

CAES Associate Director Tri-Annual Report January – May 2024

Executive Summary

Between Jan 1 – April 30, 2023, ISU CAES researchers had published more than 17 peer-reviewed articles, attended several conferences/workshops, received over \$750,000 in educational and research grants, submitted more than 40 collaborative proposals, provided multiple tours of the CAES building/ ISU's facilities, engaged with private companies/industry from Idaho and beyond, signed strategic MoUs on research collaboration with a focus on CAES activities with the University of Doha for Science and Technology (UDST) in Qatar and Gachon University in South Korea, among many other accomplishments. The ISU-UDST MoU was noted as a best practice during the United States-Qatar Strategic Dialogue in 2024.

Tours Led by University Reps

1. Tour of CAES facilities for ISU EHSS Department. (Jan 31).
2. Tour of CAES facilities and discussing opportunities for College of Eastern Idaho students to work in intern positions at CAES. Disciplines discussed from Health Physics Technicians to instrument/equipment repair and maintenance technicians with Kole Bowman, Check Bohleke, Gayr Holyoak and Mathew Taylor. (Feb 5).
3. Tour of CAES facilities including an AVL demo for ISU's Alumni Board. (Feb 6).
4. Tour of CAES facilities for Justin Walsh's group (INL). Project Manager wanted to highlight CAES capabilities and discuss how to bring projects into CAES. Alex Winston requested the tour (Feb 15).
5. Tour of CAES facilities and discussing opportunity for industry collaboration with Wulf Lebrecht and Lon Kreger on Graphene/Graphite, Wastewater Treatment, and Advanced Manufacturing. Wulf and Lon are from the industry/startups and would like to utilize the facilities at CAES by engaging with ISU faculty and students. (Feb 20).
6. Tour of CAES facilities in support of ISU Master Plan with the Smith Group. (Feb 22).
7. Tour of CAES facilities by ISU's Geosciences Department Chair, meeting with Travis/Phil on geoscience/critical minerals collaboration. (Feb 22).
8. Tour of CAE facilities with an emphasis on MaCS and AML with Asef Redwan (INL). (March 11).
9. Dr. Kitty Griswold with ISU's Office of Research, Allied Faculty in the Dept. of Biological Sciences and Co-PI on the NSF-EPSCoR Track-1 award for Idaho's Community-Resilience in Energy Water Systems (I-CREWS), toured CAES on March 14 to learn about collaborative opportunities with CAES researchers to support the grant. I-CREWS is a five-year, \$24million project that aims to address the impacts of climate, population and technological change on energy-water systems. Partners on the project include the three CAES universities (BSU, ISU and UI), INL and the Shoshone-Bannock and Coeur d'Alene tribes. <https://www.idahoepscor.org/i-crews>
10. Tour of CAES facilities by U of I EHSS Director. (March 18).
11. Ray Clark, Executive Director at PCI Foundation, visited ISU and toured the CAES Building on April 11 discussing collaboration on grant opportunities for workforce development, leveraging the capabilities at ISU and CAES Building.

12. ISU and INL collaboration with Sporadic Mycelium Mitigation. The group met in the CAES Building on April 23.

Section 1. University Publications on behalf of CAES

List publications and indicate pending, submitted/accepted.

Amir Ali

Title: Net Zero Project Design

Journal/conference presentations: American Nuclear Society (ANS), Student Conference 2024

Authors: Brooklyn Wise, Brandon Jenkins, Ethan Lang, Leo Gannon, Moses Bosquez, Salvador Muñoz, Sweet Shanahan, Amir Ali

Status: Accepted, presented

Title: Development of Novel Oval-Twisted Helical Tube Once-Through Steam Generator: Part I: Single-Phase Laminar Flow

Journal/conference presentations: Progress in Nuclear Energy Journal

Authors: Scott Wahlquist, Amir Ali, Kyle Schroeder, Su-Jong Yoon, Piyush Sabharwall

Status: Submitted, under review

Taher Deemyad

Title: Autonomous Surveillance Breakthrough by Implementing Facial Recognition in Dog Robots

Journal/conference presentations: Intermountain Engineering, Technology, and Computing Conference (i-ETC) in Utah (IEEE)

Authors: Amir Hafezi, Minhaz Zibran, Taher Deemyad

Status: Accepted

Mostafa Fouda

Title: Joint UAV Trajectory Planning and LEO-Sat Selection in SAGIN

Journal: IEEE Open Journal of the Communications Society, vol. 5, pp. 1624–1638, Mar. 2024

