



Artie McFerrin Department of
CHEMICAL ENGINEERING
TEXAS A&M UNIVERSITY

ChEGSA
TEXAS A&M UNIVERSITY

Chemical Engineering Graduate Student Association

presents

11th ANNUAL RESEARCH SYMPOSIUM

2024



Memorial Student Center



07th March 2024



07:15 AM to 05:00 PM



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Welcome!!

We hope to highlight the research conducted in the Chemical Engineering Department of Texas A&M University through the 11th Annual ChEGSA symposium and provide students an opportunity to showcase their work to their peers and industry professionals. We gratefully appreciate the industrial and internal Texas A&M sponsors for their generous monetary and technical support. Our goal is to offer a forum for the discussion of ideas that will enhance science and technology. We hope the event is successful and productive for all attendees.

Meet the team!!

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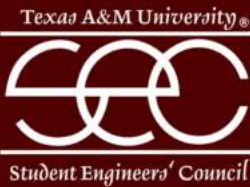
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Floor Plan - MSC

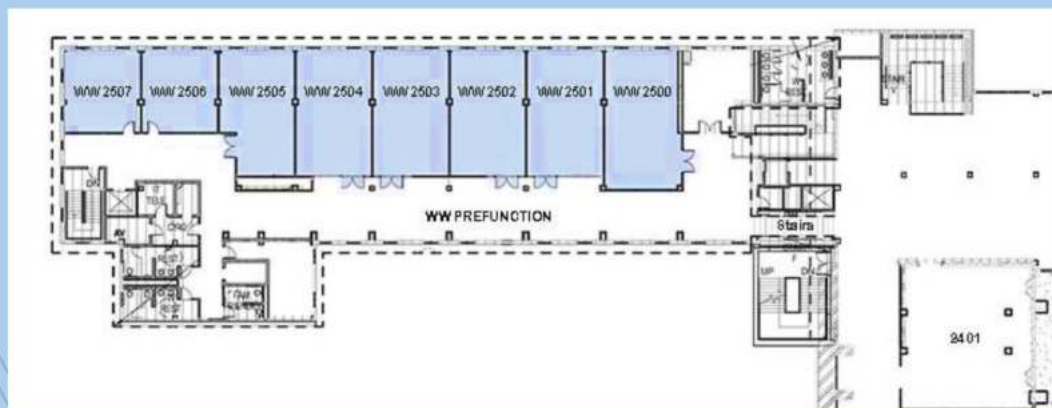
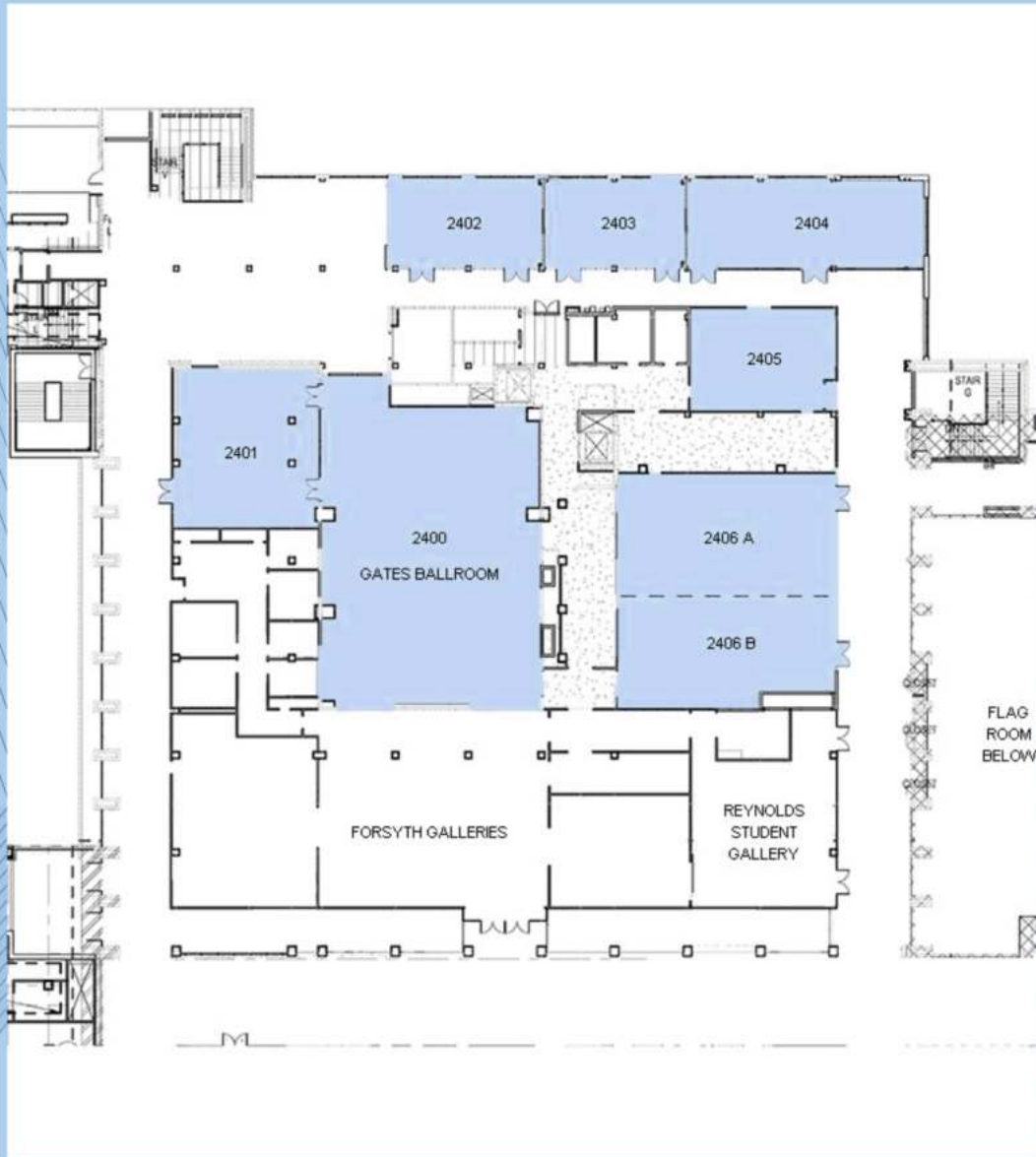


