

January 2024

Connection

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PennState
College of Earth
and Mineral Sciences

John and Willie Leone Family

**Department of Energy and
Mineral Engineering**



Dear friends and colleagues,

The new year is the perfect time to reminisce and think about the upcoming year. I see a bright future for the John and Willie Leone Family Department of Energy and Mineral Engineering (EME) as we continue to be the premier program devoted to all aspects of energy whether that be renewable energy production, mineral and fossil fuel exploration and production, utilization and sustainability, risk analysis, economics, and environmental impact assessment.

This last year we strengthened our connection to the two online programs in EME, the Energy and Sustainability Policy (ESP) undergraduate program and the graduate Renewable Energy and Environmental Sustainability MSP program (RESS). The ESP program has several hundred B.S. students, while the RESS program has over a hundred M.S.P. (professional masters) students. The faculty members coordinating these majors are now administratively housed within EME, and we look forward to continuing our work together.

Our programs consistently rank among the best in their respective areas, and their excellent quality is evidenced by the high undergraduate and graduate enrollment numbers that exceed 1,000 students, making us one of the larger engineering programs at Penn State. Our Mining Engineering program is ranked #2 in the United States by the latest QS World University survey, while the Petroleum and Natural Gas Engineering program is ranked #5 in the U.S. and #19 worldwide. The unique combination of our six undergraduate and two graduate programs within one department offers advantages in collaboration that do not exist in any university worldwide and gives our students an opportunity to develop a truly thorough systems-level understanding of the design, implementation, and analyses of life cycles in capstone courses.

Producing enough energy for more people, while reducing greenhouse gases and avoiding future environmental catastrophes, is a complex problem. All aspects of environmental damage, not just greenhouse gases, must be considered and we are uniquely positioned from both a policy and technical perspective to embed sustainability as a core value in all facets of energy and mineral engineering. We have the expertise to study the environmental impact, assess the risks, perform systems-level optimization, perform sophisticated economic analysis of decisions, and propose policies that consider both the engineering and social aspects. Our faculty engage in research across program areas and have strong ties to world-class institutes within the University that provide extensive and state-of-the-art infrastructure, allowing our faculty to develop new research directions and proposals. Unfortunately, we can only share the briefest spotlight of some of our achievements in these twelve pages, but I encourage you to visit our website for a larger picture of what keeps us so busy throughout the year.

We live in exciting times, with major shifts both in our energy landscape and our perceptions regarding sustainability and stewardship of Earth's resources. The department continues to evolve to address these challenges and pursue exciting opportunities. I look forward to exchanging ideas regarding these issues with you and value your involvement in defining the future of the EME department.

Best wishes,
Russell Johns

The Connections Newsletter is published twice a year, one print and one online, for alumni, students, faculty, and friends of the John and Willie Leone Family Department of Energy and Mineral Engineering.

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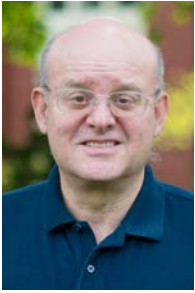
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Cover Image: Ibrahim Mohammed Hamed Al-Hinaai looks on during the summer PA facilities tour, pg. 10

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Energy Business and Finance (EBF)



Dear EBF alums,

Climate change has directly impacted the field of energy business. Our belief is that EBF students need a strong background in the science and economics of climate change with a focus on the modern challenges in the energy sector, almost all of which are affected by climate change.

To do this, we have proposed curriculum changes to require students take courses specifically in climate change to further their understanding of energy in the changing world. We also believe that our students need stronger training in the economics of energy. Thus, we wish to change our requirements so that EBF students take additional economic courses.

Of course, we cannot just add more courses, we understand that we must make room in students' schedules and are planning to eliminate some requirement while proposing additional changes in the curriculum to give them more international learning options.

The proposed changes will increase choice for our students, increase our focus on the impact of climate change, and, hopefully, increase student enrollment into the program.

Sincerely,

Andrew Kleit

Professor of Energy and Environmental Economics
Program Chair for Energy Business and Finance

Energy Engineering (ENENG)



Dear friends of the ENENG program,

As the spring semester kicks off, it presents a good time to reflect on the last year. The Energy Engineering program graduated fourteen majors in spring 2023, as well as six more in the summer, and ten majors plan to graduate this semester (fall 2023). These graduates will go on to work at energy and technology companies of all sizes, utilities, and some will continue their education in graduate school.

