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The Roosevelt Project

How the Gulf Coast Can Lead the Energy Transition

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A New Deal for Employment, Energy, and Environment

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How the Gulf Coast Can Lead the Energy Transition

April 2022

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A New Deal for Employment, Energy and Environment

About the Roosevelt Project

The Roosevelt Project takes an interdisciplinary approach to the transitional challenges associated with progress toward a deeply decarbonized economy. The project aims to chart a path forward through the transition that minimizes worker and community dislocations and enables at-risk communities to sustain employment levels by taking advantage of the economic opportunities present for regional economic development. The first phase of the project involved an analytical assessment of cross-cutting topics related to the transition. The second phase of the project assesses the transition through the lens of four regional Case Studies, working with local partners on the ground in the Industrial Heartland, Southwest Pennsylvania, the Gulf Coast, and New Mexico. The project was initiated by former Secretary of Energy, Ernest J. Moniz, and engages a breadth of MIT and Harvard faculty and researchers across academic domains including Economics, Engineering, Sociology, Urban Studies and Planning, and Political Science.

REPORT SPONSOR

Emerson Collective

The Roosevelt Project would like to thank the Emerson Collective for sponsoring this report, and for their continued leadership on issues at the intersection of social justice and environmental stewardship.

PROJECT ADMINISTRATION

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MIT ROOSEVELT PROJECT: GULF COAST CASE STUDY

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Acronyms and Definitions

BIPOC	Black, Indigenous, and people of color
BOEM	U.S. Bureau of Ocean Energy Management
BP	British Petroleum corporation
CBD	central business district
CCS	carbon capture and storage
CCUS	carbon capture, utilization, and storage
CORE	Cadre of On-Call Response/Recovery Employees
DOE	U.S. Department of Energy
DCA	LexisNexis Directory of Corporate Affiliations
DSCEJ	Deep South Center for Environmental Justice
EIA	Energy Information Administration
EJ	environmental justice
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
GHG	greenhouse gas
GHP	Greater Houston Partnership
GIS	geographic information system
GLO	General Land Office
GMP	Gulf of Mexico program
GNO	greater New Orleans
HBCU	historically Black colleges and universities
IPCC	International Panel on Climate Change
LIHEAP	Low Income Home Energy Assistance Program
LNG	liquified natural gas
LVEJO	Little Village Environmental Justice Organization
MSA	metropolitan statistical area
NETL	National Energy Technology Laboratory
NGO	nongovernmental organization
NIEHS	National Institute of Environmental Health Sciences
NLIHC	National Low Income Housing Coalition
NREL	National Renewable Energy Laboratory
OPEC	Organization of the Petroleum Exporting Countries
PPE	personal protective equipment
QR	quick response
RPC	Regional Planning Commission
R&D	research and development
SMR	steam-methane reforming
WHEJAC	White House Environmental Justice Advisory Council

Acknowledgments and Dedication

We thank the Gulf Coast folks, including our Expert Advisory Group, who generously shared their insights with us over the past year and more as we learned about their energy transitions. Your depth of expertise, straightforward candor, and good humor made this research a real pleasure, and our one regret is that the pandemic prevented us from in-person visits. We are also grateful to the Emerson Collective and the Harvard University Office of the President for funding this research. We used the funds to support the work of doctoral student research assistants from Arizona and North Carolina at Harvard, local researchers in Baton Rouge and New Orleans, and a locally led training project to build resilient housing in coastal communities. Finally, we appreciate the expertise, data, and feedback shared by Steve Ansolabehere, Kathy Araujo, John Deutch, David Dismukes, Jeanette Dubinin, Barbara Entwisle, Justin Farrell, Amy Glasmeier, Shaun Golding, Peter Goldmark, Rob Hatley, Jeff Hebert, Andy Karsner, Mike Kearney, Seth Kleinman, Ernie Moniz, Erin Mayfield, Betsy McIntyre, Jennifer Montez, Rob Sampson, Sara Shostak, Dustin Tingley, Jalonne White-Newsome, and Beverly Wright.

We dedicate this report to our hoped-for audience of Louisianans, Texans, and others interested in the opportunities that large-scale energy transitions present.

Expert Advisory Group

The authors of this report are solely responsible for its content. We are grateful to the following extraordinary people, who volunteered their valuable time to advise us on how to make this case study more than a simple "desk study" dropped on the region from 50,000 feet. We know Cambridge, Massachusetts, is some 1,776 miles away from Lake Charles, Louisiana, and we thank our Expert Advisory Group for helping to close that distance intellectually. But: the inclusion of their biographical sketches below **should not be read as any sort of endorsement**. There were strong, constructive disagreements among us, enabled by following the Chatham House Rule. We think the friction sharpened the study.

Amy Bellone-Hite, PhD, is the Clarence Jupiter Professor of Sociology at Xavier University of Louisiana. In addition to teaching in the areas of comparative sociology, demography, and gender, she is head of the Department of Sociology and chairperson of the Division of Social and Behavioral Sciences. Bellone-Hite holds interdisciplinary BA, MA, and PhD degrees in Latin American Studies. Since joining Xavier's faculty in 2004, she has served as an academic assessment coordinator since 2005 and on the Core Curriculum Assessment Committee since 2016.

Hon. Dr. Charles Boustany Jr. is a former congressman (R-LA) and prominent heart surgeon, now a partner with Capitol Counsel, LLC. During his 12 years in Congress, Dr. Boustany served on the influential House Committee on Ways and Means, where he was chairman of the Subcommittees on Tax Policy, Oversight, and Human Resources. As a Ways and Means Committee member, Dr. Boustany established himself as an expert and leader on tax, trade, health care, and entitlement policy. Dr. Boustany is a leader in trade assistance and enforcement issues and has led seminars on the conduct of legislative oversight for members of parliament from emerging democracies. He has authored numerous opinion pieces on health care, energy, trade, and foreign policy in *Politico*, the *Hill*, the *Wall Street Journal*, and in the peer-reviewed journal *Asia Policy*. For 14 years, Dr. Boustany had a private practice of medicine in the field of thoracic and cardiovascular surgery in Lafayette, Louisiana.

Kathleen B. Cooper has served in a variety of posts during her career: under secretary for economic affairs at the U.S. Commerce Department, chief economist for the Exxon Mobil Corporation, executive vice president of Security Pacific National Bank, and dean of the College of Business at the University of North Texas. In addition to her current role as senior fellow at Southern Methodist University's John G. Tower Center for Political Studies, Dr. Cooper is a director of Deutsche Bank Trust Company of the Americas, director and former chair of the National Bureau of Economic Research, and a member of the Council on Foreign Relations. She recently retired from more than a dozen years on the board of the Williams Companies, an energy infrastructure company, during which time she served one year as chair of the board. She has held positions as president of the National Association for Business Economics and the U.S. Association for Energy Economics, chair of the American Bankers Association's Economic Advisory Committee, and founding director of Texas Security Bank. She holds a PhD in economics from the University of Colorado.

Christine DeMyers, PhD, is a local consultant and professional anthropologist formerly with the Water Institute of the Gulf, where she worked with a range of community leaders and stakeholders who are preparing for or responding to water management challenges in southern Louisiana. She is also an elected commissioner in the East Baton Rouge area. DeMyers collects and analyzes primary data (audio, video, or field notes from participant observation, workshops, interviews, or surveys) to understand and aggregate experiences with—and solutions to—environmental risks. She applies systematic summaries of relevant community and stakeholder perspectives to sustainable water management and climate change adaptation plans.

Albert Girgis has 20 years of experience as a diverse financial professional and is a key leader in the commercial team for the Williams Companies. Mr. Girgis has most recently served as vice president of corporate strategic development, which included leading corporate strategy, market intelligence, and enterprise optimization efforts. He also oversaw the strategic initiatives for environmental, social, and governance (ESG) and due diligence and integration process related to acquisitions and divestures. Prior to joining Williams, Mr. Girgis's roles included major projects development and financial controls at Cheniere, business development for Kinder Morgan, financial advisory services at Deloitte, and project controls at Fluor Daniel. Past responsibilities include negotiating contract terms, developing risk-mitigation plans, and leading acquisitions and divestitures. Mr. Girgis has a bachelor's degree in management information systems and supply chain management from Texas A&M University and earned a master of business administration degree in finance from St. Thomas University.

Keala J. Hughes, a native of Baton Rouge, Louisiana, earned a bachelor of science in biology with a minor in chemistry from Xavier University of Louisiana and holds a master of business administration from the University of Phoenix. She currently represents her district on the Jefferson Parish Animal Shelter Board and is a 2015 graduate of the New Orleans Federal Bureau of Investigations' Citizens Academy. Hughes has served as an environmental protection specialist for the U.S. Environmental Protection Agency's (EPA) Gulf of Mexico Program (GMP). GMP is focused on the health, productivity, and restoration of the Gulf of Mexico and all the communities that rely on this national resource. As a member of the Partnerships Team, she worked to develop a communications plan for the GMP, which included tasks such as developing and editing website content and developing public documents to highlight the accomplishments of the GMP staff. Prior to joining the GMP, Hughes served as the communications and engagement coordinator of the Gulf Coast Ecosystem Restoration Task Force. Recognizing the importance of the Gulf of Mexico, President Obama established the task force in 2010, bringing together the five Gulf states and 11 federal agencies to undertake its urgent mission: to ensure a more resilient and healthy Gulf of Mexico ecosystem. Hughes coordinated stakeholder meetings across the Gulf Coast, drawing on the ideas of more than 2,000 stakeholders to assist the task force in developing the Gulf of Mexico Regional Ecosystem Restoration Strategy. The strategy identifies goals for Gulf Coast restoration, along with major actions needed to achieve them. Previously,

Hughes served as a congressional/intergovernmental affairs liaison for the Department of Homeland Security Federal Emergency Management Agency (FEMA) under FEMA's Cadre of On-Call Response/Recovery Employees (CORE) to provide senior staff with awareness through the eyes of a survivor of Hurricane Katrina, the nation's largest natural disaster. Hughes worked closely with congressional, state, parish, local and tribal leaders to provide information and build relationships with those involved in disaster response and recovery programs and activities due to hurricanes Katrina, Rita, Gustav, and Ike.

