



Energy
Transition Institute
UH ENERGY

Shell
FOUNDING
PARTNER

ANNUAL REPORT

OCTOBER 2025





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LETTER FROM THE EXECUTIVE DIRECTOR



Joseph B. Powell, Ph.D.

*ASPIRE INITIATIVE ENDOWED EXECUTIVE DIRECTOR, SHELL ENDOWED CHAIR FOR ENERGY TRANSITION
PROFESSOR, WILLIAM A. BROOKSHIRE DEPARTMENT OF CHEMICAL AND BIOMOLECULAR ENGINEERING*

◆
Welcome to the 2025 edition of the University of Houston Energy Transition Institute (ETI) Annual Report.

Our mission remains steadfast: to bring together industries, communities, and governments to meet global energy demands through innovative, sustainable, and resilient solutions. In just a few years, ETI has grown into a vibrant hub for collaboration, discovery, and education—driving critical advancements that are shaping the energy future.

Our strategic emphasis on critical topics on reliable, affordable, and resilient energy continues to position ETI—and Houston—as a global leader in the energy transition. From supporting groundbreaking student and faculty research to building new partnerships with industry and government, we are enabling progress that scales from lab to real-world impact.

Thank you for being part of this journey. Let's continue to accelerate solutions that deliver secure, affordable, and sustainable energy for all.

Regards,

A handwritten signature in black ink that reads "Joseph B. Powell". The signature is written in a cursive, flowing style.

An aerial photograph of a city skyline at dusk or night. The sky is dark, and the city lights are visible. Several tall buildings are prominent, some with construction cranes on top. The foreground shows lower-rise buildings and streets.

WELCOME NOTE FROM THE COO



Debalina Sengupta, Ph.D.

*ASSISTANT VICE PRESIDENT, DIVISION OF ENERGY AND INNOVATION
CHIEF OPERATING OFFICER, ENERGY TRANSITION INSTITUTE*

◆.....

The year 2024-25 saw significant changes to the mission of energy transition worldwide, and our work at the University of Houston was never more meaningful than now! From the programmatic aspect, we strengthened our pillars of impact with research, converting our seed grants to externally funded projects, and developed comprehensive workforce development and outreach activities that created an impact for the energy transition ecosystem in the country. Generous gifts from Shell and the Cullen Foundation were augmented with funding from other organizations, solidifying the mission and vision of the Institute with economic commitments. The ETI-led webinar series showcases the in-depth faculty research at the university, and the Driving the Energy Transition (Radio Series) reaches the general public in one-minute episodes with information on the various pieces in the puzzle for our energy mix today. Our programs for student support really benefit students at all levels, in the areas of student research support (Energy Scholars, Energy Fellows), student engagement (through the Energy Coalition year-wide events), energy career fairs, and the newly launched student hackathon inaugurally sponsored by the Glenn Bailey Foundation. Grants from bp and the Honda Foundation have continued, showing the impact and trust of our community partners in executing the mission of energy transition in our university ecosystem!

We wish to continue our growth over the next year with the launch of a brand-new advanced recycling facility, supported by a consortium on Texas Chemical Circularity that addresses one of our pillars. The consortium was launched after a successful symposium held in April 2025, and continues to recruit industry, academic, and local area governance partners. Stay tuned for the integration of our existing facilities and the test bed for integrated learning, technology development, commercialization, and student learning opportunities. For now, subscribe to our updates on our social media pages to keep up to date and join us on campus for events, networking, and thought leadership!

Regards,

Debalina Sengupta

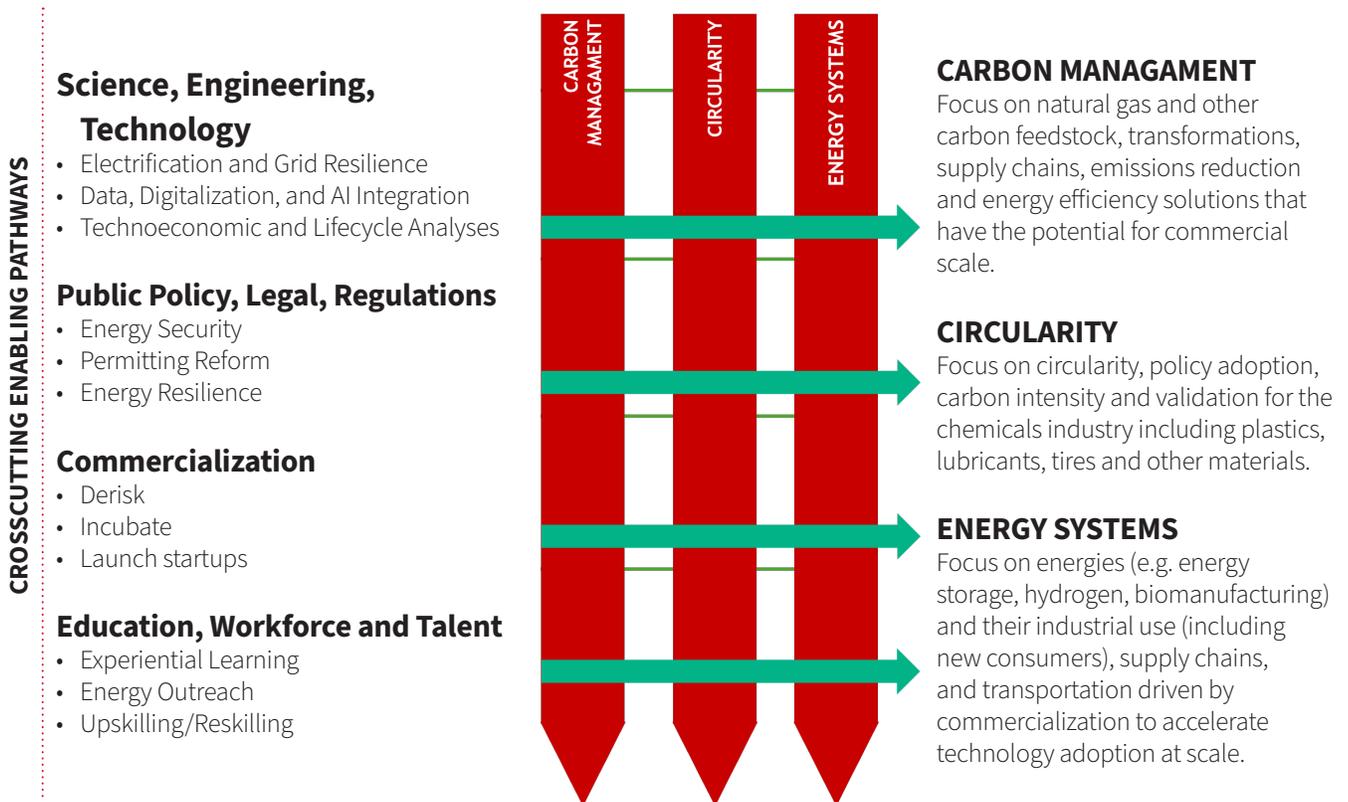
Vision

To become the world's foremost academic leader in driving the energy transition, pioneering transformative solutions that reshape the future of sustainable energy.

