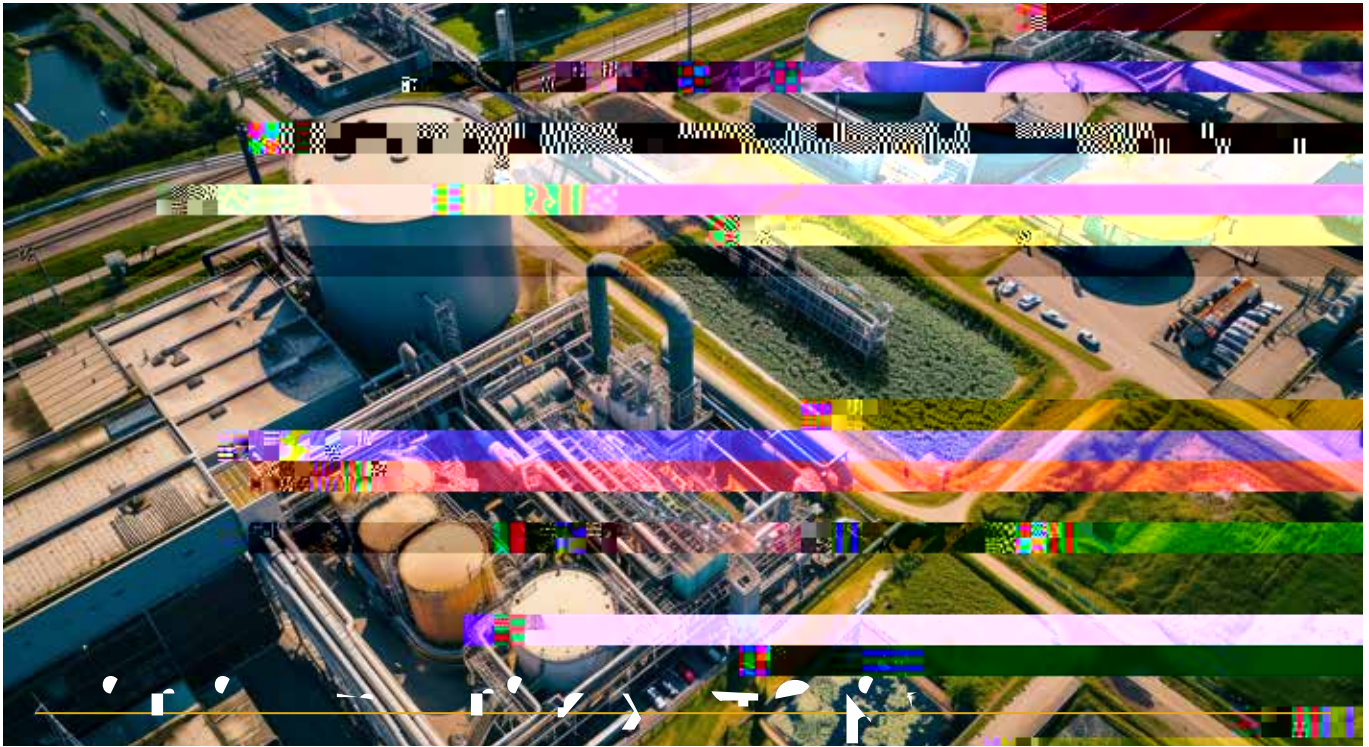


LSU | Center for
Energy Studies

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David E. Dismukes, Executive Director | lsu.edu/ces



On November 16, 2022, the LSU Center for Energy Studies released the 2023 edition of the Gulf Coast Energy Outlook (GCEO). As in previous years, this sixth edition of the GCEO provides a comprehensive overview of the Gulf Coast region's energy industry outlook for the upcoming year. David E. Dismukes, executive director and professor, and Greg Upton, associate professor, LSU Center for Energy Studies, authored the report.

The previous year's GCEO addressed post-pandemic operational adjust

Decarbonization policies will challenge existing Gulf Coast energy manufacturing but also create

Oil and Gas Well Plugging and Abandonment (P&A) Liabilities

Center for Energy Studies faculty collaborated on a paper that examines offshore well plugging and abandoning (P&A) liabilities and provides guidance to federal policy makers during the formulation of P&A programs. Part of an oil and gas research initiative at Columbia University's Center on Global Energy Policy, the study identifies at least three objectives of potential P&A programs: reducing future financial P&A liability for tax payers, lowering environmental risk, and preserving or increasing employment while reducing greenhouse gas emissions.

The report's authors are Mark Agerton, assistant professor, University of California-Davis Department of Agricultural and Resource Economics and nonresident scholar, Center for Energy Studies, Rice University's Baker Institute for Public Policy; Siddhartha Narra, research associate, LSU Center for Energy Studies; Brian Snyder, associate professor, LSU Department of Environmental Sciences; and Greg Upton, (corresponding author), associate professor - research, LSU Center for Energy Studies.

Findings include:

As of the end of 2020, approximately 22,000 offshore oil and gas wells in the United States were not permanently P&Aed. The cost to P&A all of these wells is estimated at approximately \$47 billion.

