The University of Houston’s vision is to be recognized as The Energy University – the leader for energy related education, research and innovation.

The key goals of the UH Energy Initiative are:
1. Increase engagement of the Energy Advisory Board
2. Increase ‘visible’ programs in Energy Education
3. Enhance energy research
4. Increase awareness of the UH Energy Initiative on campus
5. Enhance relationships with energy-related educational departments on campus
EDUCATION & STUDENT OPPORTUNITIES
I. Future of the Electric Grid: Renewed or Gridlocked?

Summary: A panel discussion on the challenges facing the grid.

- Attendance: 659
- Youtube Views: 524
- Facebook Views: 375

III. Offshore Wind: Will it Happen in Texas?

Summary: A panel of experts discuss the use of offshore wind globally and its feasibility in Texas.

- Attendance: 323
- Youtube Views: 39
- Facebook Views: 111

II. Carbon Management: Panacea or Hype?

Summary: A provocative panel discussion on technologies and policy regarding CCUS.

- Attendance: 465
- Youtube Views: 175
- Facebook Views: 166

IV. Cybersecurity in Energy

Summary: A half-day series of panel discussions on how cybersecurity effects the energy industry and best practices.

- Attendance: 75
- Youtube Views: N/A - closed door.
- Facebook Views: N/A - closed door.
FUTURE OF THE ELECTRIC GRID: RENEWED OR GRIDLOCKED?

Thursday, September 27, 6:00pm
Student Center South, Houston Room

ENERGY SYMPOSIUM SERIES
Kenneth M. Mercado, Senior Vice President, CenterPoint Energy

Kenny Mercado is senior vice president of CenterPoint Energy’s electric utility business, with financial and operational responsibility of the company’s 5,000 square-mile service territory, as well as power delivery to more than 2.4 million homes and businesses in the Houston area.

He previously served as division senior vice president of Grid and Market Operations at CenterPoint, responsible for automating and integrating the company’s nearly 53,000 miles of electric transmission and distribution grid to serve the Texas market.

Mercado received a bachelor’s degree in electrical engineering and a master’s degree in industrial engineering from the University of Houston. He also received an executive MBA degree from Texas A&M University.

John Berger, Founder and CEO, Sunnova Energy Corporation

William J. (John) Berger co-founded Sunnova Energy Corp. in 2012 and serves as CEO. He previously was co-founder and CEO of SunCap Financial, a residential solar power service company.

His previous work in renewable energy includes helping start Standard Renewable Energy, a Top 10 installer of renewable energy and energy-efficient products and services for residential, commercial and government customers, co-founding and serving as managing partner for Contango Capital Partners, LP, a venture capital firm focused on renewable energy and energy technology.

He began his career as an analyst for Enron Corp., including serving as director for Enron Energy Services. Berger graduated cum laude with a bachelor’s degree in civil engineering from Texas A&M University and earned a MBA from Harvard Business School.

Jesse Grossman, Co-Founder, Chairman and CEO, Soltage

Jesse Grossman co-founded Soltage in 2006 and serves as chairman and CEO, overseeing the corporate and project finance activities of the firm, as well as sales and acquisition. Prior to co-founding Soltage, he worked in venture development and management, project finance, marketing and resource use strategies in East Africa, Indonesia and the United States.

Grossman has a bachelor’s degree in biology from Carleton College and a master’s in environmental science from the Yale School of Forestry and Environmental Studies.

Matt Rogers, Senior Partner, McKinsey & Company

Matt Rogers is a senior partner in McKinsey & Company’s San Francisco office. He focuses on the role technology and innovation play in restructuring markets, especially in oil, gas, power and other energy and industrial companies. He has spent more than 25 years serving energy and clients globally and currently leads the firm’s oil and gas practice in the Americas.

Rogers graduated magna cum laude from Princeton University and joined Credit Suisse First Boston as an energy investment banking analyst. He earned an MBA from Yale University.
UPCOMING SYMPOSIUMS
Natural Gas: Stranded Asset or Global Fuel? Thursday, February 7
Offshore Wind: Will it Happen in Texas? Thursday, March 28

JOIN THE CONVERSATION
#CARBONMANAGEMENT #WEAREUHENERGY

MEDIA SPONSOR:

2018–2019 Energy Symposium Series
Critical Issues in Energy

Tuesday, November 13th, 6:00pm
UH Hilton Hotel

CARBON MANAGEMENT: PANACEA OR HYPE?

#CARBONMANAGEMENT #WEAREUHENERGY
Romany M. Webb, Associate Research Scholar and Senior Fellow, Sabin Center for Climate Change Law, Columbia Law School

Romany Webb is associate research scholar at Columbia Law School and senior fellow at the Sabin Center for Climate Change Law. Her research explores legal and policy tools to minimize the climate impacts of energy development and has addressed topics such as the regulation of energy sector greenhouse gas emissions under U.S. federal and state law; federal and state approaches to supporting clean energy development; and legal and policy issues relating to carbon capture and sequestration. Webb holds a master of laws with a certificate in environmental law from the University of California, Berkeley and a bachelor of laws and bachelor of commerce (economics) from the University of New South Wales in Australia.

Bill Peacock, Vice President of Research, Texas Public Policy Foundation

Bill Peacock is the vice president of research at the Texas Public Policy Foundation, where he oversees the accuracy, integrity and applications of free market principles of foundation research on issues facing Texas and the nation. His own research focuses on energy, economic freedom and growth, property rights and regulatory issues, with an emphasis on identifying and reducing the harmful effects of regulations on the economy, businesses and consumers. He has extensive experience in Texas government and policy.

Peacock holds a bachelor’s degree in history from the University of Northern Colorado and an MBA with an emphasis in public finance from the University of Houston.

SYMPOSIUM MODERATOR

Steve Oldham, CEO, Carbon Engineering

Steve Oldham is Chief Executive Officer of Carbon Engineering, a Canadian-based clean energy company focused on commercializing groundbreaking technology to capture CO2 directly from the atmosphere and synthesize it into clean, affordable transportation fuels that are drop-in compatible with existing engines and infrastructure.

Oldham has more than 20 years of executive experience, including previous roles in technology, robotics and aerospace sectors. He has been involved in a number of “Canada firsts” in technology commercialization, including the first robot used to perform brain surgery, first radar satellite and robots that clean the inside of nuclear reactors. He has a bachelor’s degree in mathematics and computer science from the University of Birmingham in England.

Brock Forrest, Senior R&D Engineer, NET Power and 8 Rivers Capital

Brock Forrest is the senior research and development engineer at 8 Rivers Capital and NET Power, where he focuses on the design and development of the supercritical CO2 Allam cycle. Forrest’s work has included primary process modeling, engineering oversight and procurement for NET Power’s 50 megawatt natural gas demonstration plant, the world’s first supercritical CO2 power plant. He currently leads the design effort for the first 300 megawatt commercial NET Power plant.

Forrest previously worked for MWH, where he was responsible for developing over 15 industrial plants that function as aquatic life support systems. Forrest has a bachelor’s degree in environmental engineering from the Massachusetts Institute of Technology.
UPCOMING EVENTS

ENERGY COALITION: ENERGY BANQUET
Wednesday, April 10th

CYBERSECURITY IN ENERGY
Thursday, April 18th

JOIN THE CONVERSATION

#TXOFFSHOREWIND   #WEAREUHENERGY

@uhenergy   @uhoustonenergy
uh.edu/energy

2018–2019 Energy Symposium Series
Critical Issues in Energy
Thursday, March 28th, 6:00pm
Student Center South

OFFSHORE WIND: WILL IT HAPPEN IN TEXAS?

#TXOFFSHOREWIND   #WEAREUHENERGY
Michael J. Osborne, Co-founder, Texas Renewable Energy Industries Alliance

Michael Osborne is a co-founder of the Texas Renewable Energy Industries Alliance and has worked on renewable energy and climate change issues since the 1970s. He was involved with Texas' first wind farm, installed in 1981.

An activist and speaker, he is a member of the city of Austin's Electric Utility Commission and the Joint Sustainability Committee. He served as chairman of Austin's Generation Resource Planning Task Force, which aims for 65 percent of the city's electricity to be generated from renewable resources. Osborne previously served on the steering committees of the Texas Energy Policy Partnership, the Sustainability Development Council and the Texas Energy Coordination Council.

John Hartnett, Business Opportunity Manager, Shell Wind Energy

John Hartnett is business opportunity manager for Shell Wind Energy and president of Mayflower Wind Energy, a joint venture between Shell and EDP Renewables established to develop projects in the New England region. Mayflower last year acquired a lease off the coast of Massachusetts.

A second joint venture with EDF Renewables, Atlantic Shores, holds a lease off the coast of New Jersey and will develop projects for the New York and New Jersey markets, among other states. The two ventures together hold more than 300,000 acres of offshore leases, with the potential to develop more than 4,000 megawatts. Hartnett has been with Shell for 17 years and in the energy industry for more than 30 years.

Deniz Ekici, Marine Operations Manager, Equinor

Deniz Ekici is marine operations manager for Equinor and has more than 15 years of experience in engineering and managing large capital projects, including offshore wind development projects in northern Europe and Asia.

He has published a number of technical papers on oil and gas, as well as offshore wind, presenting at conferences including the Offshore Technology Conference Houston, the Offshore Technology Conference Asia and the American Wind Energy Association's Offshore WINDPOWER Conference.

Ekici is a licensed professional engineer and holds certification from the Project Management Institute.

Jim Bennett, Program Manager, Renewable Energy Program, Bureau of Ocean Energy Management (BOEM)

Jim Bennett is program manager for the Bureau of Ocean Energy Management's Renewable Energy Program, where he oversees development of renewable energy resources on the outer continental shelf. The program now manages 15 active leases covering nearly 1.7 million acres.

He previously led the bureau's Division of Environmental Assessment, overseeing compliance with the National Environmental Policy Act (NEPA) and other environmental laws. He has been involved in projects including the Exxon Valdez and Deepwater Horizon oil spills, the Cape Wind energy project and offshore renewable energy activities off the Atlantic coast. Bennett has master's degrees in environmental planning and computer systems management.

Michael J. Osborne, Co-founder, Texas Renewable Energy Industries Alliance

Michael Osborne is a co-founder of the Texas Renewable Energy Industries Alliance and has worked on renewable energy and climate change issues since the 1970s. He was involved with Texas' first wind farm, installed in 1981.

An activist and speaker, he is a member of the city of Austin's Electric Utility Commission and the Joint Sustainability Committee. He served as chairman of Austin's Generation Resource Planning Task Force, which aims for 65 percent of the city's electricity to be generated from renewable resources. Osborne previously served on the steering committees of the Texas Energy Policy Partnership, the Sustainability Development Council and the Texas Energy Coordination Council.
Please join UH Energy and the College of Technology for an afternoon of valuable insights on cybersecurity solutions for the energy industry. Our upcoming half-day symposium, Cybersecurity in Energy, will take place on April 18, 2019, at the University of Houston’s Hilton Hotel. The event will begin with a lunch-time keynote speech followed by panel discussions on key challenges, best practices, and opportunities for the application of cybersecurity in energy related challenges.

SYMPOSIUM OVERVIEW

The digital transformation of the energy industry has been accelerating and is seen as the key to increasing reliability and efficiency and making energy more affordable. The emergence of smart grids, the digital oil field and the data analytics driven sustainability enterprises across the energy sector are critical to the growth of a modern global economy. Cyber threats, especially ones that can result in significant loss of physical assets, financial loss and data theft, remain a persistent challenge that will grow with the expanding digital transformation of the industry. The development of best practices especially inspired by leading industry such as finance and defense, advances in technology and most importantly the education pathways for skilled talent and executives will be the topic of the half-day symposium.

Registration Fee: $200

*Lunch Is Included In Registration Fee
12:00pm  Introduction
12:05pm  Keynote Speaker 1
12:45pm  Keynote Speaker 2
1:10pm   Thanks and Symposium Outline
1:15pm   Break
1:30pm   Best Practices and Cybersecurity Value Chain
3:00pm   Break
3:30pm   Cybersecurity in Energy
5:00pm   Education and Training Opportunities
5:30pm   Closing Remarks

Please join us for a reception to follow.
Keynote Speakers
Alex Phillips, Chief Innovation Officer, NOV
Robert Smith, National and Homeland Security, Idaho National Laboratory

Best Practices and Cybersecurity Value Chain

Moderator
Arthur Conklin, Associate Professor, Information System Security, University of Houston

Panelists
Marty Edwards, Director of Strategic Initiatives, International Society of Automation
Jonathan Pollet, Founder & CEO, Red Tiger Security
Stuart Wagner, Sr. Dir., IT Security & Compliance, Enterprise Products
Bryan Owens, Principal Cyber Security Manager, OSIsoft

Cybersecurity in Energy

Moderator
Chris Bronk, Assistant Professor, Information System Security, University of Houston

Panelists
Rebekah Mohr, Security Manager, Accenture Security
Chris Spirito, Nuclear Cybersecurity Consultant, Idaho National Laboratory
Greg Rogers, Sr. Director, Pipeline and Facility Control Systems, Enterprise Products
Tyler Williams, External Innovation & New Venture Development, Shell

Education and Training Opportunities

Moderator
Ramanan Krishnamoorti, Chief Energy Officer, University of Houston

Panelists
Arthur Conklin, Associate Professor, Information System Security, University of Houston
Aron Laszka, Assistant Professor, Computer Science, University of Houston
Claudia Neuhauser, Associate Vice President/Associate Vice Chancellor for Research and Technology Transfer, University of Houston
Below are the GEDS accomplishments for the Academic Year 2018 - 2019. Please note: these are the accomplishments we deem appropriate for public promotion of GEDS activities; they do not constitute all that we have worked on in terms of marketing, networking, writing, etc.

I. Establishment of Key GEDS Partnerships:

Planning/Execution of International Conference on Oil and Gas in Trinidad and Guyana (ongoing - August 2017-Present):

In partnership with The Faculty of Law and the Institute of Gender & Development Studies (IGDS) at the University of West Indies, St.Augustine Campus.

