



RIVERSIDE

College of Engineering –
Center for Environmental
Research and Technology

CE-CERT

2024 ANNUAL REPORT

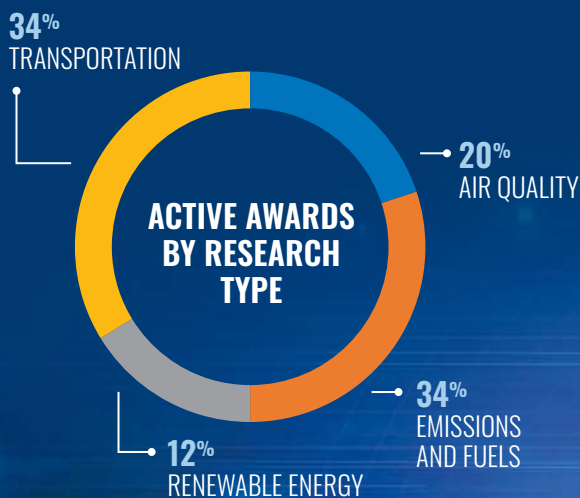
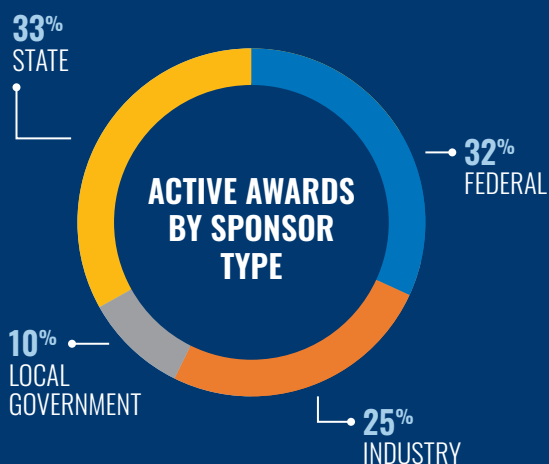
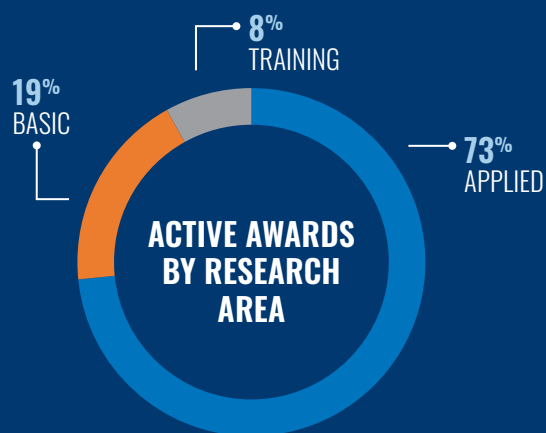


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OVERVIEW

TOTAL ACTIVE PROJECT AMOUNT	\$38 MILLION IN ACTIVE RESEARCH FUNDING
ACTIVE RESEARCH PROJECTS	88
CE-CERT STUDENTS	87 SUPPORTED 32 UNDERGRADUATES 55 GRADUATES
FACULTY & STAFF	63



DIRECTOR'S MESSAGE



Discover CE-CERT: Leading the Way in Environmental Research and Technology. **Watch the video.**

This year, CE-CERT was honored with the Leadership in Air Quality Award, presented by the South Coast Air Quality Management District. This distinction highlighted over 30 years of impactful work improving air quality and public health—an achievement that reflects the dedication and expertise of our faculty, staff, and students.

CE-CERT's research portfolio and partnerships continued to be robust in 2024, with active projects and new grants in air quality, climate science, renewable energy, and sustainable transportation. Our research groups were engaged in a total of 88 active projects, supported through grants totaling \$38,000,000. This funding supported 63 research faculty and staff, 55 graduate and 32 undergraduate students. We are grateful to our government partners, industry collaborators, and community members whose support allows us to continue to deliver innovative and impactful solutions.

Our research groups secured funding in critical areas including infrastructure planning for zero-emission trucks, Arctic climate studies, evaluation of particulate emissions from container ships and trains, and hydrogen facilities planning processes. Community engagement continued to be a core focus for us, including through the annual STEP Summer Labs and the STEP Conference that engaged over 100 high school students, introducing them to cutting-edge research and encouraging critical thinking about sustainability. CE-CERT also started production on the Air Quality and Climate Training (ACT) program, which will offer introductory to advanced courses on key topics that will complement the traditional curriculum offered by UCR.

Looking ahead, CE-CERT remains focused on building stronger collaborations, expanding our research efforts, and tackling pressing challenges in air quality, climate change, and sustainability. With these priorities at the forefront, we are well-positioned to further amplify our contributions to environmental innovation and education. This annual report reflects our progress and celebrates the contributions of our team members.

Thank you for being part of our journey. As always, we encourage you to visit our website, [cert.ucr.edu](https://www.cert.ucr.edu), to learn more about our work, and we welcome your thoughts and engagement.

You can support CE-CERT's work by making a donation at the link below.

Sincerely,

Dr. Don Collins

CE-CERT Director, Professor of Chemical and Environmental Engineering



Join us in creating a brighter, more sustainable future by contributing to the **Friends of CE-CERT Fund**. For more information, visit <https://www.cert.ucr.edu/giving>.

MAJOR 2024 HIGHLIGHTS

1 CE-CERT RECEIVES LEADERSHIP IN AIR QUALITY AWARD

CE-CERT was honored with the Leadership in Air Quality Award at the 34th Annual Clean Air Awards, presented by the South Coast Air Quality Management District (SCAQMD). This recognition highlights over three decades of transformative research to reduce air pollution and improve public health. CE-CERT's interdisciplinary efforts, including advancements in emissions reduction strategies and renewable energy, have had a lasting significant impact on science, technology, and public policy.



Dr. Don Collins with the Leadership in Air Quality Award.

2 CE-CERT JOINS DOE'S ATMOSPHERIC RADIATION MEASUREMENT FACILITY

A team of APL researchers led by Dr. Sarah Petters is partnering with the U.S. Department of Energy's (DOE) Atmospheric Radiation Measurement (ARM) User Facilities to develop weatherproof optical particle spectrometers. These instruments are central to the Coastal-Urban-Rural Gradient Experiment (CoURAGE) field campaign, which examines aerosols and their role in air quality in Baltimore, Maryland. After thorough testing at CE-CERT, the instruments will collect data to improve understanding of urban and coastal atmospheric dynamics.



Dr. Sarah Petters and a student work on a high-voltage power supply that manipulates nanoparticles.

3 CE-CERT FACULTY APPOINTED TO EPA ADVISORY SUBCOMMITTEE

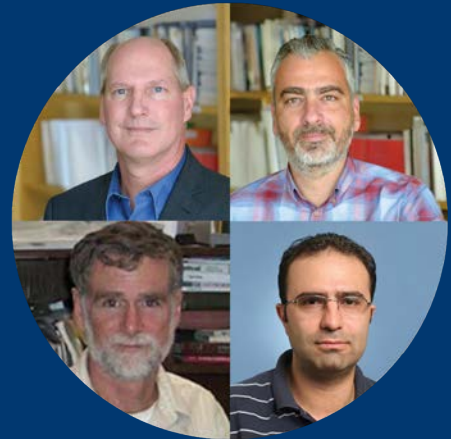
Dr. Kanok Boriboonsomsin has been selected to join the U.S. Environmental Protection Agency's Mobile Sources Technical Review Subcommittee (MSTRS), an advisory group focused on vehicle emissions and air quality improvements. With more than 20 years of expertise in sustainable transportation and emissions modeling, Dr. Boriboonsomsin will help address the complex challenges associated with pollution driven from mobile sources, and to create practical and impactful solutions for the future of transportation.



Dr. Kanok Booriboonsomsin

4 FOUR CE-CERT FACULTY NAMED AMONG THE WORLD'S TOP 2% SCIENTISTS

For the third consecutive year, four CE-CERT researchers—Dr. Matthew Barth, Dr. William Carter, Dr. Georgios Karavalakis, and Dr. Hamed Mohsenian-Rad—have been included in Stanford University's Top 2% Scientists list for 2024. This ranking recognizes researchers based on metrics such as citations, h-index scores, and contributions across 22 fields and 174 subfields.