Studies show that, because leaks from wells in shallow water and closer to shore pose greater environmental risks than those from wells farther offshore, and because P&Aing deeper-water wells more expensive, the cost/benefit ratio of P&Aing wells nearer to shore is more favorable than that for offshore wells.

P&A costs associated with certain inactive wells in shallow waters that are not likely to resume production is estimated at \$8.3 billion.

Over a 10-year period, approximately 10,500 jobs per year could be created through a P&A program for shallow-water wells.

Oil and gas production is not expected to be impacted because the wells that would likely be P&Aed no longer produce significant quantities of hydrocarbons.

Center for Energy Studies

Throughout the past year, CES faculty have been involved in research projects totaling more than \$10 million.



Dismukes, David E. and Gregory B. Upton. 2023 Gulf Coast Energy Outlook. LSU Center for Energy Studies. LSU White Paper. Fall 2022.

Iledare, Omowumi O. (with E. Nsenkyire, J. Nunco, and J. Sbeu). Household multidimensional energy poverty: Impact on health, education, and cognitive skills of children in Ghana. Child Indicators Research. October 2022.

Iledare, Omowumi O. (with K. Gbakon, J. Ajiienka, and J. Gogo). Oil production forecasting models and oil end-

“Louisiana industrial decarbonization opportunities.” Louisiana Chemical Association/Louisiana Chemical



Executive Director and Professor David Dismukes appeared on the June 30 episode of On Par with the President, a podcast hosted by Louisiana State University President William F. Tate IV. In this segment, Dismukes discusses gasoline prices, energy, the global impact of Louisiana's energy industry, and more.

The On Par podcast features LSU students, faculty, or staff who are at the very top of their game about their journey to success, setting and fulfilling goals, creating a legacy, and a variety of other topics.



In December 2021, the U.S. Environmental Protection Agency (EPA) proposed to deny more than 60 pending small refinery exemption (SRE) petitions from small refineries that were requesting an exemption from the Renewable Fuel Standard (RFS) program. The RFS is a federal program that requires transportation fuel sold in the United States to contain a minimum amount of renewable fuels, such as ethanol, blended into the fuel purchased by consumers.

Center for Energy Studies Associate Professor-Research Greg Upton and Assistant Professor-Research Cody Nehiba, on behalf of the Perkins Coie Law Firm, LLP, provided an opinion on two specific claims made by the EPA in its proposal. Their expert opinion was submitted to the EPA in Docket No. EPA-HQ-OAR-2021-0566.

Perkins Coie LLP, 20 small refineries with diverse geographic dispersion, and three anonymous academic reviewers were given the opportunity to review and provide feedback on the report.

The report is available for download at https://www.lsu.edu/ces/research/sre_upton_nehiba_2022.php



As part of his Spring 2022 Energy Supply Chain MBA course, CES Associate Professor Greg Upton had students visit several energy sites in South Louisiana

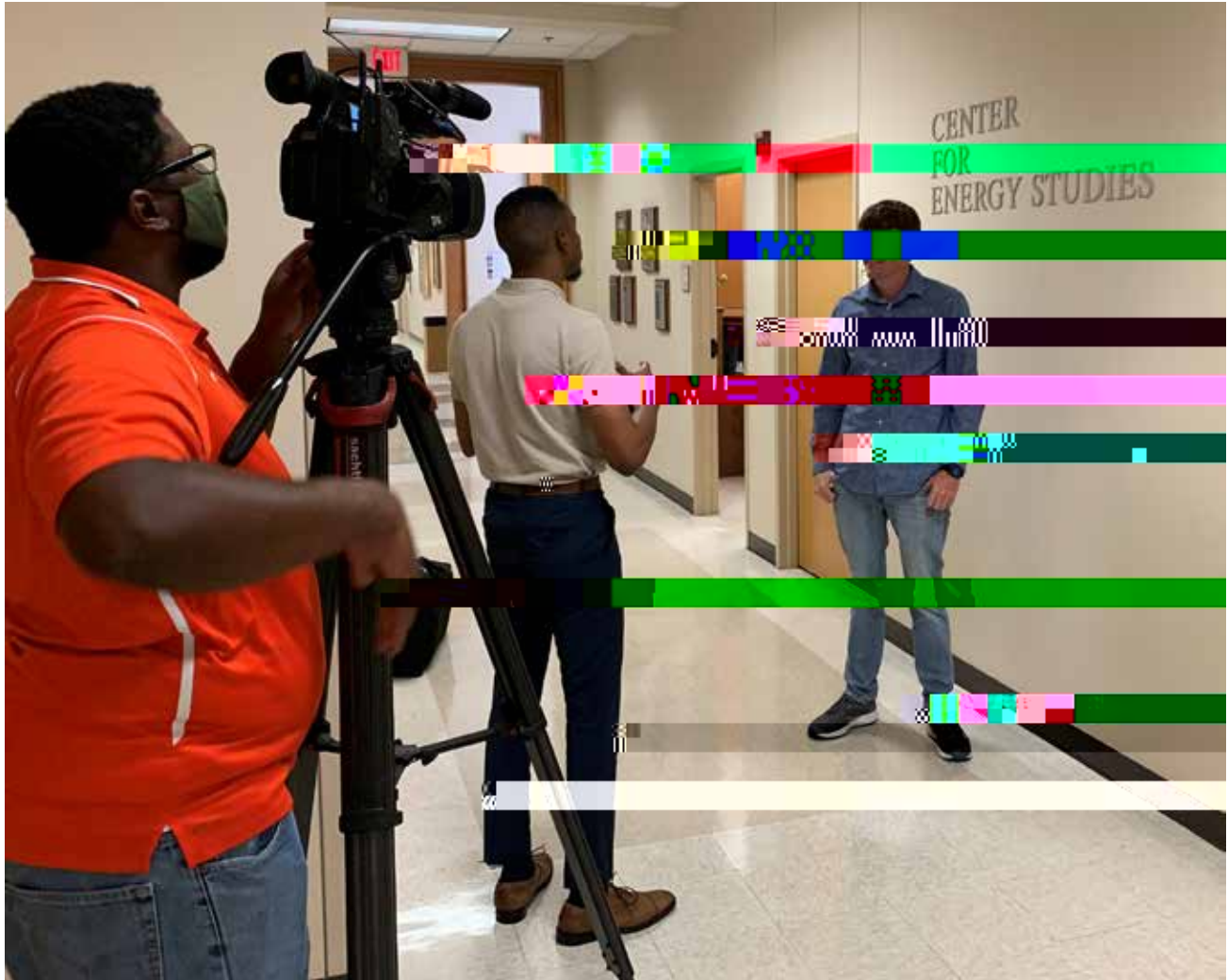
the LSU co-gen plant, which serves more than 350 buildings with 20 MW of electrical generating capacity, 21,500 tons of cooling, and 250,000 pounds per hour of 150 pound steam; and Entergy's J. Wayne Leonard Power Station, a 980-megawatt combined-cycle, natural-gas-fired power plant, anticipated to save customers approximately \$1.3 billion over its anticipated 30-year life.

