcrop geologic maps
- Subsurface structural elements
- Free-air gravity and Aeromagnetic anomaly maps and contours
- Heat flow datapoints and map
- ArcGIS map for wells, fields, and location of 2025 bid blocks

EPA APPROVES FIRST MRV PLAN IN UTAH FOR LISBON VALLEY GAS PROCESSING PLANT

EGI CARBON MANAGEMENT GROUP

The Energy and Geoscience Institute (EGI) at the University of Utah, in partnership with CoolSky Energy Solutions LLC, has received approval from the U.S. Environmental Protection Agency (EPA) for a Monitoring, Reporting, and Verification (MRV) Plan under the Clean Air Act, demonstrating responsible carbon management and qualifying the plant for the 45Q tax credit. The plan supports Class II underground injection control (UIC) wells associated with the Lisbon Valley Gas Plant near Moab, Utah. This marks the first approved MRV plan in the state of Utah.

The University's EGI team, including Professor Brian McPherson, Professor Nathan Moodie, Professor Ting Xiao, Professor Eric Edelman, Dr. Kevin McCormack, along with the entire Carbon Science Initiative group and in collaboration with CoolSky Energy Solutions LLC, developed and submitted this successful MRV Plan.

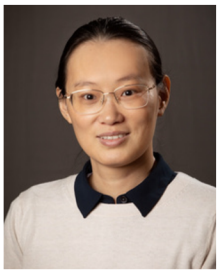
According to Sharyn Lie, Director of the Climate Change Division at EPA, the agency reviewed and approved the Lisbon Valley Gas Plant MRV Plan as required by 40 CFR Part 98, Subpart RR of the Greenhouse Gas Reporting Program.

David Bullion, Chief Technology Advisor at American Helium, highlighted the impact of this decision, stating:

"*The EPA's approval further enhances the value of American Helium's holdings within the Paradox Basin and highlights the long-term commitment for carbon capture and storage of CO_2 removed from the processing of our natural gas stream.*"


BRIAN MCPHERSON PH.D.


NATHAN MOODIE PH.D.


TING XIAO PH.D.


ERIC EDELMAN PH.D.


KEVIN MCCORMACK PH.D.

EGI'S CARBON MANAGEMENT GROUP

Professor Brian McPherson emphasized the significance of this approval:

"*This first MRV Plan for Utah is a landmark achievement. It not only ensures rigorous accounting of carbon dioxide at the Lisbon Valley Gas Plant, but also highlights the University of Utah as a leader in advancing the nation's goals for responsible carbon management. We are working with Utah's Division of Oil, Gas and Mining, who, under H.B. 204 (2022), is pursuing EPA primacy for Class VI carbon sequestration to ensure consistent regulation while continuing to approve Class II wells only as defined by statute. By enabling Class II wells to operate under a transparent monitoring framework, we are reducing pollution and protecting the sensitive natural and cultural landscapes of southern Utah.*"

This achievement underscores the University of Utah's role in developing innovative approaches to carbon management while advancing state and national goals for reducing greenhouse gas emissions.

U-CREW CO-DIRECTOR JULIE SIEVING RECOGNIZED WITH 2025 LIFETIME ACHIEVEMENT AWARD

CARLA WELLS (UTAH AEE PRESIDENT) LEFT, JULIE SIEVING (MIDDLE), AND JASON GROOMS (UTAH AEE PRESIDENT-ELECT) RIGHT.

U-CREW Co-Director Julie Sieving Recognized with 2025 Lifetime Achievement Award from the Utah Chapter of the Association of Energy Engineers.

Julie Sieving, P.E., ExecMBA, C.E.M., Co-Director of U-CREW at the University of Utah, has received the 2025 Lifetime Achievement Award from the Utah Chapter of the Association of Energy Engineers (AEE). The award recognizes her lasting contributions to energy efficiency and to the education of the engineers who will help shape its future.

Julie's work is reflected in her nine years of service as Co-Director of the Intermountain Industrial Assessment Center (Intermountain IAC), now known as the Utah Center for Renewables, Efficiency, and Workforce (U-CREW).