-Title, Date, and Location of Conference:
  Caribbean Energy Policy, Societies, and Law Conference
  October 4th -5th 2018, The University Inn and Conference Centre
-This effort is being spearheaded/coordinated by Dr. R. Golden Timsar

Coordination and Co-Teaching of GEDS content courses in UH Law Center (ongoing, Nov. 2017-present)

After a meeting with Dean Greg Vetter, an agreement was forged between GEDS and EENR for to create and co-teach GEDS content courses for UHLC. Some of the terms of agreement:
- GEDS faculty to be under direction of Professor Victor Flatt.
- UHLC students can use GEDS courses for their EENR requirements or as electives.
- Courses will be taught each semester, based on preferred UHLC scheduling.
- GEDS Directors can visit UHLC events/classes to promote GEDS courses and the GEDS Certificate.

Collaboration with MD Anderson Special Collections: Oil and Gas Archives

After a meeting with Dean German (UH Libraries) and the Head of Special Collections Christian Kelleher, it was agreed that GEDS would work with Mr. Kelleher and the Special Collections unit to explore possibilities of funding for the collection of archival materials related to the history of oil and gas in Texas, the U.S., and around the world.

The commencement of this collaboration will take place through the attendance of Dr. Klieman at attend 9th Conference of the European Oil & Gas Archives Network (EOGAN) in Stavanger, Norway from June 7 -8, 2018, where she will work to establish networks between the oil and gas archives officials present, and present a web-resource page about UH holding that Mr. Kelleher will prepare.
GLOBAL ENERGY, DEVELOPMENT, AND SUSTAINABILITY PROGRAM | EDUCATION

II. Promoting GEDS as a Source of Thought Leadership/Scholarship on Sustainability and the Oil and Gas Industry

UH Energy/Forbes Online Blogposts (in order of publication)

Scholarly Collaborations with other Institutions:
- T. Mitro, Represented GEDS/UH at Columbia Center on Sustainable Investment Executive Sessions on impact of political economy on extractives governance issues.
- T. Mitro, Represented GEDS/UH in collaboration with U.S. Department of Commerce and CCSI to produce an LNG import and power generation economics model (available as open access online in June/July 2018).

III. GEDS Sponsorship and Participation in Energy-Related Events, Houston

Dr. Klieman nominated this scholar to the ASA. He was awarded the Presidential Fellowship, and thus funded by the ASA for travel to the USA to share his scholarship with Africanist colleagues.

Sponsorship (with K. Klieman serving as moderator) of the U.S. Africa Bilateral Chamber of Commerce OTC event:

GLOBAL ENERGY, DEVELOPMENT, AND SUSTAINABILITY PROGRAM | EDUCATION

IV. National/International Conference Presentations by GEDS Directors

Papers Presented:


As a result of this presentation, Dr. Klieman was asked by Marathon Pipeline Company, Ohio, to meet with their community outreach team and prepare a proposal for training their mid-to-high level employees on current issues/debates about energy in the US. This was prepared and sent in December of 2017. Although the company declined to develop a training program with GEDS, the directors became aware through this experience that much of the content they have used to teach about creating beneficial community relations in Africa can be put to use in the domestic context as well.


As a result of this presentation, Dr. Golden Timsar was asked by the Editor-in-Chief of The Extractive Industries and Society journal to submit the paper for publication. She is preparing the article now.


Paper Proposals Submitted and Accepted:

Klieman:

Conference Theme: “Learning From Energy History”
Klieman Paper Accepted: “Teaching ‘Liberal Arts Thinking’ through the Energy Humanities: Methods for Imparting Analytical Skills that Help Transform the World.”
GLOBAL ENERGY, DEVELOPMENT, AND SUSTAINABILITY PROGRAM | EDUCATION

K. Klieman, R. Golden Timsar, T. Mitro (moderator), et al:
Conference Theme: Energies: Power, Creativity, and Afro-Futures
Panel Proposed and Accepted: “Re-Theorizing the ‘Resource Curse’ in an Age of Energy Transitions: Case Studies from Africa and the Caribbean (With a View to the Future)”
Papers Accepted: from both Klieman and Golden Timsar

V. Academic/Programmatic Accomplishments

Two New MA Programs Created with GEDS Certificates as Concentrations/Minors
Submitted Fall 2017 to the GPSC, requests/curricula for the creation of:
1) The Master in Master in Public Policy/GEDS (MPP/GEDS)
2) The Master in Executive Human Resources Development/GEDS (ExHRD/GEDS)

Three New Courses Developed and Taught in Fall 2019
K. Klieman – Spring 2019
History 4381: African and the Oil Industry (Co-Taught with Dr. Steven Armah, Professor of Development Economics at Achesi University in Ghana)
Description: This was an undergraduate Distance-Ed course that looked at the history and economics of oil in Africa. Three-fourths of the class meetings were live-streamed, lectures shared, and students required to carry out research projects and presentations in in teams of combined UH/Ashesi students. 15 students from UH were enrolled, 26 students from Ashesi were enrolled. It was a great success according to student reviews and student capstone paper grades.

R. Golden Timsar – Spring 2019
Law 5397/ILAS 6397: Promoting Sustainable Oil and Gas Projects: Legal and Social Frameworks (Co-taught with Professor Emeritus Jaqueline Weaver)
Description: An interdisciplinary approach (Social Sciences, Law) trains students to identify, analyze, and problem-solve re: social, political, environmental challenges associated with oil and gas projects in developing nations and new production sites. Topics may include: key stakeholders and varying priorities; issues of ethnicity/identity, religion, health, social and enviro justice; international “soft law” codes of conduct and human rights; formal and informal regulation of IOC operations by courts, arbitrators, and industry trade groups; the role of international law, U.S. law, host government laws, and petroleum contract obligations in interactions with host communities or nations; IOC pressures from/alliances with NGOS. Again, this class was a great success based on student reviews/feedback and the high quality of work completed.
T. Mitro – Forthcoming Fall 2019

LAW 5397/ILAS 6397: Global Service and Procurement Agreements in the Oil and Gas Sector (Co-Taught with Dr. Julian Cardenas, UHLC)

Content Focus: Managing sustainable performance can fill operational and contractual gaps in the oil and gas sector that, in turn, help drive outcomes to benefit all stakeholders. This course provides an overview of oil company/contractor relationships, impacts on compliance and local content, typical contract terms, financial implications, project finance, and best practices/new trends developing around integrated service contracts.
The Energy and Sustainability minor is designed to provide an interdisciplinary approach to broad issues in energy and sustainability. The minor will educate students on the basics of energy sources, fossil fuels, and the future of energy. In addition to a common introductory and capstone course, the minor offers a blend of courses in technology, business, engineering, architecture, social science, and natural science.

Coursework will focus on topics such as existing, transitional, and alternative energy sources, as well as energy and sustainability from the perspectives of economics and business, engineering and technology, architecture and design, and public policy and education.

The minor is housed in the Honors College, but students do not have to be in Honors to join. It is an interdisciplinary collaboration with colleges and departments across campus, and students of all majors are encouraged to apply. Students may take the introductory course without declaring the minor. Energy and Sustainability Minor (Interdisciplinary - Open to All Majors on Campus).

Requirements to Declare
Applicant must have at least a 2.5 cumulative GPA in 15 or more hours at UH, and must have at least sophomore standing (30+ hours) to declare the minor.

Requirements to Graduate with the Minor
A 2.0 or higher cumulative GPA in all courses attempted for the minor is required for graduation. All required courses and electives for the minor are included in this calculation.

Minor Curriculum -- for students who declare the minor beginning in fall 2018
A minor in Energy and Sustainability requires 18 hours of approved coursework. Students who declare the minor beginning in Fall 2018 will have to complete the following curriculum, consisting of two required courses and four electives, two from each of two categories. Additionally, students may not choose more than 2 courses (6 hours) from any one department. In courses used to fulfill minor requirements, a 3.0 minimum cumulative GPA is required for graduation. No more than 6 hours of a student’s major may be applied to the minor.
ENERGY AND SUSTAINABILITY MINOR | EDUCATION

I. ENRG 3310: Introduction to Energy and Sustainability (3 hours)

II. ENGR 4320: Case Studies in Energy and Sustainability (3 hours)

III. Category Requirement: ENERGY PRODUCTION AND MANAGEMENT (6 hours)
    ARAB 3397: Oil, Culture, and the Middle East
    ECON 3385: Economics of Energy
    ENRG 4397: Corporate Social Responsibility
    ENRG 4397: Overview of Energy Industry
    FINA 4370: Energy Trading
    FINA 4372: Upstream Economics
    FINA 4373: Petrochemical and Refining Economics
    HIST 3394: Africa and the Oil Industry
    HIST 3394: Energy in Modern America
    HIST 3395: Ideology and Empire: Russia
    INDE 3333: Engineering Economy
    MIS 4390: Energy Trading Systems
    POL 3397H: Politics of Energy and the Environment
    POLS 4341: Risk Assessment and Analysis (Energy Focus)
    POLS 4349: International Energy Policy
    SCM 4302: Energy Supply Chain Management
    TECH 1325: Energy for Society

IV. Category Requirement: SUSTAINABILITY AND THE FUTURE (6 hours)
    ARCH 4376: Case Studies: Sustainable Architecture
    ARCH 3368: Sustainable Development
    ARCH 3397: Sustainability Workshop
    ARCH 4373: Urban Environments
    BIOL 4368: Ecology
    CIVE 3331: Environmental Engineering
    CIVE 4333: Waste and Water Treatment
    CIVE 4337: Transportation Engineering
    ECON 3363: Environmental Economics
    ENRG: Ethics & Corporate Social Responsibility
    GEOL 1302: Introduction to Global Climate Change
    HIST 3378: The Modern Middle East
    INTB 3354H: Introduction to Global Business
    INTB 4397H: Capstone Seminar on Globalization
    TECH 4310: Future of Energy and Environment

Michael Cohen presented BP’s Statistical Review highlights, showcasing a growing divergence in 2018 between demands for action on climate change and the actual pace of progress on reducing carbon emissions. Attendee’s learned about the effect this had on global energy markets and what the implications may be for the future transition of energy.

This event hosted 27 faculty members, Ph.D. students and 20 students from an energy-focused delegation visiting the UH Law Center from Mexico.
UH Energy partnered with the Houston Advanced Research Center to host Jigar Shah as part of HARC’s People & Nature Speaker Series.

On Wednesday, May 1, 2019, UH Energy & HARC hosted Mr. Shah to discuss public and private sector investment in infrastructure and how to maintain resilience in the face of significant impacts of climate change at the University of Houston.

Students, faculty, private and public sector, nonprofit, energy sector professionals, and all support industries were encouraged to attend. UH Energy and Hard made the event free to attend for all faculty and staff.
UH Energy assisted UH Law Center’s Energy, Environment and Natural Resource Center to host a one-day workshop on risk management and investment protection, using Venezuela as its case study on Friday, March 29, 2019.

In an effort to promote dialogue about asset protection and chemical security in the oil and gas industry, the UH Environment, Energy and Natural Resources (EENR) Center recently brought industry and law experts together to discuss the risk and security of energy assets during the “Risk Management and Investment Protection: A Due Diligence Approach in the Case of Venezuela,” conference in late March.

The conference opened a broader conversation about the security concerns of petroleum assets in a country undergoing a profound social and economic transformation.

The conference had two keynote presentations by Vanessa Neumann, current President Guaido’s Diplomatic Representative in the U.K.; and Luis Quintero, President of the Society of Petrophysicists and Log Analysts. Then, panels discussed technical and legal issues with experts including Roxio Medina, president of the American Society of Safety Professionals (ASSP) and former CITGO Vice President; David Moore, president and CEO of AcuTech Consulting Group and author of the U.S. standard for security risk assessment in the petroleum and petrochemical industry called “ANSI/API Standard 780 Security Risk Assessment Methodology”; Julian Cardenas, Research Professor at the University of Houston Law Center (UHLC); Sashe Dimitroff, partner at BakerHostelter and Adjunct Professor at UHLC; Katya Casey Managing Director at Actus Veritas Geoscience, and Ricardo Colmenter, Principal at Entra Consulting and Adjunct Professor at UHLC.

The conference consisted of two panels, one discussing the security risk management including the evacuation of personnel security, telecommunications, chemical security, and oil and gas facility security. While the other examined the legal framework applicable to the protection of oil and gas investments in cases of armed conflicts or civil unrest.
Venezuela is undergoing a profound transition which precise outlook is unknown. Acting President Juan Guaidó has captured the imagination of the Venezuelan people who want deep societal reform, but President Maduro - backed by a fragmented military - is unwilling to cede power despite the national and international pressure. Thus, investors in Venezuela must prepare for drastic political and economic transformations if Acting President Juan Guaidó succeeds, and also if Maduro stays.

Security issues will inevitably arise if Acting President Juan Guaidó succeeds and a transitional government takes power. The fragmented and corrupt national army might not be able to provide the stability necessary for any successful national reconstruction and governance reforms. Oil and gas will be necessary fund reconstruction, but these investments will also potentially be at risk of attack or sabotage being the target of guerrilla and paramilitary groups which thrive absent strong security and rule of law. Thus, a new government deprived of military support to provide security and governance might open the door to international military cooperation and the assistance of an international security task force.

In this context, oil and gas companies should be prepared to implement strategies to mitigate the risk posed for their investments, personnel, and the environment. Furthermore, industry players must pay due regard to the contract and international law applicable in cases of armed conflicts or civil unrest for the protection of their investments.

The conference will consist of two panels. One will discuss security risk management including the evacuation of personnel, security, and telecommunications, while a second panel will deal with the legal framework applicable to the protection of investments in cases of armed conflicts.

More information: https://lnkd.in/empJccb

*final agenda to be announced
UH Energy partnered with the UH Law Center’s Environment, Energy & Natural Resource Law to host a townhall conversation with Former Congressman Bob Inglis on Wednesday, October 3, 2018.

Arguing that conservatives shouldn’t concede climate change to Democrats and other progressive voters, former U.S. Rep. Bob Inglis spoke at the University of Houston campus on Wednesday, October 3, 2018.