Clockwise: Dr. Matthew Barth, Dr. William Carter, Dr. Hamed Mohsenian-Rad, Dr. Georgios Karavalakis.



For additional information on CE-CERT's organizational structure, personnel, funding sources, and publications—and to access a digital version of this report—please visit <https://www.cert.ucr.edu/annualreport2024>.

ATMOSPHERIC PROCESSES LABORATORY (APL)

MISSION

The Atmospheric Processes Laboratory (APL) research group aims to advance understanding of the sources and impacts of air pollution, including particles, air toxics, ozone, and greenhouse gases. The group characterizes air pollution across the United States using advanced measurement, modeling, and data fusion approaches. Advanced approaches are used to understand secondary aerosol formation in the atmosphere and answer questions related to exposure and source characterization. Environmental chambers are employed to simulate atmospheric conditions and study the evolution of pollution from a wide range of sources.



Explore APL's cutting-edge research on air quality and climate change using the world's largest atmospheric chamber.

2024 HIGHLIGHTS

1

National Science Foundation CAESAR Project: APL researchers participated in the NSF-funded Cold-Air Outbreak Experiment in the Sub-Arctic Region (CAESAR) campaign. Led by Dr. Markus Petters, the team joined international collaborators on flights aboard an NSF Lockheed C-130 Hercules aircraft, departing from Kiruna, Sweden. The team measured aerosols, cloud condensation nuclei, and black carbon to study marine cold air outbreaks, which influence Arctic warming by impacting cloud formation, snowfall, and sea ice dynamics. This data is critical for advancing understanding of the accelerated warming in the Arctic and improving global climate models. *Campaign blog:* caesar2024.github.io.

Lington Cai, Ph.D student, stands in front of the NSF CAESAR project aircraft. 



2

Collaboration for Ice Nucleation Research: CE-CERT's Cold Stage facility, an instrument facility providing access to specialized ice nucleation instrumentation, partnered with West Texas A&M University to study the freezing dynamics of cloud droplets, which are essential for understanding the onset of precipitation in convective clouds. Led by Dr. Sarah Petters, the team deployed an open-hardware cold-stage instrument to measure ice-active particles at temperatures as low as -40°C . The project also integrates ice nucleation research into West Texas A&M's curriculum, providing students with hands-on experience in atmospheric science.

A student holds a calibration slide with droplets of pure water for analysis. 



3

CARB Multi-Year Field Program: APL concluded the field component of a multi-year CARB-supported project aimed at understanding the sources of fine particulate matter in three California cities with distinct emissions and meteorological conditions. Ph.D. students Xuanlin Du and Ying Zhou, along with postdoctoral researcher Alex MacDonald, led the final study at a CARB monitoring site in Bakersfield, following fieldwork in Riverside and Wilmington in 2022 and 2023. The project combines experimental work by the Collins and Bahreini groups with synthesis and modeling by former APL member Dr. Cesunica Ivey. Measurements of directly emitted and chemically formed particulate matter will be contrasted across sites to refine source contributions for current and future emissions scenarios.

Dr. Don Collins and Ying Zhou analyze data in the laboratory. 

4

Indoor Air Quality Research: Principal Investigator David Cocker and graduate student Daniel Gonzalez led a study in partnership with the Los Angeles Cleantech Incubator (LACI). APL completed a comprehensive study comparing the impacts of natural gas and induction stoves on indoor air quality, revealing critical insights into how cooking technologies influence indoor air pollution and its potential contributions to public health concerns. The findings highlight the importance of adopting cleaner cooking technologies to mitigate exposure to harmful pollutants. Results were shared in a webinar hosted by LACI, targeting audiences focused on advancing clean energy solutions and promoting healthier indoor environments.

KEY PUBLICATIONS

- Kasparoglu, S., Cai, L., Meskhidze, N., & Petters, M. D. (2024). Evolution of refractory black carbon mixing state in an urban environment. *Atmospheric Environment*, 333, 120651. <https://doi.org/10.1016/j.atmosenv.2024.120651>.
- Le, C., Xu, N., Li, Q., Collins, D. R., & Cocker III, D. R. (2024). Experimental characterization of particle wall-loss behaviors in UCR dual-90m Teflon chambers. *Aerosol Science and Technology*, 58(3), 288–300. <https://doi.org/10.1080/02786826.2023.1871234>.
- Mahant, S., Snider, J. R., Petters, S. S., & Petters, M. D. (2024). Effect of aerosol size on glass transition temperature. *The Journal of Physical Chemistry Letters*. <https://doi.org/10.1021/acs.jpclett.4c01415>.
- Zhu, Z., Du, X., & Collins, D. R. (2024). Direct measurement of the growth of small particles in ambient air using captive aerosol chambers. *Atmospheric Environment*. <https://doi.org/10.1016/j.atmosenv.2024.120915>.

PROFESSIONAL ACTIVITY

- **Sarah Petters**, American Association for Aerosol Research-Education Committee

FACULTY LIST

- **David Cocker**, Professor of Chemical & Environmental Engineering
- **Don Collins**, Professor of Chemical & Environmental Engineering and CE-CERT Director

- **Markus Petters**, Professor of Chemical & Environmental Engineering
- **Sarah Petters**, Assistant Research Engineer
- **Roya Bahreini**, Professor of Environmental Sciences, and CE-CERT affiliate faculty
- **Will Porter**, Assistant Professor of Environmental Sciences, and CE-CERT affiliate faculty

KEY SPONSORS AND PARTNERS

- Aclima, Inc.
- Asphalt Institute Foundation
- California Air Resources Board
- California Department of Transportation
- Coordinating Research Council
- Department of Energy Atmospheric Radiation Measurement Program
- Department of Energy Atmospheric System Research Program
- Environmental Protection Agency
- National Science Foundation Atmospheric Chemistry Program
- National Science Foundation Community Instruments and Facilities (CIF) Program
- National Science Foundation Physical and Dynamical Meteorology Program
- South Coast Air Quality Management District

EMISSIONS AND FUELS RESEARCH GROUP (EFR)

MISSION

The Emissions and Fuels Research (EFR) group studies mobile source emissions and their effects on air quality, human health, and the environment. Using advanced tools such as Portable Emissions/Activity Monitoring Systems (PEMS/PAMS) and On-board Sensing and Reporting (OSAR), the group conducts field and lab research on vehicles, off-road equipment, and large engines, including marine vessels and locomotives. EFR also leads State programs like CARB's Clean Truck Check and collaborates on emerging technologies, such as hydrogen-powered and battery-electric vehicles. In partnership with the University of Michigan, the group is set to launch the Hydrogen Engine Alliance of North America in 2025.



See how EFR is driving change by reducing emissions from vehicles and other mobile sources.

2024 HIGHLIGHTS

1

On-board Sensing and Reporting (OSAR) Program: EFR deployed sensors on 100 ultralow NOx heavy-duty Natural Gas Vehicles (NGVs) to study their emissions in urban environments. The team is now expanding the program to include over 100 heavy-duty diesel vehicles and off-road equipment, with completion anticipated by 2025. This research evaluates potential emission leaks and their impact, providing critical data to support cleaner heavy-duty vehicle technologies.

EFR team conducting leak testing on a heavy-duty vehicle.



2

Advancing Maritime Emission Regulations: The International Maritime Organization (IMO) expanded its greenhouse gas (GHG) emission standards for ocean-going vessels to include methane and nitrous oxide emissions alongside carbon dioxide. Dr. Wayne Miller was part of the subgroup on Continuous Emission Monitors. This effort supports the development of robust maritime emission regulations to combat climate change.

3

Brake-Wear and Wheel-Wear Particulate Emissions Research: The EFR team, led by Dr. Georgios Karavalakis and Dr. Zisimos Toumasatos, is investigating brake-wear and wheel wear particulate emissions from trains operating in California as part of a \$1.2 million CARB-funded research program. The study examines the physical, chemical, and toxicological properties of these emissions through field testing in California and lab analysis in Berlin, Germany. Collaborative partners include Link Engineering, UC Irvine, San Diego State University, and Deutschebahn Systemtechnik GmbH.