The ENENG program also had some faculty changes this last year, with the retirement of Ljubisa Radovic and departure of Derek Hall (now in the Department of Mechanical Engineering at Penn State), and addition of Olumide Ogunmodimu, assistant professor of energy and mineral engineering. As of this August, I have taken over the program chair duties from Derek Hall.

Furthermore, our Association of Energy Engineers (AEE) student group has been quite active under the leadership of Elizabeth Baierlein and Ryan Manning. This past fall, the AEE student group organized guest speakers, a tour of the Sustainability Experience Center, and disseminated valuable career-seeking information to its student membership. Please look for members of our AEE group at the MIT Energy Conference in March 2024!

If there is information you would like to share, we would love to

hear from you. Please contact me at eugene.morgan@psu.edu.

Sincerely,

Eugene Morgan

Associate Teaching Professor

Program Chair for Energy Engineering

Associate Head of Undergraduate Education

Environmental Systems Engineering (ENVSE)



Dear ENVSE alums,

Enrollment in the Environmental Systems Engineering (ENVSE) program remains strong with a total of 117 students as of fall 2023, including thirty-seven students currently in the major and another eighty students who have indicated ENVSE as their preference across all campuses. Although down from the peak enrollments of five to six years ago, the number of ENVSE B.S. degrees conferred

has remained relatively constant with approximately thirty graduates per year.

At the end of the fall 2022 semester, Dr. Ljubisa Radovic announced his retirement. Department Head Sanjay Srinivasan expressed his sincere thanks to Ljubisa for his dedicated and effective service to the department at the Spring 2023 Awards Luncheon. We are in the process of identifying instructors for core-courses previously taught by Dr. Radovic including EGEE 470 Air Pollutants from Combustion Sources, which our alumni frequently identify as being particularly relevant in their work.

The student Society of Environmental Systems Engineers (SESE) has been very active holding meetings, organizing social events such as the October Halloween outing to Harner Farms, coordinating events with other student societies, and promoting the major to prospective students at the Earth and Mineral Sciences Exposition (EMEX). The student society has also continued the tradition of inviting program graduates back as speakers and has found the SESE Group on LinkedIn to be very useful for maintaining ties with ENVSE alumni. The LinkedIn SESE Group currently has eighty-one members, and all current and former students are encouraged to join and network with their fellow ENVSE students and grads.

The ENVSE program continues to benefit from the generous donations of industry stakeholders. Funding provided by Chevron allows the program to maintain and upgrade equipment that is critical to our teaching laboratories. In addition, Baker Hughes previously donated a field mobile X-ray Fluorescence (XRF) instrument (Thermo-Scientific Niton FXL) for elemental analysis. It is anticipated that this instrument will find use in the laboratories of both program options. The support of Chevron and other industry partners over the years is greatly appreciated.

Sincerely,

Bill Groves

Associate Professor of Industrial Health and Safety

Program Chair of Environmental Systems Engineering

Petroleum and Natural Gas Engineering (PNGE)



Dear PNGE alumni,

I am pleased to relay our continued improvements to undergraduate education in PNGE. 2023 has been an excellent year for the program, with our students and faculty receiving several international and regional awards, including the Presidential Award for Outstanding Student Chapter for our Society of Petroleum Engineers (SPE) student chapter, SPE Anthony F. Lucas Gold Medal

for Russell Johns, SPE Regional Service Award for Luis Ayala, SPE Regional Distinguished Achievement Award for Petroleum Engineering Faculty for Hamid Emami-Meybodi, and SPE Regional Reservoir Description and Dynamics Award for Zuleima Karpyn.

We are pleased to welcome Yashar Mehmani and Anne Menefee, who joined the program as tenure-track assistant professors. We are also hiring an assistant teaching professor who will teach some of our courses and labs, including the rock and fluid properties lab, drilling lab, and production engineering lab.

Enrollment in the PNGE program currently stands at 170. At the graduate level, we have fifty students, roughly 20 percent M.S. and 80 percent Ph.D. degree candidates. During the 2023 calendar year, we have granted seventy-four B.S. degrees in PNGE, making Penn State ranked #1 in awarded PNGE B.S. degrees among U.S. universities, with 100 percent job placement in 2023 and median starting salaries of over \$100K. At the same time, three M.S. students and six Ph.D. students completed their graduate work and received their degrees. We hope that through the recently established Subsurface Energy Recovery and Storage (SERS) JIP, we receive more industry support to recruit graduate students and conduct cutting-edge, high-risk research.