Mission

The University of Houston Energy Transition Institute is shaping the future of energy by empowering the next generation of leaders. We drive innovation in hydrogen, carbon management, and circular chemicals, delivering scalable solutions to meet the demand for secure, reliable, affordable, and sustainable energy.

Detailing the Energy Transition Institute



Advisory Board Members

The Energy Transition Institute is guided by a distinguished Advisory Board of industry leaders, innovators, and policy experts who provide strategic insight and direction. Their diverse expertise ensures that ETI's work remains relevant, impactful, and aligned with the evolving energy landscape.

CONTINUING BOARD MEMBERS



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Senior Director, Energy Policy
Oxy



WEI CAI, PH.D.
Chief Technology Officer
Technip Energies



HANNEKE FABER (M.B.A. '92)
Chief Executive Officer
Logitech



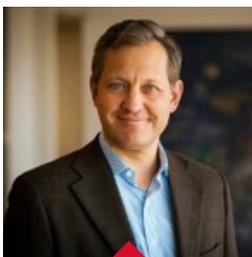
ANDREY SHULALOV
Vice President of Energy Transition
Shell USA



MARVIN E. ODUM
President, Shell Oil Company (Retired)
Director
Cullen Foundation Board of Directors



DARRYL WILLIS
Corporate Vice President
Energy & Resources Industry
Microsoft



SCOTT NYQUIST
Chair, Senior Advisor
McKinsey & Company



PETER F. GREEN, PH.D.
Deputy Laboratory Director
for Science and Technology
Chief Research Officer
National Renewable Energy Laboratory



SELDA GUNSEL
President, Shell Global Solutions
Shell

NEW FACULTY APPOINTMENTS



SRI BALA GORUGANTU – Presidential Frontier Faculty
Cullen College of Engineering, Pyrolysis and Plastics Circularity

Dr. Sri Bala Gorugantu is an Assistant Professor and Presidential Frontier Faculty Fellow in the William A. Brookshire Department of Chemical and Biomolecular Engineering at the University of Houston. She holds a Ph.D. from Ghent University, Belgium, and has prior degrees from IIT Madras and B.M.S. College of Engineering in India. Her research centers on reaction engineering, kinetic modeling, plastics recycling, biomass conversion, and pyrolysis. Before joining UH, she was a postdoctoral researcher at Northwestern University and collaborated with institutions like Politecnico di Milano and Karlsruhe Institute of Technology. Her work bridges theoretical modeling with practical applications in sustainable chemical processes.



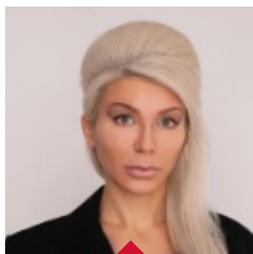
XIN JIANG – Presidential Frontier Faculty
Cullen College of Engineering, Operations Research

Dr. Xin Jiang is an Assistant Professor in the Department of Industrial and Systems Engineering at the University of Houston. He earned his Ph.D. in Electrical and Computer Engineering from UCLA, advised by Lieven Vandenberghe, and previously held postdoctoral positions at Cornell and Lehigh University. His research lies at the intersection of optimization, data science, and machine learning, with a particular focus on graphical data. Dr. Jiang is known for developing theoretically grounded yet practical algorithms for large-scale problems, emphasizing simplicity and elegance in design. His work spans convex and nonconvex optimization, distributed systems, and scientific machine learning, and he actively mentors graduate students and postdocs interested in these areas.



JOHANNES KLAUSMANN – Presidential Frontier Faculty
Bauer College of Business, Climate Finance, Socially Responsible Investing (SRI)

Dr. Johannes Klausmann is an Assistant Professor of Finance at the University of Houston's C.T. Bauer College of Business. His research focuses on Sustainable Finance, Socially Responsible Investing (SRI), Corporate Innovation, and Empirical Asset Pricing. He earned his Ph.D. in Finance from ESSEC Business School in Paris and has held academic positions at the University of Virginia – Darden School of Business and was a visiting scholar at the University of Texas at Austin during the 2021–2022 academic year. His current research includes topics such as carbon markets, green revenues, ESG preferences in trading environments, and the financial implications of biodiversity and climate change. Dr. Klausmann's work blends rigorous empirical methods with pressing environmental and social issues, contributing to the evolving field of sustainable finance.



RITA M. JULIEN – Presidential Frontier Faculty
UH Law Center, Tax Law

Dr. Rita M. Julien is an Assistant Professor at the University of Houston Law Center, specializing in international tax law, tax policy, and the intersection of taxation with sustainability and anti-corruption efforts. Before joining UH, she was a Visiting Assistant Professor of Tax Law at NYU School of Law, where she taught courses on property transactions and tax policy. Her research explores topics such as tax treaties, EU tax law, base erosion and profit shifting (BEPS), and Unexplained Wealth Orders (UWOs)—a legal tool for asset recovery in corruption cases. Dr. Julien holds an LL.M. in Taxation from Georgetown University, an LL.M. in European and International Tax Law from the University of Luxembourg, and a doctoral degree in business law from Vienna University of Economics and Business (WU), where she received the European Doctoral Tax Thesis Award and the Wolfgang Gassner Science Prize.