Close-up of a brake enclosure.



CARBTest Referee Sites and Clean Truck Check Program: As part of CARB's Clean Truck Check (CTC) program, the EFR team developed 10 CARBTest referee sites across California in partnership with California State University at Fresno. These sites address inspections of high-emitting vehicles, part exemptions, and motorhome verifications, with a dedicated website to streamline scheduling. This program plays a vital role in reducing heavy-duty vehicle emissions in urban areas and supporting CARB's regulatory initiatives.

Miles Mahoney conducting inspections for the CARB Clean Truck Check program.



KEY PUBLICATIONS

- Ma, T., Li, C., Luo, J., Frederickson, C., Tang, T., Durbin, T. D., Johnson, K. C., & Karavalakis, G. (2024). In-use NO_x and black carbon emissions from heavy-duty freight diesel vehicles and near-zero emissions natural gas vehicles in California's San Joaquin Air Basin. *Science of the Total Environment*, 907, 168188. <https://doi.org/10.1016/j.scitotenv.2023.168188>.
- Tang, T., Zhu, H., Ma, T., Hao, P., Durbin, T. D., Johnson, K. C., & Karavalakis, G. (2024). A comparison between the gaseous and particulate emissions from diesel and natural gas yard tractors. *Emission Control Science and Technology*. <https://doi.org/10.1007/s40825-024-00245-4>.
- Toumasatos, Z., Zhu, H., Durbin, T. D., Johnson, K. C., Cao, S., & Karavalakis, G. (2024). Real-world particulate, GHG, and gaseous toxic emissions from heavy-duty diesel and natural gas vehicles. *Atmospheric Environment*, 327, 120512. <https://doi.org/10.1016/j.atmosenv.2024.120512>.
- Zhu, H., Li, C., McCaffery, C., Cao, S., Johnson, K. C., Karavalakis, G., & Durbin, T. (2024). Emissions from heavy-duty diesel, natural gas, and diesel-hybrid electric vehicles—Part 1. NO_x, N₂O, and NH₃ emissions. *Fuel*, 371, 132175. <https://doi.org/10.1016/j.fuel.2024.132175>.

AWARDS AND HONORS

- George Karavalakis**, Stanford's Top 2% Scientist List
- Brenda Lopez**, Recipient of the UC President's Postdoctoral Fellowship
- Wayne Miller**, the Yorba Linda Water District honored Dr. Miller by dedicating its new state-of-the-art PFAS water treatment plant in his name

PROFESSIONAL ACTIVITY

- EFR** attends the Coordinating Research Council (CRC) Real World Emissions Workshop
- Wayne Miller**, Judge for the Secretary of Defense Environmental Awards
- Wayne Miller**, Cochair of the Emissions Group for the Natural Gas Vehicle America

FACULTY LIST

- Kent Johnson**, Research Faculty
- Tom Durbin**, Research Faculty
- Wayne Miller**, Research Faculty
- Georgios Karavalakis**, Professor of Chemical & Environmental Engineering
- Heejung Jung**, Professor of Mechanical Engineering
- David Cocker**, Professor of Chemical & Environmental Engineering
- Zisimos Toumasatos**, Assistant Research Engineer
- Thomas Eckel**, Project Scientist

KEY SPONSORS AND PARTNERS

- 3DATX
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- California Air Resources Board
- California Energy Commission
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- Caltrans
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- Horiba
- National Center for Sustainable Transportation
- NGK Sparkplugs
- RA Automotive
- Sensors, Inc.
- South Coast Air Quality Management District
- Southern California Gas Company
- Subaru
- Tetra Tech, Inc.
- The Texas A&M University System
- TSI Incorporated
- U.S. Department of Defense
- U.S. Department of Energy
- U.S. Department of Transportation Maritime Administration
- U.S. Environmental Protection Agency
- United Parcel Service
- Volvo Truck Corporation

TRANSPORTATION SYSTEMS RESEARCH (TSR)

MISSION

The Transportation Systems Research (TSR) group advances shared, electric, connected, and automated mobility systems to address critical environmental and energy challenges in transportation. By leveraging sensing and communication technologies, advanced computing, and control theory, TSR transforms mobility systems and infrastructure into sustainable solutions that enhance safety, mobility, environmental health, equity, and economic outcomes.



Learn how TSR is transforming the future of mobility with innovative transportation solutions.

2024 HIGHLIGHTS:

1

Wins U.S. DOT Intersection Safety Challenge: The CE-CERT TSR team was one of 15 winners nationwide selected from 120 submissions, earning recognition for its innovation in enhancing intersection safety and community well-being. At the 2024 Transportation Research Board (TRB) Annual Meeting, CE-CERT earned recognition in the U.S. DOT Intersection Safety Challenge for its *Safety Assurance System for Vulnerable Road Users at Signalized Intersections (SAINT)* project. Developed in collaboration with the City of Riverside, the project enhances safety along University Avenue through advanced technologies.

2

New U.S. DOT Climate and Transportation Research Center: In collaboration with UC Davis, UC Riverside became a partner in the U.S. DOT-funded Climate and Transportation Research Center. With \$100,000 in annual funding for five years, UCR will contribute to strategies that reduce greenhouse gas emissions and integrate climate considerations into transportation planning. This initiative is part of five U.S. DOT-sponsored research centers addressing climate challenges in transportation.

3

The 4th IEEE Forum for Innovative Sustainable Transportation Systems (IEEE-FISTS): From February 26-28, CE-CERT and the IEEE ITS Society hosted the 4th IEEE Forum for Innovative Sustainable Transportation Systems in Riverside, California. The global conference brought together 120 attendees and featured 80 technical presentations on topics such as sustainable freight, electric vehicles, and shared mobility. This event fostered collaboration and innovation, advancing eco-friendly intelligent transportation systems.

4

UCR EcoCAR Completes Year 2, Advances to Year 3: The UCR EcoCAR team completed Year 2 of the EcoCAR EV Challenge, demonstrating expertise in electric powertrains, autonomous vehicle technologies, and equity in mobility. After showcasing their achievements during the Year 2 Competition in Phoenix and Yuma, AZ, the team is now focused on refining automated features and inclusive design in Year 3, continuing to innovate in sustainable transportation.

The UCR EcoCAR team at the Year 2 Competition in Arizona.



KEY PUBLICATIONS

- Bai, Z., Wu, G., Barth, M. J., Liu, Y., Sisbot, E. A., Oguchi, K., & Huang, Z. (2024). A survey and framework of cooperative perception: From heterogeneous singleton to hierarchical cooperation. *arXiv preprint arXiv:2208.10590*. <https://doi.org/10.48550/arXiv.2208.10590>.
- Garrido, J., Hidalgo, E., Barth, M. J., & Boriboonsomsin, K. (2024). An intelligently controlled charging model for battery electric trucks in drayage operations. *IEEE Transactions on Vehicular Technology*, 73(4), 4530–4540. <https://doi.org/10.1109/tvt.2023.3347730>.
- Liu, H., Hao, P., Liao, Y., Tanvir, S., Boriboonsomsin, K., & Barth, M. J. (2024). Eco-friendly crowdsourced meal delivery: A dynamic on-demand meal delivery system with a mixed fleet of electric and gasoline vehicles. *IEEE Transactions on Intelligent Transportation Systems*, 25(9), 11397–11410. <https://doi.org/10.1109/tits.2024.3367621>.
- Un-Noor, F., Scora, G., Wu, G., Yoon, S., & Boriboonsomsin, K. (2024). Cost-effectiveness of off-road equipment electrification incentives: Cost estimation, evaluation, and usage framework. *Transportation Research Record*, 2678(2), 574–593. <https://doi.org/10.1177/03611981231175892>.
- **Matthew Barth**, Senior Editor, IEEE Transactions on Intelligent Transportation Systems
- **Kanok Booriboonsomsin**, Member, Mobile Sources Technical Review Subcommittee, U.S. Environmental Protection Agency
- **Kanok Booriboonsomsin**, Member, Air Quality and Greenhouse Gas Mitigation Committee, Transportation Research Board
- **Kanok Booriboonsomsin**, Member, Urban Freight Transportation Committee, Transportation Research Board
- **Kanok Booriboonsomsin**, Vice Chair, Environmental Justice and Goods Movement Subcommittee, Transportation Research Board
- **Kanok Booriboonsomsin**, Associate Editor, IEEE Intelligent Transportation Systems Magazine
- **Guoyuan Wu**, Associate Editor, IEEE Transactions on Intelligent Transportation Systems
- **Guoyuan Wu**, Associate Editor, IEEE Open Journal of Intelligent Transportation Systems
- **Guoyuan Wu**, Associate Editor, SAE International Journal of Connected and Automated Vehicles
- **Guoyuan Wu**, Member, Standing Committee of Research Innovation, Implementation, and Management Committee, Transportation Research Board

