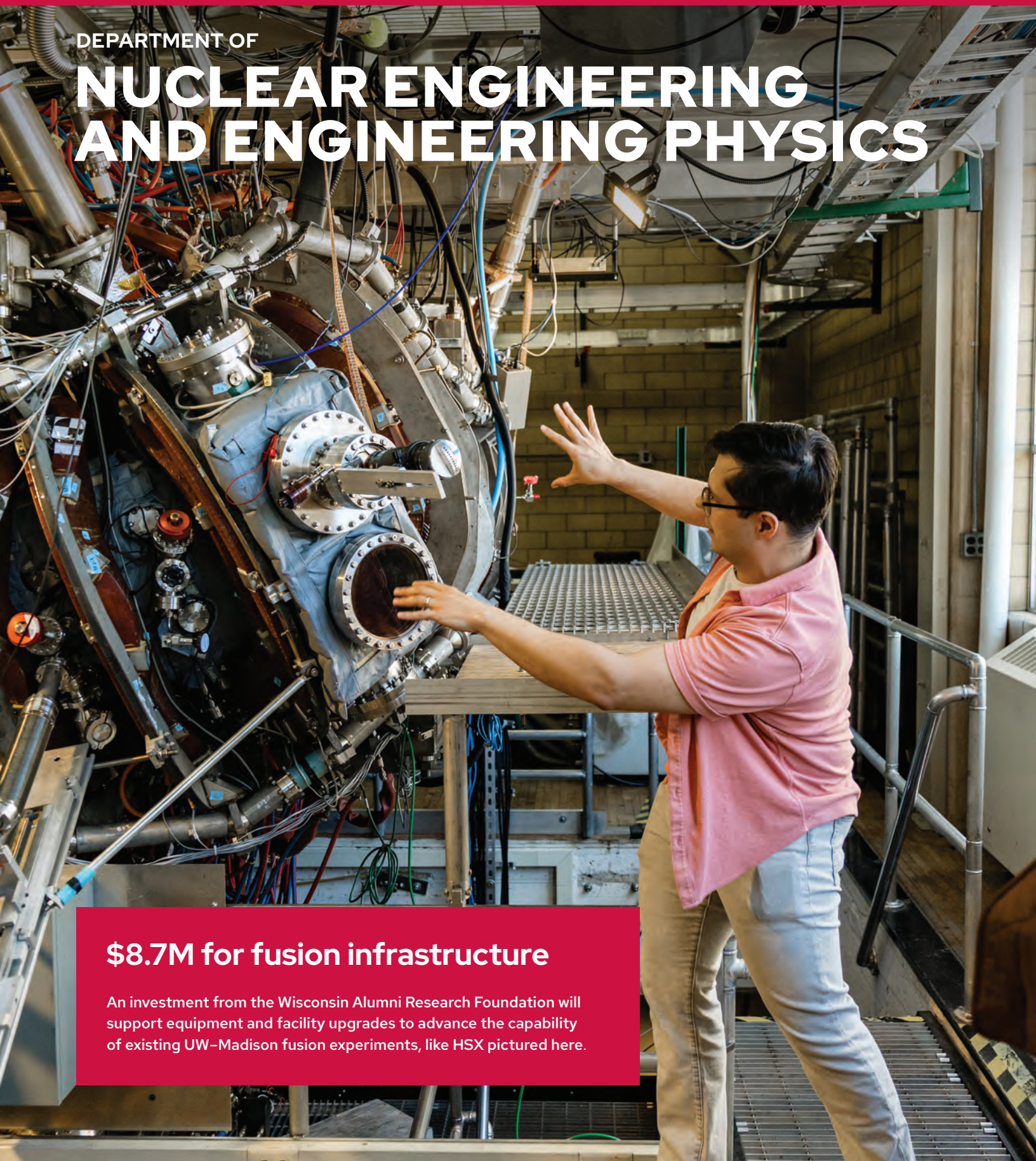
College of Engineering
UNIVERSITY OF WISCONSIN–MADISON

FALL 2026 NEWSLETTER

DEPARTMENT OF

NUCLEAR ENGINEERING AND ENGINEERING PHYSICS



$8.7M for fusion infrastructure

An investment from the Wisconsin Alumni Research Foundation will support equipment and facility upgrades to advance the capability of existing UW–Madison fusion experiments, like HSX pictured here.