With generous gifts from Chevron Corp., we have purchased and built several experimental setups for the teaching and research labs focusing on carbon dioxide sequestration and seasonal hydrogen storage. This is a fine example of how external support can be critical in providing the best education for our talented students and advancing academic programs.

Our Industrial and Professional Advisory Committee has been very valuable in evaluating our program and providing crucial input for modifying our curriculum to meet the demands of the petroleum industry. We appreciate and welcome PNGE alumni to participate in our activities and volunteer.

So, here comes the new year, full of promises for all of us. I hope we will meet again at the end of 2024 with our aspirations realized, and new promises to pursue.

All the best,

Hamid Emami-Meybodi
Associate Professor and Program Chair, Petroleum and Natural Gas Engineering

Mining Engineering (MNGE)



Greetings Mining and Mineral Processing alumni!

For those of you who don't know, I was appointed as the Chair of Mining Engineering starting August 1, 2023, as our new department head, Luis Ayala, and acting head, Russ Johns, wanted to reorganize. More meetings and a few new responsibilities, including being the caretaker of our scholarship and operational

endowments. We are truly grateful to those who, over the many decades of mining and mineral processing at Penn State, have set up endowments to provide some funding to our students to reduce their costs and to allow them to travel to conferences and other events.

With low enrollment, we can really support our students with rather significant scholarships, both need-based and for outstanding academics. But, with low enrollment, we also find the faculty needing to teach courses that have higher student credit hours—the new Penn State budget model. So, we need you to recruit! Talk about mining/mineral processing engineering as a career to your family, your neighbors, your high school classmates at your reunions (yes, this works). We need more students, so the mining industry has more skilled engineers. When we can talk to a potential student, we usually get them to commit.

For outreach, we hosted our first MINING PA conference in August. Some statistics: 157 overall attendees, twelve exhibitors, fourteen sponsors, nine different states, thirty-five from academia, one consultant, twenty-eight from government, ninety-two from industry, one from media. Our graduate students starred with their poster presentations. We plan to do this biennially. In November, we hosted the PA Drilling and Blasting Conference.

Some other good news: Mohammad Rezaee was promoted to associate professor, and Shimin Lui was promoted to professor this summer. Shimin and his student, Guijie Sang, received the prestigious SPE Rossiter Raymond Award for his paper on Carbonate Caprock-Brine-CO₂ Interaction. Professor Emeritus Raj Ramani was accepted into Penn State's Emeritus Academy—address him as 'Academy Professor' when we see him. He's assisting on a new NIOSH project with Ashish Kumar, Sekhar Bhattacharyya, Bill Groves (ENVSE), and me.

This spring, look for us at the SME MINEXCHANGE in Phoenix. And keep a look out for our first Mining Summer Camp. We'll be asking for recommendations for students to attend, for your sponsorship of these students, potential activities, and more. We're trying to pull out all the stops for recruiting!

Barbara Arnold, '82, '85g, '89g
Program Chair and Professor of Practice, Mining Engineering

Energy and Sustainability Policy (ESP) and Master of Professional Studies in Renewable Energy and Sustainability Systems (RESS)



Dear RESS and ESP alums,

Both programs had another strong year: the online student population continued growing to reflect ever-increasing interest in subjects of energy transition and sustainable development. The RESS program offers two professional tracks: (i) Renewable Energy Systems and (ii) Sustainability Management and Policy, which allow students to tailor their coursework based on their focus.

The ESP Program: Applications and enrollment to the ESP program have been steady, and currently the total student population is around 180, including both the B.S. and B.A. options. The energy policy field changes quickly, which requires frequent course revisions as well as staying connected to the professionals in industry to drive our curriculum towards the demands of the job markets. We continue working together with Penn State World Campus to reach out to diverse audiences and establish the strong image of RESS in the workforce development space for energy transition and sustainability across the world.

Faculty updates: The diversity of the faculty and instructors remains one of the program's strengths. Both faculty and industry practitioners are engaged in program courses, which provides a unique blend of academic expertise and practical knowledge for students to learn from. The combination of research and industry experience provides a holistic education and gives students analytical skills to work in a variety of sectors. This year we welcomed Eugene Morgan as one of EME faculty teaching RESS core curriculum and welcomed two new instructors to ESP: Seth Blumsack and Phill Becker.