Inglis, a Republican from South Carolina, is headlining what is called the republicEn EnCourage Tour, a 14-city series of events proposing free-enterprise climate solutions. Inglis served in Congress from 1993-99 and 2005-11.

His talk, “Solving climate change with courage and conservative principles,” was followed by a town hall-style question-and-answer session. It is sponsored by UH Energy and the Environment, Energy & Natural Resources Center at the UH Law Center.
The primary goal of the E-90 Competition is to educate about aspects of energy in an entertaining and creative way. We challenged UH students to create videos that explain a complex energy-related concept in an “edutaining” way.

UH Energy is excited to announce the 2nd ANNUAL E-90 student energy video competition!

The competition was open to all current University of Houston students. Participants were required to create a 90 second video based on an energy-related topic. The winners were announced at the Energy Banquet hosted by the Energy Coalition on April 10th at the UH Hilton Hotel.

In total, 73 students registered to compete and 38 videos were submitted by either individual students or groups up to four members. An additional prize for ‘Peoples Choice’ was also awarded at the Energy Banquet after attendees completed a live vote. In total, $4,000 was awarded to students.

Since it’s first year, student participation in the competition increased by 30%!
ENERGY EFFICIENT HOME DESIGN COMPETITION | SCHOLARSHIPS

UH Energy partnered with Change Happens!, a not-for-profit organization, to host the first Energy Efficient Home Design competition. The first and second place team members were awarded $1,250 and $750 respectively, with the number of scholarships totalling $10,000.

Two interdisciplinary teams of UH students vied for the 1st place of the Change Happens! Energy Efficient Home Design competition. The local non-profit sought out challenge high-achieving students to bring research and imagination to design a net zero housing complex in the Third Ward.

The final round of the competition showcased the two best designs in early February to Change Happens! officials including Reverend Leslie Smith, president of the Houston non-profit, and Energy Coalition Board members. The winning team includes team leader Cydnee Willingham, a finance senior; Theophilus Kaaya, a mechanical engineer graduate student; Luisa Leon Mai, a chemical engineering senior; Prasanna Krishna Devulapalli, a mechanical engineering graduate student; and Doumit Doumit, an architecture graduate student.

The first place design has a total of 149 units with 1 bedroom, 2 bedrooms, and 3 bedrooms layouts located on three upper levels with amenities such as a workout area, gardens, a community area, and playgrounds along with adequate parking on the street level of the building for residents.

The students used solar power, geothermal power, and reverse osmosis for energy generation and conservation in order to achieve a “net zero” building. The students were able to create a design that conserved and produced energy while building a solid presentation that examined costs and benefits that built the case to go forward into the construction phase.
UH Energy sponsored two UH students to attend the Forbes 30 Under 30 Summit in Boston from September 30 - October 3, 2018. The summit offers students a chance to learn and network with game-changers and entrepreneurs, with access to days filled with inspiring speakers.

Among the students selected were C.T. Bauer College of Business seniors Jadelyn Nava, a finance major; Alejandro Restrepo, supply chain; and Nebil Adam-Omar, management information systems senior; and Cullen College of Engineering senior John Muyiwa, a petroleum engineering major.

The students attended the Boston summit sponsored by UH Energy and Bauer, where they had the chance to meet and pitch their start-up company ideas.
SUSTAINABLE ART CAR CHALLENGE
| STUDENT OPPORTUNITIES

UH Energy partnered with the City of Houston and CenterPoint Energy to create the Sustainable Art Car Challenge. This partnership challenged students to design a car for the 32nd Annual Houston Art Car Parade held on April 13th, 2019.

The competition was open to all current University of Houston students. Participants were required to create an Art Car design based of the EVolve partnership. The design was required to:

- Represent clean, sustainable transportation
- Be completely removable from the City of Houston’s Nissan Leaf following the parade
- Be built within the $2,500 design budget

In total, 2 teams of 5 students pitched their design ideas to UH Energy and CenterPoint Energy. The winning team was selected based on their creative concept and budget adherence. The winners then had a week to build their designs before they got to ride in their creation during the Art Car Parade.
SUSTAINABLE ART CAR CHALLENGE
| STUDENT OPPORTUNITIES
A South Korean delegation visited the University of Houston as part of the State Department’s International Visitor Leadership Program (IVLP) to learn about developments in technology and commerce for the global supply of liquified natural gas (LNG).

The objective of the visit was to fully explore the LNG market, learning more about technological opportunities and major issues. In addition to UH Energy’s Chuck McConnell, other representatives of UH Energy met with the delegation, including Ramanan Krishnamoorti, chief energy officer at UH.

Discussion topics ranged from trade patterns and market capabilities to investment opportunities and risks, along with the growing emphasis on sustainability. The delegation was interested in how carbon management, specifically carbon capture utilization and storage (CCUS) technology, might affect Korean coal and gas use for power generation.

“They recognized there is much to learn,” McConnell said. “Having a relationship with us and our Carbon Management Center was a big reason for them to make this visit, because they believe it could benefit their future.”
UH Energy’s booth at Sustainability Fest focused on the benefits of renewable energy, specifically wind. The booth included two miniature models of wind turbines and a volt meter to measure the wind. Students could guess how many windmills are needed to power one homes for a chance to win prizes.

In celebration of Earth Day, The Office of Sustainability at the University of Houston hosted the 6th annual UH Sustainability Fest on campus. Sustainability Fest educated the UH campus community about sustainability initiatives on campus and in the Greater Houston region. We strive to educate students—who are trailblazers in the making—to become mindful, resourceful, and sustainability-driven global citizens. Our goal is for exhibitors to showcase sustainability related efforts and engaging activities for the UH community.
In advance of OTC, UH Energy placed an ad in the Center for Public History's *Houston History* magazine. The entire issue was dedicated to the Offshore Technology Convention and detailed its 50 year history.

Additionally, UH Energy advertised specific times OTC attendees could meet our faculty and research experts in 5 issues of OTC 2019, which was handed out the day before and each day during the event.

**MEET OUR RESEARCH EXPERTS**

<table>
<thead>
<tr>
<th></th>
<th>MON - 05/06</th>
<th>TUES - 05/07</th>
<th>WED - 05/08</th>
</tr>
</thead>
<tbody>
<tr>
<td>AM</td>
<td>Robotics &amp; Automation</td>
<td>Early Kick Detection</td>
<td>Geosciences</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Experiments and Modeling</td>
<td></td>
</tr>
<tr>
<td>PM</td>
<td>Power Electronics</td>
<td>Carbon Management in Energy</td>
<td>Educational Programs</td>
</tr>
</tbody>
</table>

**EDUCATION. INNOVATION. PARTNERSHIPS.**

We are Houston’s Energy University.

[uh.edu/energy](http://uh.edu/energy)
UH Energy’s booth at the annual Offshore Technology Conference in Houston, Texas, spotlighted our education, research, and innovation initiatives. Partnered with the several energy related colleges, UH Energy was able to inform attendees about its current and upcoming activities including the new Engineering Katy campus and energy related programs and research. OTC is a great opportunity for students and researchers to network with industry professionals.
UH Energy and ABB, a multinational technological leader in robotics & automation, recently partnered to recruit UH students for an informative “mini-internship” experience. UH Students were part of a four-day educational and collaboration conference, called ABB Customer World 2019.

The experience included educational sessions that focused on developing helpful skills in young professionals and a visit to the 40,000 square foot Technology & Solutions Center. The students also had the opportunity to meet and network with industry executives and student ambassadors from different universities.

UH Energy’s Chuck McConnell was also part of a lunchtime panel “The Future of Energy”. This panel discussion focused on insights into how interwoven trends will play out and what the implications are for electricity utilities and their customers.
UH Energy hosted Industrial Engineering Masters students from the University of Applied Sciences Technikum Wien, Vienna, Austria on January 28, 2019. The group of 21 students and professors met and toured the University of Houston and met with various departments.

Dean Tedesco, Dr. Suresh Khator, and Dr. Lim hosted the group of students to discuss the capabilities of the Cullen College of Engineering Industrial Engineering Program. The group of students then toured the UH campus and finished their half-day at the university at the Texas Center for Superconductivity.
The Oil & Gas Career Conference presents students with an opportunity to visualize their career prospects in high school and hit the ground running once they start their college career.

Over 650 freshman and sophomore high school students from IPAA/ PESA Energy Education Center Petroleum Academies participated in the one-day Oil & Gas Career Conference organized by IPPA/PESA and hosted on the UH campus Oct 23.

The students had the chance to learn first-hand about the oil and gas value chain and STEM careers including business, engineering, landman and computer science from employees of leading energy companies, including ExxonMobil, Lowry Rhoads Associates, Occidental Petroleum, Oceaneering, Schlumberger, Shell and TechnipFMC.
UH Energy’s booth at Energy Day promoted UH Energy’s efforts on campus in a kid-friendly way! We continued to showcase that UH is the “Energy University” to the Greater Houston Area.

Energy Day is Houston’s largest FREE family festival showcasing exhibits focused on science, technology, engineering and mathematics (STEM). Energy Day featured exciting exhibits and interactive demonstrations to teach students and their families about various forms of energy and how through STEM education, they can find an exciting career in the energy industry. With the support of our local schools and energy experts, it’s our hope that students and families who attend can learn something new and develop an interest in STEM education.
CITY OF HOUSTON: ENERGY DAY | OUTREACH

ENERGY DAY

Education for the Energy City

- FREE, Family Friendly Festival
- Science, Energy, Technology, Innovation & Conservation
- Music, Fun Events, Prizes, Food & Games

Saturday, October 20, 2018
11 am - 4 pm
Sam Houston Park
1000 Bagby Street
Houston, Texas 77002
www.energydayfestival.org

Kathleen van Keppel
kvankeppel@consumerenergyalliance.org
713-337-8802

Consumer Energy Alliance
2211 Norfolk, Suite 410 Houston, Texas 77098
www.consumerenergyalliance.org

Follow Energy Day on Facebook and Twitter.

Energy Day is a Registered Trademark of Consumer Energy Alliance
Junior and senior high school students from the four Houston high schools which offer IPAA/PESA Energy Center Petroleum Academies competed in the first annual UH Energy Technology Challenge, racing remote controlled electric cars across the field of TDECU Stadium, powered by piezoelectric technology developed by NASA.

The students learned about piezoelectric materials’ ability to generate electric charge in response to applied mechanical stress, using the concept to harness energy.

The collaboration between UH Energy and IPAA/PESA provides high school students with the skills and knowledge they will need to succeed in high school, college and into the energy industry.
IPAA TECH CHALLENGE | OUTREACH
The Graduate School hosted the annual Graduate Student Orientation Tuesday, August 14, 2018. UH Energy was there to promote programs in energy and research centers, answer questions about what our office does, and educate graduate students about our events.
RESEARCH & INDUSTRY PARTNERSHIPS
UH Energy, in collaboration with the Division of Research, established the Center for Carbon Management in Energy. Dr. Ramanan Krishnamoorti and Professor Tracy Hester have been named co-directors of the center, with Charles McConnell as the Energy Center Officer.

The Mission of the Center for Carbon Management in Energy is to identify and develop conversion carbon management strategies applicable during the production and distribution of energy resources and products.

These carbon management strategies include, but are not limited to, carbon capture and utilization during energy production and distribution as well as negative emissions technologies.

To achieve this goal, the Center will:

• Identify, sponsor, and fund fundamental and applied research on technologies to help capture or offset carbon emissions during the production, development, distribution, and use of energy resources, as well as negative emissions technologies.
• Undertake and participate in academic research on the economic, political, and legal policies and tools needed to appropriately promote and govern the development and deployment of carbon management technologies in energy development and production as well as negative emissions technologies.
• Provide programs and resources to transparently convey the results of this research to the energy industry, the academic community, and the general public.
• Train the next generation of students and graduates to work in this field through the creation of innovative and effective academic programs and coursework.
UH Energy, in collaboration with the Division of Research, established the Consortium for Energy Corporate Social Responsibility. The companies participating in the Center for Carbon Management will also get the benefit of participating in the consortia.

The University of Houston, in collaboration with a consortium of energy companies, is advancing the practice of Corporate Social Responsibility (CSR) focused on the various sectors of the energy industry. We intend to educate and carry out research in collaboration with members of the Consortium for Energy Corporate Social Responsibility (CECSR).

The purpose of the CECSR organization is to enable a common platform for industry and academic subject matter experts to enable sharing of practices, development of common approaches, address many of the critical commercial and pedagogical issues, address critical research and deployment challenges that advance CSR knowledge and its translation to the energy business, all with the intent to advance the practice of CSR in the energy industry.

The initial focus of CECSR will be on:

- Development of methodology and approach for addressing the business case for practice of CSR in the upstream, midstream and downstream energy industry.
- Establishing processes and rubrics for CSR implementation in the various sectors of the energy industry
- Development of standards for CSR performance metrics
- Development of training materials and training of entry level, mature CSR professionals and energy industry executives.
UH Energy hosted a launch event for the Center for Carbon Management in Energy and the Consortium for Energy Corporate Social Responsibility. Faculty, students, and industry professional were invited to attend.

Oil and gas will remain a major part of the energy mix for many decades. When people have access to affordable energy, their standard of living is enhanced. However, the expectation is growing among general society and key stakeholders that the industry will provide oil and gas, reliably, sustainably, and with minimal environmental footprint.

This event announced two substantial efforts that UH Energy is launching to partner with the energy industry to integrate sustainability. The launch will include a keynote presentation by Dr. Sami Alnuaim, manager of petroleum engineering application services and the current president of the Society of Petroleum Engineers (SPE).

A panel discussion following the keynote speech will discuss Operationalizing Sustainability Vision with Dr. Ramanan Krishnamoorti (UH Chief Energy Officer), Dr. Sami Al-Nuaim (President SPE), and Ms. Flora Moon (Sustainability Director, Expressworks International) to be moderated by Mr. Trey Shaffer (Senior Partner, ERM).
Sustainability Means Survivability for the Oil and Gas Industry, World Abroad

Matt Zborowski, Technology Writer | 22 January 2019

Sami Alnuaim, 2019 SPE president, spoke at an event unveiling two new oil- and gas-related sustainability programs at the University of Houston.