THE UNIVERSITY OF UTAH
UTAH CENTER FOR RENEWABLES, EFFICIENCY, AND WORKFORCE
U-CREW

In this role, she has mentored more than 100 student engineers through applied, hands-on experience, combining academic rigor with meaningful fieldwork.

During her tenure, the program has expanded to include commercial facilities and support for distributed energy resources and on-site generation, broadening opportunities for students to engage with real-world energy challenges.

Working together with Co-Director Dr. Kody Powell, PhD, Julie helped support the organization's growth into U-CREW, which now houses the U.S. Department of Energy's Industrial Training & Assessment Centers (ITAC) program, the successor to the long-running Industrial Assessment Centers (IAC) program, along with additional initiatives that promote energy efficiency through research-based learning and workforce development. Through these programs, U-CREW student teams conduct on-site assessments for commercial buildings and small- to medium-sized manufacturers, identifying opportunities for energy, productivity, and waste-reduction improvements.

Julie's career spans nearly 30 years in the energy consulting field and reflects a steady commitment to collaboration, education, and continuous improvement. Her work continues to support U-CREW's mission to advance energy efficiency through research-based learning and workforce development across the Intermountain region.

To learn more about U-CREW, please visit energy.utah.edu and connect with us on LinkedIn at linkedin.com/company/ucrew.

DISTINGUISHED LECTURER

Kristine Pankow, University of Utah: "Utah FORGE: A Field-Scale Geothermal Laboratory"

The Continental Scientific Drilling Division is proud to announce its 2025-2026 Distinguished Lecturer, **Dr. Kristine Pankow.**

The Utah Frontier Observatory for Research in Geothermal Energy (FORGE) is a U.S. Department of Energy funded project to de-risk technologies necessary to make Enhanced Geothermal Systems (EGS) commercially viable. Utah FORGE will not generate energy, instead Utah FORGE is a field-scale laboratory for testing new technologies and hypotheses. No other similar field-scale laboratory exists elsewhere in the world.

This talk will highlight findings and advancements made at Utah FORGE with an emphasis on how seismic monitoring with deep instrumented boreholes and near-surface modeling is providing important details on geothermal reservoir development, strategies for mitigating risks related to induced seismicity, and seismic forecasting utilizing adaptive traffic light systems.

EGI RESEARCH PROFESSOR NAMED ASSOCIATE EDITOR FOR THE JOURNAL OF PETROLEUM GEOLOGY

Journal of Petroleum Geology (JPG) "a multidisciplinary platform for investigating the geological, geochemical, geomechanical, and geophysical aspects of petroleum geosciences" has selected **Dr. Rasoul Sorkhabi** as Associate Editor in 2025.

JPG is published by Wiley and has been in press since 1978. Sorkhabi served as Associate Editor for the AAPG Bulletin in 2023-2024 and for Elsevier's Unconventional Resources in 2022-2026. EGI scientists have a long track record of serving the professional community through academic, industrial and publication avenues.

EGI ATTENDS AAPG IMAGE 2025

EGI Director Dr. Milind Deo at IMAGE 2025

In August, EGI attended the 2025 IMAGE Conference in Houston as an exhibitor.

An Influential Platform for Energy Professionals – IMAGE highlights traditional petroleum geoscience topics while uncovering the latest energy market.

Those representing EGI consisted of EGI Director Dr. Milind Deo, Research Professor Dr. Rasoul Sorkhabi, Research Scientist Dr. Eiichi Setoyama, Research Assistant Professor Dr. Palash Panja, and UtahFORGE principal investigator Dr. Joe Moore.

The EGI team appreciated the opportunity to engage with attendees at the event, where we had the chance to share insights into our recent projects, real-world geoscience applications, and innovative engineering solutions.