In June, the Association of Environmental and Resource Economists (AERE) accepted CES Assistant Professor Cody Nehiba into its Scholars Program, a mentoring initiative focused on increasing diversity in the fields of environmental and natural resource economics. The program is open to early-career scholars in environmental or natural resource economics who are no more than five years post Ph.D. Scholars receive \$1,500 per year for travel to the AERE Summer Conference for the two years beginning and ending the program. In its announcement of Nehiba's acceptance, the AERE commended his research focus on "market failures and negative externalities in the transportation sector, with an emphasis on producing equitable and efficient polund1/Lan.5

ana's energy and petrochemical companies, Upton noted that those efforts had the potential to serve as major economic drivers in the region, citing a recent clean energy investment by Air Products in Ascension Parish.

Panelists included Adam Knapp, CEO of the Baton Rouge Area Chamber; LelaMae Wilkes, CEO of Brown Eagle; William Campbell, Jr.ish.

The event also included a panel discussion on hydrogen, considered a leading clean energy source due to



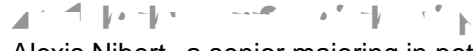
In 2022, Center for Energy Studies faculty were quoted or interviewed more than 100 times in local, regional, national, and international news outlets. Their commentary covered timely issues, including oil prices and the Ukraine invasion, developments in the liquefied natural gas sector, renewables in Louisiana, carbon capture, offshore wind, the impact of the Inflation Reduction Act on the Gulf Coast power sector, and more.



The Center for Energy Studies awarded two scholarships for the 2022-2023 academic year to LSU students pursuing energy-related fields of study and careers.



Dana Lochary, a junior majoring in petroleum engineering, from Baltimore, MD.



Alexis Nibert, a senior majoring in petroleum engineering, from Johnstown, PA.

The Center congratulates our scholarship recipients and wishes them well as they continue their studies.



David E. Dismukes, Ph.D., executive director, director of the Policy Analysis Division, and professor

Diana Reynolds, assistant to the executive director

Marybeth Pinsonneault, communications manager



Gregory B. Upton, Jr., Ph.D., associate professor

Mike McDaniel, Ph.D., professional-in-residence (retired)

Don Goddard, Ph.D., associate professor (retired)

Cody S. Nehiba, Ph.D., assistant professor



Mark J. Kaiser, Ph.D., director of the Research & Development Division and professor

Siddhartha Narra, Ph.D., research associate



Omowumi (Wumi) Iledare, Ph.D., Professor Emeritus, director of the CES Energy Information and Data Division, professor of petroleum economics and policy research, adjunct professor of petroleum economics at the Craft & Hawkins Department of Petroleum Engineering at LSU, and director of the Emerald Energy Institute, University of Port Harcourt, Nigeria.