FACULTY RESEARCH & SEED GRANT PROJECTS

Seed Grant Projects

HYDROGEN

- Advancing Sustainability in Hydrogen Supply Chains (HSC): An AI-Enabled Approach for Digital Transformation in Hydrogen Transportation and Logistics in the State of Texas
- Competition Versus Cooperation: Examining the Dynamics of Green Hydrogen Economy Growth and a Renewable-Dominated Texas Power Grid
- Seawater Electrolysis
- New Liner and Liner Application Technology for Repurposing Existing NG Pipelines for Hydrogen Transport

CIRCULAR PLASTICS

- Systematic Repurposing of Decommissioned Wind Turbine Blades (DWTB) for Civil Infrastructure

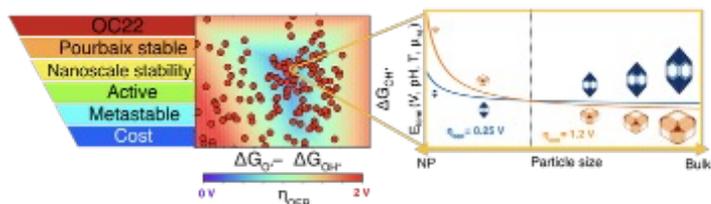
CARBON MANAGEMENT

- Towards Development of Electrochemical Systems for Carbon Capture (CCME)
- Processing of Algae to Biodiesel and Organic Acid Using Re-Usable Whole Cell Immobilized Catalyst to Enable Microalgae-Based Carbon Capture (CCME)
- Real Time Subsurface Wireless Communication and Sensing System for CO₂ Storage (CCME)

Research Project Updates and Highlights

FLEXIBLE SCREENING FRAMEWORK FOR CATALYSTS (LARS GRABOW, CULLEN COLLEGE OF ENGINEERING)

UH ETI supported a flexible screening framework to identify oxide catalysts for oxygen evolution reaction. Using Open Catalyst 2022 dataset (OC22 data, a large-scale collection of quantum mechanical simulation results for use in training machine learning [ML] models for catalysis and graph neural networks, the study showed nanoscale stabilization expanded the pool to 190 viable candidates, broadening the materials scope for sustainable hydrogen production via electrocatalysis. This work has been published in *Nanoscale* (doi.org/10.1039/D4NR01390E).



HEURISTIC OPTIMIZATION OF ENERGY STORAGE FOR ON-GRID PROSUMERS: NET BILLING VS. NET METERING (MENG LI, BAUER COLLEGE OF BUSINESS)

This research develops a mathematical framework to determine optimal energy storage sizing for prosumers—those who both consume and generate electricity—under different U.S. state-level crediting policies: net metering and net billing. It uses a multi-period stochastic model to simulate variable distributed energy resource (DER) output, demand, and pricing, and introduces a heuristic optimization model to simplify analysis and derive closed-form solutions for optimal storage capacity. The study compares how each policy affects storage investment decisions, considering factors like: surplus energy pricing (retail vs. wholesale), storage costs and efficiencies, local demand and DER generation patterns. Ultimately, it provides policy and investment guidance to help harmonize pricing schemes with storage adoption, promoting more effective integration of renewable energy.

COMPETITION VERSUS COOPERATION: EXAMINING THE DYNAMICS OF GREEN HYDROGEN ECONOMY GROWTH AND A RENEWABLE-DOMINATED TEXAS POWER GRID (DR. LEI FAN, DR. JIAN SHI, CULLEN COLLEGE OF ENGINEERING)

The team has published three peer-reviewed papers on quantum optimization for hydrogen and power systems. Results were presented at two international conferences and in a seminar at Argonne National Laboratory. A student supported by this project has joined Pacific Northwest National Laboratory as a postdoctoral researcher, strengthening collaboration with PNNL.

Externally Funded Research Projects

UNIVERSITY OF HOUSTON PARTNERS IN CB&I-SHELL LIQUID HYDROGEN STORAGE COLLABORATION

CB&I, Shell, GenH2, and the University of Houston have partnered to develop and demonstrate a first-of-its-kind, commercial-scale liquid hydrogen (LH₂) storage tank at NASA's Marshall Space Flight Center. This initiative, supported by the U.S. Department of Energy, aims to enable cost-effective, large-scale hydrogen storage for international trade applications.

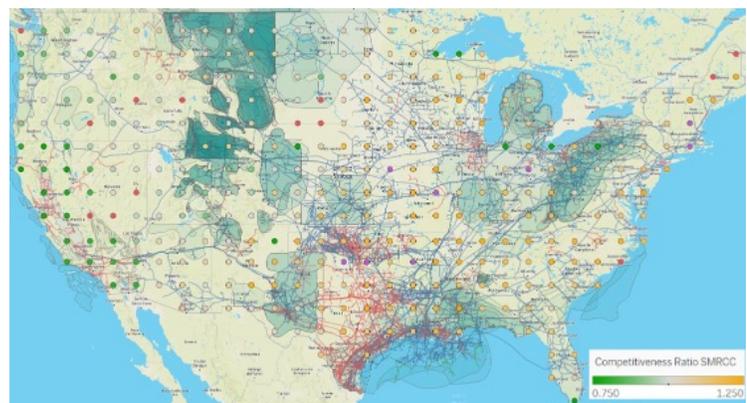
The University of Houston played a pivotal role in this collaboration, contributing academic expertise and innovation to the design and testing of a novel non-vacuum insulated tank—a significant advancement over traditional vacuum-insulated systems. Dr. Ramanan Krishnamoorti, UH's Vice President of Energy and Innovation, emphasized the importance of this partnership as a model for how academia, government, and industry can work together to unlock scalable energy solutions.

UH's involvement helped validate the tank's design and insulation technologies under cryogenic conditions, supporting the broader goal of accelerating the commercialization of liquid hydrogen infrastructure. The project also enhances UH's reputation as a Tier One research university committed to advancing the energy transition through strategic industry partnerships.



HOUSTON HYDROGEN TRANSPORTATION PILOT – PI CHRISTINE EHLIG-ECONOMIDES

The DOE funded Houston Hydrogen Transportation Pilot (HHTP) project is extending the work published in a UH Energy White paper in 2024 to evaluate how well hydrogen fueled vehicles can compete with battery electric and liquid (gasoline and diesel) fueled vehicles in the Greater Houston area. This project has more than 100 stakeholders and has identified potential pilot projects. Publications related to these projects include:



Liu, P., & Ehlig-Economides, C. (2025). United States Hydrogen Transportation Fuel Supply. SPE Western Regional Meeting Proceedings.