Authors: Ehab Mahmoud Mohamed, Mohammad Alnakhli, and Mostafa M. Fouda

Status: Published, doi: 10.1109/OJCOMS.2024.3372551

Title: RIS-Assisted Integrated Sensing and Communication Systems: Joint Reflection and Beamforming Design

Journal: IEEE Open Journal of the Communications Society, vol. 5, pp. 908–927, Feb. 2024

Authors: Mohamed I. Ismail, Abdullah M. Shaheen, Mostafa M. Fouda, and Ahmed S. Alwakeel

Status: Published, doi: 10.1109/OJCOMS.2024.3353770

Title: Optimized Multi-User Dependent Tasks Offloading in Edge-Cloud Computing Using Refined Whale Optimization Algorithm

Journal: IEEE Transactions on Sustainable Computing, vol. 9, no. 1, pp. 14–30, Jan.-Feb. 2024

Authors: Khalid M. Hosny, Ahmed I. Awad, Marwa M. Khashaba, Mostafa M. Fouda, Mohsen Guizani, and Ehab R. Mohamed

Status: Published, doi: 10.1109/TSUSC.2023.3294447

Title: Underwater Target Detection Using Deep Learning: Methodologies, Challenges, Applications, and Future Evolution

Journal: IEEE Access, vol. 12, pp. 12618–12635, Jan. 2024

Authors: Anwar Khan, Mostafa M. Fouda, Dinh-Thuan Do, Abdulaziz Almaleh, Abdullah M. Alqahtani, and Atiq Ur Rahman

Status: Published, doi: 10.1109/ACCESS.2024.3353688

Title: Managing Natural Disasters: An Analysis of Technological Advancements, Opportunities, and Challenges

Journal: Internet of Things and Cyber-Physical Systems, vol. 4, pp. 99–109, Jan. 2024

Authors: Moez Krichen, Mohamed S. Abdalzaher, Mohamed Elwekeil, and Mostafa M. Fouda

Status: Published, doi: 10.1016/j.iotcps.2023.09.002

Title: Secure and Robust User Authentication Using Transfer Learning and CTGAN-based Keystroke Dynamics

Conference presentations: Proc. of the 2024 International Conference on Computing and Machine Intelligence (ICMI 2024), Mt. Pleasant, MI, USA, Apr. 13–14, 2024

Authors: Hussien AbdelRaouf, Mostafa M. Fouda, and Mohamed I. Ibrahim

Status: Published

Title: FedSafe-No KDC Needed: Decentralized Federated Learning With Enhanced Security and Efficiency

Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024

Authors: Mohamed I. Ibrahim, Mostafa M. Fouda, and Zubair Md Fadlullah

Status: Published, doi: 10.1109/CCNC51664.2024.10454870

Title: A Distillation-based Attack Against Adversarial Training Defense for Smart Grid Federated Learning

Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024

Authors: Atef H. Bondok, Mohamed Mahmoud, Mahmoud M. Badr, Mostafa M. Fouda, and Maazen Alsabaan

Status: Published, doi: 10.1109/CCNC51664.2024.10454744

Title: Robust Deep Learning-based Secret Key Generation in Dynamic LiFi Networks Against Concept Drift

Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024

Authors: Elmahedi Mahalal, Muhammad Ismail, Zi-Yang Wu, Mostafa M. Fouda, Zubair Md Fadlullah, and Nei Kato

Status: Published, doi: 10.1109/CCNC51664.2024.10454770

Title: Evasion Attacks in Smart Power Grids: A Deep Reinforcement Learning Approach

Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024
Authors: Ahmed T. El-Toukhy, Mohamed M. E. A. Mahmoud, Atef H. Bondok, Mostafa M. Fouda, and Maazen Alsabaan
Status: Published, doi: 10.1109/CCNC51664.2024.10454768

Title: Secured Cluster-Based Electricity Theft Detectors Against Blackbox Evasion Attacks
Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024
Authors: Islam Elgarhy, Ahmed T. El-Toukhy, Mahmoud M. Badr, Mohamed Mahmoud, Mostafa M. Fouda, Maazen Alsabaan, and Hisham A. Kholidy
Status: Published, doi: 10.1109/CCNC51664.2024.10454830

Title: Electricity Theft Detection Approach Using One-Class Classification for AMI
Conference presentations: Proc. of the 2024 IEEE 21st Consumer Communications & Networking Conference (IEEE CCNC 2024), Las Vegas, NV, USA, Jan. 6–9, 2024
Authors: Madeleine Miller, Hany Habbak, Mahmoud Badr, Mohamed Baza, Mohamed Mahmoud, and Mostafa M. Fouda
Status: Published, doi: 10.1109/CCNC51664.2024.10454859