Kenneth B. Medlock III, PhD, is the James A. Baker, III, and Susan G. Baker Fellow in Energy and Resource Economics at the Baker Institute and the senior director of the Center for Energy Studies. He is also the director of the Masters of Energy Economics program and holds adjunct professor appointments in the Department of Economics and the Department of Civil and Environmental Engineering at Rice University. Medlock is also a distinguished fellow at the Institute of Energy Economics, Japan, and is a member of the advisory board of the Payne Institute at Colorado School of Mines. In 2012–13, Medlock held the prestigious Haydn Williams Fellowship at Curtin University in Perth, Australia. He teaches advanced courses in energy economics and supervises PhD students in the energy economics field. Medlock has published numerous scholarly articles in his primary areas of interest, which include natural gas markets, electricity markets, energy commodity price relationships, transportation, national oil company behavior, economic development and energy demand, energy use and the environment, and various energy transitions topics, ranging from engineered and nature-based carbon capture to hydrogen to the economic drivers of technology adoption. He has testified multiple times on Capitol Hill on U.S. energy exports and electricity market evolution, has spoken at OPEC, and is frequently asked to speak about global and domestic energy issues. Medlock is the past vice president for conferences for the United States Association for Energy Economics (USAEE) and previously served as vice president for academic affairs. In 2001, he won (jointly with Ron Soligo) the International Association for Energy Economics Award for Best Paper of the Year in the *Energy Journal*. In 2011, he was given the USAEE's Senior Fellow Award, and in 2013 he accepted on behalf of the Center for Energy Studies the USAEE's Adelman-Frankel Award. In 2019, Medlock was awarded the Lifetime Achievement Award for the Advancement of the Education of Future Energy Leaders by the Abdullah Bin Hamad Al-Attiyah Foundation. He is also an active member of the American Economic Association and is an academic member of the National Petroleum Council. Medlock has served as an advisor to the U.S. Department of Energy and the California Energy Commission in their respective energy modeling efforts. Medlock received his PhD in economics from Rice University in May 2000.

Julie Nelson joined Cheniere in August 2018 as vice president, state and local government affairs. Ms. Nelson is responsible for safeguarding Cheniere's license to operate at the state and local level for all Cheniere locations within the United States. She also manages corporate giving, ensuring that the company is investing within the communities where Cheniere employees work and live. Ms. Nelson has extensive experience in the energy, maritime, and transportation industries. Prior to joining Cheniere, Ms. Nelson was a principal consultant for Boardwalk Pipeline and a senior counselor at Strategic

Public Affairs, a Houston-based public affairs consulting firm. Her LNG experience includes vice president of government relations and public affairs at Cameron LNG and head of government affairs for the U.S. and Mexico at BG Group (acquired by Shell). She has also served as a senior political appointee under President George W. Bush at the U.S. Department of Transportation, Maritime Administration. Julie holds a bachelor's degree and a law degree from Indiana University, along with a master's degree in maritime and admiralty law from Tulane University. She has authored and presented papers at many international conferences focusing on social imperatives for LNG projects and LNG shipping opportunities. In the United States, she has been a featured speaker at natural gas, maritime, and transportation conferences.

Kristina Peterson is the facilitator and cofounder of the Lowlander Center, established to lower risk from hazards. Believing that risks can only decrease when structural violence and socially constructed vulnerabilities are addressed and the capacity and voices of the full community are the problem-solvers, Peterson is a staunch practitioner of participatory action and rights-based principles. Through inclusivity of all types of knowledges and wisdom, and with the leadership of risk-bearers, dynamic networks and platforms of action, education, and policy have been formed. Her work on hazard mitigation and community engagement at University of New Orleans's Center for Hazards Assessment, Response and Technology (CHART) coincided with her doctoral work in the planning department, in which she investigated the impacts on outside institutions and leaders who engage in participatory action research with local communities. She taught environmental and hazard planning at the University of New Orleans and continues to mentor students on problem-solving engagement with at-risk communities to address risks and understand measures of adaptation to our current climate crisis. Justice is core in all of what Peterson does, in her advocacy, action, and research and in her personal life. Peterson dwells on the lands of the Biloxi, Chitimacha-Choctaw in Bayou Blue, Louisiana, where we celebrate life and lift all our sisters and brothers, human and non, to live fully in the present and envision a just and sustainable future for our future generations. Thus, her home is a work in process to understand and live with ever-changing climate impacts. Using principles of permaculture, rejuvenating the soil, replanting native species, and lowering the carbon footprint through fortified and green structural techniques, she has made her home a living laboratory for folks to learn and share. Her work with communities is about capacity-building, decision-making and knowledge of resources and options for the many ways of adaptation to climate crisis coupled with severe land loss and complex hazards. These adaptation strategies are the "between now and then" in an unknown scenario of risk and time and energy transition. Some strategies have developed into resettlement plans, such as the one created with Isle de Jean Charles Tribe for the Clinton Global Initiative and later submitted to the HUD_NDRC competition. Other strategies, such as the current Canal refilling project, are to rejuvenate and protect land and to help in coastal restoration projects. Peterson participates on the cultural lifeways committee with Barataria Terrebonne National Estuary Program Management Team; is a member of the Thriving Earth Exchange of the AGU; participates in the resettlement/adaptation working group of UUSC and Rising Voices; is a member of the Special Committee on Racism, Truth and Reconciliation of the PCUSA; is a facilitator of the Disaster Justice Network; is a mission/vision

facilitator with the Greater New Orleans Interfaith Climate Change Coalition; chairs the Stewardship of Creation Commission of the Louisiana Interchurch Conference; provides resource support for the Louisiana First Peoples' Conservation Council, North American Alliance of Hazards, and Disaster Research Institutes; and serves a congregation within the PCUSA. She is honored to have cocreated and coproduced written pieces with her community colleagues, especially from the coastal Tribes of Louisiana and from the fenceline communities of Death Alley. Her years of justice work within the disaster mitigation field have contributed to the creation of and being a founding board member of both the National Hazards Mitigation Association and the Gender and Disaster Network. Her justice work includes multiple dimensions of safe, green-built and natural environment, holistic planning, adaptation and resettlement. She has been working on ways to address and decolonize outcomes from the Doctrine of Discovery through forms of restorative justice. All accolades or honors received are those that are shared with and by the communities whose voice is the most important.

Emily Reichert, PhD, serves as chief executive officer of Greentown Labs, the largest clean technology startup incubator in North America. As the company's first employee, Emily has spearheaded the rapid growth of Greentown Labs into a global center for clean technology innovation, attracting visitors and partners from around the world. Emily started her career at Arthur D. Little as a PhD scientist and progressed into R&D, business development and general management roles. Prior to Greentown Labs, she was the director of business operations at the Warner Babcock Institute for Green Chemistry, where she helped grow the angel-funded startup into a sustainable contract R&D business with a mission to minimize environmental impact of chemical products. Emily also served as an MIT Sloan fellow in innovation and global leadership, as well as a VentureLabs fellow at Flagship Ventures, a Boston-based venture capital firm. Emily has been appointed to leadership positions in innovation, economic development, entrepreneurship, and clean technology commercialization at the city, state, and federal level, including the Massachusetts governor's Economic Development Planning Council and the U.S. secretary of commerce's National Advisory Council on Innovation and Entrepreneurship. Globally, Emily serves as a member of the World Economic Forum's Futures Council on Advanced Energy Technologies. Emily has served as a board member or as an advisor for a number of entrepreneurship and clean-technology-focused organizations, including the MIT Energy Club, Northeast Clean Energy Council, Cleantech Open Northeast, Cyclotron Road, the Incubatenergy Network, the MIT Enterprise Forum, the Museum of Science Board of Trustees and Overseers, and the Alliance for Business Leadership Energy and Environment Council. Emily was profiled in *Forbes* magazine as "The Woman Who Runs the Fastest Growing Cleantech Startup Hub on the East Coast" and listed as one of Mashable's "15 People Shaping Boston's Tech Scene." The Northeast Clean Energy Council named Emily "Startup Supporter of the Year" in 2015 and honored her with the Decade of Influence Award in 2017. *Mass High Tech* named her a "Woman to Watch" in 2014, and the *Boston Business Journal* presented her with the Women Who Mean Business Award in 2017 and the Power 50 Executive Award in 2018. Emily has earned international recognition for her leadership in cleantech innovation and entrepreneurship and has received invitations to speak at international conferences such as the World Economic Forum Global Future Council in Dubai; the World Efficiencies Solutions Conference in Paris, France; Les

Rencontres Economiques d'Aix-en-Provence, France; and the Japanese Women's Leadership Initiative Summit in Tokyo, Japan. She holds a PhD in physical chemistry from the University of Wisconsin–Madison and earned her MBA from MIT Sloan School of Management.

Richard Schmalensee, PhD, served as the John C. Head III Dean of the MIT Sloan School of Management from 1998 through 2007. He was a member of the president's Council of Economic Advisers from 1989 through 1991 and served for 12 years as director of the MIT Center for Energy and Environmental Policy Research. Professor Schmalensee is the author or coauthor of 11 books and more than 120 published articles, and he is coeditor of volumes 1 and 2 of the *Handbook of Industrial Organization*. His research has centered on industrial organization economics and its application to managerial and public policy issues, with particular emphasis on antitrust, regulatory, energy, and environmental policies. He has served as a consultant to the U.S. Federal Trade Commission, the U.S. Department of Justice, and numerous private corporations. Professor Schmalensee is a fellow of the Econometric Society and the American Academy of Arts and Sciences. He was the 2012 distinguished fellow of the Industrial Organization Society. He has served as a member of the Executive Committee of the American Economic Association and as a director of the International Securities Exchange and other corporations. He is currently a director of the National Bureau of Economic Research and chairman emeritus of the Board of Directors of Resources for the Future.

Brittany Tarufelli, PhD, at the time of the study, worked as an applied microeconomist at the Louisiana State University Center for Energy Studies, studying relationships between public policy, energy markets, and the environment. Her research evaluates the ongoing transition to clean energy, focusing on interactions between subglobal environmental policies and energy market designs. She recently accepted a new position at the Pacific Northwest National Laboratory.

Mary C. Waters, PhD, is the John L. Loeb Professor of Sociology and the PVK Professor of Arts and Sciences at Harvard University. She specializes in the study of immigration, intergroup relations, the formation of racial and ethnic identity among the children of immigrants, the challenges of measuring race and ethnicity, and the longitudinal impact of natural disasters.

Executive Summary

Oil, gas, and petrochemicals enable modern life, from the energy consumed by the neonatal intensive care units that save thousands of infants every year, to the plastics in our clothes and computers, to the global transportation network connecting communities. How can these human needs be met while also meeting the human need to reduce greenhouse gas emissions?