Ehlig-Economides, C. A., & Barros-Galvis, N. E. (2025). Role of NonDarcy Flow in Maintaining Uniform Flow among Parallel Propped Hydraulic Fractures in an Engineered Heat Exchanger. GRC Transactions, 49.

The GIS image on the previous page shows green dots where low carbon intensity hydrogen cost could be competitive with gasoline or diesel for light duty vehicles. The cost estimate does not rely on tax credit incentives.

ZOOS EDUCATING ON ELECTRONICS AND BATTERY RECYCLING AWARENESS(ZEEBRA) - PI JIAN SHI

ZEEBRA PROJECT HIGHLIGHTS			
<p>TIMELINE</p> <ul style="list-style-type: none"> Start date: August 15, 2024 End date: December 31, 2027 Percent complete: 25% 	<p>BARRIERS ADDRESSED</p> <ul style="list-style-type: none"> Lack of public awareness on electronic and battery recycling Shortage of metals and critical minerals vital to electronics and batteries 	<p>BUDGET</p> <ul style="list-style-type: none"> Total project funding: \$4,860,332 U.S. DOE share: \$4,860,332 Funding for FY2025: \$1,844,427 Funding for FY2026: \$1,598,813 	<p>PARTNERS</p> <ul style="list-style-type: none"> Prime: <ul style="list-style-type: none"> Harris County, Texas Subrecipients: <ul style="list-style-type: none"> Houston Zoo University of Houston Elevate Communications

ZEEBRA (Zoos Educating on Electronics and Battery Recycling Awareness) is a U.S. Department of Energy-funded initiative led by Harris County, in partnership with the Houston Zoo, the University of Houston, and Elevate Communications. Its mission is to boost public participation in battery and electronics recycling by linking these actions to wildlife conservation. Through interactive exhibits at the Houston Zoo, mobile education pods, culturally relevant outreach materials, and targeted community engagement, ZEEBRA seeks to raise awareness, encourage responsible recycling behaviors, and recover critical materials that reduce the need for virgin mining. The project also integrates scientific modeling to quantify the environmental and biodiversity benefits of recycling, translating metal recovery into tangible conservation gains.

"SECOND WIND" - USING DECOMMISSIONED WIND TURBINE BLADES TO SUPPORT INFRASTRUCTURE FOR COASTAL RESILIENCE - PI GANGBING SONG, LARRY MO, DEBALINA SENGUPTA

ETI's innovative seed grant on Wind Turbine Blades Repurposing Project has earned a prestigious shortlisting (only 10 projects were selected out of more than 200 submissions from the Gulf States) in the Gulf Futures Challenge Competition from the National Academies of Sciences Gulf Research Program, and received \$300,000, a testament to its transformative impact and forward-thinking approach. Addressing two pressing challenges, coastal vulnerability and wind turbine blade waste, the project reimagines decommissioned blades as durable infrastructure for fishing piers, sea walls, storm barriers, and elevated housing. These high-strength composite materials offer exceptional energy absorption, helping protect communities from flooding, wave damage, and high winds. By diverting blades from landfills and repurposing them for climate-resilient infrastructure, the initiative not only strengthens environmental sustainability but also showcases ETI's leadership in cross-disciplinary innovation. The Gulf Futures Challenge recognition highlights the project's potential to inspire similar solutions worldwide, where renewable energy waste becomes a vital resource for building safer, more resilient communities.

The National Academies of
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ENERGY FACULTY SUCCESSION STORIES





ZHENG FAN RECEIVES PRESTIGIOUS NATIONAL SCIENCE FOUNDATION CAREER AWARD

Associate Professor of Mechanical Engineering Technology Zheng Fan, ETI seed grantee, has been awarded \$549,771 for his CAREER Award proposal, Understanding the Formation of Pore-Free Interlayers through Automated in situ Diagnosis to Tame Lithium Metal. This project will investigate a new composite material, a metal-carbon mixed ionic-electronic conductor (c-MIEC), as a solution for overcoming interface issues common to current iterations of high storage density solid-state lithium metal batteries. Enhancing the performance and scalability of solid-state lithium metal batteries to improve range and performance will be crucial in the broader implementation of next-generation electric vehicles.



HALEH ARDEBILI LEADS "BIOMS" TO SEMIFINALS OF NATIONAL SCIENCE FOUNDATION ENGINES COMPETITION

The University of Houston is one step closer to winning a \$15 million grant from the U.S. National Science Foundation. UH was recently named one of 29 institutions to advance to the semifinal round of the NSF Regional Innovation Engines competition, a contest that encourages coalitions of universities, nonprofits, and other organizations to foster innovative ecosystems across the country. Led by Cullen College of Engineering Professor Haleh Ardebili, UH moved forward in the competition with its “Biomanufacturing of Chemicals and Materials for Sustainability (BioMS)” proposal. The UH team included key members of the ETI and CCME seed grantees, as well as external regional partners like the Greater Houston Partnership, Biowell, and others.

STUDENT INVOLVEMENT



At the Energy Transition Institute, students are at the center of our mission—driving innovation, fostering interdisciplinary collaboration, and leading the next wave of energy solutions.



CHEVRON ENERGY GRADUATE FELLOWS PROGRAM

Eight outstanding graduate students were awarded \$12,000 fellowships to support cutting-edge research across hydrogen, carbon management, circular plastics, and sustainable systems. These fellows represent the next generation of energy innovators contributing to UH's leadership in energy research.



ENERGY COALITION IMPACT

The Energy Coalition, UH's largest student organization focused on the energy sector, continues to thrive with 30+ member organizations and over 5,000 active student members. Through events like Energy Night, Energy 101, and industry panels, the Coalition creates a powerful network for students to explore careers and leadership in the energy space.

New Programs

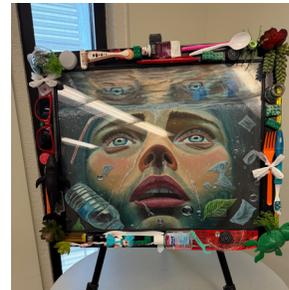


COOGS FOR ENERGY HACKATHON

More than 120 students from across the University of Houston applied to tackle real-world challenges in energy transition at the inaugural COOGS for Energy Hackathon. With support from industry, faculty mentors, and local area partners, students developed solutions in hydrogen deployment, circular economy logistics, carbon tracking, and more.