Mustafa Mashal

Title: Mobile Robot for Security Applications in Remotely Operated Advanced Reactors
Journal: Applied Sciences, MDPI, 14(6)
Authors: Ujwal Sharma, Uma Shankar Medasetti, Taher Deemyad, Mustafa Mashal, and Vaibhav Yadav
Status: Published

Title: Reducing the Carbon Footprint through the Utilization of Precipitated Calcium Carbonate (PCC) in Soil-Cement Applications
Journal: Civil Eng. Sustainability MDPI, 16(5):1909.
Authors: Kabiraj Phuyal, Ujwal Sharma, James Mahar, Kunal Mondal, and Mustafa Mashal
Status: Published

Section 2. Conferences Attended on behalf of CAES

Taher Deemyad

Name: Intermountain Engineering, Technology, and Computing Conference (i-ETC) in Utah (IEEE)
Location: Utah State University, Logan, UT 84322
Purpose: Present and share the most recent advancement with other researchers in the field of research and looking for future collaboration
Attendees from university/CAES: This is an international conference where most attendees are from industries and universities in the Mountain area (Utah, Idaho, Montana, Wyoming, etc.)

Chikashi Sato

Name: Research and Creative Works
Location: ISU, Pocatello

Purpose: Poster presentation
Attendees from university/CAES: Yashodha Nyaupane

Name: 64th Idaho Academy of Science and Engineering Symposium and 17th Intermountain Conference on the Environment Joint Symposium

Location: ISU, Pocatello

Purpose: Poster presentation

Attendees from university/CAES: Yashodha Nyaupane

Rene Rodriguez

Name: 64th Idaho Academy of Science and Engineering Symposium and 17th Intermountain Conference on the Environment Joint Symposium

Purpose: Oral Presentation and Poster Presentation

Attendees from university/CAES: Prof. Rodriguez and undergraduate students Shanae Van Leuven and Adam Storms

Mostafa Fouda

Name: 2024 IEEE Consumer Communications & Networking Conference (CCNC)

Location: Las Vegas, NV, USA

Purpose: Presenting accepted papers and connecting with international researchers

Attendees from university/CAES: None

Name: 2024 International Conference on Computing and Machine Intelligence (ICMI)

Location: Mt. Pleasant, MI, USA (attended virtually)

Purpose: Presenting accepted papers and connecting with international researchers

Attendees from university/CAES: None

Mustafa Mashal

Name: 64th Idaho Academy of Science and Engineering Symposium and 17th Intermountain Conference on the Environment Joint Symposium

Location: Pocatello, Idaho

Purpose: Sponsor and presenter in the conference

Attendees from university/CAES: Many CAES students and researchers (>20) from ISU were in attendance.

Name: Idaho National Laboratory Joint Appointment “Lighting Talks”

Location: Virtual

Purpose: Highlighting the research of joint appointees and connecting them with other collaborators at INL

Attendees from university/CAES: David Estrada (BSU)

Name: Advanced Manufacturing for Extreme Environments

Location: Idaho Falls, Idaho

Purpose: Developing the first new focus area for CAES

Attendees from university/CAES: Many researchers and CAES leadership from ISU, UI, BSU, and INL

Sections 3. University Proposals Related to CAES Activities (use attached table)

Section 4. Patents, Licenses, other IP

List all patents, licenses, and/or other IP related to CAES:

What were the impactful accomplishments associated with CAES strategic initiatives?

- Mustafa Mashal and Daniel LaBrier (2024). “A Modular Prefabricated Concrete Block Technology for Containment Facility in Advanced Reactors”, US Patent and Trademark Office, 63/626,716. (Provisional Patent Filed)
- Mustafa Mashal, James Mahar, Kunal Mondal, Kabiraj Phuyal (2024). “Eco-Friendly Concrete and Soil Cement Utilizing Waste Products”, United States Patent and Trademark Office, 63/638,006. (Provisional Patent Filed)

Section 5. Grants and Awards

Amir Ali

Title: Understanding the multiscale modeling of Additive Manufacturing for optimized product quality

Awarding Organization/Institution: BAE

Timeframe (if applicable): 05/01 – 09/30.