What people don’t know about the oil and gas industry hurts the oil and gas industry. This goes for people outside the industry whose perceptions of extraction, distribution, and use are shaped by the relentless campaign against hydrocarbons, as well as those inside the industry who don’t truly realize the value they add to the world.

Sami Alnuaim wants to change the narrative while encouraging the industry as a whole to embrace sustainability. The 2019 SPE president was on hand 21 January at the University of Houston to welcome the launch of two initiatives aligned with his cause: the Consortium for Energy Corporate Social Responsibility (CECSR) and the Center for Carbon Management in Energy (CCME).
CECSR is headed by Suryanarayanan Radhakrishnan, managing director of UH Energy and clinical assistant professor of Decision and Information Sciences in the UH Bauer College of Business. The group of energy firms will promote the advancement of corporate social responsibility principles in the industry.

CCME is led by Charles McConnell, a long-time energy executive and former assistant secretary in the US Department of Energy. The organization will seek out and develop carbon management strategies, including carbon capture and utilization during production and transportation along with negative emissions technologies.

Both initiatives will fund and participate in research and encourage knowledge sharing in their respective areas.

**Spreading the Word**

Such programs are critical to the long-term viability of the oil and gas business. Explaining that the industry’s image doesn’t reflect all the good things it does, Alnuaim cited a survey published in 2017 by Ernst & Young in which a mere 25% of US teens polled had a positive view of oil as an energy source. In another example, he mentioned a crossword puzzle that appeared in a major US newspaper in which the answer to the clue “explosives used in fracking” was “TNT.”

As a result, traditional oil companies are removing “oil” from their names, in part, to attract younger talent who may be hesitant to join the industry. Keeping a steady inflow of young professionals and maintaining a license to operate will require an image transformation, said Alnuaim, who laid out a number of ways the industry is acting as a good global steward.

More than half of the world’s energy mix is oil and gas, which benefits not only the gross domestic products of countries that produce and export it, but also those that import and use it to generate additional GDP within their own borders, he explained. In one scenario outlined in BP’s 2018 Energy Outlook, world GDP is slated double by 2040, lifting 2.5 billion people from low incomes.

At the same time, the industry will have to keep pace with growing demand for oil and gas. And it is doing so by continuing to invest in exploration, development, and technologies—even through the downturn, as some $2 trillion was spent between 2012 and 2018—to ensure there will be adequate supplies. Demand from the transportation sector in particular will continue to rise despite growth in electric vehicle usage. This can be attributed to trucks, marine, and aviation, according to the outlook.

While oil and gas activity has continued to increase, safety metrics have improved dramatically in recent decades. “I don't think you can find any industry that can match our excellent performance when it comes to safety,” Alnuaim said.
Growth in carbon dioxide emissions is also declining. Enabled by hydraulic fracturing, abundantly produced natural gas in the US has supplanted coal as the country’s biggest source of electric power generation. But the International Energy Agency (IEA) forecasts 70% of additional global power capacity will come from renewables, a shift SPE supports and the entire industry should get behind, he said. In other words, both forms of energy should coexist.

Ultimately the industry remains the main driver in reducing energy poverty, which fell below 1 billion in 2017, according to an IEA estimate. But there’s still much work to be done in Africa, whose population is about that of North America and Europe combined.

**Making a Business Case**

One area where the industry has been roasted publicly is flaring. Alnuaim noted that, through the adoption and implementation of best practices, the industry has reduced flaring by 15% over the last 20 years even as production has increased. This is a problem, he said, that should be viewed from a business perspective. Outside investment in infrastructure in developing countries would enable excess gas to be used for power generation or petrochemicals, improving GDP and quality of life.

At Saudi Aramco, where Alnuaim is a more than 30-year veteran, the company is leading development of crude-to-chemicals technology to get more out of each barrel of oil. The firm and Saudi chemical giant SABIC last year announced plans to build a complex at Yanbu on the country’s west coast that will process 400,000 B/D of crude and produce 9 million tons/year of chemicals and base oils.

Along those same lines, Radhakrishnan said CECSR is emphasizing a business case in its advocacy of corporate social responsibility. If sustainability initiatives are all seen as costs, adoption of those initiatives will be much slower.

Alnuaim hopes to see progression of carbon capture and sequestration, an area of interest for CCME. While it has long been discussed as way to mitigate the industry’s carbon impact, the industry has been slow on the uptake due to the high costs associated with the technology.

However, Aramco has implemented CCS at Saudi Arabia’s giant Ghawar oilfield, where 800,000 tons/year of CO₂ is being injected in an effort to boost recovery. “The results so far are very, very promising,” he said, noting that it represents only 1% of the field. Extrapolating the technology across the field and to other massive fields globally would be a “game changer,” he added.
The Center for Carbon Management in Energy hosted a full-day workshop of the “Monetization of Carbon: 45Q - Technology, Policy, Legal” on Wednesday, June 12, 2019.

The event featured speakers from the marketplace that have insights from projects and experiences, providing opportunity for engagement during the presentations and networking activities throughout the day.

UH Energy captured videos of the full day of presentations that will be made available to the organizations in the CCME consortia.
EVolve Houston Partnership

| RESEARCH & INDUSTRY |

UH Energy has partnered with CenterPoint Energy and the City of Houston, along with other industry leaders, to create the EVolve Houston coalition. Their goal is to improve regional air quality and reduce greenhouse gas emissions in the Greater Houston Area.

**STEPS FORWARD**

EVolve Houston, launched in January 2019 with a kickoff breakfast at the Hotel Zaza, where stakeholders including industry and non-profit members, came together to hear Mayor Sylvester Turner champion the vision of Houston as a leader in electrified transportation.

This was followed by an Electric Vehicle Roadmapping workshop in May with City of Houston officials, University of Houston energy experts, and other partners that identified the drivers of electric vehicle adoption and brainstormed ideas to advance electric vehicle adoption.

Michael Conklin, External Engagement Manager for CenterPoint Energy and team member of the EVolve Houston effort, says that Houston’s love of business innovation is a key advantage for a high-technology region seeking to lead the energy transition.

“Electrified transportation is an ideal fit for energy companies seeking to lead the future of transportation, and Houston has the right stakeholders to be at the head of that evolution,” he said.

EVolve Houston is working to better our city in ways that ensure the long-term success and competitiveness of the Greater Houston Area. “Electric vehicles have a natural role to play, not only to improve our air quality, but to create a positive impact on the community and economic development of the city of Houston,” said Conklin.

Over the next few months, members of the EVolve Houston Coalition will participate in working groups to shape a practical implementation plan for the electrification of transportation. The issues the groups will focus on are directly related to key topic areas identified in the EV Roadmapping workshop.

The plans developed by the groups will be announced by Mayor Turner later this year.
Following the establishment of EVolve Houston, UH Energy hosted an Electric Vehicle Roadmapping workshop on May 7, 2019 with City of Houston officials, University of Houston energy experts, and other partners that identified the drivers of electric vehicle adoption and brainstormed ideas to advance electric vehicle adoption.

Over the next few months, members of the EVolve Houston Coalition will participate in working groups to shape a practical implementation plan for the electrification of transportation. The issues the groups will focus on are directly related to key topic areas identified in the EV Roadmapping workshop.
UH Energy in partnership with the UH Law Center’s Environment, Energy and Natural Resource Center, hosted “Negative Emission Technologies in the Energy Sector” workshop on September 14, 2018. The purpose of the workshop was to bring together industry and academia to discuss developments under Chatham House rules.

This workshop assessed the possible uses in the energy sector of negative emissions technologies such as biological energy carbon capture and storage (BECCS), direct air capture, and several other alternative technologies that can remove and utilize greenhouse gases from the ambient atmosphere. These technologies could potentially offset current emissions from energy production and consumption as well as reduce stockpiles of greenhouse gases in the atmosphere from historical energy production and other sources. It will also identify private governance and financial strategies to spur the development of desirable negative emissions technologies for use by the energy industry.

Invitees included climate engineering researchers, climate scientists, energy industry leaders, and experts in law, public policy, energy economics, ethics, philosophy, and risk analysis and communication.

BACKGROUND
With little fanfare or public attention, negative emissions technologies have grown into a key element of international and domestic strategies to combat climate change. In particular, the vast majority of computer models which identify successful pathways to attain the Paris Agreement’s 2°C goal (much less the more ambitious 1.5°C target) rely heavily on BECCS. Even if mitigation efforts drastically reduce current and future emissions of greenhouse gases, current concentrations of CO2 in the atmosphere from historical industrial activities would result in dangerous anthropogenic climate effects for centuries, if not millennia, into the future. The leading methods to address these current accumulations of carbon dioxide in a timespan relevant to human wellbeing are negative emissions technologies that can effectively and speedily reduce those concentrations.

The impact of these technologies on the energy sector, however, remains largely unexplored. Energy producers, both globally and in the United States, face increasing challenges the central role of fossil fuels in their current business models, including attempts to:

- limit the production and use of fossil fuels;
- require limits on emissions of greenhouse gases from energy generation units;
- impose mandatory offsets or netting of greenhouse gas emissions, including from niche market uses that are difficult to directly offset (e.g., aviation fuels);
• force restatements of reserves to reflect the risk of “stranded assets” of carbon-based fuels; and
• disrupt financing provided for capital investment to construct new manufacturing and energy production facilities.

The United States recently extended tax credits for carbon capture and sequestration technologies to include direct air capture technologies. This financial incentive could provide a substantial boost to research, development, and initial field testing of negative emissions technologies that may play an important role in future hydrocarbon energy development and use. In particular, the development and deployment of commercially viable negative emissions technologies could provide an important tool for the energy industry to manage its own greenhouse gas emissions and offset emissions from the use of its products that are difficult or impossible to control.

This workshop will evaluate the feasibility and aspects of integrating negative emissions technologies (and, if appropriate, other climate engineering technologies) as a component of energy production strategies. It will evaluate both technical aspects of incorporating negative emissions technologies into energy systems as well as potential governance options that they might create in the near future.

From this workshop, Tracy Hester of the UH Law Center published a white paper based on the conversation between attendees that took place that day, in addition to his own research.
UH Energy, in collaboration with Department of Industrial Engineering, conducted a research study on opportunities and challenges in the Permian Basin. This study assessed the ultimate outcome of this increased production. The key findings of the study were validated through conversations with industry, government and infrastructure leaders.

The study was made possible with sponsorship from Hastings Equity Partners.
Researchers from the University of Houston began a $1.4 million project to demonstrate using carbon dioxide captured from nearby petrochemical plants to boost oil recovery in a field in the Indian state of Assam, a project which will help to reduce the country’s carbon footprint.

The project is part of an ongoing partnership launched last year between the University and Oil India Limited, the Asian nation’s national oil company.

The initial phase, funded by $500,000 from Oil India, included the calculation by UH researchers that the company’s oil reserves are substantially higher than previously thought, as well as recommendations that increased production by 21 percent at one well alone, a first-year revenue increase of $4 million.

“This ambitious partnership has offered clear benefits for both Oil India and for the University of Houston,” said UH President Renu Khator. “Finding a way to safely meet the growing demand for energy in India and other parts of the world is a fundamental challenge, and we appreciate the opportunity for our faculty and students to play a vital role in solving such important real-world problems.”

The project is led by Ganesh Thakur, who was recruited by UH in 2016 as director of Energy Industrial Partnerships. A member of the National Academy of Engineering and a former executive at Chevron Corporation, Thakur also serves as Distinguished Professor of Petroleum Engineering.

He has overseen both Phase 1 of the partnership, cemented by a Memorandum of Understanding signed last year, and Phase 2, which focuses on demonstrating the effectiveness of flooding key oilfields in northeastern India with carbon dioxide, a technique that has been used to enhance oil recovery in the United States for 45 years.

Demand for energy is increasing in India, where the gross domestic product (GDP) is rising about seven percent a year, Thakur said. The country now imports more than 80 percent of its oil consumption, making it important to increase what it can produce domestically. The UH team is composed of a dozen people, from faculty members and post-doctoral researchers to graduate students, in disciplines including petroleum and chemical engineering and the geosciences.
Moreover, Thakur said the partnership also offers advantages for UH.

“It provides a good field research lab for us,” he said. “It allows us to take the challenges the oil industry is facing and provide an integrated solution.”

The carbon capture project will also include technical training for Oil India personnel on advanced enhanced oil recovery techniques and project design, along with a seismic study of the Makum-North Hapjan Field.

The initial project was completed in June with several key accomplishments:

UH research indicated the oil resources are about 20 percent higher in the key field of Oil India than previously thought.

Research-based production recommendations led to a production increase of 220 barrels per day from just one well, a 21 percent increase worth $4 million a year.

Fifty Oil India reservoirs were screened for enhanced oil recovery (EOR) opportunities; UH researchers also developed and patented a methodology to rank reservoirs and assess EOR potential. Researchers found the four top-ranked reservoirs have a potential for 17 million barrels of additional recovery.

UH field research discovered that drilling at a potential site would be uneconomic. The result was a savings of $4 million in drilling costs.
The Environment, Energy and Natural Resources Center (EENRC) at the University of Houston Law Center along with UH Energy, was asked to review the draft of the Hydrocarbons Code, document presented by BW Energy Gabon Pte. Ltd. on behalf of the Republic of Gabon.