AWARDS AND HONORS

- **Kanok Booriboonsomsin**, appointed to EPA's Mobile Sources Technical Review Subcommittee (MSTRS) by EPA Administrator Michael Regan
- **Matthew Barth**, Stanford's Top 2% Scientist List
- **Yejia Liao and Ruili Yao**, IEEE ITSC 2024 Best Application Paper
- **Xuanpeng Zhao**, Zoox AutoDriving Security Award at the 2nd ISOC Symposium on Vehicle Security and Privacy (VehicleSec)

PROFESSIONAL ACTIVITY

- **Matthew Barth**, Vice-President of Education, IEEE Intelligent Transportation Systems Society
- **Matthew Barth**, Member, U.S. EPA Mobile Sources Technical Review Subcommittee; Chair, EPA Modeling Workgroup

- **Peng Hao**, Associate Research Faculty and Adjunct Professor of Electrical & Computer Engineering
- **George Scora**, Research Faculty
- **Hang Qiu**, Assistant Professor of Electrical & Computer Engineering
- **Konstantinos Karydis**, Associate Professor of Electrical & Computer Engineering

KEY SPONSORS AND PARTNERS

- California Air Resources Board
- California Attorney General's Office
- California Department of Transportation
- California Energy Commission
- City of Rialto
- City of Riverside
- Honda
- James Irvine Foundation
- Leidos
- Mobility Development Operations
- National Science Foundation
- Ohmio
- Riverside County Transportation Commission
- South Coast Air Quality Management District
- Southern California Association of Governments
- Sumitomo Electric
- Toyota InfoTech
- University of California Institute of Transportation Studies
- U.S. Department of Energy
- U.S. DOT: Center for Advancing Research in Transportation Emissions, Energy, and Health
- U.S. DOT: Center for Assured & Resilient Navigation in Advanced Transportation Systems
- U.S. DOT: Center for Emissions Reduction, Resiliency, and Climate Equity in Transportation
- U.S. DOT: National Center for Sustainable Transportation
- Voltu
- Volvo Trucks
- Western Riverside Council of Governments

FACULTY LIST

- **Matthew Barth**, Professor of Electrical & Computer Engineering, BCOE Associate Dean for Research and Graduate Education
- **Kanok Boriboonsomsin**, CE-CERT Associate Director of Finance & Administration, Research Faculty
- **Guoyuan Wu**, Research Faculty and Adjunct Professor of Electrical & Computer Engineering

SUSTAINABLE INTEGRATED GRID INITIATIVE (SIGI)

MISSION

The Sustainable Integrated Grid Initiative (SIGI) conducts research on energy systems that integrate intermittent renewable energy, energy storage, and a variety of electric and hybrid vehicle technologies. Key efforts emphasize bidirectional EV charging, microgrid energy management, mobile microgrids, and strategies to address the water-energy nexus, showcasing innovative approaches to sustainable energy solutions.

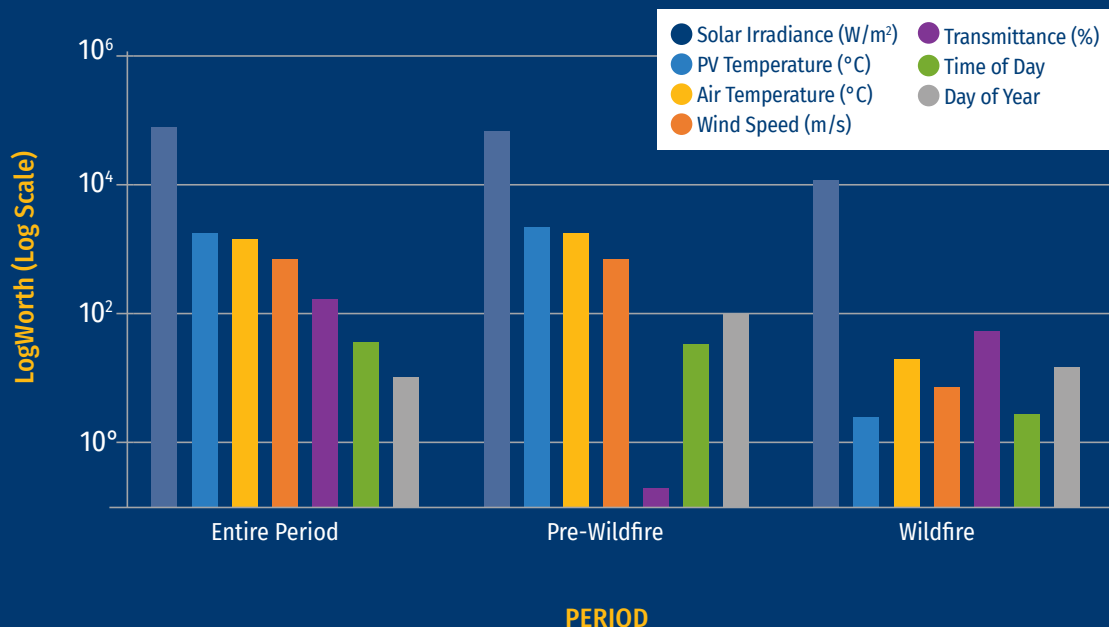


2024 HIGHLIGHTS

1

Evaluation of Xponent Power's Retractable Solar PV System: Through the CalTestBed program, researchers conducted a comprehensive analysis of Xponent Power's innovative retractable solar PV system. The evaluation incorporated multivariate analysis to assess environmental conditions, energy characteristics, system performance, and operational efficiency. The study also examined the effects of wildfire conditions on solar irradiance and transmittance, providing unique insights into how such factors influence PV energy production. The research highlighted the system's resilience and its potential applications in diverse environmental scenarios, advancing the development of adaptive solar technologies.

Wildfire soiling impacts on solar PV transmittance



MORBUG and Energy Management Strategies: The Mobile Renewable Backup Generation (MORBUG) project continues to push the boundaries of mobile energy storage systems by integrating lithium battery platforms with microgrid technologies. Researchers are advancing energy management strategies (EMS) to optimize peak load reduction by leveraging EV charging integration, energy storage, and load control mechanisms. The goal is to support grid stability and enhance energy resilience, making MORBUG a critical step toward flexible, sustainable energy solutions for future infrastructure.

FACULTY LIST

- **Sadrul Ula**, Research Faculty
- **Matthew Barth**, Professor of Electrical & Computer Engineering, and BCOE Associate Dean for Research and Graduate Education
- **Mike Todd**, Principal Development Engineer

KEY SPONSORS AND PARTNERS

- CalTestBed – Xponent Power, Dakota Energy
- Kern County Community College District
- Research Hub for Electric Technologies in Truck Applications (RHETTA) – CALSTART, Electric Power Research Institute (EPRI)
- Southern California Edison
- Western Municipal Water District

SIGI students showcase the MORBUG trailer featuring the retractable solar PV system. ☺



SUSTAINABLE FUELS INITIATIVE (SFI)

MISSION

The Sustainable Fuels Initiative (SFI) group advances sustainable energy solutions by developing and applying advanced technologies for producing and utilizing renewable fuels including hydrogen and renewable natural gas. Focus areas include energy systems analysis, zero-emission infrastructure planning, waste-to-energy conversion, high renewables grid management, and conducting techno-economic and life cycle assessments.