PBS UTAH FEATURES UTAH FORGE IN 'UTAH'S POWER PIVOT: GEOTHERMAL'

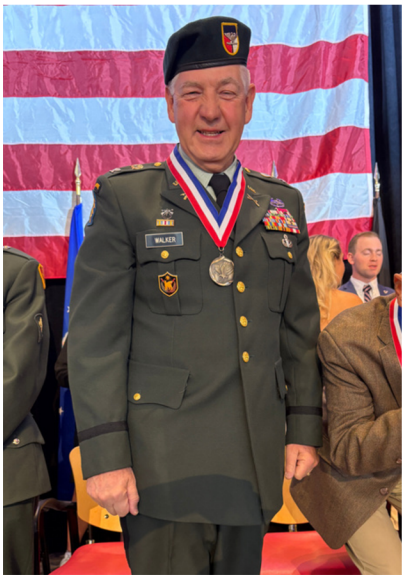
Last year Utah FORGE was included in a story on PBS Utah's program *Utah Insight* titled 'Utah's Power Pivot: Goethermal'.

The episode won a 2025 Rocky Mountain Regional Emmy® under the Environment / Science - Short Form Content category. The piece also won 1st place for a *Utah Society of Professional Journalists* award.

Overhead powerlines have roots deep in the earth, where geothermal energy is harnessed to create electricity. Beaver County's FORGE Lab is paving the way for new energy uses, working to keep geothermal generator costs down and return on investments high. Watch here: /www.pbs.org/video/geothermal-energy-in-utah-83ohal/

EGI'S AL WALKER ONE OF 12 VETERANS HONORED IN U CEROMONY

Al Walker, Engineering Advisor at EGI was honored along with 11 other remarkable Utah veterans during the University's 27th annual Veterans Day Commemoration.



The ceremony took place in the Union Ballroom on Friday, November 15.

This is an annual event for the University of Utah and an opportunity for us to thank all veterans for their service.

Al served nine years in the US Army and is a retired Army Reserve Special Forces colonel with over thirty years' service. He served three combat tours in Afghanistan, the Philippines, and Iraq.

SPRING 2026 EGI WEBINARS

DISCUSSIONS AND INSIGHT FROM EGI

The Energy and Geoscience Institute at the University of Utah (EGI) is pleased to announce a Spring Webinar Series. EGI is a multidisciplinary research institute at the University of Utah specializing in petroleum production, carbon management and renewable energy. The energy landscape is changing rapidly. The webinars are intended to provide information on ongoing research in advanced energy technologies. The Webinar Series will also help EGI gather feedback from its industrial partners and the community on the ongoing work and collaboration opportunities.

EGI has performed groundbreaking geoscience research around the world, worked on innovative geothermal technologies, and developed a portfolio of carbon dioxide sequestration projects. EGI manages FORGE (Frontier Observatory for Research in Geothermal Energy), an EGS (Engineered Geothermal Systems) project funded by the US Department of Energy. EGI has added decarbonization and grid management expertise to provide integrated and optimized solutions across the entire energy value chain for the low carbon future. Strength in petroleum exploration, well construction, production, and refining as well as in renewables and carbon management allows EGI to lead in the ongoing energy transition, while promoting energy security.

EGI collaborates with industrial partners through its Corporate Associate Membership Program or through sponsored research projects and consortia. Participants benefit from the discoveries, and by interacting with faculty, students and scientific staff while engaging in multi-sponsored, cost-shared research.

THURSDAY, APRIL 30TH 9 AM

Pengju Xing, Ph.D. Research Scientist

From Rock Thermal Heterogeneity to Multi-Well Optimization: Insights from Utah FORGE

THURSDAY, MAY 28TH 9 AM

Kristie McLin, Ph.D. Director of Research and Science

Update on Utah FORGE Activities

RECENT PUBLICATIONS

Bahr, M., Kumawat, P., Billings, B., Panja, P., Powell, K. (2025). A dynamic 2D Borehole Thermal Energy Storage (BTES) model for enhanced computational efficiency. *Case Studies in Thermal Engineering,* Volume 75, 2025, 107054, ISSN 2214-157X, doi.org/10.1016/j.csite.2025.107054.

Chen, Y., Sergi, B., Ho, J., Stephen, G., Cole, W., Powell, K. (2025). Sparse chronology strategy for integrating seasonal energy storage in capacity expansion models. *Journal of Energy Storage*, Volume 132, Part C, 2025, 117950, ISSN 2352-152X. doi.org/10.1016/j.est.2025.117950.