Faculty Members from UH traveled to Gabon to present this information. The faculty members involved in this project were:

**Senior Advisors:**
Dr. Ramanan Krishnamoorti
Dr. Jamie Ortiz

**Faculty Experts:**
Prof. Jacqueline L. Weaver
Prof. Bret Wells
Prof. Tom Mitro

**Project Coordinators:**
Prof. Julian Cardenas
Dr. Alfonso de la Osa

The goals of this partnership are as follows:

- To analyze the above-mentioned draft that will promote off-shore oil and gas investments in Gabon.
- To review the appropriateness of its content and identify gaps from a fiscal and legal perspectives in relation to the most significant regulatory frameworks in Africa and other parts of the world.
- To recommend processes to address the gaps and recommend commensurate best practices with benchmarked fiscal and legal terms, contractual terms, and administrative regulatory aspects of the oil and gas industry in Gabon.
- To submit a final report in English and French by Monday, September 10th 2018.
UH Energy continues its partnership with IPAA/PESA’s Petroleum Academies throughout Houston. The participating high schools are Milby High School, The Energy Institute High School, Young Women’s Prep Academy and Westside High School. This partnership strengthens UH’s pipeline from high school, allowing us to develop and nurture relationships with future students, encouraging their interest in STEM and in the University of Houston.
The Energy Coalition is a diverse 15 member Executive Board student organization that works towards solidifying UH’s global position as The Energy University. The Energy Coalition was formed to bring together students from various colleges and organizations who plan to pursue careers in the energy industry. The Energy Coalition has 34 member student organizations and over 5,600 student members, both undergraduate and graduate, from six colleges across campus. We plan, promote, and organize huge events around campus with administrative support from UH Energy – Office of the President.

**Benefits**

- $1,000 Scholarship ($500 per semester)
- Networking opportunities at our Energy Career Fair, Corporate Dinner, Energy Banquet, and more.
- Mentorship from Senior Leaders in the Energy Industry; Visit UH Energy Advisory Board website to see mentors’ bio.
- Serve as Energy Ambassadors
- Professional development and leadership experience

**Eligibility Requirements**

- Full time student, with at least 1 year remaining
- Cumulative GPA of 3.2 or higher
- Energetic, outgoing, creative and organized, with outstanding verbal and written communication skills
- Preferred: Involved with student organizations or previous industry experience
- Preferred: Previous leadership and volunteer experience
Once a semester, the Energy Coalition Executive Board gets the honor and privilege to network with some of the top executives in industry who serve on the Energy Advisory Board. Over breakfast and coffee, we get the opportunity to learn from industry’s leaders and expand our understanding of energy. The Energy Advisory Board help guide us as we develop as young professionals and tackle the next challenges in energy.
Partnering with Williams in early September, the Energy Coalition hosted a BBQ Social where students had the opportunity to savor some good, smoky, Texas BBQ as they networked with Williams recruiters!
Equinor and in partnership with the University Career Services, the Energy Coalition hosted the 3rd Annual Energy Career Fair during the Fall Semester. Our Energy Career Fair is the only interdisciplinary energy focused career fair on campus. Our career fair has representation from over 40 corporate partners, and over 1,000 students form 34 different majors across 6 colleges on campus. The event’s success continues to grow and provides our talented UH students along with the best companies in industry with an incredible one stop shop platform to launch successfully careers.

The Energy Career Fair hosted over 40 companies within the industry and attracted over 1,000 students from six different college at the University of Houston. The event was successful as the fair provided students a platform to secure next step in their careers.
COMPANY INFORMATION SESSIONS | ENERGY COALITION

September 12, 2017 & April 17, 2018

Part of the Energy Coalition’s mission is to connect students from all majors with professionals in the energy industry. This past academic year, we hosted 2 information sessions, one with Equinor bringing out over 100 students. For the first time at UH, created by the benefits of interacting with EAB members during the breakfast meetings, the Energy Coalition hosted an information session with EAB member and Managing Partner Scott Nyquist of McKinsey & Company.

September 12, 2017 & April 17, 2018
Every fall, the Energy Coalition throws on all the red in our wardrobe to celebrate our dear old varsity! Partnering with our member organizations, we embody the Houston spirit putting on large tailgates as we celebrate our camaraderie!

September 22, 2018
Energy Night serves as an event to bring together over 300 students from our student organization members to learn from a selected group of our corporate sponsors about industry, their organization and careers. In early November, the Energy Coalition hosted an insightful series of talks from key executives from NOV and Telsa as we celebrate our students are the Powerhouse at the University of Houston. With great food and free giveaways, this is the night where we give back to the students while addressing key topics in industry.
The success of the Energy Coalition relies on the continuance of talented students who are ready to take their leadership abilities to the next level at the University of Houston. Our EC 101 Mega Mixer is a fun filled event open to all UH students to learn more about what the Energy Coalition is, what we do, and of the opportunities to apply for a board member position for the
In the continued partnership with our distinguished platinum sponsor Phillips 66, the Energy Coalition working along with the commercial supply & trading recruitment team at Phillips 66 planned and organized an exclusive opportunity for some UH’s brightest students to tour the exclusive Phillips 66 campus.

The event hosted over 50 students who took part in a panel discussion from Commercial Katalyst program graduates & recruits, a Market Outlook session hosted by CFO Kevin Mitchell, one on one resume review sessions with recruiters and participated in the “Crude Pursuit” trading simulation exercise.
Our 4th Annual Energy Banquet is a professional dinner that serves as our capstone for the year. We celebrate the accomplishments of The Energy Coalition, UH Energy, UH Students and the university towards President Khator’s energy initiative. We host our distinguished corporate sponsors with a

The banquet hosted over 300 guests to include students, faculty and industry professionals. The event provided an incredible opportunity for our student member organizations to network with over 20 companies in attendance as guest at their table. Highlights included keynote speaker Brian Mandell EVP of Marketing & Commercial and presentation of the winners from the E-90 Video Competition. The banquet was also the where the winners on the E-90 Video Competition were unveiled.
About

The Subsea Systems Institute (SSI) is a collaboration between the University of Houston, Rice University and the Johnson Space Center (NASA). The SSI has a focus on applied research to support translational engineering and technology development for offshore, deepwater exploration and production.

Mission

Economically develop engineering, science and policies to create safe and the most efficient technologies for offshore energy development. Provide unbiased third party validation to ensure public trust in the safe operation of offshore drilling and production.

Opportunities

The Subsea Systems Institute creates a major opportunity to form strong alliances between the academic/research sector, oil and gas and space industries, international organizations and other industries. These include:

- Major oil and gas operators
- Offshore equipment manufacturers and service sector
- Government agencies
- Industry trade organizations
- International research organizations

Contact

Subsea Systems Institute
ramanan@uh.edu
www.subseasystems.institute

Programs

Research & Technology:

- Utilize RESTORE Act and industry funding to support the collaborative development and validation of safe and efficient technologies for the exploration and production of hydrocarbons. Collaborative development requires inter-disciplinary and multi-institutional programs;
- Collaborate as partners with industry to develop new technologies that support the safe and economic development of deepwater resources.

Training and Certification:

- Training and courses for professionals, new employees and graduate students
A collaboration between the University of Houston, Rice University and NASA-Johnson Space Center. SSI pursues applied science and engineering technology development for hydrocarbon development of deep and ultra-deep water assets in the Gulf of Mexico and other regions

**MISSION:** Positively impact offshore safety and efficiency through engagement with industry to develop the best available technology and risk mitigation practices for the Gulf of Mexico; Support economic and workforce development in partnership with industry.

**CURRENT ACTIVITIES:**
- Subsea Power and Communications
- Robotics and Automation
- Drilling and Production Facility Monitoring: Seismic and Sonar Imaging
- Autonomous Underwater Vehicles (AUVs)
- Development of riser gas numerical models
- New test/research facilities

“This project was paid for [in part] with federal funding from the Department of the Treasury through the State of Texas under the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act).

The content, statements, findings, opinions, conclusions, and recommendations are those of the author(s) and do not necessarily reflect the views of the State of Texas or the Treasury.”

Ramanan Krishnamoorti
Director, Subsea Systems Institute
Summary: An integrated sensing technology based on pressure transducers, FBG sensors and piezoelectric transducers will be utilized to monitor the seal performance of bolted flanges.

Overview: Recent subsea oil leakage incidents originating at flanged connections are of great concern for the oil and gas industry. Now, more than ever, much attention is being given to the development of technologies that will monitor and minimize the failure of bolted flanges and bolted connections.

Need: Improved detection at subsea pipeline connections.

Key results: Will gain deeper insight into flange behavior under tensile and bending loads. Surface profiling scans will provide new information about the formation of leak paths while fiber optic sensors will show the distribution of loads around the flange as the flange is loaded to failure. Results from this test will help define and verify operational envelopes for pipeline flanges.

Dr. Gangbing Song
John and Rebecca Moores Professor of Mechanical Engineering
Director, Smart Materials and Structures Laboratory
University of Houston
Stress Wave Assisted Communications in Subsea Environments

Summary: A new stress wave based communication method using piezoelectric transducers will be introduced for subsea communication.

Overview: Through specially designed sensor nodes, data is gathered from subsea sensors, encoded into modulated stress waves and transmitted through manmade subsea structures as pipelines.

Need: Long distance underwater communication.

Outcomes: Follow-on activities funded by NSF ($1.2 MM).

Dr. Gangbing Song
John and Rebecca Moores Professor of Mechanical Engineering
Director, Smart Materials and Structures Laboratory
University of Houston
Hazard Mitigation and Facility Monitoring: Fiber-Optic Seismic Systems

Summary: Fiber-optic motion sensors, ocean-bottom seismometers and active sonar scanners used to assess drilling progress.

Overview: The goal of this project is to develop proof-of-concept vibration monitoring systems to improve the safety and efficiency of offshore drilling and production.

Key results: Successfully tested scaled wellhead leaks using ultrasonic scanning. Designed and surveyed with ocean-bottom nodes in the lab. Potential for marine microseismic and seismic imaging capability. Novel processing of sub-bottom sonar with drill core to determine sediment stratigraphy and hazard. Pipeline monitoring system using fiber-optic sensors (FBGs) for flow monitoring & seismic imaging.

Robert R. Stewart, Ph.D., P.G.
Director, Allied Geophysical Labs (AGL)
Cullen Chair in Exploration Geophysics
University of Houston
A Model-Based Real-Time Annular BOP Monitoring System

Summary: Focused on real-time health and risk assessment of annular blowout preventers (BOPs).

Overview: Develop a rigorous analytical approach to systematic blowout BOP monitoring using an adaptive model-based real-time strategy.

Need: To detect annular elastomer degradation, models that adaptively estimate the stiffness.

Key results: Predictive models to be developed. Well bore pressure detection.

Matthew A. Franchek, Ph.D.
Founding Director, Subsea Engineering Professor, Mechanical Engineering University of Houston
A Model-Based Real-Time Annular BOP Monitoring System

Summary: Focused on real-time health and risk assessment of annular blowout preventers (BOPs).

Overview: Develop a rigorous analytical approach to systematic blowout BOP monitoring using an adaptive model-based real-time strategy.

Need: To predict the response of BOPs under different operational conditions and to supplement existing experimental data with high fidelity analysis.

Key results: Characterization and high fidelity model of elastomers used in BOPs. High fidelity numerical simulations to compliment scarce test data. Nonlinear hyper-elastic reduced order model of a BOP to consider a wide range of conditions.

Matthew Brake, Ph.D.
Assistant Professor of Mechanical Engineering
Rice University
Gas in Riser: Modeling & Validation

Summary: Hydrocarbon Influx Behavior within a Deepwater Marine Riser - Implications for Design and Operations

Overview: The project’s goal is to develop a comprehensive assessment of the risks and consequences of influx of hydrocarbons entering the drilling riser. The research team seeks to develop a new computational model describing the response of hydrocarbons in the riser under different hydrocarbon influx situations, operating conditions and response procedures and implement that model in a computational code. Ultimately, the objective is to evaluate new technologies which can improve hydrocarbon detection and provide a comprehensive physical and practical understanding of events that can occur when hydrocarbons are introduced into an offshore drilling riser.

Key results:

Research Team:
Ramanan Krishnamoorti, Chief Energy Officer and Professor (UH)
Andrea Prosperetti, Distinguished Professor of Mechanical Engineering (UH)
George Wong, Associate Professor of Petroleum Engineering (UH)
Konstantinos Kostarelos, Associate Professor of Petroleum Engineering (UH)
Colin Leach, Mulberry Well Systems LLC
Remote Robotics for Unmanned Human Environments

Summary: Providing baseline proof-of-concept evidence that robotic assets can perform tasks normally done by humans in complex oil and gas environment.

Overview: Team will establish and work alongside an advisory council comprised of energy operations experts to ensure that robot task development and proof-of-concept tests are properly aligned to the needs found across the oil and gas sector, existing and future normally unmanned installations (NUIs), and potential space exploration assets.

Key results: Convened advisory council and developed roadmap for near-term achievements by robotic systems in the energy industry with input from UH, Rice, and NASA JSC subject matter experts. Specific tasks have been identified as 1.) SmartTouch Inspection System Integrated with NASA’s Valkyrie’s robot at Northeastern University, 2.) Close-Distance and Collision Avoidance and Maneuvering Using Multi-axis Magnetic Induction Coils and Computer Vision, and 3.) Interfacing Robots and Oil and Rig Platform Doors with SSI consultant John Allen of Allen Energy Solutions, LLC.

Aaron Becker, Ph.D.
Assistant Professor of Electrical Engineering
University of Houston

Dr. Gangbing Song
John and Rebecca Moores Professor of Mechanical Engineering Director, Smart Materials and Structures Laboratory
University of Houston

Dr. Zheng Chen
Bill D. Cook Assistant Professor of Mechanical Engineering University of Houston
Flexible Low-Temperature Lithium Ion Batteries for Subsea Applications

Summary: Design and fabricate polymer-based flexible and safe lithium ion batteries able to operate under subsea conditions. Potential applications include powering devices in underwater vehicles, emergency outage backup power, and subsea drilling structural energy storage.

Overview: Team will design and fabricate batteries that provide steady and long-term power and voltage at low temperature. Project goals are to boost the performance of the battery through enhancing the battery materials properties through novel material designs and high resolution and rigorous characterization techniques.

Key results: Will be to develop a thermo-electrochemical model and conduct the simulation at low temperature to validate the experimental results.

Dr. Haleh Ardebili  
Bill D. Cook Associate Professor of Mechanical Engineering, University of Houston

Dr. Rafael Verduzco  
Associate Professor of Chemical and Biomolecular Engineering, Rice University
SmartTouch: Towards Autonomous Subsea Robotics for Underwater Pipeline Inspection

Summary: Developing transformative robotic and SmartTouch sensing technology, that will lead to a time efficient and cost effective system for underwater pipeline inspection.