Ric Pincomb, research associate

Stacy Retherford, computer analyst

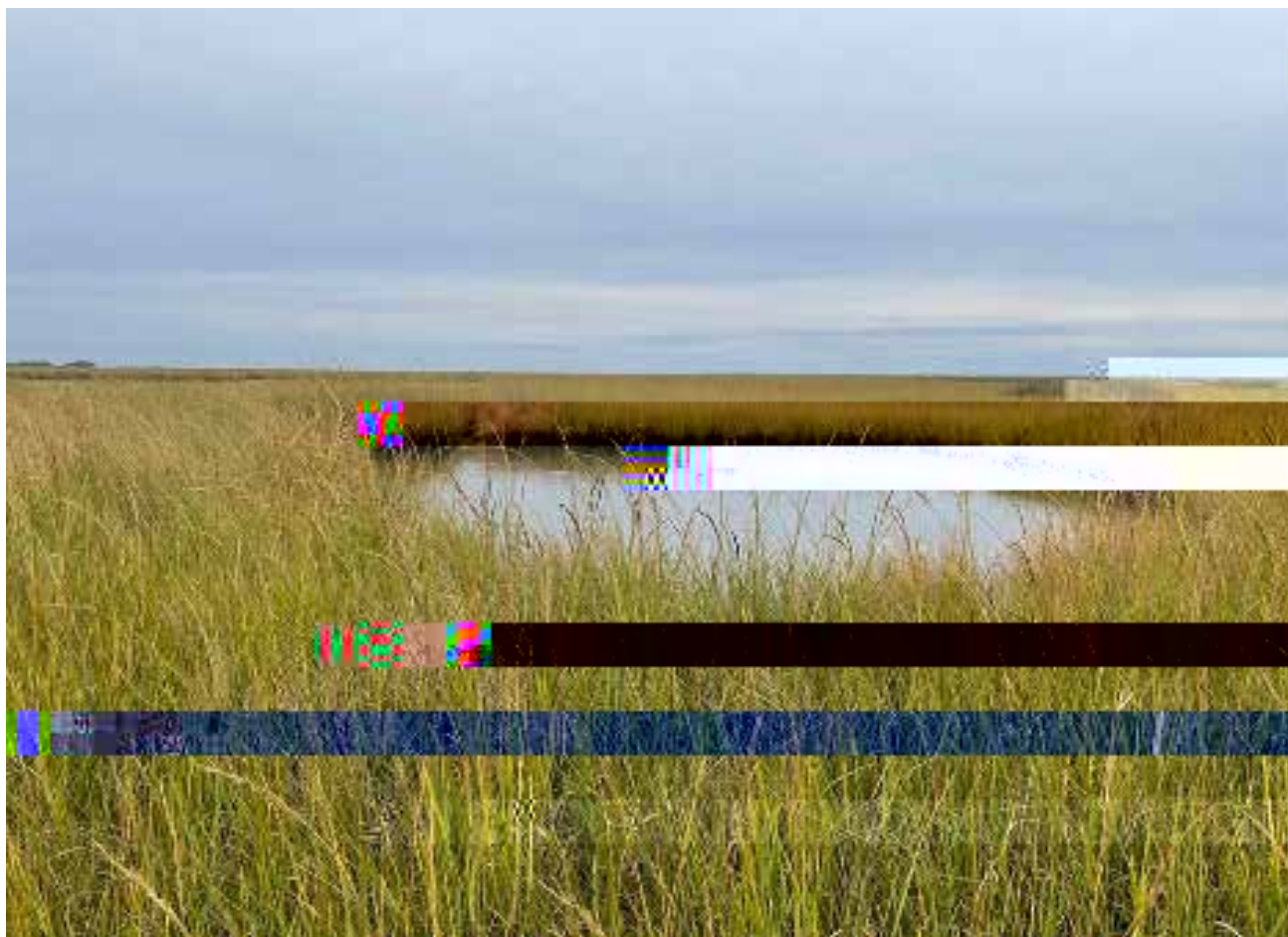
Mike Surman, IT adviser



drive catalytic depolymerization, because the catalyst surfaces heat from within, facilitating both pore diffusion and reaction.

The coastal marshes of Louisiana cover approximately 10,700 square miles and comprise approximately 12 percent of the nation's coastal wetlands. Coastal marshes are an important carbon sink, removing carbon dioxide from the atmosphere and converting it to plant biomass, comparable to the Amazon rain forest. In three recent chemical engineering Ph.D. dissertations, by S. Hacker, H. Trivedi, and S. Vora, now available at www.mpri.lsu.edu, a simulation of estuarine ecosystems to identify the critical variables to predict estuarine behavior from internal and external changes has been created.

Tidal marshes are normally categorized into two distinct zones, the lower or intertidal marsh and the upper or high marsh. In saline tidal marshes, the lower marsh is normally covered and exposed daily by the tide. It is predominantly covered by the tall form of Smooth Cordgrass (*Spartina alterniflora*). The saline marsh is covered by water only sporadically and is characterized by Short Smooth Cordgrass, Spike Grass, and Salt meadow Rush (*Juncus gerardii*). Saline marshes support a highly specialized set of life adapted for saline conditions. Tidal marshes also provide vital food and habitat for clams, crabs, shrimp, and juvenile fish, as well as offering shelter and nesting sites for several species of migratory waterfowl.



Spartina alterniflora marsh surrounds the city of Golden Meadow and was the inspiration for the city's name.

Since 1990, the Coastal Wetlands Plan

are given to evaluate rate coefficients that appear in the rate equations used to describe this nutrient cycling.