Table of Contents

Welcome Note	ii
Our Sponsors	iii
MSC Floor Plan	iv
Symposium Schedule	1
Opening Remarks	2
Keynote Address	3
Oral Presentations	4-5
Plenary Talk	6
Panel Discussion	7-9
Guest Lecture	10
Poster Presentations	11

Symposium Schedule

Thursday (7th March 2024), Memorial Student Center

Time	Event		
07:00 - 08:05	Registration (MSC 2400)		
	Breakfast (MSC 2406)		
08:05 - 08:25	Opening Remarks (MSC 2400)		
08:25 - 09:00	Keynote Address (MSC 2400)		
09:00 - 09:15	Transition/Coffee Break		
09:15 - 11:15	Advanced Materials and Nanotechnology (MSC 2501)	Health and Bioengineering (MSC 2502)	PSE and Data Science (MSC 2503)
11:15 - 11:25	Transition		
11:25 - 12:05	Plenary Talk (MSC 2400)		
12:05 - 13:10	Lunch (MSC 2406)		
13:10 - 14:10	Panel Discussion (MSC 2400)		
14:10 - 14:45	Guest Lecture (MSC 2400)		
14:45 - 15:00	Transition/Coffee Break		
15:00 - 16:30	Poster & Networking Session (MSC 2406)		
16:30 - 17:00	Closing Remarks & Awards (MSC 2400)		

Opening Remarks

Micah Green



Dr. Micah Green is a Professor and Associate Department Head of External Engagement in Chemical Engineering at Texas A&M University. Holding a Ph.D. from MIT and a B.S. from Texas Tech University, his research focuses on nanomaterials, polymer nanocomposites, and environmental characterization. Recognized with awards like the George Armistead, Jr. Faculty Excellence Award and NSF CAREER Award, he's renowned for his contributions to nanotechnology.



Dr. Hung-Jen Wu



Dr. Hung-Jen Wu, an Associate Professor and Director of Graduate Studies in Chemical Engineering at Texas A&M University, specializes in nanostructured materials for medical diagnostics. With a Ph.D. from Texas A&M and degrees from National Cheng Kung University, Taiwan, his research focuses on pathogen-host cell recognition and targeted drug delivery. Wu has received accolades like the Kaneka Junior Faculty Award for his contributions.