Program stats: Currently the RESS program has 249 graduate students on its roster, including 178 master's degree students and seventy-one graduate certificate students. In 2023, the RESS MPS program received seventy-eight applications, and sixty-one new students were accepted into the program. 2023 was also one of the biggest graduation years for the program, with thirty-five students completing their professional master's degree, and twenty receiving graduate certificates.

RESS Global Energy Transition partnership: The RESS program entered into a partnership with Global Energy Transition (GET) based in Houston—the organization that provides upskilling and employment opportunities to oil and natural gas sector professionals. This initiative is designed to provide us with access to new professional audiences and to promote our Solar and SMP Certificate programs. I joined the GET Board of Directors.

ESP Study away component: Developing a global perspective is one of the program's learning objectives, and traveling abroad is an excellent way to build a worldview. Through the Global Renewable Energy Education Network (GREEN) program offered in partnership with the College of Earth and Mineral Sciences,

ESP students were offered an opportunity to travel to Iceland in Spring 2023—the trip led by ESP faculty Haley Sankey.

ESP Individualized advising: One important factor that sets the program apart is our commitment to individualized academic advising. The consistent support and guidance provided from the very first contact to graduation day keeps students on track and allows them to tailor their academics to their career interests.

Student success: Many recent graduates reached out to us to testify how the RESS and ESP programs helped them to advance in their careers, noting that the skills and knowledge they received have been of high use in their everyday job. In fact, too many to name them all of our RESS graduates are acquiring leadership positions. ESP graduate—Melissa Lopez—was even featured in Penn State News for her career success as a stewardship coordinator at a land conservation organization.

Moving forward: In August 2023, program leadership identified avenues for future growth and success by developing more synergies with other programs in EME. We plan steps for further integration of RESS into EME as well as closer collaboration with ESP and other programs that share similar focus areas. We will also be working on ways to allow RESS students to earn several certificates that add up to the full master's degree. We continue to work with the Penn State World Campus marketing team to reach out to broader audiences nationally and further grow the program enrollments.

Sincerely,

Mark Fedkin

Associate Teaching Professor

Program Chair Energy and Sustainability Policy and Master of Professional Studies in Renewable Energy and Sustainability Systems

Stay Up to Date



Connect with EME on social media to stay up-to-date with news, hear stories about faculty, alums, and students, attend online seminars, and see photos from all the events and fun happenings across the department.

Also, be sure to join EME's LinkedIn Group, where faculty, alumni, and students can boast about our rich history, our extremely successful community, and our research while sharing opportunities and events.



LinkedIn

EMS honors EME faculty excellence at annual awards celebration

In April, Penn State's College of Earth and Mineral Sciences recognized exceptional students and faculty for their academic excellence, service, and leadership during its annual Wilson Awards Celebration. The Wilson Awards are named in honor of Matthew and Anne Wilson, major benefactors of the college.

Paul F. Robertson Award for EMS Breakthrough of the Year

- Seth Blumsack, professor of energy policy and economics
- Mort Webster, professor of energy engineering

G. Montgomery and Marion Hall Mitchell Award for Innovative Teaching

- Mark Fedkin, assistant teaching professor in the John A. Dutton Institute of Teaching and Learning Excellence
- Brandi Robinson, assistant teaching professor in the John A. Dutton Institute of Teaching and Learning Excellence
- Haley Sankey, assistant teaching professor in the John A. Dutton Institute of Teaching and Learning Excellence
- Erich Schienke, assistant teaching professor in the John and Willie Leone Family Department of Energy and Mineral Engineering

E. Willard and Ruby S. Miller Faculty Fellowship

- Luis Ayala, William A. Fustos Family Professor of Energy and Mineral Engineering, for his proposal "Pore-scale investigation of multicomponent, multiphase flow of geofluids: A fugacity-based mesoscopic approach"

George H. Deike, Jr. Research Grant

- Barbara Arnold, professor of practice in mining engineering, for her proposal "Revalorization of mine tailings"

Gladys Snyder Junior Faculty Grants

- Ashish Ranjan Kumar, assistant professor of energy and mineral engineering, for his proposal, "Development of a Virtual Reality System for Classroom Teaching of Complex Mining Operations"

Read full story: <https://bit.ly/40KXeme>

Johns awarded technical honor from Society of Petroleum Engineers



Russell Johns, professor of petroleum and natural gas engineering and acting department head, was selected to receive the 2023 SPE/AIME Anthony F. Lucas Gold Medal from the International Society of

Petroleum Engineers (SPE) for technical leadership. The medal is SPE's highest international technical award.