This is the essential question raised in energy transitions. Indeed, the next two years are pivotal for policies aiming at answers on the U.S. Gulf Coast, home to 10 million people. Louisiana governor John Bel Edwards has appointed a high-profile Climate Change Task Force, which is now fully formed, holding hearings, and seeking solutions. After the deadly failures of the Texas electrical grid last winter, many Texans are calling for improving the electrical system. These state-level moves, combined with pressure from United States and international investors, renewable energy investments by traditional energy companies, the political priorities of the current federal executive administration, and the urgent need to reduce greenhouse gas emissions, all indicate that now is the time to accelerate energy transitions.

In summary, Louisianans and Texans currently confront challenges to the energy system:

- Shifting global energy demands,
- Increasing risks of land loss from erosion, subsidence, and stronger storms,
- Rising investor calls for community accountability,
- New public commitments to reduce greenhouse gas emissions,
- Risks from extreme cold, extreme heat, and more frequent flooding,
- Changing technological developments that transform markets, and
- Disproportionate burdens of environmental risks.

The Gulf Coast—especially its most energy-intensive part, from Corpus Christi to New Orleans—is rich in cultural and ecological diversity and can lead the United States in community-based adaptation strategies. As communities adapt, large-scale low-carbon or decarbonized energy transitions are underway. Yet, communities along the Gulf Coast face many challenges to system-wide energy transitions that support vibrant economies and community life.

1. BIPOC people, the poor, and petrochemical workers face transition risks.
2. The production and consumption of oil and gas contribute massively to the region's public budgets, private employment, and overall economy.
3. The region hosts large investments in existing energy infrastructure, including large ports in Houston and New Orleans, which can create incentives to maintain the status quo, unless new opportunities are well planned and coordinated.
4. Many people in the region feel excluded from decision-making, distrustful of powerful institutions, and disrespected in the national debate over energy and climate.

How can the region acknowledge and also overcome barriers to leading energy transitions? What can Gulf Coast communities, employers, policymakers, and leaders do in the next 12–24 months to build the foundation for successful energy transitions that:

- Sustainably provide reliable and cost-effective energy,
- Offer equitable employment opportunities,

- Build on the region's many comparative advantages,
- Recognize and respond to legacies of environmental injustice, and
- Manage and reduce carbon to mitigate the risks of extreme weather?

Our study of the U.S. Gulf Coast identifies short- and medium-term actions that can transform these challenges into opportunities for an equitable and therefore successful energy transition. We approach the question of what energy transition pathways might be most promising for the region with a sense of gratitude toward the people whose work in oil, gas, and petrochemicals makes our modern lives possible and a sense of optimism about the leadership roles the region can play in the energy system of the future, given its immense comparative advantages.

This study offers practical pathways to success. Guided by our local Expert Advisory Group, we have completed a yearlong study drawing on:

- In-depth interviews with more than 70 stakeholders interested in the energy system,
- Participant observation at industry and environmental justice events,
- Social network analysis of businesses operating in the region,
- Demographic analysis of data from the U.S. Census Bureau,
- Economic modeling of the effects of different pathway scenarios, and
- Local fieldwork with marginalized Indigenous coastal communities.

Our analysis shows that today's transitional steps powerfully impact tomorrow's community wellbeing, especially employment. Focusing only on the outcome of employment, the clear takeaway is that policy choices can make energy transitions net positive for jobs, even in this energy-intensive region, which features difficult-to-decarbonize industrial production and a large and needed oil-and-gas-producing sector.

How? What are the pathways to successful energy transitions on the U.S. Gulf Coast? The complexity and centrality of energy transitions to life on the Gulf Coast calls for leadership from the private sector, coordination and predictability from all levels of government, and engagement with communities who bear the risks of the energy system. We recommend action in eight areas:

1. Initiating a regional Gulf Energy Transitions Council—community, industry, and policy leaders—that would be charged with setting energy transition goals, monitoring progress, building trust among polarized communities, and facilitating accountability.
2. Establishing a regional training consortium of employers, colleges, and policymakers to build new training programs to meet rapidly changing needs of energy employers.
3. Pursuing nature-based carbon management for carbon storage, environmental justice, and storm resilience—a true win-win-win.
4. Supporting social equity, entrepreneurship, and workforce development via an inexpensive Clean Energy Internship Program for Environmental Justice, which could be supported by federal dollars under the Justice40 guidelines.
5. Implementing low-level but predictably increasing renewable portfolio standards to incentivize investment in renewable energy for complementary transitional power.
6. Enabling the region to use all of its natural resources in energy transitions, including wind, solar, geothermal, tidal, and hydrogen energy, in addition to traditional sources.

7. Using onshore and offshore carbon sinks to profit from the current federal 45(Q) carbon incentive, verifiably reduce greenhouse gas emissions, and support land stewardship.
8. Demonstrating new technologies with local incubators and presentations by the National Renewable Energy Laboratory to local stakeholders, including industry associations, as well as environmental justice communities.
9. Supporting action to raise predictability and reduce risks for markets. Our current political polarization is imposing high costs and delaying action.

We conclude our report by showing examples of initiatives that are already underway in the region, which already has a long and proud tradition of adapting to changing energy sources:

- Louisiana's and Houston's announcements of 2050 net zero goals.
- The Gulf Region's GNO Wind Alliance, with well over 100 members and counting.
- The Lowlander Center's sustainable energy construction-training demonstration.
- ExxonMobil's 2021 announcement of a $100 billion investment plan for carbon capture.
- G2 Net-Zero LNG (liquified natural gas) project using existing infrastructural endowments.
- Greentown Labs, the largest climate-tech incubator in North America, opening its second location in Houston in 2021.
- The Lake Charles area's promotion of LNG with CCS, including training programs.
- The Greater Houston Partnership's release of its energy transition strategy.
- The Louisiana Climate Task Force's release of its draft strategy and action reports.
- The Center for Houston's Future roadmap of a hydrogen hub strategy.

Introduction

Oil, gas, and petrochemicals enable modern life, from the energy consumed by the neonatal intensive care units that save thousands of infants every year, to the plastics in our clothes and computers, to the global transportation network that connects people. How can these and other human needs be met while reducing greenhouse gas emissions?

This is the essential question raised in energy transitions. Indeed, the next two years are pivotal for finding the answers on the U.S. Gulf Coast, home to 10 million people. Louisiana governor John Bel Edwards has appointed a high-profile Climate Change Task Force, which is now fully formed, holding hearings, and seeking solutions. After failures of the Texas electrical grid last winter, many Texans, including Governor Greg Abbott, are calling for reform. These state-level moves, combined with pressure from United States and international investors, renewable energy investments by traditional energy companies, the political priorities of the current federal executive administration, and the urgent need to reduce greenhouse gas emissions all, indicate that now is the time to accelerate energy transitions.

Thus the research question that motivated our study: What are the pathways to successful energy transitions on the Gulf Coast?

Our research revealed significant barriers to successful energy transitions, and we will not sugarcoat these. At the same time, our research also revealed that the Gulf Coast is rich in cultural and ecological diversity and can lead the United States in community-based adaptation strategies that draw on the region's significant comparative advantages, which include long experience with adaptation and changing energy sources. The long and deep experience of the region's people has yielded a creativity that is sorely needed, as people living on the Gulf Coast are confronting the increasing risks of land loss (erosion and subsidence), floods, droughts, sea level rise, and ocean acidification. For adaptation to be successful, large-scale energy transitions need to take place.

Gulf Coast communities face many challenges to making a system-wide energy transition in a way that supports vibrant economies and community life. First, people of color and the poor face disproportionate burdens that could be exacerbated during an energy transition. Second, the production and consumption of oil and gas contribute massively to the region's public budgets, private employment, and overall economy. Third, the region hosts large investments in existing energy infrastructure, which creates incentives to maintain the status quo. Existing investments in the region include strategic petroleum reserves, the largest concentration of refineries in the United States, and thousands of miles of oil and gas pipelines.

Our study of the U.S. Gulf Coast aims to identify short- and medium-term actions that can transform these challenges into opportunities for an equitable and therefore successful energy transition. We approach the question of what energy transition pathways might be most promising for the region with a sense of gratitude toward the people whose work in oil, gas, and petrochemicals makes our modern lives possible and a sense of optimism about the roles the region will play in the energy system of the future, given its comparative advantages.

Our highest ambition is to offer practical pathways to success. Guided by our local Expert Advisory Group, and in a collaboration between MIT/Harvard researchers and local researchers, we have completed a yearlong study drawing on:

- In-depth interviews with >30 community leaders,
- In-depth interviews with >30 direct stakeholders in the energy system,
- Participant observation at industry and environmental justice events,
- Social network analysis of businesses operating in the region,
- Demographic analysis of data from the U.S. Census Bureau,
- Economic modeling of the effects of different pathway scenarios,
- Local fieldwork with marginalized communities, and
- Localization of recent high-profile national and international energy transition reports.

We describe our research methods in greater detail in the relevant sections below and in the Appendix on Research Methods. In general, we took a multimethod approach to our study, given that energy systems—especially one so large and productive as the Gulf Coast's—intersect with nearly every aspect of human life, including the built environment, private businesses of all sizes, employees of petrochemical companies, the families of those employees, and the communities that depend on the energy system not just for employment but also for housing, transportation, food, and even clothing. A reality of the Gulf Coast energy system is its deep cultural embeddedness, which comes in part from the multigenerational dimension of petrochemical work. Thus, this report foregrounds the voices of Gulf Coast residents in an attempt to reflect part of what energy means to people.

While the COVID pandemic constrained us to much less fieldwork than we had hoped to conduct, with the collaboration of the Lowlander Center, which engages Native American and other communities in the region, we were able to gain significant insight into the kinds of problems stronger storms cause, especially problems of housing. Indeed, we see housing as a case of how energy transitions can be advanced in a thoughtful way by using the constraint of vulnerable housing infrastructure as an opportunity to build new education and training programs on sustainable construction. The Lowlander Center's pilot training program, funded by the Roosevelt Project, yielded invaluable lessons about local community needs, local community resources, and local community responses to education and training in construction that uses renewable energy.

To understand how petrochemical employers are organized across multiple locations in our region, to describe who lives in our region, and to evaluate transition pathways, we drew on publicly available secondary data from a wide range of sources. To place petrochemical employers and understand the structure of reporting and decision-making that creates a dense network of firms in this sector, we used information from the Directory of Corporate Affiliations. To describe the region's human population, we used a range of U.S. Census products, including decennial censuses dating back to 1970, and American Community Survey data from 2014 to 2018. As described more fully in the synthesis document and recapitulated in part below, we used a wide array of public data to simulate the economic effects of three different plausible policy scenarios.