PLASTICS SYMPOSIUM POSTER & ART COMPETITION

In conjunction with ETI's Plastics Circularity symposium, students presented research posters and submitted creative work in an art competition focused on sustainability and themed on plastics in the environment. The event encouraged a fusion of science, storytelling, and creativity to engage a broad audience in energy and environmental issues.



STUDENT SUCCESS STORIES

Energy Scholars Program

The Energy Scholars Program continues to empower undergraduate students to pursue high-impact, interdisciplinary research in support of the energy transition. In 2025, 15 scholars were selected from across UH and awarded \$6,000 scholarships to conduct faculty-mentored research projects spanning science, engineering, business, and policy.

These scholars exemplify the innovation and cross-disciplinary thinking necessary to address complex global energy challenges.

Notable 2025 Energy Scholars



URVI BHATIA

Conducted simulations on cobalt-based intermetallics to better understand interface behavior and structural properties for next-generation energy materials.



ALFREDO HERNANDEZ

Developed hybrid LLM/LSTM models to improve hurricane impact forecasting, contributing to climate resilience and disaster planning in energy systems.



UMEMA FATIMA SAJJAD

Engineered strains of E. coli for biological conversion of CO₂ into bioplastics, offering a sustainable path forward in carbon capture and circular manufacturing.



AVI SETHI

Investigated lignin-based alternatives to petroleum-derived epoxies, advancing the development of biodegradable, high-performance polymers.

STUDENT SPOTLIGHT

UH Chevron Energy Fellows

FELLOW PRINCE ALETA: ADVANCING CARBON CAPTURE INNOVATION



From Manila to Seoul and now Houston, Prince Aleta's academic journey reflects his dedication to advancing sustainable solutions for climate challenges. After earning his bachelor's in chemical engineering at the University of Santo Tomas and a master's in environmental engineering at Korea University, he is now pursuing a Ph.D. in Environmental Engineering at the University of Houston under Dr. Mim Rahimi, focusing on electrochemical methods to electrify carbon capture. His research explores both capturing CO₂ from power plant emissions and removing it from oceans to combat acidification and restore natural alkalinity. Recognized as a UH-Chevron Energy Graduate Fellow and Vice Chair of the UH Energy Coalition, Prince has also led his team, ECHO Solutions, to national recognition, winning over \$47,000 in competitions for their decarbonization technologies. With mentorship from industry leaders and the support of UH's energy community, he continues to advance electrochemical carbon capture research with the goal of bridging science, industry, and sustainability. "I am hopeful that the progress I'm making in my research will expand our understanding of carbon capture and open the door to new, potentially better ideas," Aleta said.

FELLOW ANSHIKA: INVESTIGATING PHTHALATES FOR PLASTICS CIRCULARITY



Anshika, a Ph.D. student in Atmospheric Sciences at the University of Houston, grew up in Delhi, one of the most polluted cities in the world. That backdrop sparked her early awareness of air pollution, climate change, and the energy transition. After completing her master's in environmental sciences at J.C. Bose University, she turned her focus to the underexplored area of plastic emissions, inspired by the Great Pacific Garbage Patch. Her research investigates phthalates, chemicals in plastics that leach into the environment and hinder recycling efforts, while exploring more sustainable and accessible alternatives. As a 2024–2025 UH Chevron Energy Fellow, Anshika credits the fellowship with providing opportunities that have advanced her research and perspective on sustainability. "My research will further the understanding of how we can actually deal with plastic in a way that is more sustainable, not just environmentally sustainable, but economically sustainable," she said.

WORKFORCE DEVELOPMENT



Energy Transition Institute
UH ENERGY

Sponsored by **NIST**

Plastic Circularity Micro Credential Course for Industry Professionals

BADGE 1: INTRODUCTION TO THE PLASTICS CIRCULAR ECONOMY

LECTURES

- 2 INTRODUCTION TO PLASTIC RECYCLING
- 1 DEFINITION/MODELS CIRC. ECON.
- 1 WASTE CLASSIFICATION, HANDLING
- 4 SUPPLY CHAIN & SAFETY
- 2 ENVIRON. IMPACT, MICROPLASTICS
- 1 PUBLIC POLICY FRAMEWORK
- 2 REGULATORY FRAMEWORK
- 1 COMMUNITY OUTREACH
- 1 INTRO TO LCA/TEA

BADGE 2: POLYMER TAXONOMY & RECOVERED MATERIAL IDENTIFICATION

LECTURES

- 2 POLYMER TAXONOMY/ PRODUCTION
- 1 SEPARATIONS & SORTING
- 3 CHEMICAL SPECTROSCOPY, IMAGING, AI/ML FOR SORTATION
- 3 CHARACTERIZATION OF MARINE & MICROPLASTICS
- 1 CHARACTERIZATION OF PLASTICS IN SOIL
- 2 HANDS ON DEMONSTRATIONS

BADGE 3: MEASUREMENTS & CHARACTERIZATION TOOLS FOR CIRCULAR PLASTICS

LECTURES

- 1 TYPES & USES OF PLASTICS
- 3 POLYMER PROCESSING
- 2 MORPHOLOGY/ STRUCTURE-PROPERTY
- 2 RHEOLOGY & FLOW
- 3 THERMAL & MECHANICAL PROPERTIES & IMPACT ON USE
- 2 FILMS (INCLUDING MULTI-LAYER)
- 1 ADVANCED CHAR. TOOLS
- 2 HANDS-ON DEMONSTRATIONS

BADGE 4: NEW FRONTIER OF POLYMER RECYCLING & REUSE

LECTURES

- 2 ENHANCED MECHANICAL RECYCLING
- 2 CHEMICAL RECYCLING
- 2 PYROLYSIS/GASIFICATION
- 1 PHYSICAL RECYCLING
- 3 UPCYCLING
- 2 COMPOSTABLE PLASTICS
- 3 DESIGN FOR REUSE

BADGE 5: VALUATION, LIFE CYCLE ANALYSIS, & TECHNOECONOMIC ANALYSIS

LECTURES

- 2 SYSTEMS LEVEL ANALYSES
- 4 VALUATION OF WASTE PLASTICS: MICRO & MACRO LEVEL
- 2 BUSINESS MODELS & CASE STUDIES FOR PLASTICS CIRCULARITY
- 1 ENVIRON., SOCIAL, GOVERNANCE
- 2 LIFE CYCLE ANALYSIS
- 2 TECHNOECONOMIC ANALYSIS
- 2 LCA/TEA CASE STUDIES

REGISTER



**CONTACT FOR MORE
INFORMATION:**
UHETI@CENTRAL.UH.EDU

UNIVERSITY OF HOUSTON HOSTS R&D GREET LIFE CYCLE ASSESSMENT WORKSHOP

The University of Houston’s Energy Transition Institute (ETI), in collaboration with Argonne National Laboratory (ANL), successfully hosted the first trainer-led R&D GREET Life Cycle Assessment (LCA) Model Workshop, bringing together more than 50 participants from industry, academia, and the Gulf Coast energy community.