Established in 1936, the medal honors those responsible for developing new technology and concepts and demonstrating distinguished achievement in improving the technique and practice of finding and producing petroleum.

Johns has more than 250 publications and specializes in advanced oil recovery research. His research on using water, carbon dioxide, and surfactants has led to more efficient recovery practices.

Read full story: <https://bit.ly/3u5S8oI>

Professor, recent alum win best paper from the Society of Petroleum Engineers



Shimin Liu, professor of energy and mineral engineering and the Thomas V. and Jean C. Falkie Mining Engineering Faculty Fellow, and co-author Guijie Sang, who recently earned his doctorate in energy and mineral engineering, received the Rossiter W. Raymond Memorial

award from SPE and the American Institute of Mining, Metallurgical, and Petroleum Engineers (AIME) for the best paper published in AIME's fields. Liu was honored by SPE President Med Kamal and AIME President Elizabeth Holmes during the 2023 SPE Annual Technical Conference & Exhibition, held Oct. 16–18 in San Antonio, Texas.

The paper, "Carbonate Caprock–Brine–Carbon Dioxide Interaction: Alteration of Hydromechanical Properties and Implications on Carbon Dioxide Leakage," focuses on the long-term integrity of carbon caprock, which is used to secure, seal and trap carbon dioxide in subsurface formations as part of geological carbon sequestration for carbon management.

Read full story: <https://bit.ly/3uqUw9y>

Ezgi Toraman named to Chemical & Engineering News' 'Talented 12' list



Ezgi Toraman, assistant professor of energy and mineral engineering and chemical engineering, is one of twelve early-career scientists named to *Chemical & Engineering News*' 2023 "Talented 12" list that highlights early-career researchers in the chemical

sciences who are fearlessly tackling difficult global problems. The "Talented 12" were selected out of nearly 400 chemists nominated from around the world.

Toraman was selected for her research in technologies that turn waste into fuels, chemicals and other products. In 2022, Toraman was awarded a \$3.4 million contract from the REMADE Institute to fund research targeting the inefficient methods currently used to process and upcycle mixed plastic waste.

Read full story: <https://bit.ly/465A3nS>

EME doctoral alum receives national 2023 Rong Yu Wan Ph.D. Dissertation Award



Behzad Vaziri Hassas received the 2023 Rong Yu Wan Ph.D. Dissertation Award in Metallurgical Engineering from the Society for Mining, Metallurgy, and Exploration (SME). Hassas, who earned his doctorate in energy and mineral engineering from Penn State earlier this year, was recognized for his dissertation, "Process development for

selective separation of critical elements from secondary resources."

"Considering Dr. Rong-Yu Wan's amazing journey to success, I was tremendously honored to receive this award for my doctoral dissertation," Hassas said.

Hassas, who is now a postdoctoral researcher at Columbia University, was advised by Mohammad Rezaee, associate professor in EME and holder of the Centennial Career Development Professorship in Mining Engineering in the Penn State College of Earth and Mineral Sciences.

Read full story: <https://bit.ly/3MSr2Ye>

Berkebile lauded for commitment to students, alumni



Jerry Berkebile, president of Augustin Exploration LLC, in Midland, Texas, is the 2023 recipient of the Colleen Swetland Alumni Achievement Award given by Graduates of EMS (GEMS) Board of Directors.

Berkebile, a 1977 Penn State graduate in petroleum and natural gas engineering, was chosen for his commitment to improving the careers of

alumni, his dedication to serving the University, and his efforts to improve the education of current students.

"I am honored to receive this award, especially because it is named after Colleen Swetland, who served the College of Earth and Mineral Sciences so well for so many years," Berkebile said. "It has been rewarding to work with many outstanding individuals from the faculty, staff, and fellow alumni. The highlight to me, though, has been my opportunity to meet and talk with so many bright and talented Penn State students who have decided to pursue energy careers."

Read full story: <https://bit.ly/3QA8220>

Shelley Corman-Frisby appointed to Earth and Mineral Sciences alumni board

In July, the College of Earth and Mineral Sciences announced the three-year appointment of Shelley Corman-Frisby, a 1985 graduate in mineral economics, to the Graduates of Earth and Mineral Sciences (GEMS) board of directors.