To localize these findings within the broader knowledge of the energy industry, climate change impacts, climate change vulnerability and resilience, and adaptation opportunities on the Gulf Coast, we conducted a comprehensive

review of local and national reports on these topics within the Gulf Coast region. Such reports underscored and supported many findings from the REMI model and networks analysis and informed our approach to in-depth interviews with experts and community members. Our review of existing reports also showed us opportunities where this research could add to and complement existing knowledge on energy transition in the region. We draw on the wealth of knowledge from existing reports throughout this document.

In what follows, we present our findings in seven chapters.

Chapter 1, "People and Places," examines the current social and economic climate of the case study region. Topics covered include the region's age and racial composition, empirical measures of social cohesion, trends in average life expectancy, average income by economic sector and metropolitan statistical area, and sociopolitical points of contestation within the case study region.

Chapter 2, "Environmental Justice": Ensuring that energy transitions are not only successful but also just is a guiding principle of the Roosevelt Project. As such, this section defines environmental justice and highlights current environmental inequities with respect to the relationship between the oil and gas industry and the communities within which it operates, broader environmental issues faced by the case study region, and recommendations that have been previously proposed by other groups concerned with environmental justice.

Chapter 3, "Energy Transitions Today: Where Does the Gulf Coast Energy System Stand?" addresses the question: Where does the Gulf Coast energy system currently stand? This chapter begins with macro- and meso-level analyses of the energy sector in the case study region, focusing first on the sectoral composition of the economy before narrowing in to analyze both the geographical distribution and contributions of the oil and gas sector within the regional economy. After exploring these issues, it then turns to residents' concerns and fears as they relate to the economic changes that an energy transition would inevitably bring.

Chapter 4, "Turning Constraints into Opportunities," is the heart of our report. Our study underscores that the oil and gas industry is an important contributor to the economy of the case study region. However, we believe that this dependency, while appearing to be a hindrance to a successful energy transition, is a major comparative advantage for the coastal regions of Louisiana and Texas. This chapter explores how these advantages may be leveraged to promote both a just energy transition and the cause of environmental justice, while also frankly discussing the obstacles that may arise in the process.

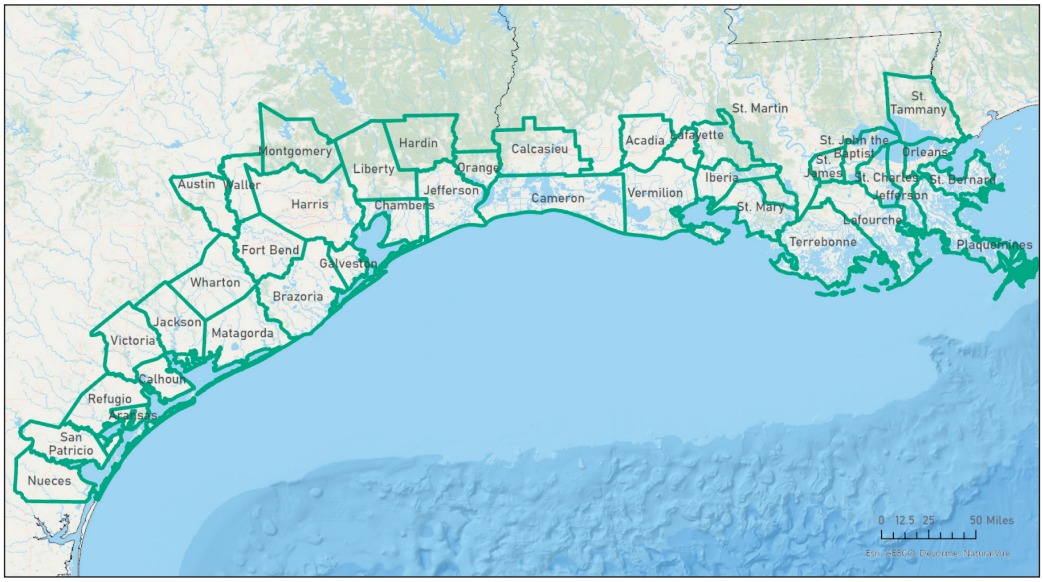
Chapter 5, "Evaluating Transition Pathways," examines the results of economic and energy models based on three distinct policy scenarios. The results of those scenarios are evaluated with respect to the possible energy and economic futures for the Gulf Coast economy. We sketch out who might gain what from different transition pathways.

Chapter 6, "New Developments": The energy economy of the 21st century is extremely dynamic. The case study concludes with a discussion of many of the recent developments in the energy sector as they relate to the Gulf Coast region. We see significant evidence of momentum.

Chapter 1. People and Places

The counties and parishes of the case study (shown below) are amongst the most energy-intensive within the U.S. Gulf Coast region and span 30,000 square miles from Corpus Christi, Texas, to New Orleans, Louisiana. The population of the region has been fairly stable over the past two decades. However, some Louisiana parishes have experienced population declines owing to the impacts of Hurricanes Katrina and Rita. Moreover, the Houston metro area has experienced population growth of over one million people in the decade between 2010 and 2020. Additionally, the region is both culturally and ethnically diverse. It's the home of dozens of both federally recognized and unrecognized Native American tribes; descendants of Vietnamese immigrants; Black Americans, many of whom have continuously inhabited the region since the days of slavery; people of mixed European, Native American, and African ancestry; general descendants of French and Spanish colonial settlers; and more.

Figure 1: The Most Energy-Intensive Region of the U.S. Gulf Coast



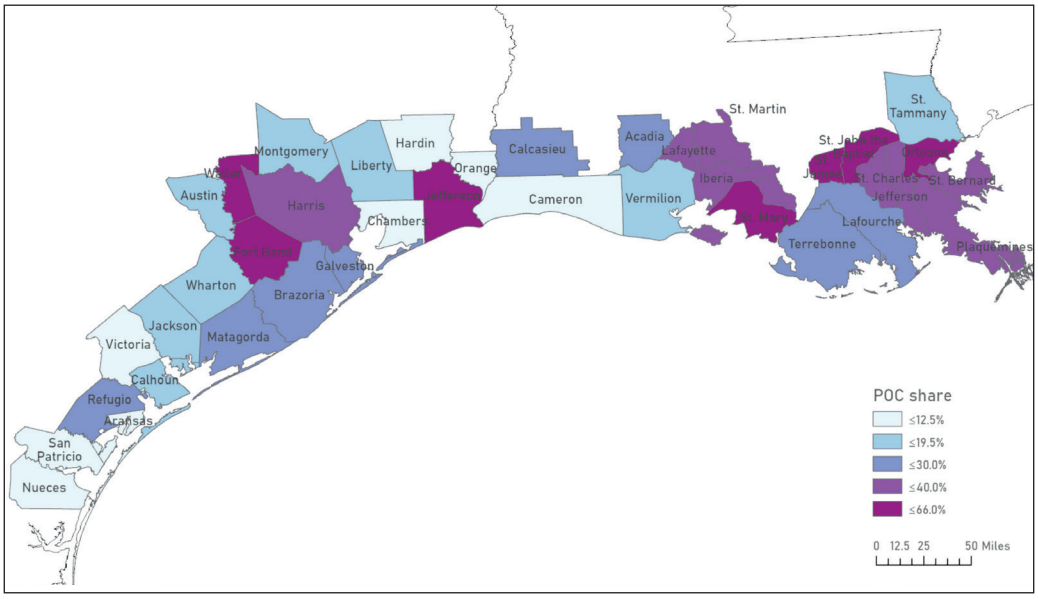
Demographics

Many of the counties and parishes in the region are majority-minority in composition. However, this description doesn't adequately convey the region's diversity. Fort Bend County, Texas, calls itself "the most diverse county in the nation," with a composition of 45% White, 24% Latinx, 22% Black, 17% Asian, and 11% Other residents. Harris County, the largest in our region, contains a population of just over four million people, with a racial composition of 41% Latinx, 31% non-Hispanic White, 20% non-Hispanic Black, and 7% Asian residents. Residential racial segregation in this region is significant, especially in the Houston metro area, where the suburban counties are 70–80% White. Jefferson Parish, Louisiana's most populous parish, with 433,000 people, is 61% White, 25% Black, 5% Asian, and 15% Latinx. Orleans Parish, Louisiana's most populous parish before Hurricane Katrina, now stands at 390,000 people and is 60% Black, 33% White, 3% Asian, and 5% Latinx.

Table 1: Gulf Coast Population by Race, 2014–2018 American Community Survey Data

Race	Combined Area
Total Population, 2018*	**10,063,351**
White Alone	6,695,215
Black or African American alone	1,963,628
American Indian alone	46,321
Asian alone	591,055
Native Hawaii & Other Pacific Is. alone	4,910
Some other race alone	534,766
Two or more races	227,456
Percent of Total	
White Alone	66.5%
Black or African American alone	19.5%
American Indian alone	0.5%
Asian alone	5.9%
Native Hawaii & Other Pacific Is. alone	0.0%
Some other race alone	5.3%
Two or more races	2.3%

Figure 2: People of Color as a Share of Total County/Parish Population



As with the racial composition of the case study region, the age and educational distributions of the counties and parishes are also diverse. Figure 3 provides a broad view of the age composition of the coastal regions of Louisiana and Texas. It shows that the percentage of residents who are 19 years old or younger is substantially greater than the percentage of residents that are 65 years or older. However, upon examining Figure 4, it becomes clear that there is an uneven distribution of the elderly within the region, who appear to be concentrated within more rural areas. Similarly, the educational attainment of the counties and parishes within the region is also diverse, with the most educated counties and parishes being those which are also some of the most urbanized (see Figure 5).