In 1994, Nelson Mandela wrote, "There is nothing like returning to a place that remains unchanged to find the ways in which you yourself have altered." That resonated with me this summer as I returned to UW-Madison to chair the NEEP department, especially walking the familiar hallways of ERB and biking the lake paths as I once did as a PhD student. At the same time, the department has blossomed with many new ideas, projects, faculty, staff and students. My first few months getting to know this new cast of characters and the research they're undertaking in 2026 has been dazzling.

On July 22, the U.S. Department of Energy announced the first 278 awards from its Genesis Mission, an ambitious effort to use artificial intelligence and advanced computing to accelerate scientific discovery. UW-Madison won five Phase I awards, more than any other public university. Two came to NEEP. Grainger Professor of Nuclear Engineering Paul Wilson is using artificial intelligence and machine learning to accelerate the design of breeding blankets for stellarator fusion power plants. Senior scientist David Smith, working with NEEP scientist Semin Joung and Ryan Coffee, a scientist at SLAC National Accelerator Laboratory, is developing high-throughput edge AI to analyze plasma turbulence data in real time at the DIII-D National Fusion Facility.

Our faculty ranks are changing, too. This summer, we celebrated the promotions of Steffi Diem and Ben Lindley to associate professor. Steffi's experimental plasma research includes microwave heating and current drive while Ben works across reactor physics, advanced reactor design, and integrated energy systems. In August, we welcomed two new senior faculty. Jamie Coble, who joins us from the University of Tennessee-Knoxville, is an expert in nuclear system monitoring, diagnostics, data analytics and artificial intelligence. Meanwhile, Hong Qin, an internationally recognized theoretical and computational plasma physicist, joins us after more than two decades at Princeton and the Princeton Plasma Physics Laboratory.

There is plenty ahead. In August, the Wisconsin Alumni Research Foundation announced a $27 million investment in four UW-Madison research initiatives, including fusion materials and manufacturing. That investment will help propel the College of Engineering's moonshot toward limitless distributed power, building on Wisconsin strengths in fusion engineering, plasma physics, materials, computation and manufacturing.

In the years since I left Madison, I've been part of several institutions dedicated to advancing nuclear science and engineering. I'm delighted to return to one with familiar roots, many new faces and world-class work underway.

On, Wisconsin!

Kathryn (Katy) Huff
NEEP Department Chair and Spangler Faculty Professor
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On the cover: Researchers give participants in the second Great Lakes Fusion Energy Summit, held on May 5, 2026, a tour of the HSX experiment at UW-Madison. Photo: Tom Ziemer.



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FOCUS ON NEW FACULTY

Jamie Coble harnesses data analytics to improve nuclear power plant operations and maintenance

Jamie Coble joined the department as a professor in August 2026. She is an expert in online monitoring, diagnostics and prognostics; risk-informed decision making; and advanced control for nuclear systems.

Coble grew up in Johnson City, Tennessee, and received all four of her degrees from the University of Tennessee-Knoxville—a bachelor's degree in nuclear engineering and mathematics in 2005, a master's degree in nuclear engineering in 2006, a master's degree in reliability and maintenance engineering in 2009, and a PhD in nuclear engineering in 2010. She comes to UW-Madison from the University of Tennessee-Knoxville, where she was a professor of nuclear engineering.

What is the focus of your research? Coble: The work my research group does is broadly in data analytics and machine learning for a variety of nuclear applications. A lot of my work focuses on using the data already being collected from nuclear power and fuel cycle facilities to monitor what's happening in the system and make data-driven, risk-informed decisions about operations and maintenance.

Much of the inspection and maintenance in nuclear power plants is time-based, periodic maintenance. In my research, we're looking at how we can defer the periodic maintenance that doesn't actually need to happen without missing any indicators of problems that could lead to equipment failures. A significant amount of the cost of generating electricity from nuclear power is operations and maintenance, so looking at how we can better manage those costs in a way that doesn't affect nuclear safety can have a big economic impact.

What attracted you to UW-Madison? UW-Madison NEEP has a long reputation for being an outstanding department. A big draw for me was the UW Nuclear Reactor. I'm excited to explore what I can do with the reactor in terms of research—instrumentation and controls, digitalization, system monitoring, or digital twin development—and even pursuing a license to operate the reactor!

What are your hobbies and other interests? I enjoy reading fiction of all types; my goal each year is to wear out my library card. I've got a 4-year-old son, and most of my time outside work revolves around fighting pretend bad guys, chasing after wobbly bicycles, and building large structures out of moving boxes.