Award Amount: \$40,000

Vince Bowen

Title: Rural Idaho Saves Energy (RISE) Audits

Awarding Organization/Institution: US Department of Agriculture (USDA); Boise State University (BSU)

Timeframe (if applicable): Ends 10/31/2025

Award Amount: \$148,500

Mahesh Acharya

Title: Laboratory Evaluation of Carbon Fibre Reinforced Polymer (CFRP) Bars to Improve Joints in Natural Fibre Reinforced Concrete (NFRC) Pavements

Timeframe (if applicable): 07/2024-06/2025

Award Amount: \$6,500

Emmanuele Zappala

Title: Novel AI-based Concrete Elasticity Determination using DIC Technology

Timeframe (if applicable): 07/2024-06/2025

Award Amount: \$6,500

Mostafa Fouda

Title: Reinforcement-Learning-Based Approach to Optimizing Quality of Service and Security on Fifth-Generation Networks

Awarding Organization/Institution: Laboratory Directed Research & Development (LDRD)
Timeframe (if applicable): Feb. 2023 to Sep. 2024
Award Amount: \$150K

Title: Collaborative Research: NeTS: JUNO3: SWIFT: Softwarization of Intelligence for Efficient 6G Mobile Networks

Awarding Organization/Institution: National Science Foundation (NSF)
Timeframe (if applicable): Sept. 2022 to Aug. 2025
Award Amount: \$225K

Section 6. Incoming CAES Personnel

List any intern, undergrad student, grad student, postdoc, professor, fellow, employee or other visitor that is new to CAES.

Taher Deemyad

Name: Atulan Gupta
Institution: Idaho State University
Focus of work: Machine learning-based image processing on dog robot

Name: Dinesh Khanal
Institution: Idaho State University
Focus of work: Machine learning-based image processing on dog robot

Name: Jonas Miramontes
Institution: Idaho State University
Focus of work: Autonomous navigation and mapping by dog robot

Kristi Moser-McIntire

Name: Jessica Mauseth
Institution: Idaho State University
Focus of work: student intern for Safety at CAES

Name: Madison Hansen
Institution: CEI
Focus of work: student intern for Safety at CAES

Name: Steven Zundel
Institution: CEI
Focus of work: student intern for Safety at CAES

Anirban Chakraborty

Name: Bronwyn (Rhys) Ellis; undergraduate intern
Institution: Idaho State University
Focus of work: Literature review on state of the art of bio-concrete research

Mostafa Fouda

Name: Hamza Kaddour (MS ECE student working under Dr. Mostafa Fouda)
Institution: Idaho State University
Focus of work: Machine Learning and Cybersecurity

Mustafa Mashal

Name: Tyler Johnson (Undergrad)
Institution: Idaho State University
Focus of work: Electrical and Computer Engineering

Name: Ila Garrido (Undergrad)
Institution: Idaho State University
Focus of work: Mar/Comm intern for ISU CAES

Name: Prajita Budhathoki (Undergrad)
Institution: Idaho State University
Focus of work: Sustainability

Name: Anjan Koirala (Masters student)
Institution: Idaho State University
Focus of work: Novel alloys in civil engineering

Section 7. Outgoing CAES Personnel

List any intern, undergrad student, grad student, postdoc, professor, fellow, employee or other visitor that is leaving CAES.

Amir Ali

Name: Sutapa Biswas (completed her master's degree)
Institution: University of Florida (Ph.D. program)
Focus of work: Nuclear Engineering

Kristi Moser-McIntire

Name: Maira Orozco
Institution: ISU
Focus of work: graduate student intern for Safety at CAES

Name: Raaghul Kumar
Institution: ISU
Focus of work: graduate student intern for Safety at CAES

Rene Rodriguez

Name: Jacob Egbert
Institution: Idaho State University
Focus of work: Jacob took a job at the Idaho Accelerator Center and is now working as a lab assistant on the Cu-67 Medical Isotope Project

Mustafa Mashal

Name: Kathryn Hogarth (PhD student)

Institution: Idaho State University

Focus of work: Civil Engineering

Name: Saksham Maharjan (Master's student)

Institution: Idaho State University

Focus of work: Civil Engineering

Name: Arpan Adhikari (Undergrad)

Institution: Idaho State University

Focus of work: Civil Engineering

Section 8. Industry Engagement

List all new industries you've engaged.