An EME alumna, Shelley Corman-Frisby brings more than thirty-seven years of experience in business development, commercial operations, and regulatory affairs for natural gas transmission assets. She is vice president of business development at Boardwalk Pipeline Partners in Houston and has demonstrated expertise in pipeline expansion projects, deal origination, midstream agreements and negotiations, FERC rate and certificate regulation, and commercial operations.

Read full story: <https://bit.ly/3QRzr0E>

Scientists develop new method to create stable, efficient next-gen solar cells

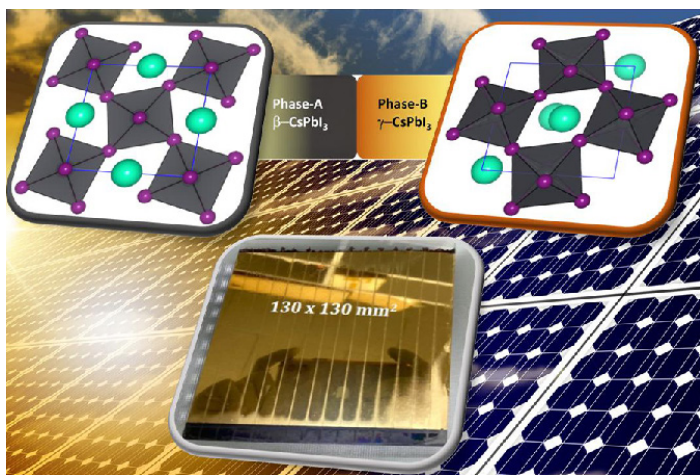


Next-generation solar materials are cheaper and more sustainable to produce than traditional silicon solar cells, but hurdles remain in making the devices durable enough to withstand real-world conditions. A new technique developed by a team of international scientists, including Penn State faculty Nelson Dzade, could simplify the development of efficient and more durable

perovskite solar cells that still achieve a high efficiency of 21.59 percent conversion of sunlight to electricity.

Perovskite solar cells, named for their unique crystalline structure that excels at absorbing visible light, are more affordable and more sustainable to produce, according to Dzade. But the leading candidates used to make these devices, hybrid organic-inorganic metal halides, contain organic components that are susceptible to moisture, oxygen, and heat, can lead to rapid performance degradation, the scientists said.

To overcome issues in degradation due to changes in the crystalline structures, the scientists developed a dual deposition technique that combined two photoactive polymorphs of cesium lead iodide to form a phase-heterojunction. The combination suppresses the undesirable changes, the scientists said.



The researchers then fabricated a device that maintained more than 90 percent of the initial efficiency after 200 hours of storage under ambient conditions, Dzade said.

The researchers said the technique could pave the way for the development of additional solar cells based on all inorganic perovskites or other halide perovskite compositions.

“With this approach, we believe it should be possible in the near future to shoot the efficiency of this material past 25 percent,” Dzade said. “And once we do that, commercialization becomes very close.”

Read full story: <https://bit.ly/3FSNLzz>

Sloan Foundation grant to fund research on governance of the U.S. electric grid



Seth Blumsack, professor of energy and environmental economics and international affairs, was awarded a \$1,193,307 grant from the Alfred P. Sloan Foundation to sustain and expand an interdisciplinary research network focused on the regional organizations that manage the electric power transmission grid in the United States and

how the governance of these regional transmission organizations (RTOs) impacts outcomes for market efficiency, sustainability, equity, reliability, and resilience.

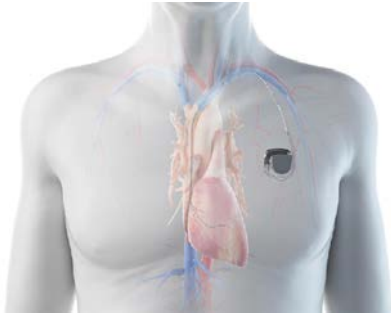
The three-year grant will be used to expand the research network’s size and scope. Research previously focused primarily on electricity markets and will be expanded to encompass other infrastructure governance issues critical to sustainable energy system transition, including transmission planning and investment and resilience of the grid to major disruptions.

“While there is a strong body of research on RTOs since their inception in 1996, there is an increasing urgency to decarbonize the grid, as well as an increased interest in resiliency to face events brought about by climate change like the Texas winter crisis in 2021,” said Blumsack. “Understanding how RTOs interact with external interests, or who is in the room when they make critical decisions, is important because even a small difference in process can lead to a big difference in outcomes.”