FOCUS ON NEW FACULTY

Hong Qin is improving simulations that predict plasma behavior for fusion energy

Hong Qin joined the department as an associate professor in August 2026. Qin is a theoretical and computational plasma physicist whose work spans fusion energy, plasma physics, accelerator physics, artificial intelligence and machine learning, and quantum computing.

He was born and raised in Zhengzhou, China, and earned his BS and MS degrees from Peking University in Beijing, then earned his PhD in astrophysical sciences from Princeton University in 1998, where he specialized in plasma physics and fusion energy. Prior to joining UW-Madison, Qin spent more than two decades at Princeton University, including as a principal research physicist at the Princeton Plasma Physics Laboratory and a lecturer with the rank of professor.

What is the focus of your research? Qin: I am a theoretical and computational plasma physicist. My research focuses on understanding the fundamental mathematical structures of plasma dynamics and using that understanding to develop more reliable computational methods and improve our ability to predict plasma behavior. I am particularly interested in geometric and topological structures and advanced simulation algorithms, and their applications to fusion energy, as well as their connections to quantum physics and quantum technologies.

What attracted you to the NEEP department? UW-Madison is becoming what I like to call the "center of the universe for fusion energy." It has an exceptional combination of plasma theory, computation, engineering and major fusion experiments. That combination is unusual and especially attractive to me because I want my theoretical and computational work to be closely connected with experiments. The department and the broader university have major plasma and fusion programs such as Pegasus-III, WHAM, MST, HSX, MAP and the Center for Plasma Theory and Computation.

What are your hobbies and other interests? Outside research and teaching, I enjoy reading about archaeology and art. I would not claim much knowledge of either, but I have managed not to let that interfere with my interest. I also enjoy dry and self-deprecating humor.



Second fusion summit at UW-Madison signals the Midwest's rise as a fusion powerhouse

As audacious of a challenge as achieving nuclear fusion continues to be—let alone producing net-positive energy from the reaction—it's merely one piece of the equation when it comes to making fusion a viable piece of the energy puzzle.

There are considerable hurdles in developing the materials to contain ultra-hot plasma at commercial scale and manufacturing the necessary specialized components for fusion reactors. Then there's the issue of educating and training a workforce in an ever-evolving industry.

And yet, those are challenges that the College of Engineering plans to tackle—in partnership with university colleagues, private industry and local and federal government entities. In that spirit, the college was among the hosts of the second Great Lakes Fusion Energy Summit, May 5, 2026, at the Discovery Building on the UW-Madison campus. Co-hosted by Wisconsin-based 5 Lakes Institute and the UW-Madison College of Letters and Science, the event brought together more than 350 fusion and plasma physics researchers from academia, industry leaders, government representatives and investors for fusion lab tours and panel discussions about supply chains, rising energy demand, the commercial fusion timeline and more.

Momentum around the idea of nuclear energy production—fusion and "traditional" fission—is building in Wisconsin. Gov. Tony Evers, who welcomed attendees, previously signed legislation commissioning a siting study for nuclear energy opportunities in the state (led by Paul Wilson, Grainger Professor of Nuclear Engineering), establishing a nuclear power summit board and providing a sales and use tax exemption for fusion projects. And the College of Engineering itself included fusion among six recently announced "moonshots"—ambitious, society-shaping research frontiers it will undertake through large-scale collaboration.

Devesh Ranjan, Grainger Dean of the College of Engineering, cited the example of groundbreaking vitamin D research that emerged from the UW-Madison in the early 20th century.

"I hope that in 10 years from now, people will say that commercial fusion, the technology that we're using came out of the engineering moonshots and the ecosystem we have created through the Great Lakes region," he told the audience.

Public-private partnership is at the core of the Great Lakes Fusion Energy Alliance, which launched at the inaugural 2025 summit. Speakers pointed to the region's historic strength in manufacturing as an advantage in building out a fusion supply chain.

"We've had great experiences working with local manufacturers," said Ross Radel (BSNE '03, MSNEEP '04, PhDNEEP '07), chief technology officer of SHINE Technologies, based in Janesville, Wisconsin, during one keynote panel session.

SHINE is one of four fusion companies to spin out of UW-Madison research labs, along with Realta Fusion, Type One Energy and Xantho Technologies. That's no coincidence; fusion and plasma physics research at the university—spanning the College of Engineering and the Department of Physics in the College of Letters & Science—has put it at the forefront of the field, with an array of experiments on campus encompassing all the leading types of fusion reactors: donut-shaped tokomaks, coiled oval stellarators and tubular mirror devices.