Figure 3: Age Distribution of the Gulf Coast Region[1]

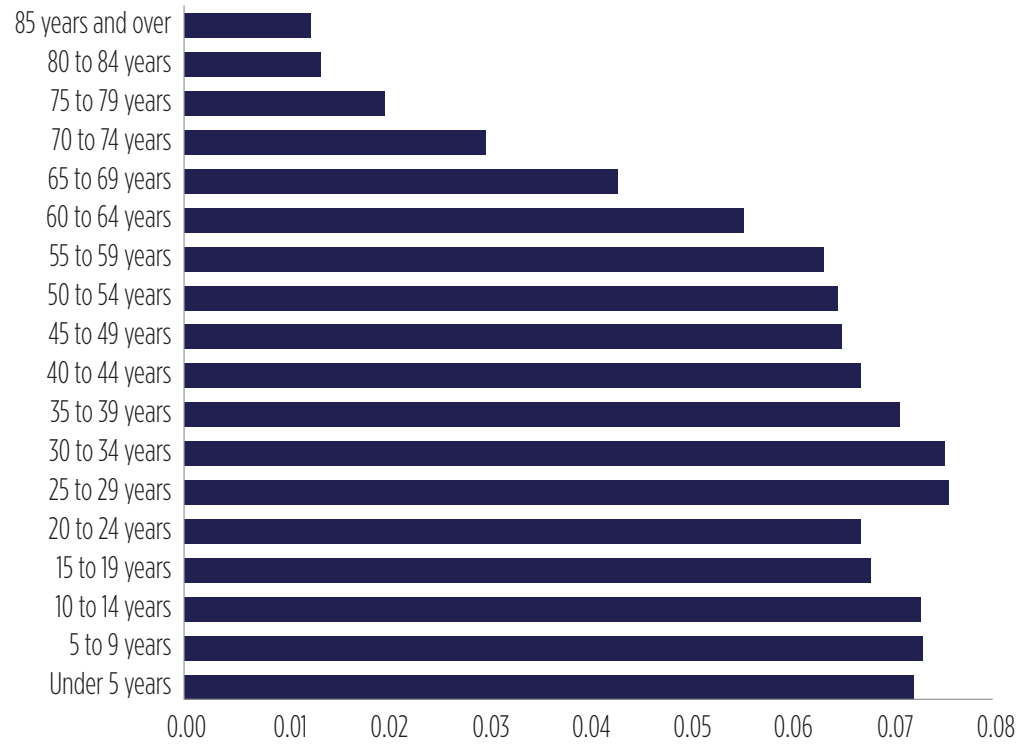


Figure 4: Population Aged 65 and Over as a Share of the Parish or County Population

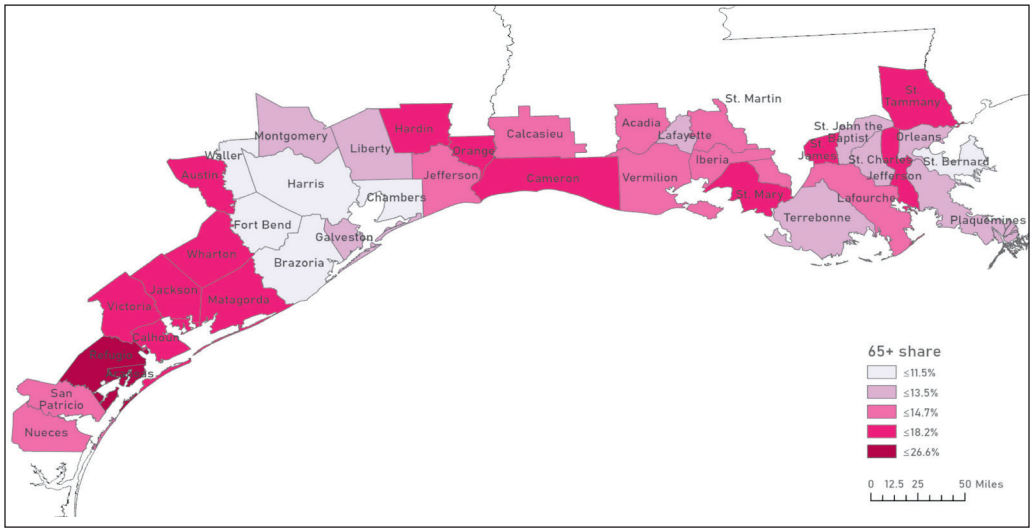
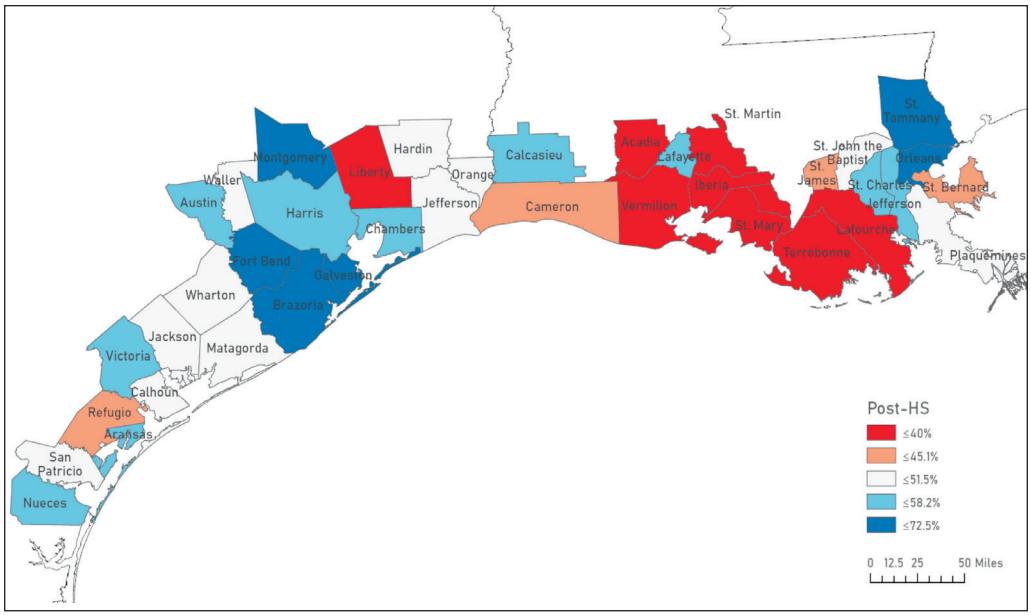


Figure 5: Postsecondary Educational Attainment as a Share of County/Parish Population



Employment

The petrochemical industries have dominated the region's economy and politics, dating back to the discovery of oil in Texas in the 1920s and 1930s and the opening to offshore drilling by the Truman administration in 1947. In many of our 39 case study counties and parishes, petrochemical firms are amongst the largest employers and contribute the largest share of the public budget. Both Louisiana and Texas have a high concentration of energy employment, presenting a challenge and opportunity for regional decarbonization. Within the region, the fossil fuels sector accounts for nearly 48% of total energy-related employment, followed by transmission, distribution, and storage (23%) and energy efficiency (14%). Certain communities are also much more heavily dependent on fossil fuel employment than others, particularly those that do not have diversified local economies or rely on a relatively small number of large employers. Low-carbon transitions will require policies and programs that will address the impacts on workers and households across the energy supply chain.

Table 2: Energy Employment in the Gulf Coast Study Region[2]

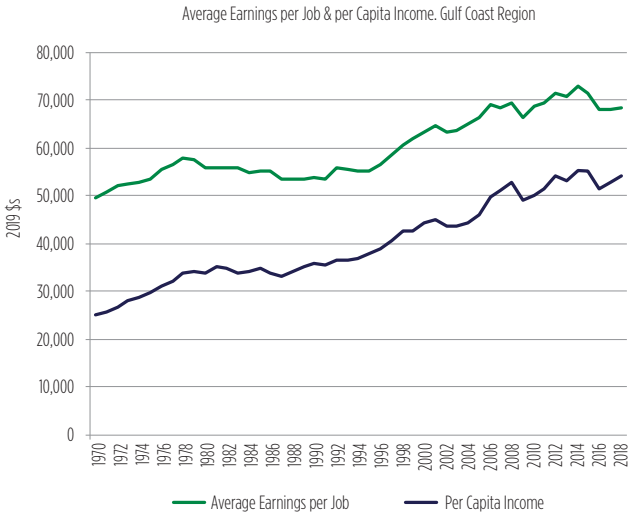
Industry	Fuels	Electric Power Generation	Transmission Distribution & Storage	Energy Efficiency	Motor Vehicles
Total Jobs by Sector (2017)	213,297	21,195	104,016	61,615	46,610
Top Three Highest Employment Counties	Harris Lafayette Terrebonne	Harris Jefferson (LA) Jefferson (TX)	Harris Jefferson (TX) Montgomery	Harris Jefferson (LA) Montgomery	Harris Jefferson (LA) Montgomery
Texas Statewide Projected Growth (2020)	3.7%	3.6%	2.2%	6.2%	3.4%
Louisiana Statewide Projected Growth (2020)	3.5%	2.4%	0.0%	4.9%	5.0%

Many jobs in the petrochemical sector are relatively high paying. As importantly, in the culture of many rural communities, there is a widespread recognition that "making it" means getting a job in the local petrochemical plant. Of course, the category "petrochemical job" is quite broad, and there is large variation in wages across the region's diverse places. For context, wages in the region's petrochemical sector can be compared to wages in the region overall. The figure below depicts the long-term trends in average wage per job and per capita income. The data are corrected for inflation and are presented in 2019 U.S. dollars. Note that the average wage will be drawn upward by increasing incomes at the top of the income distribution during these years; there has been very little real wage growth except for those within the top 20%.

Figure 6: Average Earnings Per Job and Per Capita Income

	1970	2000	2018	Change 2000–2018
Average Earnings per Job (2019 $s)	$49,633	$63,272	$68,624	$5,352
Per Capita Income (2019 $s)	$25,164	$44,293	$54,336	$10,043
Percent Change				"Percent Change 2000-2018"
Average Earnings per Job				8.5%
Per Capita Income				22.7%

- From 1970 to 2018, average earnings per job grew from $49,633 to $68,624 (in real terms), a 38% increase.
- From 1970 to 2018, per capita income grew from $25,164 to $54,336 (in real terms), a 116% increase.



The table below shows the average annual wage for the most common jobs in the petrochemical sector, by census-designated metropolitan statistical area (MSA).