08:05 AM - 08:25 AM



MSC 2400

Keynote Address



Dr. Mark Barteau

Professor,

Dept. of Chemical Engg. &

Dept. of Chemistry



08:25 AM - 09:00 AM



MSC 2400

Dr. Mark Barteau is a member of National Academy of Engineering; holder of the Halliburton Chair in Engineering and Professor in the Department of Chemical Engineering, College of Engineering and in the Department of Chemistry, College of Science. Prior to his joining at Texas A&M University, he was the Director of the University of Michigan Energy Institute at the University of Michigan, and the DTE Professor of Advanced Energy Research at the University of Michigan.

The importance of being a researcher

One of the classic reads for researchers is Sir Peter Medawar's "Advice to a Young Scientist" (1979). Despite having been written in another place and time, many of its observations are timeless and its commentaries remarkably prescient in their relevance to our time. As we researchers find ourselves buffeted by political winds and struggling with an apparent diminution of public confidence in science, it is worth revisiting the joys of discovery and the ongoing importance of our work to the human society of which we are a part.

Oral Presentations

Time	Advanced Materials and Nanotechnology (MSC 2501)	Health and Bioengineering (MSC 2502)	PSE and Data Science (MSC 2503)
09:15 - 09:30	Laxmi Sai Viswanadha	Bhavya Jaiswal	Natasha Jane Chrisandin
	<i>The influence of nanofillers and surface treatment on mechanical properties of ceramic nanocomposites</i>	<i>Bacteria Transformation using Microfluidic Continuous Electroporation in Paper (1¼CEP)</i>	<i>A Holistic Resilience Analysis for a Water-Energy Co-Generation Process</i>
09:30 - 09:45	David Kumar Yesudoss	Razeen Shaikh	Kenneth Kusima
	<i>Electrochemical Synthesis of Formamide from CO₂ and NH₃ using Titanium Nitride (Ti₂N) MXene</i>	<i>Optimal Performance Objectives in a Highly Conserved Cell-Cell Signaling System</i>	<i>A Machine Learned Enhancement to Transient Kinetic Models</i>
09:45 - 10:00	Bright Ngozichukwu	Assame Arnob	Jung Yoon (Timothy) Kim
	<i>Unprecedented Direct Methanol Coupling for Selective Conversion of CO₂ to Ethane</i>	<i>Influence of Physicochemical and Environmental Factors on Lipopolysaccharide Uptake by Synthetic Lipid Droplets</i>	<i>Recovering carbon losses in CO₂ electrolysis using a solid electrolyte reactor</i>
10:00 - 10:15	Siddhesh Borkar	Siddhant Gulati	Macro Pedro De Sousa
	<i>Using Strain as a Catalyst Design Tool to Enhance the Activity of Transition Metals and Climb Up the Volcano Plot</i>	<i>Complete enzymatic depolymerization of poly (ethylene terephthalate) (PET) plastic using a Saccharomyces cerevisiae-based whole-cell biocatalyst</i>	<i>Towards Real-time Carbon Emission Accounting and Scope Analysis to Optimize Hydrogen Production Decision Making</i>

Oral Presentations

Time	Advanced Materials and Nanotechnology (MSC 2501)	Health and Bioengineering (MSC 2502)	PSE and Data Science (MSC 2503)
10:15 - 10:30	Ray Yoo <i>Optimizing the Electrocatalytic Performance of Ti₂N MXene Through Decoupling Surface and Bulk Structure and Phenomena</i>	Harikrishnan Namboothiri <i>Modeling Recombinant Gene Expression Dynamics Across Bacterial Growth Phases</i>	Betsie Flores <i>A Systematic Multi-Scale Modeling and Optimization Framework for the Transition in Energy, Mobility, and Materials</i>
	Denis Johnson <i>Describing the Stable Mars-van Krevelen Catalytic Cycle for Green Ammonia Production on Nitride MXene</i>	Ting-Ching Wang <i>Genomic heterogeneity drives mechanical adaptation in human tumor cells.</i>	Ritu Ranjan <i>Fault-tolerant control with dynamic safety margin management in safety-critical system</i>
10:45 - 11:00	Omar El Arwadi <i>Time and Temperature-Dependent Fracture Mechanics of Self-Healing Vitrimers</i>		Marcello Di Martino <i>Food-Energy-Water Nexus Considerations in Modular Greenhouse Farming Optimization</i>
	Tanaya Mandal <i>Self-healing of High Performance Vitriimer Carbon Fiber Reinforced Polymer Composites</i>		