"I think people don't realize how much of the industry as a whole spun out of universities," said Associate Professor Stephanie Diem, director of the Pegasus-III fusion experiment.

That includes workforce talent: More than 600 PhDs in fusion and plasma physics have graduated from UW-Madison over the years, while the number of first-year undergraduate students interested in studying nuclear engineering is growing.

"UW-Madison wants to help push fusion over the line," said Eric Wilcots, dean of the College of Letters & Science who took over as interim chancellor of the university on May 17, 2026. "Today is about building the ecosystem that fusion energy requires."

Wisconsin Gov. Tony Evers addresses attendees. Photo: Tom Ziemer.



FOCUS ON NEW FACULTY:

Kathryn Huff is advancing modeling capabilities for nuclear reactors and fuel cycles

Kathryn (Katy) Huff began her new role as Spangler Faculty Professor and NEEP department chair in July 2026. Her research interests focus on advanced nuclear reactors and fuel cycles, multi-physics simulation, energy systems analysis, scientific computation and nuclear energy policy. She uses computational techniques to model and simulate both next-generation nuclear reactors of all types and how they fit in the broader system of nuclear fuel cycles.

She earned her BA in physics from the University of Chicago in 2008 and her PhD in nuclear engineering from UW-Madison in 2013. From 2021 to 2024, she held senior leadership positions in the U.S. Department of Energy, including assistant secretary of energy for nuclear energy. In that role, she led nuclear energy policy, managed a multibillion-dollar research and development portfolio, and coordinated work across national laboratories, universities and industry. Prior to joining NEEP, Huff was an associate professor of nuclear, plasma, and radiological engineering at the University of Illinois in Urbana-Champaign, where she founded the Advanced Reactors and Fuel Cycles group.

What are your plans as chair for leading the department?
Huff: My No. 1 goal is to do no harm. The NEEP department is doing great and has amazing growth and momentum. If we can keep it sailing straight on course, it could be the best department in the country soon. I'd like to leverage resources to bring more federal program managers, national laboratory scientists and others to campus so they can see firsthand our world-class facilities and research.

I'll focus on ensuring that we continue to provide an exceptional student experience in the department. Being a smaller department, we have a unique opportunity to more directly engage with all the students. As chair, my goal is to know the names of all the graduate students and undergrads by the end of my first year. We can create a strong community of support, engagement and friendship that's more than professional networking. I want the department to provide many activities and fun opportunities for people to just hang out as a group.

With DOE Genesis Mission awards, UW researchers accelerate fusion reactor design optimization

Fusion has enormous potential to address the global energy crisis, but unresolved engineering challenges and upfront financial obstacles are barriers to commercializing this source of abundant, clean energy.

Nuclear engineering researchers Paul Wilson and David Smith are leading projects that will leverage AI to dismantle these barriers faster. Their work is supported by funding from the U.S. Department of Energy Genesis Mission, a national effort to accelerate breakthroughs in energy, scientific discovery, and national security by integrating AI in research workflows.

Wilson, the Grainger Professor of Nuclear Engineering, is leading a project to advance the design of a critical fusion reactor component called a breeding blanket. Using AI to calculate optimized blanket solutions from high-dimensional data sets will help optimize the entire fusion system based on cost, construction time and other criteria.

Their work expands on existing collaborations with Type One Energy, a UW-Madison spinoff company, and research conducted by one of Wilson's former PhD students, Connor Moreno. With additional support from collaborators at Argonne National Laboratory and Cornell University, this project brings together academia, government and industry partners to advance fusion.

Plasma confinement—or maintaining the conditions necessary to produce fusion reactions—is another key challenge and cost-driver for fusion systems. Smith, a plasma physicist and fusion scientist, is developing a first-of-its-kind AI technique to enable more precise, efficient and autonomous plasma control.

Smith's novel approach will use neural networks to process large streams of data from a diagnostic instrument developed by UW-Madison and operated at the DIII-D tokamak. Real-time inferences will alert the system to fluctuations in the plasma, triggering the control system to steer the plasma back to the desired state. This quasi-continuous, quasi-autonomous operation will maximize energy production and significantly lower costs, bringing fusion devices closer to commercial viability.

The DIII-D National Fusion Facility where UW–Madison developed and operates a diagnostic on the tokamak to capture fundamental plasma dynamics. Image courtesy of General Atomics.