Table 3: Average Annual Wage for Energy-Related Occupations by Census MSA[3]

Beaumont-Port Arthur, TX	Annual Wage
Chemical Engineers	$140,750
Environmental Engineers	$128,000
Petroleum Engineers	$185,130
Geological and Hydrologic Technicians	$55,160
Hazardous Materials Removal Workers	$40,350
Service Unit Operators, Oil and Gas	$52,690
Roustabouts, Oil and Gas	$40,830
Riggers	$61,470
Power Plant Operators	$87,990
Chemical Plant and System Operators	$71,570
Petroleum Pump System Operators, Refinery Operators, and Gaugers	$91,780
Sailors and Marine Oilers	$54,720
Corpus Christi, TX	
Chemical Engineers	$121,930
Environmental Engineers	$108,110
Hazardous Materials Removal Workers	$39,730
Derrick Operators, Oil and Gas	$48,060
Rotary Drill Operators, Oil and Gas	$61,070
Service Unit Operators, Oil and Gas	$47,040
Roustabouts, Oil and Gas	$39,290
Helpers--Extraction Workers	$34,500
Riggers	$48,770
Chemical Plant and System Operators	$86,970
Gas Plant Operators	$70,080
Petroleum Pump System Operators, Refinery Operators, and Gaugers	$79,940
Sailors and Marine Oilers	$36,840
Houston-The Woodlands-Sugar Land, TX	
Chemical Engineers	$147,310
Environmental Engineers	$113,050
Petroleum Engineers	$178,240
Hydrologists	$114,960
Geological and Hydrologic Technicians	$70,520
Hazardous Materials Removal Workers	$39,320
Derrick Operators, Oil and Gas	$56,210
Rotary Drill Operators, Oil and Gas	$65,120
Service Unit Operators, Oil and Gas	$53,500
Roustabouts, Oil and Gas	$43,120
Helpers--Extraction Workers	$36,600
Wind Turbine Service Technicians	$59,670
Riggers	$49,770
Power Distributors and Dispatchers	$89,060

Power Plant Operators	$81,870
Chemical Plant and System Operators	$74,660
Gas Plant Operators	$71,740
Petroleum Pump System Operators, Refinery Operators, and Gaugers	$82,600
Sailors and Marine Oilers	$47,600
Dredge Operators	$48,820
Lafayette, LA	
Environmental Engineers	$78,140
Petroleum Engineers	$110,320
Geological and Hydrologic Technicians	$78,050
Derrick Operators, Oil and Gas	$45,010
Rotary Drill Operators, Oil and Gas	$50,320
Service Unit Operators, Oil and Gas	$50,910
Roustabouts, Oil and Gas	$35,990
Helpers--Extraction Workers	$33,070
Riggers	$36,950
Sailors and Marine Oilers	$44,410
Lake Charles, LA	
Chemical Engineers	$114,090
Petroleum Engineers	$114,990
Hazardous Materials Removal Workers	$42,840
Riggers	$53,760
Chemical Plant and System Operators	$69,130
Sailors and Marine Oilers	$40,870
New Orleans-Metairie, LA	
Chemical Engineers	$119,630
Environmental Engineers	$94,360
Petroleum Engineers	$135,320
Geological and Hydrologic Technicians	$55,710
Hazardous Materials Removal Workers	$43,260
Derrick Operators, Oil and Gas	$62,250
Rotary Drill Operators, Oil and Gas	$60,900
Service Unit Operators, Oil and Gas	$61,770
Roustabouts, Oil and Gas	$39,450
Riggers	$48,190
Power Plant Operators	$79,290
Chemical Plant and System Operators	$68,750
Gas Plant Operators	$80,240
Petroleum Pump System Operators, Refinery Operators, and Gaugers	$67,150
Sailors and Marine Oilers	$47,800
Dredge Operators	$43,300
Petroleum Engineers	$124,500
Victoria, TX	
Service Unit Operators, Oil and Gas	$46,470
Roustabouts, Oil and Gas	$42,330
Riggers	$40,050

These wage data show that petroleum, chemical, and environmental engineers receive salaries that are around twice the regional average. When people in the region refer to good jobs in this sector, they aren't referring to these top-end jobs, which are relatively few in number and often require graduate degrees. Instead, they are referring to jobs as operators, which pay around 150% of the regional average wage. The sector also includes a number of lower-wage manual jobs, including hazardous materials removal workers, roustabouts, riggers, and helpers.

Collective Efficacy

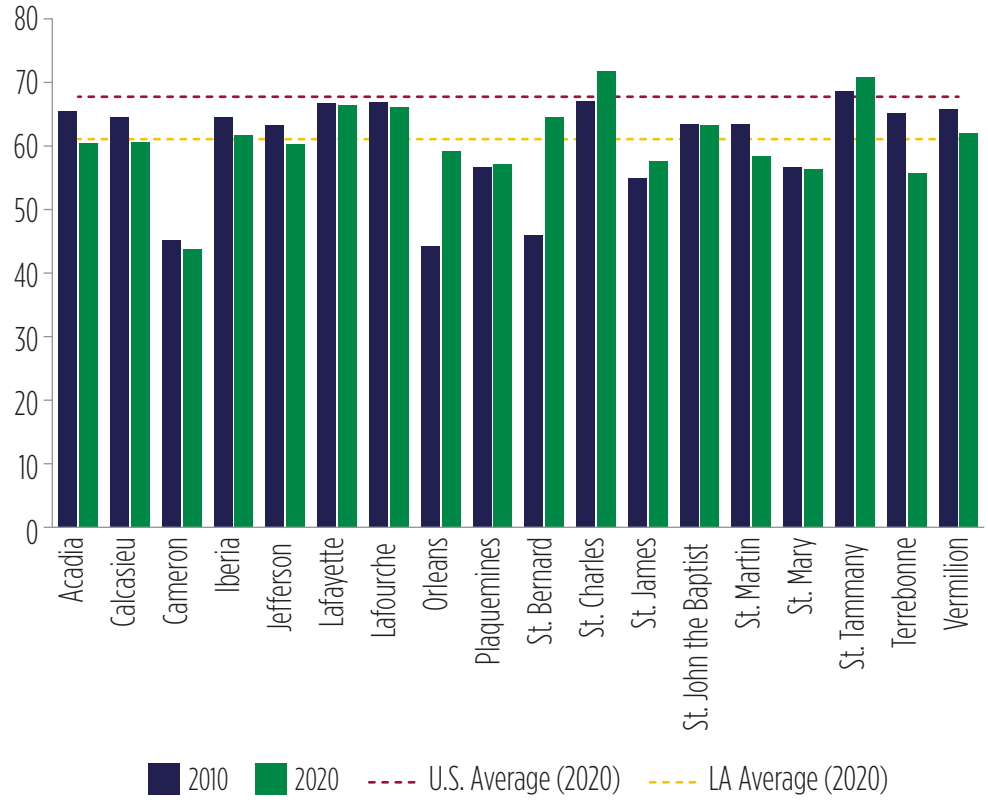
One of the primary goals of the Roosevelt Project is to identify pathways that minimize the potentially negative social and economic consequences of an energy transition on energy-producing communities. In other words, the Roosevelt Project acknowledges that a successful energy transition is dependent upon ensuring the social *and* economic vitality of the communities within the case study region. However, in order to identify and propose appropriate policy pathways, a working knowledge of the social conditions currently experienced by these communities is necessary. And while determining the economic health of these communities is a relatively straightforward process, assessing the state of community social fabric is more difficult.

A concept that has proven to be especially well suited to the task of determining the social cohesiveness of a community is that of collective efficacy. Collective efficacy captures how "close knit"—structurally—a community is and the extent to which it can come together to solve social problems. Using advanced statistical methods, previous research has identified several important correlates of collective efficacy at both the individual and community levels.[4] Community-level attributes include measures such as the percentage of residents living below the poverty line, the percentage of female-headed households, the unemployment rate, and the rate at which residents move into or out of a community, whereas individual-level correlates include factors such as age and socioeconomic status. Another widely accepted method for assessing collective efficacy is the "lost letter" experiment pioneered by social psychologist Stanley Milgram. The lost letter experiment consists of dropping stamped and addressed letters sporadically throughout a given community. By calculating the rate at which those letters arrive at their addressed destination, researchers have acquired important information regarding the relative "social helpfulness" of the communities under consideration—a concept which is closely related to the combined willingness and capacity of residents to come together to solve collective problems.

Collecting the data necessary for assessing the rates of collective efficacy within the communities of the Louisiana-Texas Gulf Coast, however, was beyond the scope of the Roosevelt Project. In the absence of such data, we employed two crude yet informative proxies for assessing the collective efficacy of the communities within the case study region. First, the rate at which county/parish residents voluntarily responded to the U.S. decennial census was utilized to reflect the more conventional lost letter experiment. There are two primary reasons that census response rates function as a valid proxy for lost letter experiments. First, responding to the U.S. census is necessary for the allocation of resources that directly benefit institutions at the local level, thereby improving the community as a whole. As such, voluntarily responding to the census not only indicates a willingness to perform one's civic duties but also a desire to be "socially helpful," in the sense that responding helps to solve collective problems such as public

school funding. Second, the legal requirement for households to respond to the census is likely to increase return rates relative to lost letter experiments, which are not supported by government sanctions (i.e., fines, jail sentences, etc.). Thus, census self-response rates are likely to provide evidence of the upper bounds of collective efficacy in communities, although actual rates of collective efficacy may be significantly lower. Trends in the U.S. census self-response rates can be seen in Figures 7 and 8.

Figure 7: Decennial Census Self-Response Rates: Louisiana[5]



Second, in 2020, the U.S. Census Bureau introduced community resilience estimates to indicate the ability of American communities to respond to the various social and economic shocks induced by the COVID-19 pandemic. These estimates are comprised of a household risk index, which itself is a weighted sum of 11 possible risks measured at either the household or individual level. Importantly, most of the risk factors that were used to construct the index either align with or are theoretically adjacent to the correlates of collective efficacy. Therefore, although the household risk index was originally intended to be employed as a means of identifying communities that were especially at risk to the adverse effects of the COVID-19 pandemic, the risk factors' close theoretical alignment to the correlates of collective efficacy enabled their use as a second proxy measure.

Using the completed risk index, the U.S. Census Bureau then grouped households according to whether they possessed zero, one to two, or three or more risk factors. The percentage of households within each category was then calculated for each county or parish. Communities with a relatively large proportion of households with three or more risk factors are considered to have lower levels of

community resilience, and thus collective efficacy, relative to other communities. It's important to note, however, that the health-related risk factors used in the construction of the index have not been identified as being associated with collective efficacy by previous research. Consequently, although the estimates may indicate that a given county or parish is less resilient than others, the estimates may understate the collective efficacy of these communities. In other words, community resilience estimates likely represent minimum levels of collective efficacy within the communities of the case study region.