Applications of the simulation results were used to predict the performance of the estuary to maximize the utility of this important natural resource as well as to indicate situations in which the survival of the system is jeopardized. The simulation can provide the mechanism to test management decisions and determine the response before taking the action on the actual system. The vast importance of estuarine systems like Barataria Bay for minerals and seafood production, recreational use, etc., greatly intensifies the importance of having an accurate analysis that can provide a better understanding for wiser and more efficient use of this precious resource.

References:

Ripple, T. M., et al., Species loss and nitrogen pollution alter litter decomposition dynamics in coastal salt marshes, *Oecologia* (2022) 200:479–490.

Trivedi, Hasitkumar K., Transport Phenomena in A Bay-Marsh System, Ph.D. Dissertation, Louisiana State University (en007 Tw 10.5 0 0 10.5 60 539.7051 Tm fh 53 ()Tj Esertatx(en-U4Uni)]u0s(Bar/2-omena in A Bay-Marsh S)3 (system

the National Center for Biomedical Research and Training (NCBRT), and the School of Veterinary Medicine (SVM). The RSO provides training and monitoring for radiation workers and performs routine surveys, inspections, survey meter calibrations (78 meters of different types), leak tests, and radioactive waste management to fully meet regulatory requirements and license/registration specifications. In addition, the RSO evaluates and inspects inventoried Class 3B and Class 4 laser systems for laser intrabeam hazards and provides laser safety training. There are 83 active Class 3B and Class 4 laser systems, 71 approved laser users (including 22 laser principal investigators), and 38 laser laboratories.

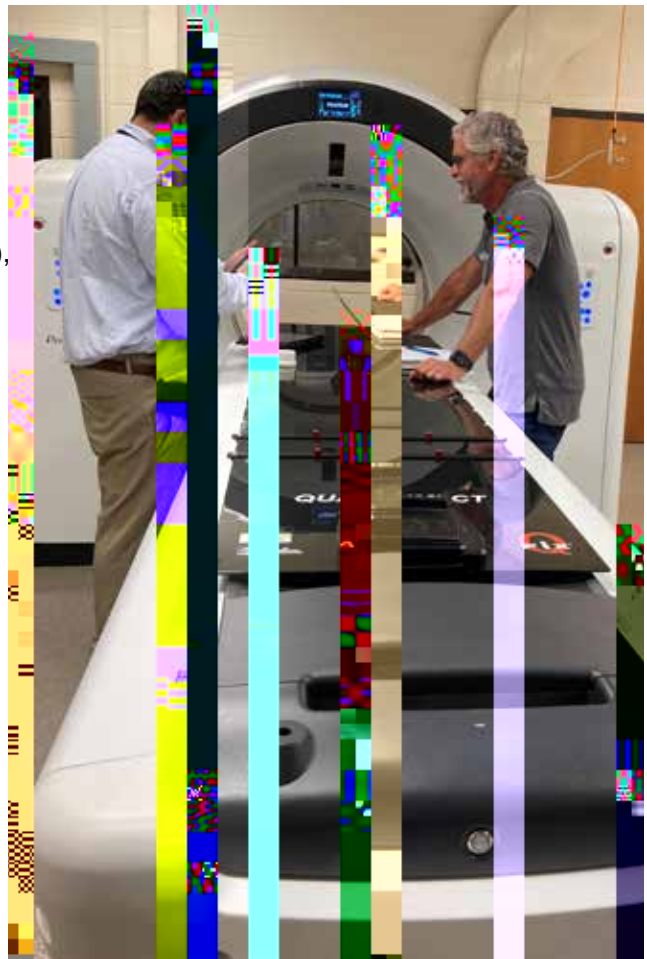
INSPECTIONS

There were four compliance and enforcement inspections conducted by the LDEQ's Emergency and Radiological Services Division, Radiation Section, in 2022.

In April, two inspectors visited the RSO and carried out inspections of the broad-scope Radioactive Material License, the physical protection of category 1 and category 2 quantities of radioactive material (PPQRM), and the radiation-producing equipment at LSU.

The inspectors reviewed the records of membership and meeting minutes of the RSC, organization chart of the RSO, authority of LSU's radiation protection program and enforcement, annual radiation protection and ALARA programs review, the National Source Tracking System, and review/approval/renewal/deactivation of authorization to use sources of radiation. They also inspected radiation safety training and examinations, inventory and leak tests of sealed radioactive sources, frequency of the leak tests, and the ordering, receiving, and delivering of sources of radiation. In addition, the inspectors reviewed personnel and environmental radiation monitoring, radiation laboratory contamination surveys and audits, radiation survey meters, and preparation, disposal, and shipment of radioactive waste, as well as designated Reviewing Officials, individuals granted unescorted access, and policy, program, and procedure requirements under PPQRM regulations (e.g., maintenance and service as well as alarm drill and testing of surveillance equipment, review of security and access authorization programs, refresher training, protection of physical and sensitive information, pre-arranged plan with the local law enforcement agency [LLEA], and an annual meeting with the LLEA).