Overview: Team will develop SmartTouch sensing for pipeline structure inspection. The robotic manipulator will be designed to be dexterous for remotely operated vehicles (ROVs) to deliver SmartTouch sensors to complex pipeline structures. Force feedback sensing and grasping control for manipulator will be developed and comprehensive testing will be completed.

Key results: An integration of the robotic manipulator controls for ROV and latest structural health monitoring and inspection methods to automate pipeline inspection, including loosened connectors and deformed pipelines inspection. Pipeline structures will be safer, more economical, and more accurate.
The Subsea Systems Institute (SSI) is a collaboration between the University of Houston, Rice University and the National Aeronautical and Space Administration Johnson Space Center (NASA JSC). Established in 2015, the SSI was created under the RESTORE Act as a Texas Center of Excellence to lead research, develop training and educational programs to improve safety and reliability for offshore energy operations.

The SSI's objective is to develop innovative research that will lead to technology advancement to positively impact safe and reliable exploration in the Gulf of Mexico reservoirs. Currently, the Institute has funded two research teams and one initiative for its robotics focus.

Robotics and automation are lauded as the next generation of innovation in the industry, focusing on the advantages of efficiency and accuracy.

“The SSI's focus on robotics stems from their objective to reduce the safety-related risk for the people who work on offshore drilling rigs while enhancing production and operational performance in the Gulf of Mexico,” said Ramanan Krishnamoorti, UH Energy Chief Energy Officer and Director of the SSI.

**SmartTouch**

Zheng Chen, Bill D. Cook assistant professor of mechanical engineering, and Gangbing Song, John and Rebecca Moores professor of mechanical engineering, are working on a transformative smart touch sensing technology to innovate deep-water pipeline maintenance and improve safety.

Thousands of miles of pipelines are installed across the seabed of the Gulf of Mexico. These pipeline systems must be able to withstand years of high pressure and high-temperature conditions. Safety immediately becomes a major concern when unforeseen events can cause damage to bolted flanges and the welding that keep the pipes working smoothly.

“In a pipeline, you do not want leakage. When two pieces of a pipeline connect through the flanges, sometimes because of dynamic flows or ocean currents the pipe moves, and this flange sometimes becomes loose. We want to detect that at an early stage to prevent damage to pipeline infrastructure,” Song said.

There is an immediate need in the subsea industry to create technology that will better detect damage in subsea infrastructure in an accurate and cost-effective way. The SmartTouch technology aims to integrate innovative robotic manipulator controls, such as piezoelectric sensors for touch-based inspection of bolted joints and the latest structural health monitoring and inspection methods to automate remotely operated underwater vehicles (ROV).

The technology has been showcased in demonstrations at the annual Offshore Technology Conference. Researchers attracted the eye of several industry members including Baker Hughes, Schlumberger and ConocoPhillips, among others.

Currently, Chen and Song are working with the Department of Energy to submit a proposal on the subsea technology to further expand their research. Both professors emphasize the importance of SSI in their research.
“SSI provides us a platform so that we can collaborate and further develop our [SmartTouch] idea and possibly lead to commercialization with industrial partners. We both appreciate the opportunities from SSI,” Chen and Song said in a joint statement.

Autonomous vehicles will be able to prevent pipeline failures and mitigate the environmental damage caused by undetected pipeline damage. SSI’s second robotics and automation research team focuses on how to make ROVs move more efficiently.

Collision avoidance in Subsea

Aaron Becker, assistant professor in electrical & computer engineering and director of the Robotic Swarm Control Lab, is working on a multi-sensor navigation-aid system that will provide collision avoidance for multiple ROVs in high-risk subsea inspection jobs.

ROVs are essential to the subsea industry because they can be used to complete tasks that can be dangerous to human personnel. Since these robots are submerged in deep-water, they need cutting-edge technology that can allow robots to communicate their location with each other to prevent collisions between other ROVs and to protect subsea assets.

Becker and graduate students in his lab have designed and tested triaxial magnetic induction antennas, consisting of loops of copper wire bound across three orthogonal loops for underwater ROVs. These antennas are a cost-efficient solution to allow underwater assets to locate their relative range and orient themselves.

SSI’s funding provided Becker access to the materials he needs to test this technology and bring on student talent to collaborate in this project.

“We’ve got our first robot and our first set of antennas put together. We also have a team working on designing new amplifiers so that we can put more energy through the antennas and get a cleaner signal that can go farther,” Becker said.

The next steps for Becker’s research team are to test the model in a large volume of water at the Neutral Buoyancy Laboratory at the NASA JSC. They will be able to record data and then reconstruct robot trajectories using computer models to verify their findings.

They hope to eventually move into testing the model in seawater, where they can test the ROV model under different conditions and compare their findings.

Meanwhile, Becker says he is thrilled with the support the SSI has given his lab.

“The SSI gave us the opportunity to purchase some high-quality robots with potentials we don’t already have. It’s also given us the opportunity to augment my team of graduate students performing research in the lab.” Becker said. “This allows us to expand our key lab mission, which is to train exceptional people to be world-class engineers and researchers.”

Interfacing Robots and Oil Rig Platform Doors

With a focus on interfacing robotics and oil rig platform doors, the SSI will be rounding out its robotics initiative with the development of an expert steering committee. Select industry partners will engage with the SSI to explore the challenge of robots opening doors, develop a strategic roadmap to implement solutions, and mobilize the roadmap through appropriate manipulation technologies.

“This is a challenge that can impact multiple fields and could lead to the economic deployment of robotics in dangerous and hazardous locations,” said Krishnamoorti.

This specific scope of work will leverage the expertise of SSI partners from NASA JSC and Rice University, John Allen from Allen Energy Consultants, LLC, as well as UH faculty and students. Participating industry partners include Oceaneering, Total, DNV-GL, Mitsubishi, and Taurob. Demonstrations are expected to include tactile sensing/adaptations and machine learning with some focus on data mining and optimization.
Texas Commission for Environmental Quality projects:

**GAD#2 – Remote High Power for Subsea Emergencies**
- **Patents:** Provisional patent application related to polymer based flexible lithium ion battery for subsea applications.
- **Licensing:** Rice University has licensed the battery and supercapacitor technologies used in this work to Tubz, LLC, and HK Motors, Inc.
- **Industry Meeting:** Proposed May 30, 2018 (Oceaneering; Peter Moles)

**GAD#4 – Marine Drilling Hazard Mitigation and Production Facility Monitoring using Seismic and Sonar Imaging**
- **Publications:**


**GAD#5 – Autonomous Underwater Vehicles for Subsea Energy Applications**
- **Publications:**


• Presentations:
  In-Pipe and Swimming Robots in Oil & Gas: An Academic Perspective, Inspection and Maintenance Robotics Seminar, SPRINT Robotics Collaborative, Houston, 11–12 April, 2017.
  A Swimming Robot for the Inspection of Above-Ground Oil Storage Tanks, Inspection and Maintenance Robotics Seminar, SPRINT Robotics Collaborative, Amsterdam, the Netherlands, 25–26 September, 2016.

• Industry Workshop: June 14, 2017 (Various partners)

GAD#6 – Stress Wave Assisted Communications in Subsea Environments
• Publications:
  X. Tu, A. Song, and X. Xu, “Prefix-free frequency domain equalization for underwater acoustic single carrier transmissions”, IEEE Access, early access online, 2018.

• Patents: Provisional patent application filed related to pipeline connections and the method used to monitor for damage without the need for manual inspection.

• Subsequent Projects: Ultrasonic Inhibition of Biofouling

• Industry Meeting: March 23, 2018 (Innospection; Alessandro Vagata)

GAD#7 – Hazard Mitigation and Facility Monitoring Program: Fiber-Optic Seismic Systems
• Industry Meeting: Proposed April 2018 (Halliburton; John Maida)
Office of the Governor projects:

Project 1 - Development of High Power Density Fault Tolerant subsea Drives with Advanced Circuit Breaker

- Publications:


- Patents: Provisional patent application filed related to High voltage direct current (HVDC) fault interruption systems and methods.

- Industry Meeting: December 4, 2017 (various partners)

Project 2 – Leakage Monitoring in Pipeline Flanges

- Industry Meetings:
  o September 21, 2017 (various partners)
  o May 10, 2018 (various partners)
This document modifies Grant Award Number: 2000008864 between the Gulf Research Program of the National Academy of Sciences ("NAS") and University Of Houston ("GRANTEE").

THE PARTIES AGREE AS FOLLOWS:

1) The GRANT AMOUNT specified in the Grant Summary of the Grant Agreement is hereby increased by $550,134.00 from $392,196.00 to $942,330.00.

2) The EXPIRATION DATE specified in the Grant Summary of the Grant Agreement is extended from November 30, 2018 to November 30, 2019.

3) ARTICLE VI - REPORTING is deleted and replaced with the following:

Grantee shall submit 1) a mid-year financial report to be submitted by May 30, 2019, 2) an annual program report to be submitted by October 31, 2019, and 3) an annual financial report to be submitted by December 31, 2019.

All other Terms and Conditions that are not hereby modified are to remain in full force and effect.

UNIVERSITY OF HOUSTON

By: Beverly Rymer
Name: Beverly Rymer
Title: Executive Director, Office of Contracts and Grants
Date: 12/4/2018

NATIONAL ACADEMY OF SCIENCES

By: Kevin Hale
Name: Kevin Hale
Title: Director, Procurement Services & Subaward Administration
Date: 12/5/2018
Subsea Systems Institute participated in the Research and Development Showcase at the Offshore Technology Convention. SSI had several researcher’s rotate through the booth to speak to attendees about the research projects that are currently being worked on at UH. OTC provided an excellent opportunity for the researchers to network with industry professionals.
UH Energy’s exhibit at SpaceCom, Space Commerce Conference and Exposition, showcased the Cullen College of Engineering’s Subsea Engineering Department and networked with other exhibitors to promote UH Energy.
The Energy Advisory Board engages industry experts and leaders to advance energy education and research. Energy is one of the key initiatives of the University of Houston, together with the arts and health. Contributing to the University of Houston as “the energy university,” board members enhance research initiatives and energy education on campus and throughout the city.

Underscoring the commitment to make the University of Houston the “go-to partner” for energy-related research, innovation, and solutions, Khator has named global industry leaders to the Energy Advisory Board. “Our board is made up of acknowledged leaders in the fields of energy development, management and implementation,” Khator said. “I am delighted that they support UH’s efforts to address the diverse research and work-force needs of the energy industry.”

The Energy Advisory Board lends strategic guidance, external coordination, and resource development for UH Energy, and strengthens the University of Houston’s reputation across the industry. Members participate in committees to develop and to execute actionable plans in the areas of energy education, innovative research, and technology incubation. The focus is on four core areas: 1) upstream, 2) midstream and downstream, 3) alternative energy, and 4) environmental sustainability.
ENERGY ADVISORY BOARD | ADVISORS

David Adams
Senior Vice President of Completion and Production, Halliburton

Lynn Bourdon (M.B.A. '87)
Chairman, President and Chief Executive Officer, American Midstream Partners, LP

Mary Anne Brelinsky
President, EDF Energy Services

John Gibson Jr.
Chairman, Energy Technology, Tudor, Pickering, Holt Co.

Stephen M. Greenlee
President, ExxonMobil Upstream Business Development Company

John Hofmeister
Founder and Chief Executive Officer, Citizens for Affordable Energy

Alex Juden ('94)
Secretary and General Counsel, Schlumberger Limited

Elizabeth Killinger ('91)
President, NRG Retail and Reliant

Andy Krieger
Head of Global Wells Organization, BP America

Greg Leveille
Chief Technology Officer, ConocoPhillips

Carri Lockhart
Senior Vice President, US Offshore, Statoil

William Maloney
Director, Trident Energy and Energy Advisor, Warburg Pincus
Derek Mathieson  
Chief Marketing and Technology Officer, Baker Hughes

Ajay Mehta  
General Manager, New Energies Research & Technology  
Shell International E&P

Joseph Mills ('92)  
President and Chief Executive Officer, Samson Resources II, LLC

Kevin Mitchell  
Executive Vice President and Chief Financial Officer, Phillips 66

Tanner Moran  
Managing Director, Hastings Equity Partners

Kieth Mosing  
Chairman and Chief Executive Officer, Mosing Group

Clay Neff  
President, Chevron Africa and Latin America Exploration and Production, Chevron Corporation

Scott Nyquist  
Chair, Student Success Sub-Committee and Senior Partner, McKinsey & Company

Bob Patel  
Chief Executive Officer, LyondellBasell

Mark Potter  
Chief Technology Officer and Director of Hewlett Packard Labs, Hewlett Packard Enterprise

H. David Ramm  
Chairman and Chief Executive Officer, BrightSource Energy Inc.

Corbin Robertson Jr.  
Chairman and Chief Executive Officer, Natural Resource Partners LP
Clay Williams
Chairman, President and Chief Executive Officer, National Oilwell Varco, Inc.

Lee Tillman
President and Chief Executive Officer, Marathon Oil Corporation
Selected from nine colleges across campus, the fellows work in collaboration with UH Energy and the Energy Advisory Board to shape the conversation on energy at UH and beyond. The fellows serve a term of one full academic year and contribute to an online blog forum hosted by UH Energy and Forbes.