2024 HIGHLIGHTS

1

DOE Grant to Address Hydrogen Permitting Challenges: SFI received \$1 million from the U.S. Department of Energy to tackle permitting and safety barriers for hydrogen technologies. In partnership with Sandia National Laboratories and key stakeholders, the project will focus on comprehensive safety assessments and community engagement, with an emphasis on equitable implementation in disadvantaged communities. This effort aims to accelerate the adoption of clean hydrogen solutions while ensuring public safety and inclusivity.

2

Advancing Cross-Border Zero Emission Freight Infrastructure: Supported by UC Alianza MX, the SFI team, led by Dr. Arun Raju, is working to advance Zero Emission Vehicle (ZEV) infrastructure for Medium- and Heavy-Duty (MHD) freight along the California-Mexico border. Stakeholders convened in Mexico City to focus on collaborative efforts in infrastructure development, regulatory alignment, and emissions reduction. The initiative seeks to improve environmental and economic outcomes in cross-border freight operations.

Stakeholders convene at Casa de California to discuss cross-border ZEV infrastructure. 



3

Regional Analysis of Zero-Emission Vehicle Infrastructure:

SFI received a research grant from the South Coast Air Quality Management District to assess regional infrastructure needs for Medium- and Heavy-Duty (MHD) zero-emission vehicles. The analysis will provide critical insights to support future ZEVs adoption and advance sustainable transportation goals.

Dr. Michael Todd moderates a panel on MHD Vehicle charging infrastructure and regulations at Xochicalco University in Tijuana.

4

Testifying on Hydrogen Economy Development: Dr. Arun Raju provided expert testimony to the State Select Committee on Building a Zero Carbon Hydrogen Economy. He addressed critical topics such as pipeline safety, leakage, and development, emphasizing the need for strategic planning and robust systems to support hydrogen's role in a sustainable energy future.

Panelists for the session “Energy Needs and Outlooks in Public Transportation” at the 15th International Transportation Congress, hosted by AMTM in Mexico City.



KEY PUBLICATIONS

- Penchev, M., Martinez-Morales, A. A., Lim, T., Raju, A. S. K., Yilmaz, M., & Akinci, T. C. (2024). Leakage rates of hydrogen-methane gas blends under varying pressure conditions. *International Journal of Hydrogen Energy*. <https://doi.org/10.1016/j.ijhydene.2024.11.413>.
- Akinci, T. C., Penchev, M., Martinez-Morales, A. A., Todd, M., Yilmaz, M., & Raju, A. S. K. (2024). Integrating artificial neural networks for predictive life cycle assessment of electric vehicles in sustainable transportation. *IEEE Global Energy Conference, December 2024*.
- Akinci, T. C., Sengezer, E., Dursun, E., Yilmaz, M., Gokmen, G., Martinez-Morales, A. A., Penchev, M., & Raju, A. S. K. (2024). Smart Meter Analytics for Residential Energy Efficiency. *IEEE Global Energy Conference, December 2024*.
- Penchev, M., Martinez-Morales, A. A., Todd, M., Akinci, T. C., & Raju, A. S. K. (2024). Economic analysis and infrastructure plan for zero-emission medium and heavy-duty vehicles in California's South Coast Region. *2nd International Symposium on Political Science and Public Administration Symposium (Theme: Climate Change and Sustainable Future)*, November 28–29, Tekirdag, Turkey.

PROFESSIONAL ACTIVITY

- **Arun S.K. Raju**, Panelist, “Key Challenges for California’s Energy Future,” California Council on Science and Technology.
- **Michael Todd**, Moderator, Baja California EV Infrastructure Planning Workshop, Xochicalco University, Tijuana, Baja California.
- **Alfredo A. Martinez-Morales**, Roundtable participant, 15th International Transport Congress, Mexico City.

FACULTY LIST

- **Arun S.K. Raju**, CE-CERT Associate Director of Operations, Research Faculty and Adjunct Professor of Chemical & Environmental Engineering
- **Miroslav Penchev**, Assistant Project Scientist
- **Alfredo A. Martinez-Morales**, Research Faculty
- **Tahir Cetin Akinci**, Assistant Project Scientist
- **Michael Todd**, Principal Development Engineer

KEY SPONSORS AND PARTNERS

- California Energy Commission
- South Coast Air Quality Management District
- Southern California Gas Company
- Strategic Growth Council and the City of Riverside
- UC Alianza MX

B³: BIOENERGY, BIOREFINING, AND BIOMATERIALS TEAM

MISSION

The B³ research team focuses on transforming lignocellulosic biomass, derived from agricultural and forestry plant waste and residues, into renewable liquid fuels and bioproducts. The team is recognized for developing low-cost technologies that enhance delignification and biomass breakdown, enabling the recovery of valuable intermediates such as cellulose fiber, fermentable sugars, and high-quality lignin. Their notable invention, Co-solvent Enhanced Lignocellulosic Fractionation (CELf), is a mild delignifying pretreatment technology that reduces costs and improves efficiency in biomass pulping, liquefaction, and lignin extraction. Key research areas include biomass pretreatment, ethanol fermentation, catalysis, sustainable aviation fuels, renewable heavy marine fuels, pulp products, and furfural production.



Discover how B³ is converting plant matter into renewable energy and sustainable materials.

2024 HIGHLIGHTS

1

DARPA Project: The B³ team was awarded a Research grant by the Defense Advanced Research Projects Agency (DARPA) to develop high-strength densified boards from wood waste sourced from military sites. This innovative approach repurposes waste materials into durable, eco-friendly construction products, contributing to sustainable practices in military infrastructure.

Researcher Brent Scheidmantle works on the indoor CELf system.

2

U.S. DOE BETO Project: The B³ team received funding from U.S. Department of Energy's Bioenergy Technologies Office (BETO) to scale up their Co-solvent Enhanced Lignocellulosic Fractionation (CELf) technology. This project aims to advance the commercialization of CELf for efficient biomass pretreatment, enabling the production of renewable fuels and bioproducts at lower costs.

Dr. Charles Cai stands in front of the CELf system.



U.S. DOE IEDO Project: The U.S. Department of Energy's Industrial Efficiency and Decarbonization Office (IEDO) awarded the B³ team a project to reduce carbon emissions in the pulping industry. By integrating CELF technology, the project seeks to modernize pulping processes, improving energy efficiency and reducing greenhouse gas emissions in one of the most energy-intensive sectors.

KEY PUBLICATIONS

- Karoki, P. K., Zhang, S., Cai, C. M., Dim, P. E., & Ragauskas, A. J. (2024). Thermally stable and self-healable lignin-based polyester. *Polymer Testing*, 137, 108515. <https://doi.org/10.1016/j.polymertesting.2024.108515>.
- Klein, B. C., Scheidmantle, B., Hanes, R. J., Bartling, A. W., Grundl, N. J., Clark, R. J., Bidy, M. J., Tao, L., Trinh, C. T., Guss, A. M., Wyman, C. E., Ragauskas, A. J., Webb, E. G., Davison, B. H., & Cai, C. M. (2024). Economics and global warming potential of a commercial-scale delignifying biorefinery based on co-solvent enhanced lignocellulosic fractionation to produce alcohols, sustainable aviation fuels, and co-products from biomass. *Energy & Environmental Science*, 17(3), 1202–1215. <https://doi.org/10.1039/D3EE02532B>.
- Leclerc, M., Klein, I., Karoki, M., & others. (2024). Structure–reactivity relationships governing hydrothermal liquefaction of lignin from co-solvent enhanced lignocellulosic fractionation (CELF). *Sustainable Energy & Fuels*, 8, 5856–5867. <https://doi.org/10.1039/D4SE01294A>.