Dvory, N. (2025). Optimizing hydraulic fracturing in the Paradox formation: A geomechanical study of the Cane Creek play. *World Oil.*

Kumawat, P., Panja, P., Wencheng, J., Munday, L., Podgorney, R., Earnest, E., Upchurch, E., Tozzi, M., Deo, M., and McLennan, J. (2025). Simplified Fracture Model for Numerical Simulation of EGS: A Utah FORGE Case Study, *50th Workshop on Geothermal Reservoir Engineering*, Stanford University, 10 - 12 February

McCormack, K. L., Li, J., Yoklavich, T. J., & Xia, Y. (2024). A review of fluids under nanoconfinement: Reactivity, geomechanics, phase transitions, and flow, *Physics of Fluids*, 36(9).

McCormack, K. L., Vega-Ortiz, C., Edelman, E. C., & McPherson, B. J. (2025). Hydraulic fracturing in the overpressured, isotropically stressed Cane Creek Unit, Paradox Basin, *Interpretation*, 13(1), T11-T19.

Panja, P., Sorkhabi, R., Bajracharya, V., Deo, M. (2025). Comparative analysis and ranking of 13 US onshore tight oil plays based on estimated ultimatum recovery. *Unconventional Resources Technology Conference* 9-11 June 2025, Houston. URTeC: 4185794. DOI 10.15530/urtec-2025-4185794

Sorkhabi, R. (2025). Drilling for ultradeep exploration. *First Break*, vol. 43, no. 7 (July) pp. 49-54.

Sorkhabi, R., Panja, P., Deo, M. (2025). Top three plays: Performance and resource analysis of Bakken, Eagle Ford and Wolfcamp. 2025 IMAGE *(International Meeting for Applied Geoscience & Energy*), Houston, 25-25 August 2025.

Sorkhabi, R. (2025). “An American energy experiment” (Book commentary). *Science* 31 July 2025, p. 462.

Sorkhabi, R. (2025). “Energy’s international history and future” (Book commentary). *Science*, 15 May 2025, p. 711

Sorkhabi, R. (2025). The rise of Guyana super-basin. *AAPG Explorer*, vol. 46, no. 9 (October), pp. 34-35.

Sorkhabi, R. (2025). Libya’s new oil. *AAPG Explorer*, vol. 46, no. 8 (August), pp. 30-31.

Sorkhabi, R. (2025). Maps, Apps & Databases: Online toolkits for geologists. *The Professional Geologist*, vol. 62, no. 3 (July-September 2025), pp. 46-49.

Sorkhabi, R. (2025). Shale restimulation: Emerging science and technology. *AAPG Explorer*, vol. 46, no. 1, pp. 36-37.

Vega-Ortiz, C., List, D., Gregor M., Edelman, E., Setoyama, E., Palash, P., Vanden Berg, M., Jagniecki, E., and McPherson, B. (2025). Advanced Source Rock Characterization Integrating Pyrolysis, Petrophysical Logs, and Machine Learning in the Unconventional Cane Creek Reservoir, Utah. *Geoenergy Science and Engineering*.

Xing, P., Panja, P., McLennan, J., and Moore, J. (2024). Prediction of Formation Properties Based on Drilling Data from Multiple Wells at Utah FORGE Site Using Machine Learning, *Geothermal Rising Conference*, Waikoloa, HI, 27 - 30 October

Xing, P., Damjanac, B., McLennan, J., & Moore, J. (2025, June). Numerical Simulation of the Circulation Tests in 2024 at the Utah FORGE Site. In ARMA US Rock Mechanics/Geomechanics Symposium (p. D031S036R001). *ARMA*.

Xing, P. (2025). Influence of Natural Fractures on Enhanced Geothermal System Development. Presentation at CUSP 2025 Annual Meeting, Salt Lake City, Utah.

Xing, P. (2025). Exploring Geothermal Frontiers: EGI’s Research, Collaborations, and Possibilities. Presentation at 8th Biot Conference on Poromechanics, Salt Lake City, Utah.

Xiao, T., Fitzgibbon, J., Vanden Berg, M. (2025). Early-stage risk assessment for the Uinta Basin CarbonSAFE Phase II project, *International Journal of Greenhouse Gas Control*, Volume 143, 104359, ISSN 1750-5836, https://doi.org/10.1016/j.ijggc.2025.104359.