Blumsack, who also co-directs Penn State’s Center for Energy Law and Policy, emphasized the layers of complexity, from the technological engineering feat of the electric grid to market dynamics and changing environmental factors, make analyzing RTOs a unique challenge that requires a collaborative network of researchers. In the coming three years, Blumsack seeks to double the number of researchers with a focus on studying the social impact and equity of the grid, a perspective that historically has often gone overlooked.

Read full story: <https://bit.ly/47lq2nX>

New wireless, rechargeable battery research aims to reduce surgical risks



Researchers at Penn State are designing a new wireless rechargeable battery for biomedical electronics, such as cardiac pacemakers, that will allow

them to be charged and managed without the need for invasive surgery.

“We want to optimize the battery and the materials design and couple that with wireless charging,” said Feifei Shi, assistant professor of energy engineering. “Currently, we are limited to cable charging, and wireless charging is definitely the future.”

Biomedical devices recreate physiological functions in the human body that relieve chronic pain and vastly improve quality of life, and the past few decades have seen tremendous growth in electronics and wireless technology that champion this cause. However, a remaining challenge for medical devices is the power supply. The bulk of most implantable electronic devices is driven by primary batteries that have a limited lifespan and must be charged using cables. With human longevity at an all-time high, scientists need a longer-lasting, more reliable alternative to the lithium iodine batteries currently being used.

To help solve this problem, Shi has received a \$150,000 grant from Johnson & Johnson for a three-year project to develop a rechargeable battery with the ability to be charged wirelessly. The result will be a first-of-its-kind remotely chargeable, high-capacity battery within the human body. This new, rechargeable battery system has the potential to eliminate the risk of infection and other complications associated with surgery and provide a more stable and durable power supply to allow more health diagnostic sensors to be integrated into implemented medical devices.

Read full story: <https://bit.ly/477sf68>

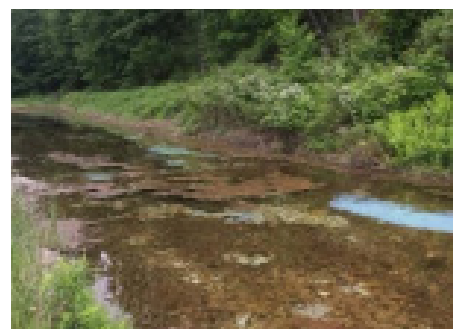
Penn State’s Center for Critical Minerals to receive \$2.1M for pilot program



Penn State’s Center for Critical Minerals will receive \$2.1 million in federal funding to design, build, and test a modular pilot-scale research and development unit intended to recover vital rare earth elements and other critical minerals from Pennsylvania streams and other environmental sources.

These minerals are prevalent in essential components of everyday life, including batteries, cellphones, automobiles, appliances, and electronic devices. Critical minerals also play a central role in defense and homeland security applications, making them vital to national security and domestic economic growth.

The pilot system will help extract these much sought-after resources, provide environmental benefits, and show the viability of a full-scale plant to help Pennsylvania become a leader in this burgeoning industry and advance the development of an independent energy future.



“Abandoned mine drainage is one of Pennsylvania’s largest sources of stream impairment,” said Sarma Pisupati, professor of energy and mineral

engineering and director of the Center for Critical Minerals. “This funding to build a pilot-scale facility at Penn State to demonstrate the feasibility of extracting rare earth and other critical minerals from acid mine drainage will generate vital information and data for robust techno-economic analysis and scaling up to a full-scale plant.”

Read full story: <https://bit.ly/40xDNgH>

Read more research news



Read the latest research stories—including Feifei Shi’s research on nuclear salt reactors—at the EME website.

eme.psu.edu/news-and-events/All

Student chapter wins SPE Presidential Award



The Penn State Society of Petroleum Engineers student chapter won the 2023 Presidential Award for the Outstanding Student

Chapter, as recognition for going above and beyond the SPE mission to engage the industry, serve local members and the community, and participate in social outreach. The award is the highest honor the society bestows college chapters, with only three U.S. universities receiving the distinction. The award marks a growing recognition for the chapter, which previously won the Student Chapter Excellence Awards in 2022 and 2020.

The honor builds on many successes for the club over the past year. The chapter placed first in the Pittsburgh Section Poster Competition and second in the Chevron Engineering Week Competition. The chapter also competed against the world's leading students in the Petrobowl Championship Qualifiers—a fast-paced quiz environment covering technical and non-technical questions about the industry.