Mustafa Mashal

Name: Burke Higley

Company: Amalgamated Sugar Company

Project Focus: Sustainability and carbon reduction in the built environment

Amir Ali

Name: Dr. Abdullah Al-Marshed / Dr. Mohamed Omar

Company: Al Zour Refinery in Kuwait through Australian University, Kuwait

Project Focus: Advancing Fouling Prediction Preheat Exchangers

Section 9. New Equipment

List new research equipment associated with CAES.

Section 10. Collaborative Research Events

List all workshops, events, and planning meetings related to CAES activities:

Taher Deemyad

Name: ISU-INL collaboration using dog robot for the security of nuclear power plants

Date: Every two weeks

Location: Online (over Google Meet)

Attendees:

Results/Impact: Developing research plan to apply for an external grant proposal

Amir Ali

Name: CAES Advanced Manufacturing for Extreme Environments

Date: 03/26-03/27

Location: INL

Attendees: Many

Results/Impact: Exploring potential collaboration and funding opportunities.

James Mahar

Name: 64th Idaho Academy of Science and Engineering Symposium and 17th Intermountain Conference on the Environment Joint Symposium

Date: 5-6 April 2024

Location: Idaho State University

Attendees: Faculty, researchers, and students from Idaho (in person), international scholars and students (online)

Results/Impact: Outstanding Interdisciplinary Interaction with Geoscience and Civil Engineering

Rene Rodriguez

Name: Advanced Manufacturing Workshop

Date: March 26-27, 2024

Location: EIL at INL

Attendees: Prof. Rodriguez

Results/Impact: Renewed Contacts with MACS personnel

Section 11. Research Highlights

List significant accomplishments (R&D milestones, etc.) related to CAES people, equipment, projects, and facilities.

Taher Deemyad

- Initiated SLAM (Simultaneous Localization and Mapping) practices using a Turtlebot to understand the intricacies of robotic navigation and obstacle avoidance. This foundational step involved the utilization of a depth camera and a 360-degree 2D LiDAR sensor, facilitating a comprehensive 2D map creation of our laboratory environment.
- After extensive research, we acquired the Unitree Go2 Edu dog robot, a decision driven by its
- outstanding features:
 - High battery life of 2-4 hours, ensuring prolonged operational capability.
 - Customizability and programmability, allowing for the integration of new sensors and the implementation of additional Python codes for enhanced functionality.
 - Lightweight design (15 kg) coupled with a high payload capacity (12 kg), making it ideal for the addition of advanced sensors.
- We have effectively familiarized ourselves with the robot's sensors, motion capabilities, and wireless charging feature. A USB Wi-Fi adapter was also integrated to facilitate remote control and feedback.
- Conducted a successful face recognition test, further augmented by the addition of a thermal camera to improve recognition accuracy under varying light conditions. The findings from these experiments have been documented in a recent submission to the Intermountain Engineering, Technology, and Computing Conference (IETC).

Date: 12/01/2023 to 04/21/2024

Impact: Collecting preliminary data for external grant proposal

Rene Rodriguez

Description: The EDS system on the SEM at Idaho State was not working. The ability to measure the atomic composition of deposited films and also to record the film morphology is an essential part of our research. With the help of Dr. John Dudgeon from the Center for Archeological Materials and Applied Spectroscopy we were able to diagnose the problems with the system and get it working.

Date: March 20, 2024

Impact: NA

Mustafa Mashal

Description: Quake Breaker: Idaho State Prof.'s Invention May Save Lives During Earthquakes ([Link](#))

Date: March 25, 2024

Impact: Research highlight (national)

Description: Researchers Receive Promising Results After Testing Use of Waste in Concrete Mixtures: 'An Exciting And Rewarding Experience' ([Link](#))

Date: February 28, 2024

Impact: Research highlight (international)

Description: Idaho State University Inks Research Collaboration MoUs with Australian University and University of Doha for Science and Technology ([Link](#))

Date: February 1, 2024

Impact: Research collaboration highlight (international)

Description: UDST, Idaho State University Sign MoU to advance academic and research endeavors ([Link](#))

Date: January 29, 2024

Impact: Research collaboration highlight (international)

Amir Ali

Description: Idaho State University Signs New MoU with Gachon University in South Korea ([Link](#))

Date: April 11, 2024

Impact: Research collaboration highlight (international)

Section 12. Other

Important updates from your university that relate to CAES. This could include changes to joint appointments, student engagement, major events, staff changes, high-level visits/tours, stakeholder engagement, lab milestones, collaborative meetings, etc.) and which you want to include in the annual report but don't fit into one of the categories above.