AWARDS AND HONORS:

- **Charles M. Cai**, nominated for an Eni Award

PROFESSIONAL ACTIVITY

- **Charles M. Cai**, American Institute of Chemical Engineers
- **Charles M. Cai**, Materials Research Society

FACULTY LIST

- **Charles M. Cai**, Research Faculty and Associate Adjunct Professor of Chemical & Environmental Engineering

KEY SPONSORS AND PARTNERS

- U.S. Advanced Research Projects Agency-Energy
- U.S. Defense Advanced Research Projects Agency
- U.S. Department of Energy

Researchers Brent Scheidmantle and Chad Larson operate the CELF system. ○



SOUTHERN CALIFORNIA RESEARCH INITIATIVE FOR SOLAR ENERGY (SC-RISE)

MISSION

The Southern California Research Initiative for Solar Energy group focuses on multiple aspects of research, demonstration, and engagement related to solar energy. The Advanced Materials and Energy Devices Laboratory (AMEDL) focuses on fundamental research and technology development, while the Distributed Energy Resources Laboratory (DERL) advances applied research in renewable energy systems, green infrastructure, and clean technology deployment. The Solar Valley Consortium (SVC) collaborates with policymakers and stakeholders to position Riverside and San Bernardino Counties as California's Solar Valley, fostering regional leadership in solar energy innovation.

2024 HIGHLIGHTS

1

Exploring Solar-Powered Bike Pathways:

With funding from Caltrans, Principal Investigator Alfredo A. Martinez-Morales and researchers are studying the feasibility of solar-integrated bike paths to address climate change. The project combines technical, economic, and environmental analyses to identify actionable low carbon solutions. This innovative effort supports California's goals for sustainable and efficient transportation infrastructure.

Map of Riverside bikeways, highlighting existing routes for sustainable transportation projects.



2

UCR Students Join STREAM-ITL Initiative: UCR students participated in the STREAM-ITL program, collaborating with Instituto Tecnológico de Hermosillo and the Sonora Energy Cluster. The program provided hands-on experience in renewable energy, IoT systems, and sustainable infrastructure through workshops, project tours, and cultural activities. Supported by UC Alianza MX, this initiative fostered cross-border learning in global sustainability.

UCR and Hermosillo participants of the STREAM-ITL initiative gather during a site visit.



4

ENERBAJA 2024 Panel on Electric Mobility:

Dr. Alfredo A. Martinez-Morales participated in the panel “Infrastructure and Technology Development to Promote Electric Mobility,” to discuss electric mobility in Baja California. The panel addressed grid advancements, public EV charging challenges, and regulatory frameworks in Mexico. Dr. Martinez-Morales shared lessons from California’s South Coast AQMD and CA-Mexico projects on sustainable energy and transportation strategies.

Dr. Alfredo Martinez-Morales speaks on electric mobility infrastructure at ENERBAJA 2024. 🌐



3

IEEE Global Energy Conference 2024: Drs. Martinez-Morales, Akinci, and Yilmaz organized the IEEE Global Energy Conference 2024, which brought together 119 participants from 24 countries. With 122 paper submissions and 72 presentations, the event highlighted innovations in renewable energy integration, smart grids, and energy policy. The conference emphasized the importance of international partnerships in advancing sustainable energy research and innovation.

KEY PUBLICATIONS

- Ersali, C., Hekimoglu, B., Yilmaz, M., Martinez-Morales, A. A., & Akinci, T. C. (2024). Disturbance rejecting PID-FF controller design of a non-ideal buck converter using an innovative snake optimizer with pattern search algorithm. *Heliyon*, 10(14). <https://doi.org/10.1016/j.heliyon.2024.e34448>.
- Isman Okieh, O., Seker, S., Akinci, T. C., & Ibrahim Idriss, A. (2024). Optimization of neuro-controller application for maximum power point tracking photovoltaic systems through Shannon’s information criteria. *Electric Power Components and Systems*, 1–12. <https://doi.org/10.1080/15325008.2024.2328799>.
- Ozcelik, M. A., Akinci, T. C., Yilmaz, M., & Martinez-Morales, A. A. (2024). Effect of LED light frequency on an object in terms of visual comfort. *Electric Power Components and Systems*, 52(8), 1368–1378. <https://doi.org/10.1080/15325008.2023.2281629>.
- Yilmaz, M. (2024). Comparative analysis of hybrid maximum power point tracking algorithms using voltage scanning and perturb and observe methods for photovoltaic systems under partial shading conditions. *Sustainability*, 16(10), 4199. <https://doi.org/10.3390/su16104199>.

AWARDS AND HONORS

- **Alfredo A. Martinez-Morales**, Invited Panelist, ENERBAJA 2024
- **Musa Yilmaz**, Interview by TRT Haber News, Turkey’s National Public Broadcaster
- **Musa Yilmaz**, Outstanding Achievement Award, Information Technology Festival (IFEST 2024)

PROFESSIONAL ACTIVITY

- **Alfredo A. Martinez-Morales**, Co-chair, Solar Valley Consortium
- **Alfredo A. Martinez-Morales**, General Chair, IEEE Global Energy Conference 2024
- **Musa Yilmaz**, Editor in Chief, Balkan Journal Electrical and Computer Engineering
- **Tahir Cetin Akinci**, Guest Editor, MDPI Big Data Analytics in Smart Cities

FACULTY LIST

- **Alfredo A. Martinez-Morales**, Research Faculty
- **Miroslav Penchev**, Assistant Project Scientist
- **Tahir Cetin Akinci**, Assistant Project Scientist
- **Musa Yilmaz**, Affiliate Visiting Researcher

KEY SPONSORS AND PARTNERS

- California Clean Energy Fund
- California Department of Transportation
- California Energy Commission
- Opportunity to Advance Sustainability Innovation and Social Inclusion
- Solar Valley Consortium Members:
 - EDF Renewables
 - GRID Alternatives
 - Intersect Power
 - Riverside County
 - Riverside Public Utilities
 - San Bernardino County
 - Southern California Edison
 - Sunrun
 - Western Riverside Council of Governments

ENGAGEMENT & PARTNERSHIPS

CE-CERT remains committed to fostering engagement and partnerships as key components of its mission. In 2024, the center broadened its impact through conferences, educational programs, professional development initiatives, and community outreach, sharing its work with the broader community.

AIR QUALITY & CLIMATE TRAINING PROGRAM (ACT)

Supported by an endowment from the South Coast Air Quality Management District, CE-CERT launched the Air Quality & Climate Research Training Program (ACT) to address workforce development needs in air quality and climate science. The program will offer courses taught by CE-CERT researchers on emissions, renewable energy, sustainable transportation, and atmospheric chemistry.

The program will offer introductory to advanced courses aimed at a range of audiences, from the general public to technical professionals. Providing advanced training to students and professionals will complement the traditional curriculum offered by UCR and other institutions, help educate community members, and prepare a skilled workforce.

SPEAKS NSF GRADUATE STUDENT RESEARCH TRAINEESHIP

The **Science to Policy Education: Activating Knowledge for Sustainable Transportation (SPEAKS)** program, supported by a five-year NSF grant and led by Dr. Matthew Barth, is shaping future leaders at the intersection of science, technology, and policy for sustainable transportation. In 2024, the program welcomed its second cohort of doctoral students while celebrating the graduation of Dr. Osten Anderson and Dr. Jacqueline Garrido, now advancing sustainable transportation policy and research.

SPEAKS provides comprehensive training through workshops, symposia, and partnerships with UCR Science-to-Policy and the National Science Policy Network, addressing challenges in decarbonizing transportation and promoting equitable solutions. This year's cohort continues to drive the program's mission of bridging research and actionable policy.

The 2024 SPEAKS cohort gathers for the Fall Kick-Off Orientation. ©



FACILITY TOURS AND OUTREACH

CE-CERT hosted several facility tours this year, welcoming policymakers, industry representatives, community members, and students. Notable visits included Congressman Mark Takano, representatives from the South Coast AQMD, and international partners such as Alianza MX and Tec De Monterrey.

Congressman Mark Takano visits CE-CERT to congratulate Prof. Cai and his team on winning a US DOE grant to develop new low-carbon pulping technologies. (From left: Charles Cai, Mark Takano, Brent Scheidemantle, and Chad Larson) ©



Through programs like **STEP Summer Labs** and **STEPCon 2024**, CE-CERT engaged over 100 high school students in hands-on learning experiences. These events provided tours of CE-CERT's laboratories and introduced students to cutting-edge research in air quality, renewable energy, and sustainable transportation. These events, supported by sponsors like NCST, CARTEEH, and SCE, inspire the next generation of scientists and engineers to tackle environmental challenges.