Plenary Talk



Dr. Shyamal Bej
Senior Principal Science Expert



11:25 AM - 12:05 PM



MSC 2400

Dr. Shyamal Bej is a Senior Principal Science Expert at Shell, specializing in low carbon renewable fuels, waste plastic conversion to chemicals, and carbon dioxide abatement. With 32 years of experience, he has worked with organizations such as the Indian Institute of Petroleum, University of Michigan, ConocoPhillips, and BP, focusing on catalysis, reaction engineering, and process development. Dr. Bej holds a PhD in Chemical Engineering from the Indian Institute of Technology, Kanpur, and conducted postdoctoral research in Catalysis at the University of Michigan. He has contributed significantly to technology development, commercialization, and troubleshooting in various industrial settings.

Overcoming Challenges Associated with the Production and Processing of Biocrudes

Lignocellulosic biomass is gaining significant importance as a sustainable feedstock for direct conversion to intermediate pyrolysis oils or biocrudes which, in principle, can potentially be further processed to produce different low carbon-based renewable transportation fuels. Most of the technologies currently being attempted to produce and upgrade such pyrolysis oils or biocrudes suffer from many drawbacks. This presentation will provide an initial overview of these processes and the various obstacles such as instability of the pyrolysis oils or biocrudes, lower carbon yield, etc. that prevent the commercial deployment of these technologies. Technical directions for conducting future research to overcome these challenges will also be presented, leveraging the vast amount of refining knowledge gained over the past several decades.

Panel Discussion

Transitioning from lab-scale research to industrial chemical engineering

Transitioning from lab-scale research to industrial chemical engineering necessitates a systematic approach for sustainability. This involves evaluating and optimizing the lab-scale process, emphasizing green chemistry principles, and conducting a thorough life cycle assessment. Raw material selection prioritizes availability, cost, and environmental impact, with a focus on renewable options. Energy efficiency is maximized through advanced control techniques and renewable energy sources, alongside effective waste management strategies. Regulatory compliance is ensured, and collaboration between researchers, engineers, and industry professionals facilitates knowledge transfer. Pilot plant testing validates scalability, while a culture of continuous improvement drives ongoing optimization. Training programs equip personnel for industrial-scale operations.

Regular feedback loops foster sustainability, minimizing environmental impact, improving resource utilization, and enhancing energy efficiency, ensuring the success and longevity of the industrial-scale process.



01:10 PM - 02:10 PM



MSC 2406

Panel Discussion

Panel Moderator



Dr. Abdoulaye Djire is an Assistant Professor of Chemical Engineering with affiliations in Materials Science & Engineering at Texas A&M University. With a Ph.D. from the University of Michigan, he brings extensive experience from roles at the National Renewable Energy Lab (NREL) and Inmatech Inc. His research focuses on catalysis, electrocatalysis, and photo-electrocatalysis for energy conversion and storage, leveraging advanced materials and in-situ spectroelectrochemical techniques.



Panel Member

Dr. Keyur Shah is a Research & Technology Director within the Specialties GBU at Albemarle Corporation. Keyur has 15 plus years of process development, scaleup, process design and optimization experience leading specialty chemicals projects from proof of concept to commercial scale execution. Keyur holds a Ph.D. in Chemical Engineering from Stevens Institute of Technology where his research focused on microreactors for methanol steam reformer and addressing critical heat transfer issues in microscale fuel processing.

Panel Member



Dr. Ron Presswood is a mechanical engineer. He has developed space flight hardware for NASA while working for Johnson Engineering - SpaceHab, novel equipment for treating contaminated ground water, tools for manufacture of dental restorations, software tools for capital asset management and working together with Ian Bishop, they develop the patented technology that is Elemental Recycling.



Panel Discussion

Panel Member



Dr. Shyamal Bej, a Senior Principal Science Expert at Shell, boasts 32 years of experience spanning catalysis, reaction engineering, and process development. His background includes roles at Indian Institute of Petroleum, University of Michigan, ConocoPhillips, and BP. With a PhD from IIT Kanpur and postdoc from University of Michigan, he specializes in low carbon renewable fuels, waste plastic conversion, and CO₂ abatement.