Figure 8: Decennial Census Self-Response Rates: Texas[6]

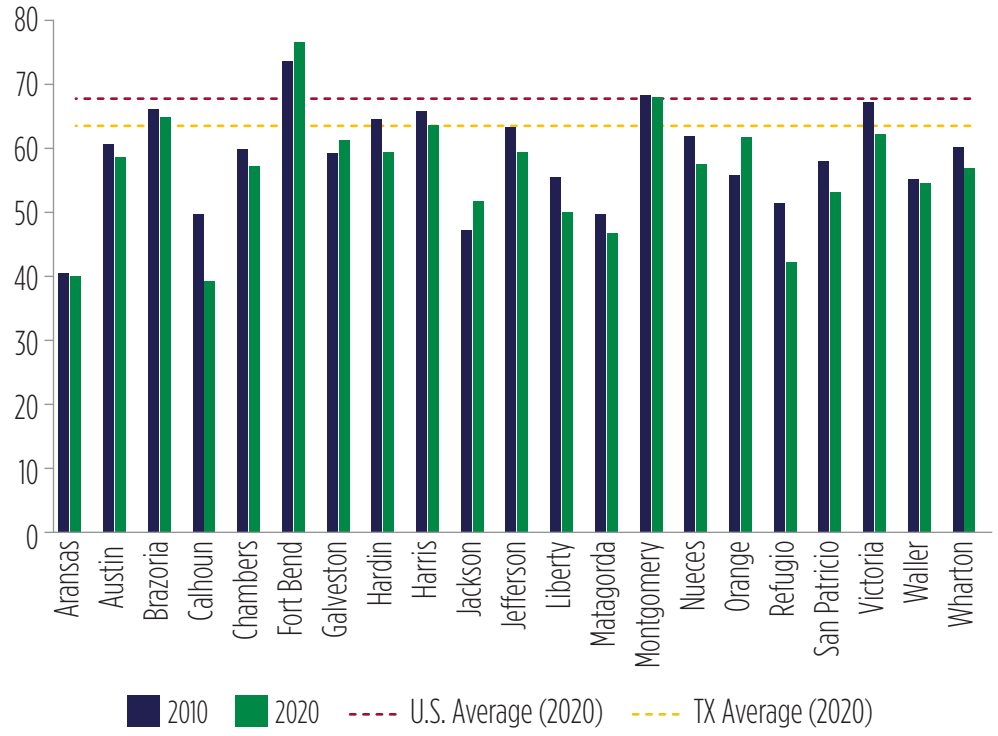


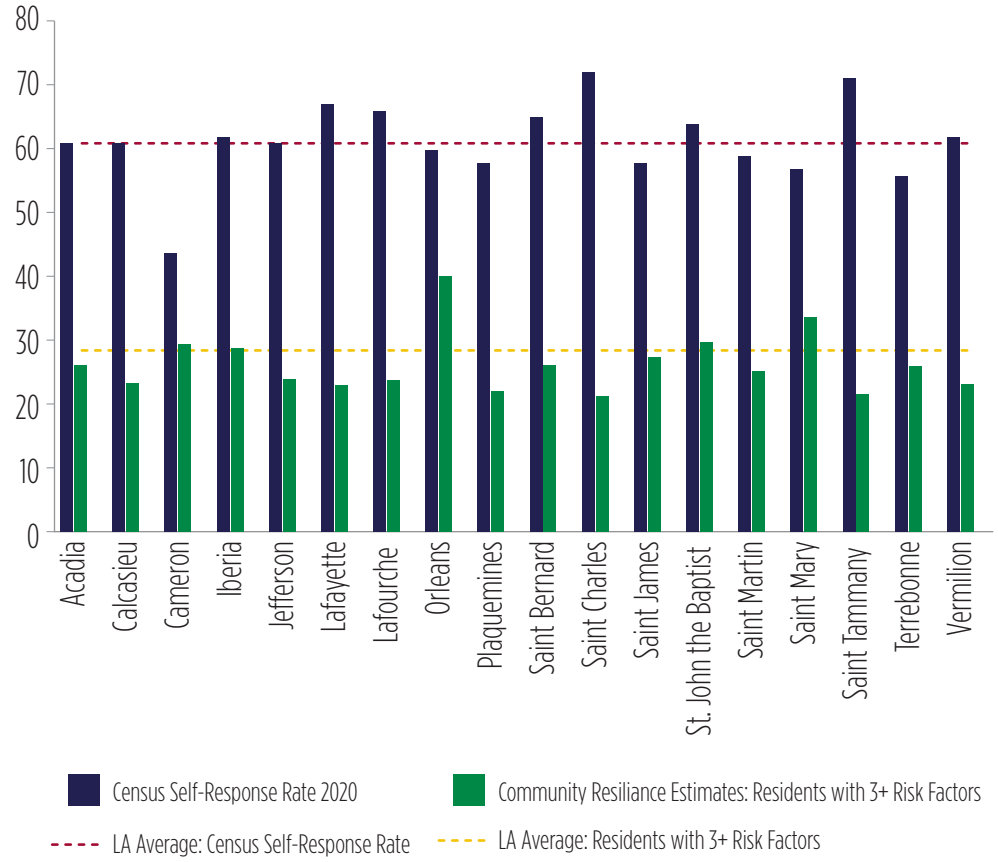
Table 4: Correlations: Census Self-Response Rates and Community Resilience Estimates

	2010 Self-Response Rate	2020 Self-Response Rate	0 Risk Factors	1–2 Risk Factors	3+ Risk Factors
2010 Self-Response Rate	—	0.75	0.4	−0.02	−0.54
2020 Self-Response Rate	0.75	—	0.31	0.16	−0.54
0 Risk Factors	0.4	0.31	—	−0.76	−0.9
1–2 Risk Factors	−0.02	0.16	−0.76	—	0.39
3+ Risk Factors	−0.54	−0.54	−0.9	0.39	—

By using both census self-response rates as an imperfect estimate of the upper bounds and community resilience estimates as an approximation of the lower bounds, we can gain clearer insight into the collective efficacy of each parish or county within the case study region. Correlations between the two measures support this claim. As Table 3 demonstrates, there is a strong negative correlation between self-response rates to the 2010 and 2020 U.S. censuses and the percentage of county/parish households with three or more risk factors. This

suggests that counties/parishes with low self-response rates also tend to possess a higher proportion of households with three or more risk factors used in the construction of community resilience estimates, as visible in Figures 9 and 10. Interestingly, this is not the case for the relationship between 2020 U.S. census self-response rates and the percentage of households with either one or two risk factors. For this relationship, we see that there is a weak positive correlation between the two measures in 2020, while there is a weak negative correlation between them in 2010. This indicates that there is no meaningful relationship between the U.S. census self-response rates and the measure for households with one to two risk factors.

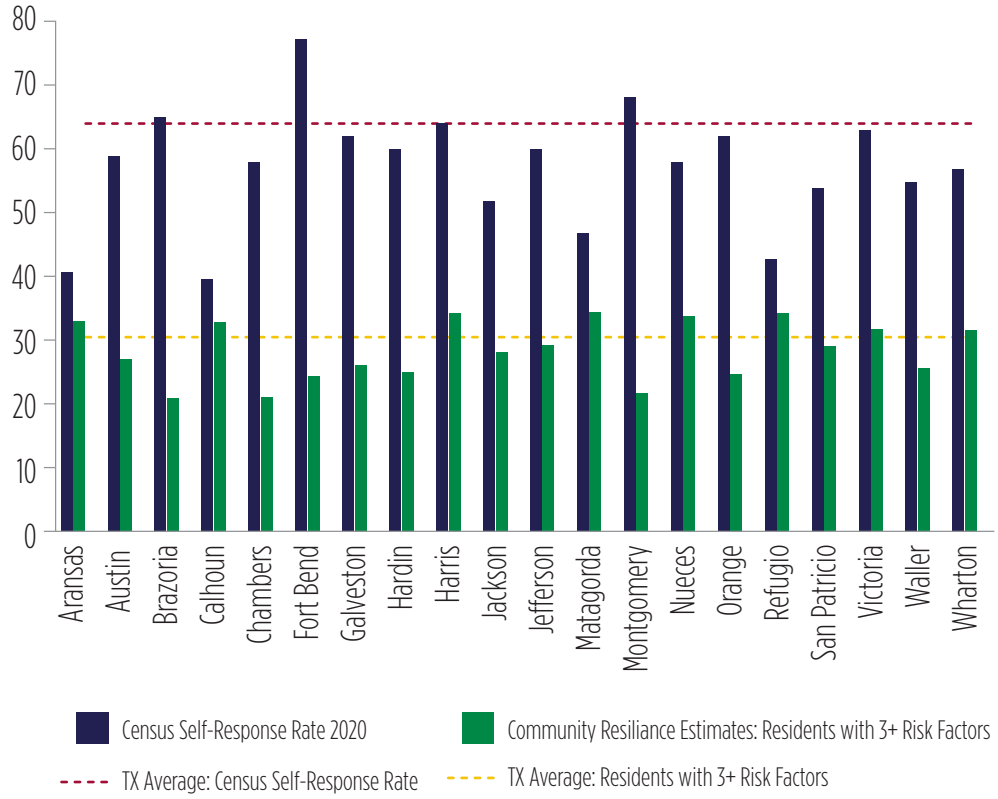
Figure 9: U.S. Census Self-Response Rates (2020) and Households with Three or More Risk Factors: Louisiana[7]



As indicated by the correlations between our two measures, Figures 9 and 10 demonstrate that counties and parishes with relatively low census self-response rates also possess percentages of residents with three or more risk factors at levels that are above, at, or near state averages. Areas of particular concern are those whose measures fall between their respective state averages. However, it is important to note that both states fall below the national census self-response rate of 67% and above the national average of 25.3% regarding the percentage of households with three or more risk factors. As such, those counties and parishes that are located between the state averages likely represent those with the lowest levels of collective efficacy in their respective regions. Our results indicate that Cameron, Orleans, and Saint Mary Parishes in the Louisiana Gulf Coast region and

Aransas, Calhoun, Harris, Matagorda, Nueces, Refugio, Victoria, and Wharton Counties in the coastal region of Texas likely possess relatively low levels of collective efficacy. Nonetheless, if the national averages were employed in the place of state averages, 50% of all parishes in the Gulf Coast region of Louisiana and 70% of all counties in the Texas case study region would be above the national average for the percentage of households with three or more risk factors and below the U.S. census self-response rates. Thus, the relatively weak social fabric of the communities within the case study region indicates that substantial social interventions will be necessary to assist and support the region's residents throughout the transition, as well as the community and public institutions upon which they depend—especially in communities that are highly dependent upon fossil fuels and associated sectors.