Study reveals massive quantities of undeclared uranium are exported from the DRC

A study conducted by UW-Madison and Princeton University nuclear engineers has identified a major blind spot in nuclear accounting with global nuclear security implications.

According to the researchers, large quantities of uranium have been extracted, concentrated and exported from the Democratic Republic of the Congo (DRC) over the past 20 years. This uranium has traveled through the DRC's cobalt supply chain without being declared to the International Atomic Energy Agency (IAEA).

Published in the journal *Nature Communications* on July 30, 2026, the research also uncovers significant environmental and health risks to miners and surrounding communities from discarded uranium in mining waste streams.

Assistant Professor Sébastien Philippe and Ryan Manzuk, a research fellow at UW-Madison and at Princeton University, who is the paper's first author, led the research. They used country-wide mineralization and geochemical data, mine-level trade records and a chemical model of cobalt processing to quantify the amount of uranium that has been dug up in the DRC and exported in cobalt-hydroxide shipments or left behind in the environment.

They estimate that 2,000 to 5,000 tonnes—approximately 4.4 million to 11 million pounds—of natural uranium were exported from the DRC, embedded in cobalt-hydroxide shipments between 2000 and 2024—even though there was no officially reported uranium production in the DRC in decades.

Less than 10% of this material appears to have been publicly declared and placed under international safeguards, according to Philippe.

"This quantity of undeclared uranium could be used to produce fissile material for roughly 600 to 1,500 nuclear weapons or fuel a standard light-water nuclear reactor for 10 to 25 years, so it's quite a large amount," says Philippe, a 2025 MacArthur Fellow. "And because this uranium is undeclared and not officially reported as being mined and extracted, it has no limitation placed on its end use. It could end up in a civilian nuclear energy program or in a military program, because nobody is going to ask where this uranium is going. It's not on the books."

Philippe says most of the shipments went to China, which is home to about 95% of the world's cobalt refineries. During the process in which crude cobalt hydroxide is refined to produce cobalt metal, uranium must be removed—and becomes a highly valuable byproduct.

In addition, the researchers estimate that 1,000–4,000 tonnes of uranium were likely discarded to mine tailings, the waste stream from mining, in chemically mobile forms, posing environmental and health risks to miners and communities surrounding the mines.



The DRC's Copperbelt is the world's leading source of cobalt, an essential metal for lithium-ion batteries. In this region, uranium naturally co-occurs with cobalt ores. And, unless deliberately removed, that uranium stays with the cobalt all the way through extraction, processing into cobalt hydroxide and being exported as an industrial raw material.

The project was built on an innovative partnership between scientists and investigative journalists working together on a public interest research investigation. Philippe and Manzuk collaborated with journalists and editors from Lighthouse Reports and the Financial Times. On July 30, 2026, the Financial Times published an in-depth investigation that expands on the findings reported in the accompanying Nature Communications paper through additional reporting, interviews and documentary evidence.

The study and resulting international media coverage has prompted a significant response from the DRC government. The DRC has announced the creation of an interagency task force to investigate the researchers' findings and launched a nationwide measurement campaign of uranium in cobalt export products. Government officials also requested technical support from the IAEA and, on the same day, suspended exports of copper and cobalt intermediary products.

Assistant Professor Sébastien Philippe (left) and research fellow Ryan Manzuk used country-wide mineralization and geochemical data, mine-level trade records and a chemical model of cobalt processing to quantify the amount of uranium that has been dug up in the DRC and exported in cobalt-hydroxide shipments or left behind in the environment. Photo: Joel Hallberg.

DEPARTMENT NEWS

A $27 million investment from the Wisconsin Alumni Research Foundation (WARF) will accelerate four UW-Madison high-impact transdisciplinary research initiatives, which include a major effort to develop materials and manufacturing technologies needed for future fusion power plants.

Fusion energy, which seeks to replicate the same reactions that power the sun, has long been viewed as a potentially transformative source of clean, abundant energy. However, one major challenge is developing materials capable of withstanding the extreme temperatures and conditions inside fusion reactors. UW-Madison researchers plan to establish new capabilities in AI-enabled materials discovery, 3D laser printing, automated alloy generation and cold-spray coating technologies to address that challenge.

The gift also will create a new institute as a one-stop entry point for industry, policy, legislative and economic partners and the public. A key goal of this institute is to ensure that research efforts are aligned with the practical requirements of future fusion systems and commercial deployment. "WARF's investment will enable us to grow dedicated materials discovery efforts for fusion and unique real-world testing capacity, including integration tests into magnetic confinement concepts that we continuously advance on this campus based on our leadership in plasma science," says Professor Oliver Schmitz, College of Engineering associate dean for corporate engagement and entrepreneurship.