The inspectors also inquired about radiation laboratory close-out procedures, deactivation of approved radiation principal investigators, corrections, enforcement actions, and the appeal process for internal violations.



They looked into RSO's emergency procedures for radiation spills, the current status of approved radiation principal investigators, radiation workers, personal radiation monitoring devices, and radiation laboratories, in addition to administrative limits for occupational radiation exposure, investigation of elevated personal exposure, functions and applications of the Health Physics Assistant database management software. Finally, they inspected quality assurance/quality control (QA/QC) and operation of radioanalytical equipment, release of liquid radioactive waste, and point of contact at the LLEA.

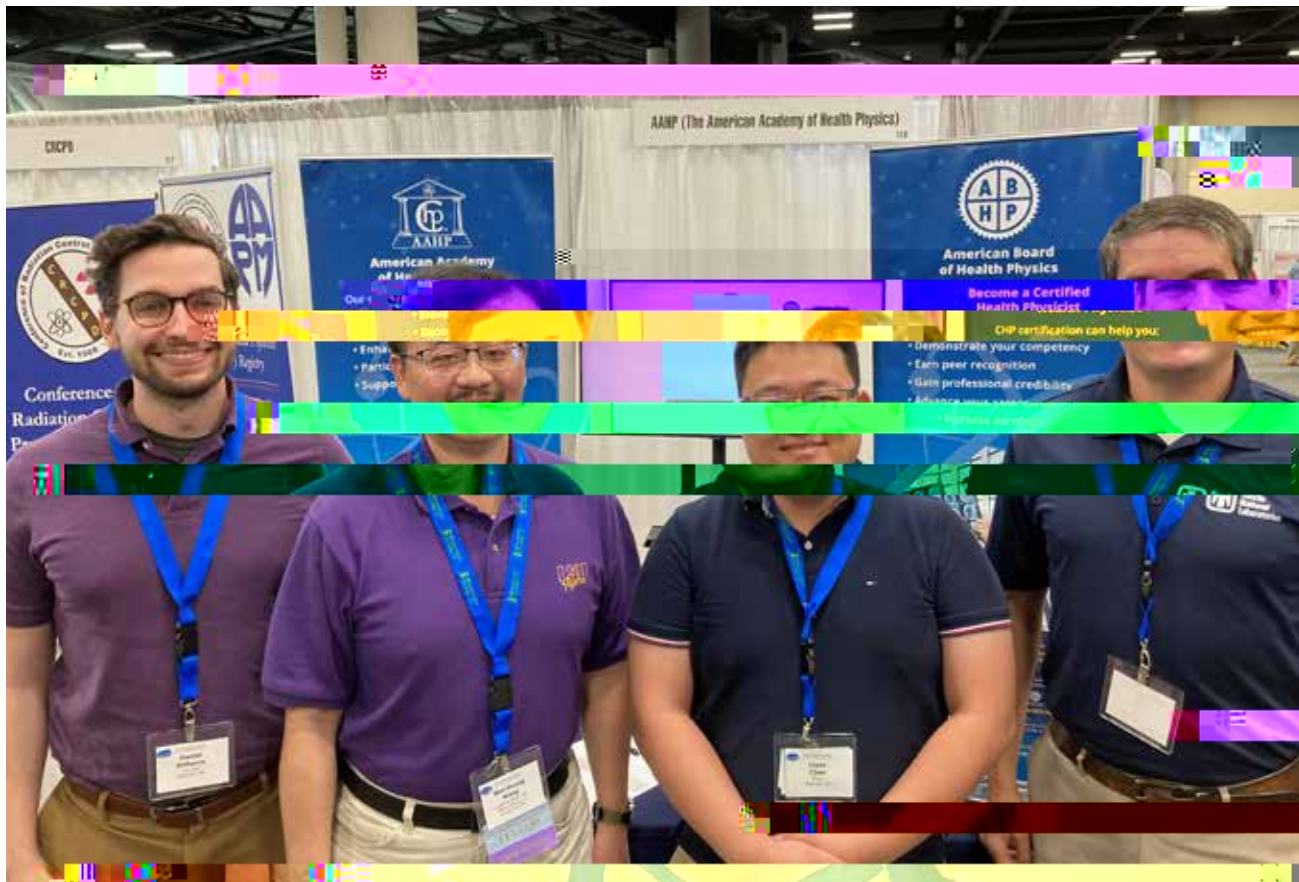
The inspectors also looked over LSU's Radioactive Material License, the Radiation Safety Manual, and the radioactive waste management process. They walked through the radioactive package receiving area, the radioactive material storage area, three radioanalytical laboratories, the radioactive waste storage facilities, and the PPQRM security zones of the RSO. They also conducted an alarm drill to observe the response by the LLEA and interviewed the responding LSU police officers regarding the response plans and training. Furthermore, they visited 16 additional radiation laboratories under LSU's radiation protection program. During the laboratory visits, they checked inventoried source location, radiation levels, function and calibration of in-laboratory survey meters, posting and barrier requirements, secured storage of radioactive materials, disposal of radioactive and mixed waste, the Radiation Safety Manual, and registration certificates. They also reviewed the source inventory and disbursement logs, the annual in-laboratory training records, the in-laboratory radiation surveys, and the functions of fume hoods. In addition, the leading inspector observed and questioned the approved radiation workers (i.e., faculty members, laboratory managers, clinical technologist, and graduate students) about the research/clinical purposes and protocols involving uses of radiation sources, designated radiation areas, wearing of personal radiation monitoring devices, patient workload and release limits, criteria for bioassay, operation and QA/QC of radioanalytical and radiotherapeutic equipment, physical operational parameters and safety features of radiation producing equipment, procedures of ordering, receiving, and storage of radioactive materials, and practice for radioactive waste labeling/storage/disposal.