Read full story: <https://bit.ly/3shsY5S>

Shekarian awarded SME Ph.D. fellowship grant



Younes Shekarian, a doctoral degree candidate, received the SME Ph.D. Fellowship grant from the Society for Mining, Metallurgy and Exploration (SME). The award helps support exceptional doctoral students who are seeking a career in academia.

Shekarian said he was overcome with gratitude

when he learned about receiving the fellowship.

“I was overwhelmed with excitement,” said Shekarian. “It was a profound moment, a real validation to be recognized by such a prestigious organization as SME. It gave me a sense of immense pride, but there was a sense of responsibility knowing that I’ve been granted this honor and the expectations that come with it.”

Shekarian said he is happy the grant also will help him continue his work developing a novel chemical-free process for the sustainable recovery of cobalt and manganese from low-concentration aqueous streams.

Read full story: <https://bit.ly/3SPE8cF>

EME Students Tour PA Facilities



Ibrahim Mohammed Hamed Al-Hinnaai, a junior majoring in environmental engineering, doesn't have a dream job—yet—but he knows he wants to help make a difference for a cleaner, more sustainable world. It's why he jumped on the opportunity to join five EME students on an energy facilities tour across central and northeastern Pennsylvania. The trip

included visits to a wind farm, an active drilling rig, compressor stations, an electric fracturing site, and an acid treatment site. The trip is part of a new initiative to offer students a chance to connect with the local energy industry while building a cross-program community early in student's academic careers.

Al-Hinnaai was drawn to the energy field because he sees a lot of opportunities for personal growth in an industry where demand has been increasing year to year. The chance to be on the vanguard of the energy transition, and address the issues associated with energy production, also appealed to him.

“It was so insightful to see all the different employees and environments and how it all related to the theoretical parts we learn in class,” said Al-Hinnaai.

Al-Hinnaai had a hard time picking his favorite part of the three-day tour. Seeing the facilities up close after the long drive on lime-coated backroads and zipping up in the thick, fireproof jumpsuit both stood out in his mind. When he learned about the wind turbine maintenance procedures, which involve wire rigs, suction cups, and dangling more than 260 feet in the air, he laughed as he imagined himself strapped in.





“I don’t know if I see myself being up there,” said Al-Hinnaai. “But if the world requires me to do it, I would be glad to.”

David Spigelmyer Sr., a 1998 alumnus in fuel science, who has a long career building partnerships as a past president of the Marcellus Shale Coalition, helped organize the tour. He was encouraged by the students’ continued excitement despite the long days in the sun.

“Providing our students with real-world field experience is a critical component of preparing our next generation of Penn State engineers with the skills necessary to meet the energy demands not only of our nation but countries across the globe. The complex challenges of meeting our future energy demands, all while protecting our environment, is fundamental to the efforts of Penn State’s energy and minerals engineering programs. It is encouraging to witness the excitement and curiosity to learn from our Penn State engineering problem solvers. The future is full of challenges, not only to keep the lights on but to meet the growing electricity demands of our technology and transportation sectors. Our Penn State student engineers will be front and center in the production, transportation and delivery of our future energy sector and their passion to learn is encouraging.”

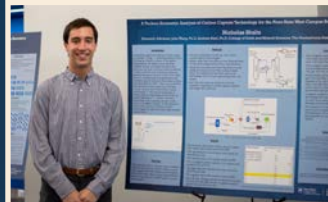
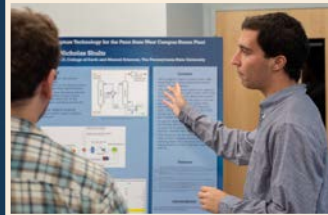
Undergrad Research



Watch Nicholas Shultz, who is a senior majoring in energy engineering, discuss his experience in Andrew Kleit’s lab researching carbon capture. Shultz’s research experience was part of EME’s Summer Research Program.



Joshua Macomber, who is majoring in petroleum and natural gas engineering, found his research home with Eugene Morgan, looking at viable areas for large scale carbon dioxide sequestration. Macomber’s research experience was also a part of EME’s Summer Research Program.



new faces



Diane Herr,
Administrative
Support Assistant



Carmel Kamens,
Industry Recruiter



Frank Male,
Assistant
Research
Professor of
Applied Research
and Energy
and Mineral
Engineering



**Thandazile
Moyo,**
Assistant
Professor
of Energy
and Mineral
Engineering



**Olumide
Ogunmodimu,**
Assistant
Professor
of Energy
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Lan Ziegler,
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Program
Coordinator



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