Dr. Charles Cai discusses his research with students during STEP Summer Labs.



Students learn about the Heavy-Duty Engine Dynamometer during STEPCon.



Students gather for an introduction by Bronwen Begakis from Southern California Edison (SCE).

DONOR APPRECIATION DINNER

On October 11th, CE-CERT hosted a Donor Appreciation Dinner, held at the Canyon Crest Country Club. The evening provided an opportunity for scholarship awardees to connect with the donors who have helped support their academic journeys. Dean Christopher Lynch and Director Don Collins delivered speeches, thanking donors for their generosity and highlighting the critical role their support plays in enabling CE-CERT's impactful research and achievements.

From left to right: Arun Raju, Jim Guthrie, Warren Norbeck, Jason Norbeck, Christopher Lynch, Don Collins, and Matt Barth at CE-CERT's Donor Appreciation Dinner. ©



STUDENTS & SCHOLARSHIPS

55

GRADUATE

32

UNDERGRADUATE

In 2024, CE-CERT supported 55 graduate and 32 undergraduate students from diverse academic and cultural backgrounds. Through cutting-edge, hands-on research, expert mentorship, and collaborative opportunities, CE-CERT fosters innovation and interdisciplinary problem-solving. Students are encouraged to address complex environmental challenges, and help contribute to the development of effective and sustainable solutions.

NATIONAL CENTER FOR SUSTAINABLE TRANSPORTATION (NCST)

As a partner of the U.S. Department of Transportation's **National Center for Sustainable Transportation (NCST)**, CE-CERT continues to advance transformative research in sustainable transportation. In 2024, NCST provided two prestigious awards to support outstanding graduate research:

◎ GRADUATE DISSERTATION AWARD

Presented to Haishan Liu and Xuanpeng Zhao for research in sustainable transportation.

◎ GRADUATE FELLOWSHIP AWARD

Awarded to Elizabeth DeFrance and Mike Stas for their contributions to sustainability in transportation.

CE-CERT 2023-2024 SCHOLARSHIP RECIPIENTS

CE-CERT is proud to announce the recipients of the 2024-2025 Scholarship Awards totaling \$52,500. We would like to congratulate them on their hard work and thank our generous donors who made these awards possible.



Learn more about the students
at <https://www.cert.ucr.edu/2024scholarships>.

ESTHER F. HAYS GRADUATE FELLOWSHIP



CHUHENG WEI
Electrical and Electronics Engineering



EMMANUEL HIDALGO GONZALEZ
Electrical Engineering



DONGBO PENG
Electrical Engineering



TROY HURREN
Chemical and Environmental Engineering



HUAWEI LI
Chemical and Environmental Engineering



SUNANDAN MAHANT
Chemical and Environmental Engineering

JIM GUTHRIE RESEARCH AWARD



HUNG NGHI NGUYEN
Electrical Engineering



RAHUL SHAH
Mechanical Engineering



ISEAN BHANOT
Computer Engineering



JOSEPH SALDIVAR
Electrical Engineering



ARTHUR LO
Mechanical Engineering



RUSSEL KONDOKER
Computer Engineering

**COLIN F. HACKETT
GRADUATE AWARD**



HAISHAN LIU
Electrical Engineering

**ATMOSPHERIC PROCESSES
LABORATORY (APL) AWARD**



XUANLIN DU
Chemical and Environmental Engineering

**MILLER DURBIN GRADUATE
RESEARCH AWARD**



ELIZABETH DEFANCE
Chemical and Environmental Engineering

SALIM KHAN GRADUATE AWARD



YING ZHOU
Chemical and Environmental Engineering

TRANSPORTATION SYSTEMS RESEARCH (TSR) GRADUATE STUDENT AWARD



ABHINAV VYAS
Electrical Engineering



XUANPENG ZHAO
Electrical Engineering

PIERSON/FORD GRADUATE AWARD



MINGHAO HAN
Chemical and Environmental Engineering



EVAN HOFFMAN JASTERMSKY
Chemical and Environmental Engineering

ACTIVE PROJECTS LIST

88 ACTIVE PROJECTS TOTALING OVER \$38 MILLION

CE-CERT continues to expand our active research portfolio, focusing on a number of research thrust areas and a diverse mix of sponsors.

AIR QUALITY

CDS&E: Harnessing Graphical Processing Units (GPUs) to Accelerate the Computational Efficiency of Air Quality Modeling Systems for Four-Dimensional AI | National Science Foundation | Cesunica Ivey

Modeling Plastic GHG Emissions Field Measurement Along Caltrans ROW | Caltrans California Department of Transportation | David Cocker

Scalable Catalytic and Assisting Technologies for Efficient Hydrofluorocarbon Destruction | Environmental Protection Agency | David Cocker

Testing Potential VOC, iVOC, and SOA Emissions from Asphalt Paving | Asphalt Institute Foundation, Inc. | David Cocker

Empowering Community-based Air Quality Monitoring through the South Coast AQMD Sensor Library Program | South Coast Air Quality Management District | Don Collins

Statewide Mobile Monitoring Initiative | Aclima, Inc. | Don Collins

TRACER-MAP: Mapping Aerosol Processes across Houston during convective cell events | Baylor University | Don Collins

Ultrafine aerosol particle formation and impacts in Houston during TRACER | UC Irvine | Don Collins

Understanding the Sources and Formation Regimes of Present-day PM_{2.5} to Mitigate Particulate Pollution in California | Air Resources Board | Don Collins

Understanding the impact of pollution aerosol from Los Angeles/Long Beach on clouds and radiation in and upwind of the EPCAPE study domain | Department of Energy Office of Science/Biological And Environmental Re | Don Collins

Application of Aerial Platform Technologies to CARB Landfill Inspection and Analytical Procedures | Air Resources Board | Francesca Hopkins

Assessment of greenhouse gas and air quality benefits of dairy digester installation in California | California Energy Commission | Francesca Hopkins

Collaborative Research: BEAR-oNS: Biogenic Emissions and Aerosol Response on the North Slope | National Science Foundation | Kelley Barsanti

ITEST: Strategies: Riverside Air Monitoring Project (RAMP) | Riverside Unified School District | Kelley Barsanti

Scalable Chemical Mechanisms of Emerging Sources for Community Air Quality Predictions | Environmental Protection Agency | Kelley Barsanti

CIF: An Ice Nucleation Cold-Stage for Research and Teaching | National Science Foundation | Markus Petters

Collaborative Research: Aerosol Properties and Autoconversion during Cold-Air Outbreak Experiment in the Sub-Arctic Region (CAESAR) | National Science Foundation | Markus Petters

Collaborative Research: Coastal Cloud Chemistry during the Eastern Pacific Cloud Aerosol Precipitation Experiment (EPCAPE-CCC) | National Science Foundation | Markus Petters

Laboratory Studies Investigating the Influence of Particle Diameter on Viscosity | National Science Foundation | Markus Petters

A Network of Optical Particle Spectrometers for Distributed Longterm Aerosol Size Distribution Measurements | Argonne National Labs | Sarah Petters

Development and Evaluation of Databases and Estimation Methods for Predicting Air Quality Impacts of Emitted Organic Compounds | Coordinating Research Council | William Carter

EMISSIONS AND FUELS

Characterization of Tire-Wear Gaseous Emissions From On-Road Vehicles | Air Resources Board | Georgios Karavalakis

Characterization of Tire-Wear and Brake-Wear PM Emissions Under On-Road Driving Conditions | Eastern Research Group, Inc. | Georgios Karavalakis

Characterization of Train Brake-Wear and Wheel/Rail-Wear PM Emissions | Air Resources Board | Georgios Karavalakis

Electric Truck Research and Utilization Center (eTRUC) |
Electric Power Research Institute | Georgios Karavalakis

Evaluation of Hydrogen-Natural Gas on Engine Performance and Durability | South Coast Air Quality Management District | Georgios Karavalakis

Evaluation of Hydrogen-Natural Gas on Engine Performance and Durability | Pacific Gas and Electric Company | Georgios Karavalakis