Panel Member

Dr. Gerry Elphingstone Jr., currently Flow Assurance Chapter Manager at Chevron Technical Center, has 22+ years of experience in process engineering, including roles at Chevron and Texaco. A Texas A&M University PhD graduate, he manages global planning and technical development at Chevron. Dr. Elphingstone's expertise spans process engineering, with previous consultancy roles in Houston and Perth. He holds a BS in Chemical Engineering from Missouri S&T.

Panel Member



Dr. Mark Holtzapple earned his B.S. in chemical engineering from Cornell University in 1978 and his Ph.D. from the University of Pennsylvania in 1981. A former US Army member, he's now a professor at Texas A&M University for nearly 29 years. Dr. Holtzapple co-authored engineering textbooks, received awards like the Presidential Green Chemistry Challenge, and conducts research in biofuels, LNG, and high-efficiency technologies, collaborating with industry and governmental agencies.



Panel Member

Dr. Martin Gomez-Osorio is a Process Engineer at Shell with a background in Chemical Engineering. He holds a Doctor of Philosophy (PhD) degree in Chemical Engineering from Texas A&M University. With over 7 years of experience at Shell, he specializes in techno-economic analysis, process modeling, and systems thinking for chemicals and hydrogen technologies. Martin is proficient in Aspen Plus and has publications in renowned journals.

Guest Lecture



Dr. Chih-An-Hwang

Senior Advisor (Retd.)

LyondellBasell Chemical



01:45 PM - 02:30 PM



MSC 2400

Dr. Chih-An Hwang, retired Senior Advisor at LyondellBasell Chemical, is renowned for his expertise in Advanced Process Control (APC) and polymer technologies. Notable contributions include optimizing Spheripol PP and Bayport C&E lines, leading Mega projects like Hyperzone HDPE and ADL/mPE startups, and spearheading APC initiatives at Chevron Phillips Chemical. With extensive experience in catalyst and process development, he holds multiple U.S. patents. As Chief Consultant at Pavilion Technologies, he pioneered Perfecter (NMPC) technology. His global impact encompasses consultancy for major polymer technologies worldwide. Formerly at Quantum Chemical, he played a pivotal role in APC consultancy and MPC development.

Non-linear Advanced Process Control in Industries

This presentation is about the pivotal role of Non-Linear Advanced Process Control (APC) in the Chemical Process Industries, with a focus on its application in polymer processing. Beginning with foundational aspects such as Control Systems Engineering (CSE), System Identification (SI), and essential APC Terminology, the discussion delves into the architecture of Non-Linear APC. Various Controller Design Methodologies, including Neural Network-based, first principles, and hybrid modeling, will be explored in detail. Rheology's significance in the context of processing and its correlation with Non-Linear APC will be elucidated. The presentation will then navigate through Polymer Non-Linear Model Predictive Control (NMPC) best practices, offering insights into its application. An examination of the gap between academia and industry in the realm of Advanced Control will be addressed, emphasizing the need for effective bridging. Drawing from extensive industrial experience, the presentation will provide practical perspectives on Non-Linear APC, culminating in a comprehensive conclusion.

Poster Presentations

Poster No.	Presenter	Presentation Title
P1	<i>Md. Saifur Rahman</i>	Engineered hydrogel-based microelectronics for recording and neuromodulation
P2	<i>Catherine Nkoutche</i>	Multi-Objective Mixed Integer Optimization Model for Proactive Planning Tool for an Integrated Strategic Framework in Resilience & Sustainability of Supply Chain Networks
P3	<i>David Kumar Yesudoss</i>	Electrochemical Synthesis of Formamide from CO ₂ and NH ₃ using Titanium Nitride (Ti ₂ N) MXene
P4	<i>Laura Hoagland</i>	Improving lithium-ion energy storage through novel 2D electrode materials
P5	<i>Somtochukwu Lambert</i>	Radio frequency-driven catalytic dehydrogenation of propane for propylene production.
P6	<i>Siddhi Kotnis</i>	High-efficiency PET degradation with a two-enzyme system immobilized on Magnetic Nanoparticles
P7	<i>Sahithi Srijana Akundi</i>	Risk-based Model Predictive Controller via Chance-Constrained programming
P8	<i>Jitendra Choudhary</i>	Large-scale Assemblies of TiC Nanowires for High-Temperature Applications
P9	<i>Amani Grati</i>	Evaluation of the maximum gas generation rate under runaway conditions: Comparative analysis of the available methodologies
P10	<i>Harikrishnan R Namboothiri</i>	Modeling Recombinant Gene Expression Across Bacterial Growth Stages