Vince Bowen – ESTEC

- ESTEC Nuclear Operation Technology students visited Sandia National Lab, Los Alamos National Lab, the National Nuclear Museum, and the Manhattan Project Historic Site during ISU's Spring Break. During this visit, Nuclear Operations Technology instructors also visited with area high school counselors to make them aware of the program and ISU.
- ESTEC's Executive Director continues to be involved in the Intermountain-West Nuclear Energy Corridor (INEC)

- All programs housed within ESTEC (Industrial Cybersecurity, Electrical Engineering Technology, Instrumentation Engineering Technology, Nuclear Operations Technology, and Mechanical Engineering Technology) held their respective program-level Technical Advisory Committee (TAC) meetings, bringing industry leaders, ESTEC faculty, and ISU College of Technology leadership together to continue collaboration to ensure graduates of the respective programs have the skills needed when they enter the workforce. CAES representatives were able to attend as schedules permitted.
- ESTEC Executive Director participated on a panel during the UEILC Summit: Leadership for a US and Global Clean Energy Transition; Tempe, AZ February 26-27, 2024.
- ESTEC Faculty from all programs participated in the CAES High School Event held March 13-14, 2024.
- ESTEC Executive Director participated in the Advance Manufacturing Workshop at CAES March 26-27, 2024.
- ESTEC Executive Director presented at “Brew with the Crew” on April 18, 2024.

Anirban Chakraborty

Description: an exhaustive literature review is being conducted to synthesize the state of the art on bio-concrete research and to uncover current knowledge gaps. Topics of literature search include parameters such as biomineralization processes and environmental conditions, bacterial species, type of inclusion in the system, nutrient medium, as well as other microbiological and durability properties of bacterial concrete on microbial self-healing performance.

Date: NA

Impact: NA

Mostafa Fouda

Dr. Mostafa Fouda was one of the facilitators at the ISU Research and Creative Activity Social Networking Event on Thursday (4/18/2024), discussing the applications and challenges of using Artificial Intelligence in several applications.

Mustafa Mashal

- **CAES Participates in INL Capitol Day:** Phil Reppert, Sunny Katseanes and Mustafa Mashal attended INL’s 75th anniversary open house and staffed the CAES information booth during INL Capitol Day on Jan. 31. They interacted with around 100 state representatives, members of the public and students from Elevate Career Technical High School. Phil Reppert also attended LINE Commission meetings.
- **CAES Supports Sustainability Conference at ISU:** CAES was a key sponsor at the joint 2024 conference for Idaho Academy of Science & Engineering/Intermountain Conference on the Environment held at ISU on April 5-6. Many CAES researchers and faculty participated in the event and showcased their research. The event was for anyone interested in the impacts of the earth’s climate and sustainable behavior to come together to learn about the science happening to support the topics.
- **BOOST Workshop:** Mustafa Mashal attended this workshop. The event hosted an array of community leaders, Idaho National Laboratory, Sandia National Laboratories, and the

Department of Energy Boost Platform for an exciting workshop focused on identifying regional technology challenges and opportunities. This Boost workshop was held on April 15th from 8am to 12 pm at INL's Energy Innovation Laboratory's Meeting.