The one-day workshop, held on August 14, 2025, marked the next big step of ANL’s Train the Trainer initiative, designed to expand local expertise in energy systems analysis and carbon management strategies.

Led by Dr. Yisha Xiang, Associate Professor in UH’s Department of Industrial Engineering—who was selected as one of the inaugural trainees for the GREET Train the Trainer program from Argonne National Laboratory—with support from Pradeep Vyawahare of ANL and Dr. Debalina Sengupta (UH ETI), the program provided participants with both foundational knowledge and hands-on training in the use of Argonne’s GREET (Greenhouse gases, Regulated Emissions, and Energy use in Technologies) model. The model is a widely used tool for evaluating the energy and environmental impacts of technologies across the energy landscape.

The agenda included sessions on Fundamentals of Life Cycle Assessment; Fuel Cycle Analysis and Hands-on Training; Applications in Hydrogen, Carbon Capture and Storage (CCS), and Sustainable Aviation Fuels; Real-world applications across oil and gas, electric vehicles, and emerging energy technologies.

With this inaugural trainer-led session, UH and Argonne advanced efforts to strengthen the energy ecosystem in the Southern states and support the transition toward a low-carbon future.



INAUGURAL COOGS FOR ENERGY HACKATHON DESIGNED AND HOSTED BY ETI

The University of Houston’s Energy Transition Institute hosted its inaugural Coogs for Energy Hackathon on February 21–22 at the UH Technology Bridge, bringing together students from multiple disciplines to tackle some of the region’s most pressing energy challenges.

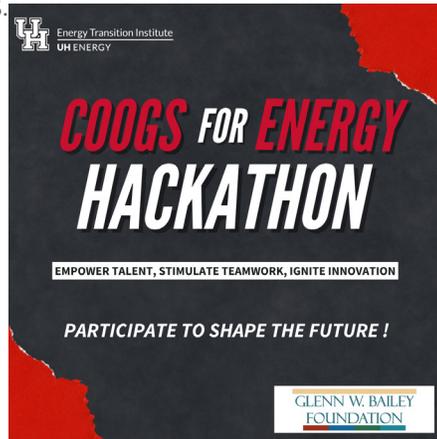
The competition, sponsored by the Glenn Bailey Foundation, featured 10 teams of students from several UH colleges, all working to develop innovative solutions in areas ranging from renewable energy and carbon reduction to electric vehicle (EV) infrastructure and circular economy initiatives.

The teams had 10 days to research their assigned problem statements before the event. During the finals in February they pitched three potential solutions and refined their ideas with guidance from industry mentors. By the second day of the finals, they had developed prototypes—either digital or physical—and presented their final proposals to a panel of judges.

After a full day of collaboration and problem-solving, the top three winning teams were awarded prizes of \$6,000 for first place, \$3,000 for second, and \$1,500 for third. The teams were Ecosix (first), Coog-nitive Sparks (second) and Friends Fueling Friends (third). Additionally, the winners earned an opportunity to present their ideas to industry leaders and stakeholders, further bridging the gap between academia and real-world energy innovation.

The hackathon provided students with hands-on experience in systems thinking, energy transition strategies, and interdisciplinary collaboration. Through mentorship and networking, participants gained insights into the challenges and opportunities shaping the future of energy.

The Energy Transition Institute hopes to build on the success of this year’s event by making the Coogs for Energy Hackathon an annual tradition.



OUTREACH



The Energy Transition Institute is committed to developing a diverse, future-ready workforce equipped with the skills and knowledge to lead in a rapidly evolving energy landscape. Our outreach initiatives target the reskilling, upskilling our current workforce, as well as raising awareness in the common public. Initiatives showcase the University of Houston's expertise and thought leadership in delivering high-value scientific knowledge, convening various international stakeholders for opinions, and provide thought leadership in energy transition.



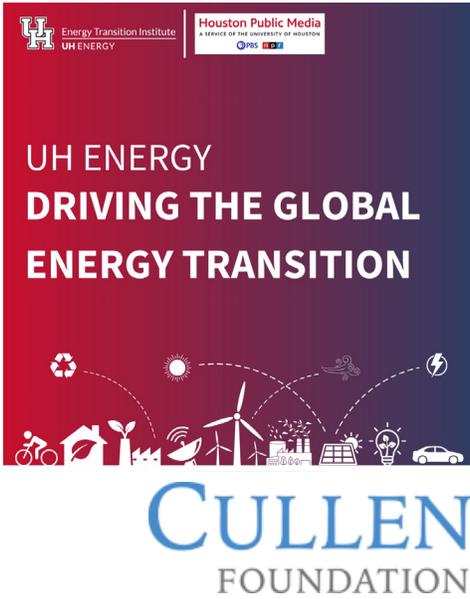
ETI WEBINAR SERIES

The ongoing ETI Webinar Series brings together experts from academia, industry, and government to explore timely topics in hydrogen, carbon management, circular economy, and sustainability. These sessions foster cross-sector dialogue, enhance public understanding, and support continuous learning for students and professionals alike.



PLASTICS CIRCULARITY SYMPOSIUM

The 2025 UH Energy Symposium on Plastics Circularity led by ETI featured thought leaders from academia, government, and global companies. A focus on policy, innovation, and the future of materials provided students and early-career professionals with insight into the roles they can play in driving sustainable solutions for plastics circularity..