After the walk-through, an exit interview was held and no areas of concern were listed on the LDEQ's Field Interview Form.

Dr. Wei-Hsung Wang, RSO director and Center for Energy Studies professor, was invited to serve as a member of the Radionuclide Cancer Risk Coefficients Review Panel of the U.S. Environmental Protection Agency (EPA) Science Advisory Board (SAB). This Panel will provide independent advice on the EPA's draft Update to Cancer Risk Coefficients for Environmental Exposure to Radionuclides (Federal Guidance Report No. 16). FGR 16 provides radionuclide-specific lifetime radiogenic cancer risk coefficients for incidence and mortality associated with internal exposure to radionuclides through inhalation of contaminated air and ingestion of contaminated water or food, and external exposure to radionuclides distributed in air, water, and soil.



Wang is one of 17 panelists, who represent academia (LSU, North Carolina State University, Northwestern University, University of California at San Francisco, University of Southern California, and Washington State University), government agencies (Lawrence Berkeley National Laboratory, National Institutes of Health, Pacific Northwest National Laboratory, Sandia National Laboratory, and Washington Department of Health), research institute (Radiation Effects Research Foundation), and private industry (Renaissance Code Development).



RSO reunion at the 67th Annual Meeting of the Health Physics Society in Spokane, Washington: (left to right) Daniel J. DiMarco, U.S. Nuclear Regulatory Commission health physicist (former RSO technical assistant); Dr. Wei-Hsung Wang, LSU RSO director and Center for Energy Studies professor; Li-Yen Chen, Mirion Technologies dose analysis lead (former RSO visiting scholar); and Andrew D. Hastings, Sandia National Laboratory health physicist/radiological engineer (former LSU CAMD acting radiation safety officer)



By Wei-Hsung Wang

LSU nuclear multidisciplinary scholarship program. Co-Investigator, U.S. Nuclear Regulatory Commission; award amount: \$199,998 (2022-2024).



By Wei-Hsung Wang

Microphysical behavior and transport of hygroscopic radiological debris. Principal Investigator, U.S. Nuclear Regulatory Commission; requested amount: \$460,178 (2022-2025).

LSU nuclear multidisciplinary fellowship program. Co-Investigator, U.S. Nuclear Regulatory Commission; requested amount: \$400,000 (2023-2027).

Novel module for separation of radionuclides from aqueous solutions. Co-Investigator, Louisiana Board of Regents; requested amount: \$40,000 (2023-2024).

Electrosorption module to treat liquid radioactive wastes. Co-Investigator, LSU Board of Supervisors; requested amount \$30,000 (2023-2024).



Zimmerman C, Chen L-Y, Wang W-H, Matthews II KL. Comparative analysis of global trend in the occupational dose of medical radiation workers. The 2022 Health Physics Society/International Radiation Protection Association North American Regional Congress, February 20-23, St. Louis, MO, 2022.

Hamideh AM, Wang W-H. Developing calibration conversion factors for iodine-131 in a silver zeolite cartridge using barium-133 as a surrogate. The 2022 Health Physics Society/International Radiation Protection Association North American Regional Congress, February 20-23, St. Louis, MO, 2022.

Chen L-Y, F Hsu, Kao W, Liu R, Liu Q, Wang W-H. Investigation of the background radiation level around Maanshan nuclear power plant in Taiwan with aerial radiation detection technology. The 2022 Health Physics Society/International Radiation Protection Association North American Regional Congress, February 20-23, St. Louis, MO, 2022.

Wang W-H. The American Board of Health Physics certification process. The 2022 Health Physics Society/International Radiation Protection Association North American Regional Congress, February 20-23, St. Louis, MO, 2022.

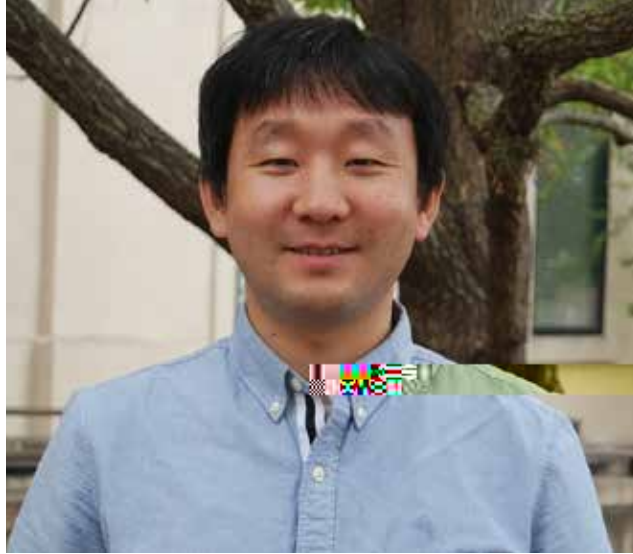


By Wei-Hsung Wang

Paper HPJ-D-22-00157 "Relationship between cancer and radiation: A new paradigm". Reviewed for Health Physics 2022 (Brant Ulsh, Editor-in-Chief).