Proposal(s) Submitted/Awarded during Reporting Period

| PI | Title | Funding Agency | Submittal Date | Start Date | End Date | Amount | Status |
|----------------------|---|--|----------------|------------|------------|-----------|--------|
| Mustafa Mashal | Design and Evaluation of Eco-Friendly Rubberized Upcycled Concrete Pavement Slabs Jointed by Titanium Alloy Dowel Bars | KFAS - Kuwait Foundation for the Advancement of Sciences | 3/18/2024 | 1/1/2024 | 12/31/2025 | \$30,000 | PS* |
| Daniel LaBrier | Development of a Hands-On Criticality Safety Workshop for Nuclear Engineering Programs in the Intermountain Western U.S. | US Department of Energy | 2/13/2024 | 8/1/2024 | 7/31/2026 | \$199,470 | PS |
| Andrew Chrysler | Electromagnetic Reactor | Process Equipment & Design, LLC | 1/15/2024 | 6/1/2024 | 5/31/2025 | \$67,747 | PS |
| Daniel LaBrier | Reimagining Irradiated Materials Testing through the Use of Diamond Anvil Cells | US Department of Energy | 1/19/2024 | 9/1/2024 | 8/31/2027 | \$560,148 | PS |
| Joshua Pak | Analysis of polymer consumption by mycelium | Sporadicate | 2/12/2024 | 1/8/2024 | 8/16/2024 | \$17,109 | AA* |
| Richard Schultz | District Heating & Coal to Nuclear Workforce Development Consultancy with Poland under NEXT | U.S. Department of State | 2/29/2024 | 10/1/2024 | 9/30/2025 | \$24,500 | PS |
| Minhaz Zibran | Idaho NASA EPSCoR Summer Faculty Fellowship | Univ of Idaho | 2/16/2024 | 6/1/2024 | 8/15/2025 | \$7,150 | PS |
| Daniel LaBrier | Nuclear Security Enabling Digital Technology Consortium (NSEDTC) | US Department of Energy | 2/2/2024 | 3/15/2025 | 3/14/2030 | \$873,763 | PS |
| Glenn Thackray | Synthetic Aperture Radar Applications to Rock Glacier Change and the Alpine Water Cycle in the Western United States | Univ of Idaho | 2/16/2024 | 6/1/2024 | 5/31/2025 | \$49,743 | PS |
| Chikashi Sato | Comparative Analysis of Precast Concrete Gravity Grease Interceptors (GGIs) and Hydromechanical Grease Interceptors (HGIs): A Review of Independent Studies | National Precast Concrete Association | 2/2/2024 | 5/1/2024 | 4/30/2025 | \$41,348 | PS |
| Mostafa Fouda | Reliable Cancer Diagnosis With Explainable AI | Univ of Idaho | 2/9/2024 | 7/1/2024 | 6/30/2026 | \$265,142 | PS |
| Taher Deemyad | Revolution in Space Manufacturing: Innovative Additive Manufacturing Method for Zero-Gravity Environments | Univ of Idaho | 2/16/2024 | 6/1/2024 | 5/31/2025 | \$49,941 | PS |
| Kumari Kavita Sharma | A multi-omics approach to study the impact of GABA-producing probiotics in Alzheimer's disease | Univ of Idaho | 3/18/2024 | 7/1/2024 | 6/30/2025 | \$139,216 | PS |

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|-----------------------|--|---|-----------|-----------|------------|-----------|----|
| Kumari Kavita Sharma | Leveraging short metabolism of photosynthetic bacterium for bio transforming methane gas into high energy density precursor. | South Dakota School of Mines&Technology | 3/18/2024 | 8/5/2024 | 8/2/2027 | \$224,309 | PS |
| Emanuele Zappala | Deep Learning for Crack Detection and Segmentation | Battelle Energy Alliance LLC | 3/13/2024 | 5/1/2024 | 8/31/2024 | \$19,345 | PS |
| Donna Delparte | UAS Applications for Subspecies Classification using Neural Networks | Univ of Idaho | 2/20/2024 | 6/1/2024 | 5/31/2025 | \$25,000 | PS |
| Farjana Eishita | Building a VR Gamified Environment to Mitigate Isolation in Space | Univ of Idaho | 2/22/2024 | 6/1/2024 | 5/31/2025 | \$49,994 | PS |
| Farjana Eishita | Higher Education Grants | Univ of Idaho | 2/22/2024 | 7/1/2024 | 6/30/2025 | \$24,939 | PS |
| Farjana Eishita | Idaho NASA ISGC K-12 | Univ of Idaho | 2/20/2024 | 6/1/2024 | 5/31/2025 | \$18,154 | PS |
| Mustafa Mashal | FY24 INL Joint Appointment Agreement - Mustafa Mashal Travel | Battelle Energy Alliance LLC | 2/9/2024 | 10/1/2023 | 9/30/2024 | \$10,000 | AA |
| Kristi Moser-Mcintire | FY24 EHS Interns | Battelle Energy Alliance LLC | 2/9/2024 | 2/14/2024 | 9/30/2024 | \$56,399 | AA |
| Anirban Chakraborty | Investigating antimicrobial resistance within viable bacterial endospores in untreated wastewater | Univ of Idaho | 2/12/2024 | 5/1/2024 | 4/30/2026 | \$136,550 | PS |
| Taher Deemyad | Empowering Idaho's Higher Education: NASA STEM Outreach & Robotics Initiative | Univ of Idaho | 2/16/2024 | 5/15/2024 | 5/15/2025 | \$24,989 | PS |
| Kumari Kavita Sharma | Investigating the impact of GABA-producing probiotics on healthy aging | National Institutes of Health | 2/26/2024 | 12/2/2024 | 11/30/2027 | \$163,271 | PS |
| Rajib Mahamud | Development Of A Deep Neural Network (DNN) Augmented Interactive Flamelet Method For The Numerical Simulation Of Supersonic Reacting Flows | Institute for Research on Poverty | 2/22/2024 | 6/1/2024 | 5/31/2025 | \$49,073 | PS |
| Srinath Pashikanti | Experimental and theoretical studies of phosphonium ionic liquids rigidity on metal chelation and separation chemistry | US Department of Energy | 3/18/2024 | 8/1/2024 | 7/31/2028 | \$999,999 | PS |
| Farjana Eishita | Analyzing the threats and feasible defense tactics in Collaborative Mixed Reality (CMR) Virtual Environment (VE) in Cybersecurity | Battelle Energy Alliance LLC | 3/8/2024 | 5/1/2024 | 8/31/2024 | \$28,953 | PS |
| Mustafa Mashal | Eco-Friendly Fast Installed Concrete Insulated Engineered Technology (EFFICIENT) | US Department of Energy | 2/28/2024 | 7/1/2024 | 6/30/2028 | \$944,597 | PS |
| Kristi Moser-Mcintire | FY24 CAES EH&S Consumables/Infrastructure Budget | Battelle Energy Alliance LLC | 3/5/2024 | 3/6/2024 | 9/30/2024 | \$165,465 | PS |
| Lyle Castle | FY24 - INL Education Contract | Battelle Energy Alliance LLC | 3/1/2024 | 4/2/2024 | 5/31/2024 | \$615,366 | AA |