The initiative also will deepen ties with Wisconsin-based companies and support growth of the Great Lakes Fusion Energy Alliance.

Ben Lindley promoted



Ben Lindley has been promoted to associate professor in recognition of his dedication to teaching and service and his outstanding research achievements in the areas of nuclear reactor physics, advanced reactor design and integrated energy systems. Lindley is leading several new and ongoing projects to reduce the cost of advanced nuclear reactors, including a multi-institution effort to develop and test a critical fusion technology. Funded by a $19 million Fusion Innovative Research Engine (FIRE) award from the U.S. Department of Energy, the project will directly benefit commercial fusion power plant developers.

Stephanie Diem promoted



Stephanie Diem has been promoted to associate professor in recognition of her dedication to teaching and service and her outstanding research achievements in experimental plasma physics, magnetically confined plasmas, and microwave heating and current drive. Diem is the principal investigator of the Pegasus-III Experiment studying innovative plasma startup techniques to reduce the cost and complexity of future fusion power plants.

Workshop on nuclear war effects



Assistant Professor Sébastien Philippe organized the Workshop on Nuclear War Effects: Scenarios and Modeling at UW-Madison in June 2026. The workshop brought together leading experts from universities, national laboratories, nonprofit organizations and policy institutions to better understand what a nuclear war would mean for people, societies and the planet.

Fusion energy workshop



Assistant Professor Adelle Wright organized a three-day workshop on fusion energy in August 2026 to strengthen international collaboration. UW-Madison hosted researchers from Japan's National Institute for Fusion Science (NIFS) and the Plasma Research Center at the University of Tsukuba.

Fusion safety analysis research



PhD student Anthony Carlos Garcia has been selected to conduct fusion safety analysis research in collaboration with Idaho National Laboratory through the U.S. Department of Energy Office of Science Graduate Student Research Program. Garcia's research aims to demonstrate the effectiveness of MELCOR-TMAP, a thermal hydraulics computer code combined with a tritium migration analysis program. Once proven effective, the tool could be used by fusion power plant designers to ensure their systems are equipped to safely handle accident scenarios.

Public policy program

Graduate students Juan Valderrama and Nivedan Vishwanath are engaging in public policy through the Fusion Student Delegation (FuSD), a new program that advocates for the students, university programs and workforce initiatives that will help bring fusion energy to fruition. Centered around an annual program in Washington, D.C., FuSD gives students the opportunity to analyze existing policy documents, write original policy statements, and engage with policymakers, think tanks, industry groups and scientific experts.

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University-industry partnership identifies new solutions for mirror fusion devices

UW-Madison researchers partnered with Realta Fusion, a private fusion startup, to publish a performance assessment identifying trade-offs between power plant design variables and candidate materials for mirror fusion devices.

Magnetic mirror fusion devices confine plasma between two magnets, causing energetic particles to bounce back and forth in a mirror-like effect. Magnetic mirrors were popular in early fusion research but have only recently resurfaced as a viable path to fusion due to new physics and magnet engineering developments.

To advance the technology to the next stage, UW-Madison researchers developed a modelling capability called ParaTAN to evaluate the neutronics performance of Realta Fusion's magnetic mirror device, determining how well the device manages the free, high-energy neutrons produced during fusion reactions.

Graduate student Hitarth Shah first-authored the assessment in collaboration with his advisor, Associate Professor Ben Lindley; Tim Bohm, a scientist at UW-Madison; and researchers from Realta Fusion.

Evaluating how free neutrons interact with other components in the system is critical. Many fusion systems are designed with a mechanism called a breeding blanket that absorbs neutrons, which then collide with lithium atoms in the blanket to produce tritium, the most common fuel used in fusion reactors. Breeding blankets also shield surrounding components from radiation.

The team investigated both tritium breeding and shielding performance through two studies comparing various blanket materials, geometries and lithium enrichment levels. The studies identified several high-performing materials and highlighted the trade-offs between them.

"Despite some major physics and engineering milestones—many of them from the WHAM machine at UW-Madison's Physical Sciences Laboratory—mirror concepts have not been well explored in comparison to tokamak and stellarator concepts," says Shah. "This tool will support rapid and extensive design exploration for magnetic mirror machines.

Graduate student Hitarth Shah. Submitted photo.