Paper HPJ-D-22-00020 "Pilot study of thoron concentration in an underground thorium mine ". Reviewed for Health Physics 2022 (J. Matthew Barnett, Associate Editor).

MEMBERS



Dr. Yong-Ha Kim, Assistant Professor in the Department of Environmental Sciences, was recommended unanimously by the RSC to become a member of the RSC. Dr Kim is an authorized radiation principal investigator and possesses proficient working knowledge and experience in the areas of radiochemistry, transport of radioactive aerosols, and radiation protection. Per LSU PM-30, Dr Kim's appointment was officially confirmed by LSU President William F. Tate IV, with the approval of Dr Dennis Paul, Chair of the LSU System RSC.

MEMBERS

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Ji Young Wiley, M.S., CAMD radiation safety officer

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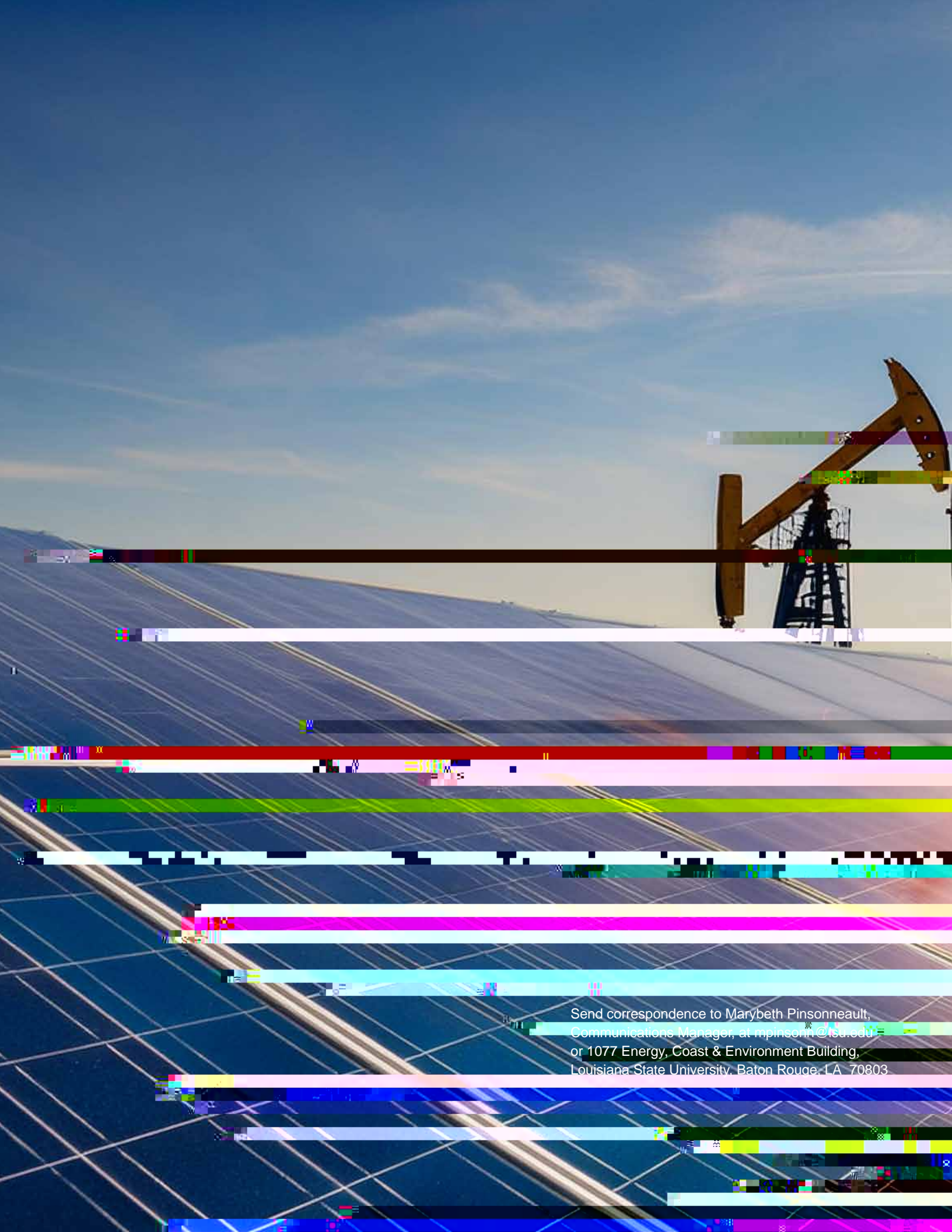
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