Meet our team



Dr. Hung-Jen Wu
Primary Advisor



Ashley Henley
Primary Advisor



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Dasari*

President



*Jenna
Vito*

Vice-President
External Affairs



*Khirabdi
Mohanty*

Vice-President
Internal Affairs



*Ethan
Harkin*

Finance Chair

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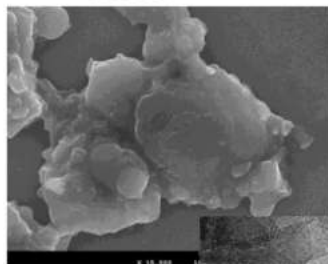
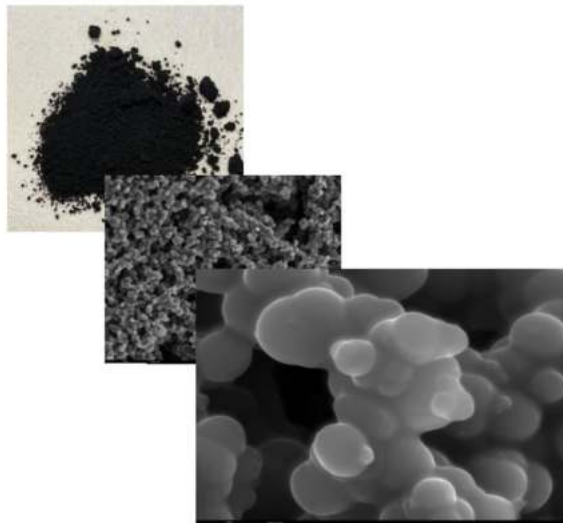
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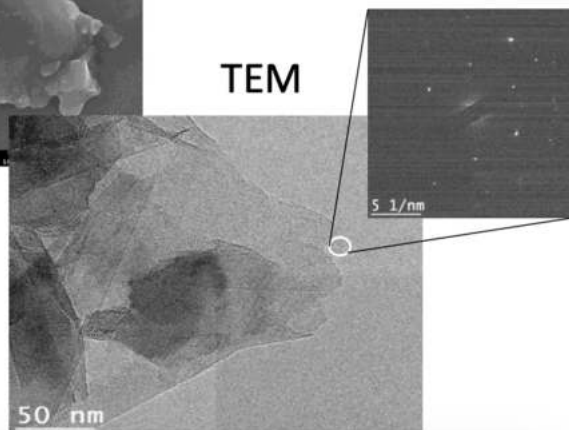
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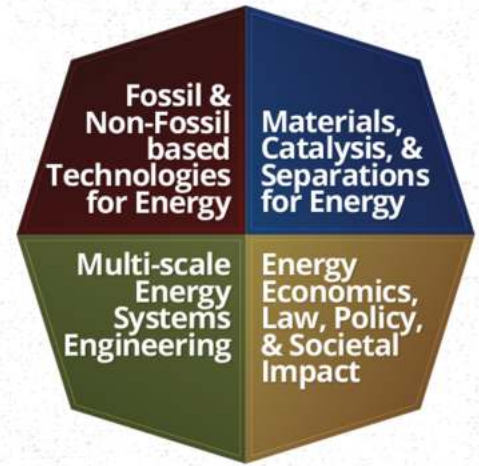
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The Vision

Discovering Energy Solutions Improving Quality of Life

The Mission

The Texas A&M Energy Institute pursues and supports new approaches for multi-disciplinary energy research, education, and external partnerships.



The Approaches:

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A "Point of Reference" within the university on energy-related matters, connecting engineering, sciences, technologies, economics, law, and policy dimensions.

Partnerships

A cultivator of a vibrant nucleus of industry and academic partners through collaborations to address the complexity and challenges of the Energy Transition.

Research

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