HPM: DRIVING THE ENERGY TRANSITION AUDIO SERIES

In partnership with Houston Public Media and supported through funding from the Cullen Foundation, ETI launched the “Driving the Energy Transition” audio series. This accessible and engaging platform highlights various perspectives from across the energy ecosystem targeting the general public including Houston's energy workforce during peak drive time and establishing Houston’s leadership in the global transition. The series has become a valuable tool for community engagement and public education. Through these programs and partnerships, ETI is not only advancing research and innovation but also building the human capital needed to deliver a secure and reliable energy future

Episode	Impressions	Episode	Impressions
1: What is the Energy Transition?	117,800	11: How the Hydrogen Economy Can Make Sense	131,200
2: Energy Choices & Global Warming	111,600	12: Signs of an Energy Transition	131,200
3: An Overview of Energy Transitions	111,600	13: Discussing Energy Resilience	196,800
4: Why Can't We Just Stop Using Fossil Fuels?	110,400	14: Symbiosis: Renewable Energy and Natural Gas	144,000
5: Challenges of Transitioning to Renewable Energy	110,400	15: Carbon Capture and Storage	144,000
6: Powering the World with Renewable Energy	90,400	16: Why Not Deploy More CO2 Capture?	131,400
7: Exploring Biofuels	190,000	17: Can We Use CO2 Versus Capture It?	131,400
8: Exploring Hydrogen	128,000	18: ET Tools – Life Cycle Assessment	*131,400
9: Hydrogen Safety	128,000	19: Techno-Economic Analysis	*131,400
10: Learning About the Impact of Batteries & Electricity	243,600	20: Why Capture CO2 From the Air?	*197,100

Element	Delivery
Episodes 1-10	1,341,800 impressions
Episodes 11-20	1,431,300 impressions
Webpages	1,286 views

Houston Public Media has delivered **2,773,100 total *impressions** for UH Energy

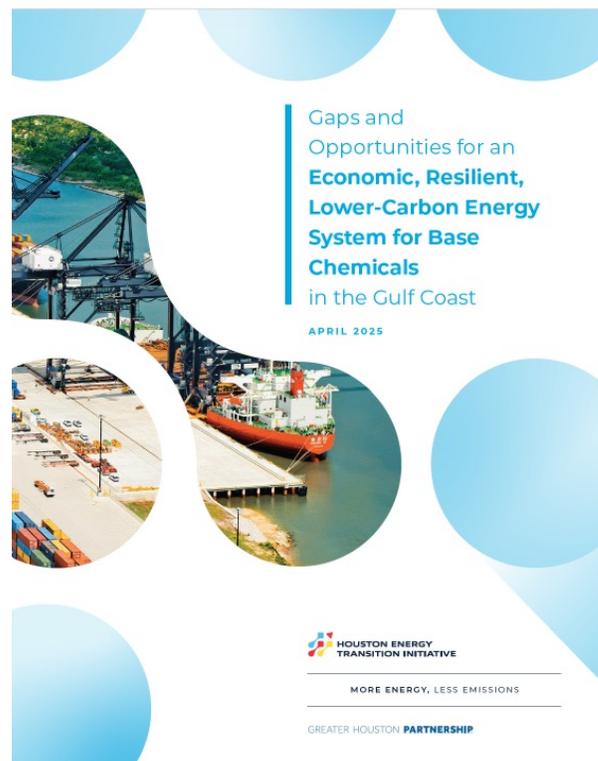
UNIVERSITY OF HOUSTON PARTNERS WITH THE HOUSTON ENERGY TRANSITION INITIATIVE TO PUBLISH WHITE PAPER ON “GAPS AND OPPORTUNITIES FOR AN ECONOMIC, RESILIENT, LOWER-CARBON ENERGY SYSTEM FOR BASE CHEMICALS IN THE GULF COAST”

The University of Houston (UH) played a vital role in shaping the outcomes of the HETI workshop with National Labs held in November 2024 and the resulting white paper. UH served as a co-host alongside other academic institutions and national laboratories, helping convene stakeholders from industry, government, and academia. UH provided leadership and strategic input, and a team of UH students acted as scribes, capturing key findings and recommendations that informed the report. UH also contributed to discussions on resilience modeling, carbon accounting, and technology scale-up, reinforcing its role as a hub for energy innovation and workforce development.

The white paper, published by the Houston Energy Transition Initiative (HETI), outlines a strategic roadmap for transforming the U.S. Gulf Coast’s base chemicals industry into a more resilient, economically viable, and lower-carbon energy system. The Gulf Coast, home to over half of the nation’s base chemical production, faces challenges from aging infrastructure, extreme weather events, and increasing global pressure to decarbonize.

Key recommendations include:

- Developing predictive resilience models through collaboration between national labs, academia, and industry.
- Advancing energy and process integration using electrification, carbon capture, and renewable energy.
- Creating transparent carbon accounting methodologies to support regulatory compliance and consumer awareness.
- Establishing pre-pilot scale assets to accelerate commercialization of emerging technologies like low-carbon hydrogen and modular nuclear reactors.





SPEAKERS AND EVENTS

In 2025, the Energy Transition Institute continued to serve as a convening force—bringing together global experts, researchers, students, and policymakers to accelerate dialogue, share knowledge, and inspire action across the energy transition landscape.

Notable Events and Engagements



UH X UNIVERSITY OF UTAH JOINT CONFERENCE

A collaborative research symposium focused on shared challenges and innovations in energy

ENERGY COALITION ALUMNI NIGHT

Brought together current students and alumni for an evening of networking, mentorship, and insights into diverse career paths within the energy industry.

DEBALINA SENGUPTA AT FEI HOUSTON

ETI's Chief Operating Officer, Debalina Sengupta, delivered a keynote at FEI Houston, highlighting ETI's strategic initiatives in research, energy innovation, policy, and thought leadership.

AICHE TALK BY JOE POWELL

ETI's Executive Director, Joe Powell, delivered a keynote at the American Institute of Chemical Engineers, addressing cutting-edge strategies for decarbonization and innovation in chemical processes.

NATIONAL LABS WORKSHOP

A technical workshop co-hosted with several U.S. National Laboratories focused on advancing federal-industry-academic collaboration for the future of the Gulf Coast Chemical industries

SHELL FUTURE ENERGY LEADERS COMPETITION

Supported by Shell, this innovation challenge highlighted scalable ideas for advancing net-zero goals. Finalists pitched to an audience of executives, engineers, and faculty.