Victor Flatt  
Environmental Law, Law Center

Lori Hathon  
Petroleum Engineering, Cullen College of Engineering

Mimi Lee  
Curriculum and Instruction, College of Education

Mark Meier  
Physics, College of Natural Sciences and Mathematics

Pablo Pinto  
Political Science, Hobby School of Public Affairs

Bruce Race  
Architecture, Gerald D. Hines College of Architecture and Design

Christiane Spitzmueller  
Political Science, College of Liberal Arts and Social Sciences

Sissy Wong  
Curriculum and Instruction, College of Education
<table>
<thead>
<tr>
<th>DATE</th>
<th>TOPIC</th>
<th>Authors</th>
</tr>
</thead>
<tbody>
<tr>
<td>7-29-19</td>
<td>The Permian is Booming. Now What?</td>
<td>Ramanan Krishnamoorti &amp; Radha Radhakrishnan</td>
</tr>
<tr>
<td>7-17-19</td>
<td>Energy Innovation Requires Critical Thinking. Here’s How to Build That.</td>
<td>Sissy Wong</td>
</tr>
<tr>
<td>7-8-19</td>
<td>Transforming Energy Education in the Digital Age</td>
<td>Mimi Lee</td>
</tr>
<tr>
<td>6-28-19</td>
<td>No More Business As Usualy for Oil &amp; Gas Companies</td>
<td>Pablo Pinto &amp; Ryan Kennedy</td>
</tr>
<tr>
<td>6-19-19</td>
<td>A Personal View of the Transportation Revolution</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>6-13-19</td>
<td>We Have to Change How We Teach Science for the Future Energy Workforce</td>
<td>Sissy Wong</td>
</tr>
<tr>
<td>6-6-19</td>
<td>Alberta Repealed Its Carbon Tax. Now What?</td>
<td>Bret Wells</td>
</tr>
<tr>
<td>6-5-19</td>
<td>A Novel Approach to LNG Contracting</td>
<td>Chris Ross</td>
</tr>
<tr>
<td>5-21-19</td>
<td>Self-Driving Automobiles: How Soon and How Much?</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>5-13-19</td>
<td>Is Russia Preparing A Gas Nuclear Option?</td>
<td>Paul Gregory</td>
</tr>
<tr>
<td>4-24-19</td>
<td>The Plastics Recycling Conundrum: Technology, Economics, and Human Behavior</td>
<td>Ramanan Krishnamoorti</td>
</tr>
<tr>
<td>4-19-19</td>
<td>Energy and Cybersecurity: What a Difference a Decade Makes...</td>
<td>Chris Bronk</td>
</tr>
<tr>
<td>4-17-19</td>
<td>Self-Driving Autonomous Vehicles: Two Visions of the Future</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>3-11-19</td>
<td>The Global Warming Hiatus: Making a Mountain Out of a Mole Hill</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>2-28-19</td>
<td>Dual Use LNG Shipping: A Gamechanger for Carbon Management</td>
<td>Ramanan Krishnamoorti</td>
</tr>
<tr>
<td>2-27-19</td>
<td>Connecting People to the Grid in India Isn’t Enough</td>
<td>Ryan Kennedy</td>
</tr>
<tr>
<td>2-21-19</td>
<td>It’s Not Just the Permian. Super Basins are a Global Phenomenon</td>
<td>Charles A. Sternbach</td>
</tr>
<tr>
<td>2-11-19</td>
<td>Merkel Salvages Nord Stream, But is Putin Losing Russia’s Gas Market</td>
<td>Paul Gregory</td>
</tr>
<tr>
<td>2-8-19</td>
<td>What You Should Know About the Green New Deal(s)</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>2-1-19</td>
<td>Not Enough Talent for the Energy Workforce? Energy’s Diversity Problem May be the Solution</td>
<td>Christiane Spitzmueller</td>
</tr>
<tr>
<td>1-30-19</td>
<td>Fact Checking the Claim of a Major Shift in Climate Change Opinion</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>1-23-19</td>
<td>Carbon Emissions Still Climbing. History Shows Us What We Need To Do</td>
<td>Bob Talbot</td>
</tr>
<tr>
<td>1-4-19</td>
<td>Policies Or Technology? The Key To A Sustainable Energy Future</td>
<td>Charles McConnell</td>
</tr>
<tr>
<td>11-13-18</td>
<td>A Disaster That Could Have Been Minimized, But Wasn’t</td>
<td>Bob Talbot</td>
</tr>
<tr>
<td>11-1-18</td>
<td>The Party for Oil &amp; Gas</td>
<td>Bob Talbot</td>
</tr>
<tr>
<td>10-26-18</td>
<td>Is There A Link Between A Warming Climate And The Increase In Severe Weather?</td>
<td>Bob Talbot</td>
</tr>
<tr>
<td>10-15-18</td>
<td>Climate Change and Cities: What We Need to Do</td>
<td>Bruce Race</td>
</tr>
<tr>
<td>10-3-18</td>
<td>On a Knife Edge: Balancing Supply And Demand In A Changing World</td>
<td>William Maloney</td>
</tr>
<tr>
<td>9-14-18</td>
<td>Negative Emissions Technologies: Has Their Time Arrived?</td>
<td>Tracy Hester &amp; Ramanan Krishnamoorti</td>
</tr>
<tr>
<td>9-7-18</td>
<td>Exactly How Much Has the Earth Warmed? And Does It Matter?</td>
<td>Earl J. Ritchie</td>
</tr>
<tr>
<td>8-22-18</td>
<td>Proximity Counts: How Houston Dominates the Oil Industry</td>
<td>Bill Gilmer</td>
</tr>
</tbody>
</table>

Number of total reads 2018-19: 381,479
In addition to being published on the Forbes website, UH Energy has created an annual, printed archive of all the blog posts. During the 2017-2018 academic year, 31 blogs were published and had a total of 381,479 views on Forbes.com. As of August 2018, the UH Energy Forbes blog have been viewed 1,061,279 times.
UH Energy creates an annual, printed catalogue detailing all academic programs that lead to a career in energy. This 120-page publication includes detailed program plans for the 30 energy-related undergraduate and 46 graduate and professional programs.
This year, UH Energy created an undergraduate program overview for high school students exploring UH degree programs, career opportunities, and average starting salaries. This book gives them the ability to learn about various UH programs and make informed decisions about their future career path.

A peek inside!
The UH Energy Connections Newsletter features and recognizes faculty and students for notable achievements in research, education, innovation, and outreach. The monthly newsletter reaches over 2,000 people and is a great way for students, faculty, researchers, and industry to connect and to keep in touch with the UH Energy community. In AY19, UH Energy distributed 12 Connections newsletters.

UH Energy Launches EVolve Houston in Collaboration with CenterPoint Energy and the City of Houston

UH Energy has partnered with CenterPoint Energy and the City of Houston to advance clean transportation in a coalition called EVolve Houston. They aim to promote the use of electric vehicles to improve regional air quality.

Read UH Energy's Latest White Paper

The Role of Hydrogen in the De-carbonization of the Energy Industry

Major Impact or Hype Paper?

Authored by the Galveston Energy Management Institute in collaboration with UH Energy

With the growing importance of data science in the energy industry, the Hewlett Packard Enterprise Data Science Institute seeks to collaborate with industry to prepare students for the challenges of a rapidly changing field.

How the Data Science Institute’s academic programs aim to build the next generation of skilled energy leaders

With the growing importance of data science in the energy industry, the Hewlett Packard Enterprise Data Science Institute seeks to collaborate with industry to prepare students for the challenges of a rapidly changing field.

Subsea Systems Institute Advances Robotics Innovation in Gulf of Mexico Offshore Exploration

The Subsea Systems Institute (SSI) funded two research teams and one initiative for its robotics focus. These projects reduce safety-related risks and enhance operational performance while advancing technological innovation in the Gulf of Mexico.

Read MORE

UH Team Wins World Finals of AAPG Imperial Barrel Award

A team of five Ph.D. and M.S. students from the University of Houston’s Department of Earth and Atmospheric Sciences won the World Finals of the 2019 American Association of Petroleum Geologists (AAPG) Imperial Barrel Award (IBA) Competition.

Want to Recruit at the Energy Career Fair? Join Us on September 4th, 2019

Interested in networking with students who have a passion for ENERGY? Attend this event, a collaboration between Energy Coalition and University Career Services to network with students and build your recruitment pipeline.

Read MORE
This year, UH Energy created our White Paper Series. This series is a collaboration of research reports examining pertinent topics throughout the energy sector and aims to provide leaders from industry, nonprofits and regulatory agencies with information they need to navigate the changing energy landscape. The White Paper Series is focused on distilling information on a variety of energy-related topics in a way that can help industry leaders prepare for the future.

conversation [Opinion]

By Ed Hirs
Dec. 29, 2018  |  Updated: Dec. 30, 2018 7:16 p.m.

A horse grazes near Calpine's Brazos Valley Power Plant in Richmond, Texas. The company has a fleet of natural gas fired plants and is uniquely suited to take advantage of the demands for cleaner-burning electricity generation. Jim Olive Photography

Photo: Calpine / Calpine

2020 is a year away, and we don’t expect major changes in the energy markets. However, the forces already driving toward 2070 will be more entrenched - the displacement of coal by natural gas, liquified natural gas exports stabilizing the world market for natural gas and displacing oil in the developing world, and a growing confidence that evolving technology will accelerate the use of wind and solar. 2020 is an election year, and local
DOWNTOWN 2020: Finally, an intentional design

ECONOMY 2020: Prepare for fundamental shifts

MUSEUMS 2020: Expect a Museum District transformed

FARKS 2020: Investments will start paying off

TRANSPORTATION 2020: From freeways to scooters, transit will get disrupted

In 2020, the volatile price of oil will still depend on geopolitical events and manipulations by OPEC in concert with Russia. The threat to Houston is that increased world oil production will again endanger offshore oil, shale plays and the Permian Basin. Sustained oil prices through to 2020 will require OPEC and Russia to continue to cede market share. Furthermore, with oil priced above the equivalent of cleaner natural gas, OPEC and Russia will cede oil’s market share to cheaper natural gas around the world. By 2020, the costs of that strategy will be apparent, and lower oil prices will be in the offing.

For Houston in 2020, continued low-cost natural gas will produce the electricity to charge electric vehicles around the nation and provide the feedstock for continued growth of petrochemicals, plastics and fertilizers.

Electricity development in the United States and around the world will rely more on micro grids, which provide greater operational reliability for assimilating renewable energy and energy storage technologies. Even today, wind and solar electricity coupled with available energy storage techniques are on a trajectory to be cost-competitive with legacy electricity generation.

As the hub for energy technology research and development, Houston will continue to draw employment and energy investment capital in 2020.

Hirs is a University of Houston energy fellow and energy economist, and managing director of Hillhouse Resources, LLC.
Any Green New Deal must involve the oil industry [Opinion]

By Charles McConnell

Jan. 24, 2019 | Updated: Jan. 24, 2019 10:26 p.m.

Fog blankets a low-lying area where pumpjacks operate in West Texas, northeast of Kermit, on Sept. 12, 2018. In December 2017, companies in the Permian Basin _ an ancient, oil-rich seabed that spans West Texas and southeastern New Mexico _ increased production by 21 percent, helping push U.S. oil output to a 13-year high.

The Green New Deal sounds great _ a United States fully powered by renewable energy sources within a decade or so. Everyone should embrace the low-carbon future now, right?

But hard things are hard, and making that transition, especially on a global scale, will be no different. That's why we must strive to reduce fossil fuel emissions while also making our entire energy supply more efficient, reliable and cost-effective, as well as
The world’s population is projected to grow by nearly 3 billion people over the next 50 years, and most of the growth will occur in what is now the developing world. Those people will need energy to enable economic growth and a rising standard of living. In the meantime, the Western World is becoming more energy intensive every day. Worldwide energy demand is projected to double in 50 years.

Global forecasts project that fossil fuel consumption will hold steady at 80 percent of the energy supply over the next half-century due to this growth in demand. Renewables will grow significantly, particularly in the United States and other developed nations, but much of the developing world will choose fossil fuels such as coal, oil and gas because they are the most accessible and affordable. Their first order is providing access to energy, not preventing climate change.

This may sound like a cop out to people calling for an end to fossil fuel use. It isn’t. It is a recognition of the challenges to powering the world into the future.

But clearly it can’t be business as usual, and the industry has begun to recognize that. Concerns about climate change, including emissions of carbon dioxide and methane, pose a serious risk to a sustainable future. In releasing its State of American Energy report earlier this month, the American Petroleum Institute acknowledged the risks and touted industry’s voluntary efforts to reduce emissions.

It’s not just talk. Sami Al-Nuaim, president of the Society of Petroleum Engineers, recently addressed members of industry and academia at the University of Houston, discussing the organization’s initiatives to protect the environment.

New regulations, including tax credits, are needed to encourage investment. Carbon taxes and cap-and-trade schemes are being discussed, and methane emissions controls
expense to valuing carbon management as an asset to the bottom line.

Companies are beginning to see sustainability as critical for their shareholders, their employees and the countries where they do business. Investment in renewable technology development is part of that, from solar farms to wind, algae, biomass and other forms. But they must also aggressively address their own existing carbon footprints. It’s good for business because it is good for the environment.

In fact, we won’t be able to reduce global emissions and address the goals of the United Nations International Panel on Climate Change without the active involvement of the oil and gas industry. That’s because the scale and capability of the industry is essential to the solution. Transformation will be enabled by research partnering with universities and the support of the state and federal government, but these industries hold the key to energy sustainability.

No amount of government intervention and “stick” will be as effective as the “carrot” of a sustainable future and a position as leaders in the global market.

Houston is the energy capital of the world. Its leadership, from industry to academia and public policymakers, must embrace our future and enable the transformation of our energy reality. That reality requires that we don’t choose either/or but use all forms of energy to make our future bright.

_McConnell, a former U.S. assistant secretary of energy, is executive director of the Center for Carbon Management in Energy at the University of Houston._
of the world

By Charles McConnell
May 16, 2019  |  Updated: May 16, 2019 6:58 a.m.

Houston can lead the effort to meet the world’s energy need while reducing greenhouse gases, the author argues.

Photo: PAUL ELLIS, Contributor / AFP/Getty Images

The global demand for a low-carbon future is undeniable. Scientific research, opinion pieces, political speechmaking and the global marketplace are all speaking loudly. The question is how? At what pace? At what cost?

And despite all the talk, the real leadership will be shown through actions to reduce greenhouse gas emissions while also meeting the growing global demand for energy.
pipelines, transmission lines, storage tanks, rail and port access - that will be required if we are to transform carbon emissions into viable commercial products.

Texas contributes significantly to the energy mix and products demanded by modern life. Globally the economic uplifting of entire countries and the continued growth of population and prosperity means that demand for energy and material goods will continue to grow, and we must ensure that these products remain affordable and become more environmentally friendly. The solution will largely fall to the energy industries in the states and countries that produce energy to embrace this future as an opportunity.