H2NG-RICE0 - Hydrogen Natural Gas Reciprocating Internal Combustion Engine Generator with near Zero emissions | Enchanted Rock, LLC | Georgios Karavalakis

In-Use Gas Can Testing | Air Resources Board | Georgios Karavalakis

SYMBIO One – California Hydrogen Fuel Cell Manufacturing Facility | Symbio One, LLC | Georgios Karavalakis

Collaborative Research: Plasma-Enhanced Electrostatic Precipitation of Diesel Particulates using High Voltage Nanosecond Pulses | National Science Foundation | Heejung Jung

Characterizing Unfiltered Exhaust Leaks During Heavy-Duty Vehicle Operations and their Impacts on Disadvantaged Communities | Air Resources Board | Kent Johnson

Demonstration of Sensor Technologies for On-Road and Off-Road Heavy-Duty Diesel Vehicles | Air Resources Board | Kent Johnson

Emission Testing and Test Method Development for Commercial Harbor Craft and Ocean-Going Vessels | Air Resources Board Kent Johnson

Medium and Heavy-Duty EV Deployment - Data Collection | Calstart | Kent Johnson

CARB Emissions Compliance Testing | Air Resources Board | Tom Durbin

Collection and Analysis of Agriculture Equipment Activity Data | Air Resources Board | Tom Durbin

Data Collection and Analysis under the California Air Resources Board (CARB) Zero-and-Near-Zero Emissions Freight Facility Grant | Tetra Tech, Inc. | Tom Durbin

Electrification Needs for Agriculture Sector in California | California Energy Commission | Tom Durbin

Emissions Testing on Caltrans F59PHI Locomotives | Capitol Corridor Joint Powers Authority | Tom Durbin

Environmental, Analytical, Research, Technical, and Hybrid (EARTH) Support Services | Eastern Research Group, Inc. | Tom Durbin

Heavy-Duty Inspection and Maintenance Referee Program | Air Resources Board | Tom Durbin

Renewable Diesel Agricultural Engine Testing | Air Resources Board | Tom Durbin

Smog Check Performance Report | Caltrans California Department Of Transportation | Tom Durbin

Zero Emission Yard Tractor Activity and Emissions Data Collection and Analysis | Tetra Tech, Inc. | Tom Durbin

RENEWABLE ENERGY

Building Resiliency with Adaptive Vehicle-to-grid Integration | Nuvve Corporation | Alfredo Martinez-Morales

Critical Resilience for Fire and Emergency Facilities with the Soboba Band of Luiseno Indians | Grid Alternatives | Alfredo Martinez-Morales

Shifting Gears to Sustainability: A Deep-Dive into Solar-Powered Bike Pathways | Caltrans California Department of Transportation | Alfredo Martinez-Morales

Eastside Climate Collaborative Transformative Climate Communities Initiative | City of Riverside | Arun Raju

Hydrogen Blending Compendium Report | Southern California Gas Company | Arun Raju

Regional Medium- and Heavy-Duty Zero Emission Vehicle Infrastructure Analysis | South Coast Air Quality Management District | Arun Raju

Southern California Energy Innovation Network (SCEIN) 2.0 | Cleantech San Diego Association | Arun Raju

Advancing the National Bioeconomy through Regional Sun Grant Centers | University of Tennessee | Charles Cai

An Experimental and Computational Approach to Investigating CO2 Uptake of Cellulose-producing Algae from Cellulosic Ethanol Production | Department of Energy Office of Fossil Energy | Charles Cai

Densified Anisotropic Nano Lignocellulosic Fibers | University of Tennessee | Charles Cai

Lignin-derived Carbon Storing Foams for High-Performance Insulation | University of Tennessee | Charles Cai

Scale-up Demonstration of Hybrid Catalytic Biorefining of Biomass to Sustainable Aviation and Marine Fuels | Department of Energy Office of Energy Efficiency & Renewable Energy | Charles Cai

Clean Energy & Grid Resiliency | Kern County Community | College District | Sadrul Ula

TRANSPORTATION

Field Study of Battery-Electric Sweepers | Caltrans
California Department of Transportation | George Scora

Analysis, Modeling and Simulation (AMS) Framework for Automated Trucks | Leidos, Inc. | Guoyuan Wu

Leveraging Advanced Detection and Adaptive Signal Priority to Improve Freight Movement Efficiency along SR 29 – SR 53 Corridor | Caltrans California Department of Transportation | Guoyuan Wu

Personalized Co-Pilot Framework Enabled by Parallel Intelligence | Toyota Motor North America, Inc. | Guoyuan Wu

Safety Assurance System for Vulnerable Road Users at Signalized INTERsections (SAINT) | Federal Highway Administration | Guoyuan Wu

UCR EcoCAR EV Challenge MSI support | Argonne National Labs | Guoyuan Wu

UCR EcoCAR EV Challenge Team | Argonne National Labs | Guoyuan Wu

Vulnerable Road User: Accurate and Reliable Detection using Roadside-Assisted Cooperative Driving | Caltrans Division of Research, Innovation And System Information | Guoyuan Wu

Assessment of Electric Vehicle Technologies Associated with Improving Energy Efficiency or Reducing Brake and Tirewear Emissions | Air Resources Board | Kanok Boriboonsomsin

Center for Advancing Research in Transportation Emissions, Energy and Health (CARTEEH) | Texas A&M University - College Station | Kanok Boriboonsomsin

City of Rialto: Smart Cities Plan to Mitigate Impacts of Warehousing and Logistics | Southern California Association of Governments | Kanok Boriboonsomsin

Decentralized and Cooperative Traffic Signal Network for Freight Energy Efficiency, Safety, Sustainability, and Public Health | Xtelligent, Inc. | Kanok Boriboonsomsin

Durability and Performance of Zero-Emission and Near-Zero-Emission Off-Road Equipment | Air Resources Board | Kanok Boriboonsomsin

First to Last Mile: Creating an Integrated Goods Movement Charging Network around the I-710 Corridor | Los Angeles Cleantech Incubator | Kanok Boriboonsomsin

OMEGA: Objective Measurement/Monitoring/Mitigation of Emissions from Goods Movement and Impacts on Air Quality | South Coast Air Quality Management District | Kanok Boriboonsomsin

Technical Support on Techno-Economic Analysis for Non-Road Decarbonization Roadmap Analysis | UC Lawrence Berkeley Laboratory | Kanok Boriboonsomsin

CAREER: Morphological Computation for Resilient Dynamic Locomotion of Compliant Legged Robots | National Science Foundation | Konstantinos Karydis

Collaborative Research: NRI: INT: Mobile Robotic Lab for In-Situ Sampling and Measurement | National Institute For Food And Agriculture | Konstantinos Karydis

California Grid Readiness Public Awareness Report | South Coast Air Quality Management District | Matthew Barth

Center for Assured and Resilient Navigation in Advanced TransportatION Systems: CARNATIONS | Illinois Institute of Technology | Matthew Barth

CoNTrO-CV: Coordinated Network Traffic Optimization with Connected Vehicles (CVs) | Toyota Motor North America, Inc. | Matthew Barth

NRT-FW-HTF: Science to Policy Education: Activating Knowledge for Sustainable Transportation (SPEAKS) | National Science Foundation | Matthew Barth

National Center for Sustainable Transportation | UC Davis | Matthew Barth

National Center for Sustainable Transportation | UC Davis | Matthew Barth

Promoting Internet of Mobility with Emerging Technologies | Toyota Motor North America, Inc. | Matthew Barth

Technical Assistance for Advanced, Low-and-Zero-Emissions Mobile & Stationary Source Tech | South Coast Air Quality Management District | Matthew Barth

Data Collection and Analysis in Riverside Clean Car Share | City of Riverside | Peng Hao

Health-Based Truck Route Assessment for the Cities of Riverside/Moreno Valley | Riverside County Transportation Commission | Peng Hao

Truck Parking Detection Technology Evaluation for I-10 TPAS in California | Caltrans California Department of Transportation | Peng Hao

Vehicle-Probe-Based Signal Management Technology Evaluation - Phase 1: Simulation Analysis | Sumitomo Electric Industries, Ltd. | Peng Hao



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