FLANDERS INVESTMENT AND TRADE - USA

FIT USA visited the University of Houston campus and met with the UH ETI and UH Technology Bridge teams. Collaboration discussions were held for electrification, where University of Antwerp is a leader and recently started their electrification institute.

UH Energy @ CERAWeek 2025

UH ENERGY AND INNOVATION LED BY UH ETI PARTICIPATED IN CERAWEEK 2025, PRESENTING INNOVATIONS ENABLING THE FUTURE LANDSCAPE IN ENERGY – PRODUCTS PORTFOLIO.

The University of Houston highlighted a diverse portfolio of advancements spanning the energy transition. In superconductivity, UH continues to lead in high-temperature superconducting materials, energy materials, and nanomaterials, with the Texas Center for Superconductivity (TcSUH) and the Advanced Manufacturing Institute (AMI) pioneering scalable solutions such as REBCO thin-film tapes, wires, and roll-to-roll manufacturing for semiconductors. Carbon management initiatives target carbon capture, utilization, and storage; direct air capture; electrified reactors; bio-inspired robotics; and multi-functional reactors. In materials circularity, researchers are advancing polymer upcycling, recycling, and biopolymer processes, including repurposing decommissioned wind turbine blades into structural components. Work in resilient power and energy systems focuses on delivering reliable, efficient, and sustainable electricity through smart grids, power electronics, AI-driven optimization, and community-based microgrids. Energy storage research spans solid-state, magnesium, sodium, and polymer-based battery technologies for applications ranging from electric vehicles to wearable electronics. Finally, UH’s hydrogen innovations include seawater electrolysis, pipeline liner technology, hydrogen hydrates, and pilot programs for transportation, reinforcing the university’s position as a leader in clean energy solutions. CERAWeek provided UH Energy with a global platform to showcase its multidisciplinary research portfolio, strengthen industry collaborations, and highlight the University of Houston’s leadership in driving the energy transition.



2025 UH Symposium on Plastic Circularity



The UH Symposium on Plastic Circularity 2025 brought together leaders from industry, government, and academia for a full day of collaboration focused on reshaping the future of plastics. Hosted by the UH Energy Transition Institute, the event created a platform where scientists, policymakers, entrepreneurs, and students could explore the latest innovations in sustainable materials, circular design, and regulatory frameworks that guide responsible plastics use.

The day opened with a keynote by Torkel Rhenman of LyondellBasell, who shared strategies for unlocking the circular potential of plastics through integrated technologies and cross-industry partnerships. Later, Senami Akle from Logitech delivered a thought-provoking lunchtime keynote, highlighting how design innovation and recycled materials can drive both environmental and business impact.

Two thematic sessions framed the technical discussions: the first addressed standards, policy, and business models that can enable a more robust circular economy; the second showcased science, technology, and real-world case studies of advanced recycling, upcycling, and material innovation. An expert panel closed the program, offering forward-looking perspectives on how to overcome remaining barriers and accelerate adoption of circularity solutions.

Beyond presentations, the symposium featured an interactive poster competition with over 20 research projects from UH and partner institutions, a technology showcase highlighting practical solutions, and an art exhibition demonstrating how creativity can turn waste into functional, inspiring designs.

By blending technical expertise, creative thinking, and policy insight, the 2025 Plastics Circularity Symposium strengthened UH's role as a convener of ideas and action—advancing tangible solutions for a sustainable, closed-loop plastics economy.



PRESS AND MEDIA HIGHLIGHTS

In 2025, the Energy Transition Institute and its partners were featured prominently across regional and national media, underscoring our growing influence in advancing the conversation on sustainable energy solutions, workforce development, and policy innovation.

Media Coverage Highlights



BRIDGING OFFSHORE ENERGY AND RENEWABLES: HOW UH RESEARCHERS ARE ENGINEERING A RENEWABLE FUTURE

The future of offshore energy is evolving, and researchers at the University of Houston are at the forefront of this transformation. Dr. Harish Krishnamoorthy, an expert in power conversion technologies, is working to integrate renewable energy sources into offshore oil and gas operations. His research, particularly through the MERIT project, aims to reduce carbon emissions, improve efficiency, and make offshore energy production more sustainable.

WHITE PAPER: NET ZERO TEXAS BY 2050

ETI contributed to the widely discussed white paper outlining actionable steps for decarbonizing Texas's energy systems. The report was cited in multiple policy forums and energy trade publications.

BOOK LAUNCH: INSIGHTS INTO THE NEW HYDROGEN ECONOMY

Co-authored by ETI Executive Director Dr. Joe Powell, this publication explores the global shift toward clean hydrogen and Houston's role in shaping its future. The launch received media coverage across academic and industry platforms.

TXU ENERGY LEADERSHIP AWARD 2025

UH Energy received the TXU Energy Leadership Award for outstanding contributions to education, innovation, and public-private partnerships in advancing the energy transition.

More News Archives Available at uh.edu/energy/eti/news.php

ENGAGEMENT METRICS

In 2025, the Energy Transition Institute (ETI) strengthened its digital footprint, expanded its audience reach, and enhanced its role as a trusted source for energy transition insights through targeted online, social media, and broadcast initiatives.

WEBSITE & DIGITAL PRESENCE

The ETI website continued to serve as the central hub for news, research updates, and event information.

- 1,286 page views and 1,045 active users on UH Energy Transition Institute's Web pages.
- Navigation updates improved accessibility, allowing stakeholders to easily explore webinars, symposiums, and innovation showcases.

LINKEDIN ENGAGEMENT

LinkedIn remained ETI's most active social media platform, showcasing research, events, and thought leadership to a professional audience.

- 974 total followers since launch in October 2024
- 1445 page views and 750 unique visitors
- 71,931 impressions, 1,779 reactions, 59 comments, and 96 reposts
- Over 10,000 page searches, reflecting strong brand recognition and topic interest

HPM BROADCAST MEDIA IMPACT

In collaboration with Houston Public Media, ETI launched the Driving the Energy Transition audio series, producing 20 one-minute episodes aired during prime listening hours.

Total Broadcast Reach: 2,773,100 impressions. Episode topics ranged from hydrogen safety and carbon capture to renewable energy integration, sparking public dialogue and amplifying ETI's voice in the global energy conversation.

ETI Partners



THANK YOU

FOR MORE INFORMATION:

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