On Houston Chronicle.com: Renewables presence expands at OTC

That means Houston, and Texas, will be critical to success. And we have the good fortune to have forward-thinking, global energy companies that recognize this coming change. Virtually all of them have a strong presence in Houston.

Texans know renewables are important, today and for the future, as the state produces more wind-generated electricity than all but six countries. The amount of solar is growing rapidly. We must strategically integrate all sources of renewables and promote electrification via clean sources of energy. This is not simply good for the environment - it will offer benefits to consumers and create value for the industries.

Texas also consumes twice as much oil, gas and coal as any other state, by virtue of our large manufacturing base, so it falls to us to create this transformation to a low-carbon future.

This transformation will require more than the efficient and lower carbon production and generation of energy. For example, Texas has led the country in the integration of industry with infrastructure and demonstrated how to reduce and capture CO2 emissions in a way that is both cost-effective and useful, storing carbon dioxide in geologic formations and using it for enhanced oil recovery.

Carbon Capture Utilization and Storage (CCUS) has been practiced for over 50 years in Texas, used both in the Permian and East Texas for enhanced oil recovery with great
We must invest in transformative technologies that will allow us to view carbon and methane as not simply a waste to be disposed of, but an opportunity to lead the nation in both eliminating emissions and creating value.

That won’t happen on its own. It will require new policies promoting investment and restructuring of the marketplace. We must all work to create a new energy ecosystem, not just new technologies to capture emissions, but to also produce lower-carbon fuels and products that can be differentiated and compete globally. It is not about choosing the “right” technology or product, but about incorporating all forms of fuels and technologies for both renewable and hydrocarbon-based energy while also lowering emissions.

**On HoustonChronicle.com:** Giant sucking sound: Technology removes carbon from atmosphere

Texas must embrace this immense opportunity to leverage our universities, energy companies and marketplace to take advantage of our world-leading energy infrastructure. If we get it right, we can become a playbook for the rest of the world. We can walk the talk here and accelerate the transformation that will benefit everyone.

There is no more important global challenge, no more important time and no more important place than Houston. Real sustainability requires meeting the growing global demand for energy and reducing greenhouse gas emissions significantly, as well as assuring energy is affordable and reliable for all. Houston and Texas must become the Sustainable Energy Capital of the World.

**Fuel Fix:** Get energy news sent directly to your inbox

*Charles McConnell, a longtime energy executive and former U.S. Assistant Secretary of Energy, is executive director of the Center for Carbon Management in Energy at the University of Houston.*
Continued industrial and population growth in Texas are arguments for more electricity generation capacity. Oddly, ERCOT and the Texas Public Utility Commission prefer to instead rely upon very costly transmission lines even when less expensive new generation capacity is available.

Photo: Tony Gutierrez, STF / AP

The Texas electricity market is rife with market manipulation and major disincentives for generators to maintain a reliable supply of power. The latest examples of this have become public in recent days, a state of affairs that costs Texas consumers real money each year.

It is time to rewire the Electric Reliability Council of Texas, or ERCOT.

The partially deregulated market that ERCOT controls — representing about 90 percent of the state's electric load — began in the early 2000s. At that time, there was an oversupply of generation capacity, and pricing regulations guaranteed profits to the generators, transmission companies and the local distribution companies that produced and delivered electricity to Texas consumers.

As “deregulation” took effect, the generators (but not the transmission companies or local distributors) were shoved into a so-called competitive market, in which they offer to sell electricity at a competitive price. Coal-fired plants, natural gas plants, nuclear plants and the nascent but heavily subsidized renewable electricity generators bid to provide electricity each day.

ERCOT — a nonprofit subject to oversight by the Texas Legislature and the state's Public Utility Commission — regulated the entry of new companies generating electric power. ERCOT could also delay, if not actually prevent, the exit of older generators. At that time, the low price of natural gas allowed gas-fired generators to undersell the costs of the legacy coal plants and nuclear plants — a state of the market that continues with today’s low-priced natural gas.
For ERCOT, peak demand occurs in August, when most generators can expect to be called into service, especially on days like we’ve had recently when demand surges. However, throughout the rest of the year, many of these power plants sit idle and thus are not earning revenues. More and more of these idle electricity power plants are closing. That reduces the safety margin for the grid, making it less likely we will have enough electricity for really hot days.

The market environment has changed.

ERCOT is the sole buyer in the market, creating what economists call a “monopsony.” A monopsony strongly resembles the old Soviet Union’s command-and-control economy, in which the industry bureau controlled who would produce electricity and how the electricity would be priced.

Monopsony markets lead to low prices. In ERCOT’s case, these low electricity prices mean that it is uneconomic to build most new generation capacity, even as legacy generating plants cannot cover their costs even when they are generating electricity.

The advent of less expensive sources of electricity via natural gas and wind-generated electricity – Texas is by far the largest producer of wind energy in the U.S. – further squeezes those legacy generators.

ERCOT’s regulated market provides for prices up to $9,000 per megawatt hour, supposedly as an incentive for generators to build new capacity and join the ERCOT market. However, it does not work that way. In fact, generators have the opposite incentive – closing down their power plants and withholding power in order to drive prices higher.

While blatant collusion in U.S. markets is illegal, the Houston Chronicle’s L.M. Sixel has detailed multiple instances of market manipulation. The incentive to remove supplies from the grid is so well recognized that there is booming business in residential and industrial backup generators. In Houston, CenterPoint sells such generators while
Continued industrial and population growth in Texas are arguments for more electricity generation capacity. Oddly, ERCOT and the Texas Public Utility Commission prefer to instead rely upon very costly transmission lines even when less expensive new generation capacity is available. An example is the decision to approve the fully regulated Houston Import Project transmission line that has absolutely cost consumers more than the less-expensive generation facilities proposed by Calpine and NRG at the time.

What can be done?

Texas should leave its Soviet-style ERCOT market in the dustbin of history. ERCOT must allow all of the generators who are necessary to supply the grid at peak times to earn profits. There are two ways to do this. Both will cost consumers more at the meter but less than buying a generator to power their own homes and businesses when the grid fails, and certainly less than the cost of a power blackout.

The first approach is to install a valid capacity market. Under this approach, a generator will be paid to stay idle on the sidelines for most of the year. In our baseball analogy, all the Astros players on the bench and in the minor leagues will be paid just because they
rate of return to all market participants, including generators. This approach would likely cost more over time because the older, more expensive coal-fired plants would then have incentives to remain in business and prevent the entry of less expensive natural gas and renewable energy plants.

In 2013, a colleague and I predicted that the ERCOT market would deteriorate, with less capacity and more manipulation at the expense of consumers. That is happening, just as we predicted. But there is still time to act.

Hirs is Energy Fellow for Natural Resources at BDO, an accounting and advisory firm, and a lecturer at the University of Houston.
UH ENERGY
2018 MARKETING & BRAND Plan
The University of Houston’s vision is to be recognized as The Energy University – the leader for energy related education, research and innovation.

A coordinated and effective set of activities driven by a well thought out strategy is critical to achieve the milestones towards achieving the vision. Equally important to achieving the vision is an effective marketing and branding strategy and implementation plan to ensure that the target audiences are aware of and value the progress being made by UH and UH Energy.
MARKETING AND BRANDING STRATEGY

Over the past decade, the reputation of the University of Houston and its programs have grown immensely. According to the US News & World Report, the number of nationally ranked programs at UH under the UH Energy umbrella has grown from 2 to 3 over the past year, a growth of 100%.

I. Audience Segmentation

Students (Future, Current and Alumni)
Faculty & Staff
Industry & Commerce
Community & Decision Makers

II. Goals

Thought Leadership: Establish UH Energy as the exemplar in Energy Thought Leadership. Examples include UH Energy Blog; Energy Symposia; TV, Radio and Newspaper Opinions and Editorials. These venues would be aimed at local, national and global audiences
Performance Metrics:
• Number of blogs
• Overall number of blog reads
• Number of Registered Symposium attendees

Energy Education: Improve student quality and student success in energy related educational programs. The targets include High School Advisors; High School Students; Top Graduate Programs (Academia); Industry Groups including Young Professionals; UH Students and Alumni
Performance Metrics:
• 6-year Graduation Rates
• Enrollment in E&S Minor
• Number of top performing programs (Top 50 in USNWR)

Research & Innovation: Establish unique and strategic partnerships in research and innovation to partner with industry and impact economic development. Targets include Industry partners; Government and Funding agencies, Academic programs; Research First Look; Website; Journal Publications; Start-ups; Business Incubator
Performance Metrics:
• Total Research Expenditures
• Industrial Research Expenditures
• Number of Patents Issued

Internal Strategic Leadership: Ensure synergy of UH Energy’s efforts with key internal groups and leaders and help advance UH’s energy related portfolio. Key administrators & faculty leaders; Identification of clusters of faculty; Faculty and research staff growth
Performance Metrics:
• Energy Coalition numbers

III. Peer Groups

MIT
University of Texas
A&M
Oklahoma University

IV. Continuous Improvement

Impact Assessment
Re-prioritize
Target & Outlet Reassignment
University of Houston is ranked #171 in National Universities. Schools are ranked according to their performance across a set of widely accepted indicators of excellence.

#171 (tie) in National Universities  
#148 (tie) in High School Counselor Rankings  
#91 (tie) in Top Public Schools  
#53 (tie) in Business Programs (Undergraduate)  
#87 (tie) in Engineering Programs (Undergraduate)  
#59 (tie) in Best Law Schools  
#69 (tie) in Best Engineering Schools

Online Programs Rankings  
#19 (tie) in Best Online Graduate Education Programs

National Law Journal 2019 Rankings  
Ranked UHLC #29 in Go-To Law School list
Energy Coalition Member Organizations

- AAD (American Association of Drilling Engineers)
- AAPG (American Association of Petro Geologists)
- ABC (Association of Builders and Contractors)
- ABSA (Asian Business Student Association)
- ACS (American Chemical Society)
- AIAS (American Institute of Architect Students)
- AIChE (American Institute of Chemical Engineers)
- AMA (American Marketing Association)
- AMS (American Meteorological Society)
- The Accounting Society
- ASME (American Society of Mechanical Engineers)
- Bauer Supply Chain Student Association
- Beta Alpha Psi
- Bauer Women Society
- Energy Association
- Economics Society
- Finance Association
- Geosociety
- Hispanic Business Student Association
- IASA (Interior Architecture Student Association)
- Internal Audit Student Association
- Investment Banking Scholars Club
- MAES: Latinos in Science & Engineering
- MBA Energy Club
- NSBE (National Society of Black Engineers)
- The National Society of Collegiate Scholars
- The National Society of Leadership and Success
- Omega Chi Epsilon
- SASE (Society of Asian Scientist and Engineers)
- SEG Wavelets
- SES (Subsea Engineering Society)
- SHPE (Society of Hispanic Professional Engineers)
- Student Industrial Designers Society of America
- SPE (Society of Petroleum Engineers)
- SPRE (Society of Petroleum Resource Economists)
- SPWLA
- SWE (Society of Women Engineers)
- Tau Beta Pi
- USGBC (US Green Building Council)
- Women’s Energy Network
Peer Groups

Number of Clips

<table>
<thead>
<tr>
<th>University</th>
<th>TOTAL FY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH</td>
<td>2,825</td>
</tr>
<tr>
<td>UT</td>
<td>4,732</td>
</tr>
<tr>
<td>Texas A&amp;M</td>
<td>11,926</td>
</tr>
<tr>
<td>MIT</td>
<td>16,753</td>
</tr>
<tr>
<td>OU</td>
<td>2,140</td>
</tr>
</tbody>
</table>

Reach (in billions)

<table>
<thead>
<tr>
<th>University</th>
<th>TOTAL FY 2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>UH</td>
<td>2.7 B</td>
</tr>
<tr>
<td>UT</td>
<td>2.4 B</td>
</tr>
<tr>
<td>Texas A&amp;M</td>
<td>5.2 B</td>
</tr>
<tr>
<td>MIT</td>
<td>11.1 B</td>
</tr>
<tr>
<td>OU</td>
<td>613 M</td>
</tr>
</tbody>
</table>
Peer Groups

Reach Percentage

<table>
<thead>
<tr>
<th>REACH PERCENTAGE</th>
<th>UNIVERSITY OF HOUSTON</th>
<th>UT AUSTIN</th>
<th>TEXAS A&amp;M</th>
<th>MIT</th>
<th>OU</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOTAL FY 2019</td>
<td>12.29%</td>
<td>11.13%</td>
<td>23.7%</td>
<td>50.11%</td>
<td>2.76%</td>
</tr>
</tbody>
</table>

Graph reflects Number of Clips: Number of media clips/news articles captured by Cision media monitoring software
Continuous Improvements

**UH Energy’s Role in the University’s Overall Marketing & Branding Strategy:**

1. The University of Houston’s Marketing, Communications and Media Relations Division is conducting a U.S. News & World Report marketing campaign to positively influence high school counselor USNWR survey responses. In this campaign, an institutional piece was sent with content tailored to high school counselors and students. This is being followed up with email communications and other online marketing efforts to direct the counselors to a web landing page. This campaign will live for the next 2 years and is an opportunity to have a focus on UH Energy and other university initiatives.

2. The University of Houston’s Marketing, Communications and Media Division is using an integrated approach to promote UH internally to the campus community and to external constituencies. One of the specific tactics is with an online marketing campaign and the personas that have been developed to target messaging. Examples of these personas are future students, corporations and influencers such as parents, family and counselors. The messaging can be designed to feature UH Energy.
This past year, UH Energy has ramped up our social media outreach. We have focused on increasing our activity, while ensuring we provide engaging content for our followers. Through social media, we have increased student and industry awareness of UH Energy and its mission as well as attendance at our events. Below is the data for each social media platform:

- Instagram (uhenergy): 531
- Twitter (uhoustonenergy): 1,404
- Facebook (uhenergy): 1,987
- LinkedIn (UH Energy): 459