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| H Carrie Bottenberg | Low-Emission Rare Earth Metal Manufacturing Pathways from Idaho Sourced Minerals | Univ of Idaho | 3/8/2024 | 8/19/2024 | 12/31/2025 | \$30,000 | PS |
| Marco Schoen | AI Based Quality Control for Potato Harvesting | Idaho State Board of Education | 3/21/2024 | 7/1/2024 | 6/30/2025 | \$95,655 | AA |
| Taher Deemyad | INL CAES Collaboration Fund: Enhancing Nuclear Power Plant Security with Dog Robot Surveillance Systems | Battelle Energy Alliance LLC | 3/8/2024 | 5/1/2024 | 8/31/2024 | \$19,940 | PS |
| Rene Rodriguez | Laser-Based Synthesis of High-Performance Materials for Harsh Service Conditions | Battelle Energy Alliance LLC | 3/11/2024 | 6/1/2024 | 8/31/2024 | \$16,447 | PS |
| Minhaz Zibran | CAES Summer Visiting Faculty | Battelle Energy Alliance LLC | 3/11/2024 | 5/1/2024 | 8/31/2024 | \$33,774 | PS |
| Minhaz Zibran | CAES Collaboration Fund | Battelle Energy Alliance LLC | 3/11/2024 | 5/1/2024 | 8/31/2024 | \$25,000 | PS |
| Tadesse Gemedra Wakjira | A Novel Framework for Cost-Effective and Environmentally Sustainable High-Performance Concrete: Advanced Artificial Intelligence and Multi-Objective Optimization Techniques with 17 Comprehensive Environmental Metrics | Portland Cement Association | 3/18/2024 | 8/19/2024 | 8/6/2025 | \$35,000 | PS |
| Lyle Castle | FY24-FY26 INL Education Contract | Battelle Energy Alliance LLC | 4/4/2024 | 6/1/2024 | 5/31/2026 | \$2,751,679 | PS |
| Emanuele Zappala | Applications of Artificial Intelligence in Structural Health Monitoring via Digital Image Correlation | KFAS - Kuwait Foundation for the Advancement of Sciences | 4/15/2024 | 1/1/2025 | 12/31/2025 | \$17,883 | PS |
| Anirban Chakraborty | Towards Sustainable Application of Carbon-Negative Bio- Concrete using Synergistic Binding of Biochar and Bacterial Siderophores - ISU | Battelle Energy Alliance LLC | 4/30/2024 | 4/24/2024 | 8/30/2024 | \$2,592 | AA |
| Amir Ali | Understanding the multiscale modeling of Additive Manufacturing for optimized product quality | Battelle Energy Alliance LLC | 4/25/2024 | 5/1/2024 | 9/30/2024 | \$40,000 | PS |
| Amir Ali | Advancing Fouling Prediction and Mitigation Strategies in Al Zour Refinery (ZOR) Preheat Exchangers | KFAS - Kuwait Foundation for the Advancement of Sciences | 4/25/2024 | 6/1/2024 | 5/31/2025 | \$3,272 | PS |

* PS = Pending, AA = Awarded