Figure 10:. U.S. Census Self-Response Rates (2020) and Households with Three or More Risk Factors: Texas[8]

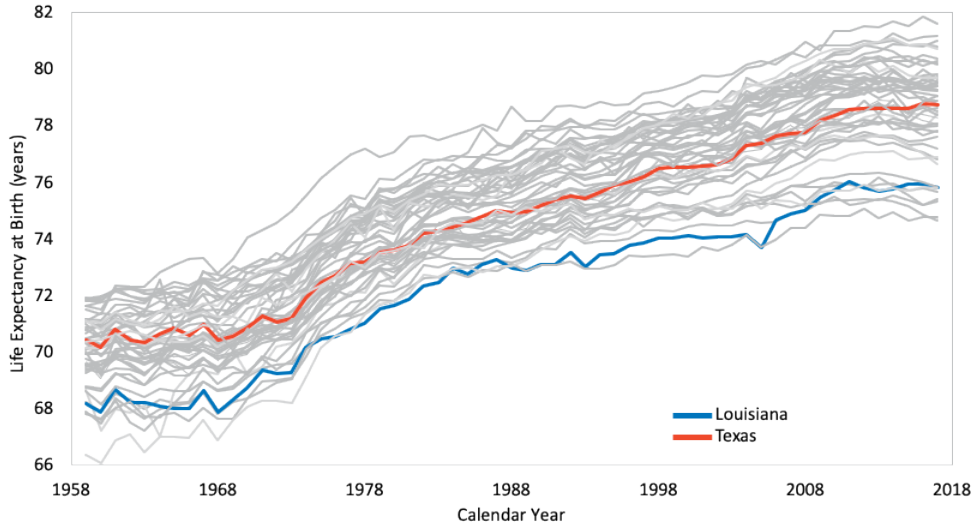


Life Expectancy and Social Health

One summary demographic measure that is highly sensitive to general social conditions is life expectancy, or the number of years a baby born today can expect to live if today's age-specific mortality rates remain the same throughout her entire life. We grant that it may seem odd to bring public health into a report on energy transitions, but we do so because we think it helps us keep our eye on the ball, to borrow a baseball metaphor. After all, the energy system isn't meant to serve itself; it's meant to serve people, and in many ways, the current Gulf Coast energy system has served its people extremely well.

The figure below shows life expectancies by state for the United States from 1958 to 2018. Texas is shown in red; Louisiana is shown in blue. Unfortunately, there is evidence that general population wellbeing in these states has stagnated over the past 10 years. This raises an agenda item for further research and discussion: What is driving this stagnation, and how can energy system innovation be leveraged to support population health improvements?

Figure 11: Trends, by State, in Life Expectancy at Birth, 1958–2018



Sociopolitical Points of Contestation

We have found that deep political polarization, which extends to climate change and energy transitions, often stifles productive conversations regarding the future of energy on the Gulf Coast. In particular, there is strong disagreement within the region over whether or not energy transitions should mean a permanent move away from the production and combustion of oil and gas. Polarization on this issue is vividly reflected by Louisiana House Bill 617, which would designate the state as an "Oil and Gas Sanctuary State." Writing in the *Shreveport Times*, Royal Alexander notes:

> Louisiana State Rep. Danny McCormick recently introduced House Bill 617, seeking to have Louisiana designated and declared a "sanctuary" state for fossil fuels in order to protect our oil and gas industry—a critically important part of our state's economy—that is again under attack, this time by the Biden Administration.[9]

It is not our place to take a side in this debate, but we do see it as valuable to reflect some of the reactions each side has to the other. We hope to help move the conversation forward by getting around defenses and helping both sides understand the other's position. The table below can thus be read as a guide to claims and ideas that may disrupt thoughtful deliberation over the most productive pathways to successful energy transitions.

Table 5: Common Assertions and Plausible Interpretations

Assertion:	Coal/Oil/Gas Proponent:	Renewables Proponent:
Carbon capture and storage (**CCS**) will help reduce greenhouse gas emissions.	The world demands oil and gas, and combustion is less GHG emitting with carbon management.	CCS is unproven, and is just a stalling tactic of Big Oil.
Existing pipelines, wires, refineries, and ports can support **hydrogen** energy	Hydrogen as an energy source is abundant, clean, and helps with storage.	Hydrogen is unproven, and is just a stalling tactic of Big Oil.
Energy transitions promise good **jobs**, with the right training investments	We already have the training, knowledge, and skills to produce O&G: why change?	There is ample demand for renewables engineers, entrepreneurs, and operators.
Ecological renewal and restoration is a win-win for the **environment** and people.	Stop worrying about the environment and think about the economy.	Ecological renewal and restoration means stopping GHG emissions.
Environmental **justice** is a necessary part of successful energy transition.	Energy is about the economy, not justice, and I hope you aren't calling me a racist.	BIPOC people have long borne a disproportionate share of pollution risks.

In part because the stakes are so high, and the petrochemical sector is the region's largest (though health care, education, consumer services, and agriculture are also large), opinions about it are many, strong, and varied. To make progress on developing plans for a thoughtful transition, we think it would be helpful for all parties to know each other's "trigger words" so that they can be avoided in favor of more descriptive, detailed, and precise language. The table below offers some examples. Openness about these matters from all sides is a necessary condition for conversations that lead to productive and creative solutions. Being more precise also carries the advantage of intellectual integrity, since these trigger words are usually just shorthand for what we really mean to say anyway.

Table 6: Words and Phrases That Risk Polarization

Trigger Word:	Pro-Coal/Oil/Gas:	Pro-Renewables:	Less Polarizing:
Fossil Fuel	Natural resources that make our lives possible	Materials that cause GHG emissions and environmental injustices	Coal, oil and gas; or, hydrocarbons
Environmental Justice	Derogatory leftist dog-whistle unfairly labeling people and especially conservatives as racists	Recognizing and reducing disproportionate suffering	Morally right and fair treatment and meaningful involvement of all people in decisions that affect health and the environment
Equity	Equality, which is impossible and unrealistic	To each according to their needs, and eliminating barriers	Expanding opportunity
Carbon Tax	Majors and supermajors: necessary to build carbon markets	Necessary to discourage more combustion of hydrocarbons	Carbon price, carbon dividend, or carbon value
Climate Change	Overheated rhetoric that ignores material human needs	Global crisis that requires switch to renewables ASAP	Strong storms, heat stress, cold snaps, flooding, droughts
Decarbonization	Unrealistic to go to zero-carbon energy anytime soon; doing so would hurt the globally vulnerable the most	Necessary to avoid the worst-case scenarios of climate change	Energy transitions, or shifts among forms of energy, which play out differently in different places, times, and peoples
Energy Transition	If it means moving away from coal, oil and gas, it is unrealistic and unnecessary	If it means ultimately moving away from coal, oil and gas, it is feasible and necessary	Energy development: using natural resources for energy sustainably, in way that reduces or eliminates GHGs

Chapter 2. Environmental Justice

Energy transitions require creativity, and one form of creativity involves combining existing ideas in a novel manner. In this sense, our goal is to bring together disconnected or conflicting groups of people in order to promote the constructive development of innovative ideas. As in other sections of this report, our role is not to offer fantastical solutions to the problems of energy transitions but to instead find new connections, offer new data, and help voice the different perspectives that are found within the region. It is in this spirit that we proceed with a discussion of environmental justice.

Before engaging in a substantive discussion of the specificities of environmental justice in the coastal regions of Louisiana and Texas, it's important to be clear about what we mean by the phrase "environmental justice." Definitions for terms such as this are abundant and have inevitably served as focal points of contestation, the bounds of which are in a state of continuous social negotiation. However, the White House Environmental Justice Advisory Council has synthesized at least 30 years of research in formulating a definition of environmental justice that, in our view, reflects the ambitions of those who invoke the phrase. Specifically, the council defines environmental justice as:

> [The] just treatment and meaningful involvement of all people regardless of race, color, national origin, or income, or ability, with respect to the development, implementation, enforcement, and evaluation of laws, regulations, programs, policies, practices, and activities, that affect human health and the environment (WHEJAC 2021, p. 79).[10]

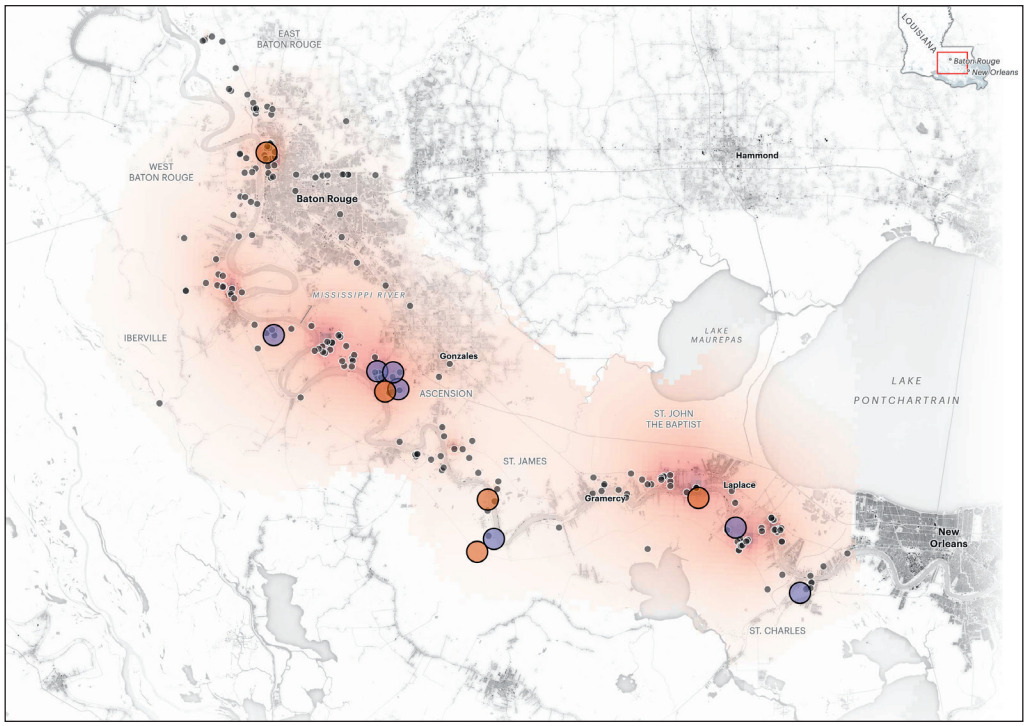
Exposure to Pollution

In considering the energy history of the Gulf Coast, the region has established a proud and innovative record of exploration, production, transportation, refining, and marketing. However, the region is also marked by the disproportionate concentration of petrochemical plants in predominantly Black neighborhoods. Moreover, despite the fact that the residents of neighborhoods adjacent to these plants often bear the greatest health-related risks, these majority African American communities are rarely granted access to the well-paying employment opportunities that they create.

Perhaps the most notorious example of this form of environmental injustice can be found in Cancer Alley. Also known as the Petrochemical Corridor, Cancer Alley spans the territory between Baton Rouge and New Orleans and is heavily populated by both petrochemical plants and African Americans. Where exactly are these "fenceline" communities? The map below, published by ProPublica, shows current petrochemical facilities (black dots), new facilities (purple), and permitted facilities (orange). Those communities within the red-shaded areas are those which are exposed to toxic levels of air pollution.

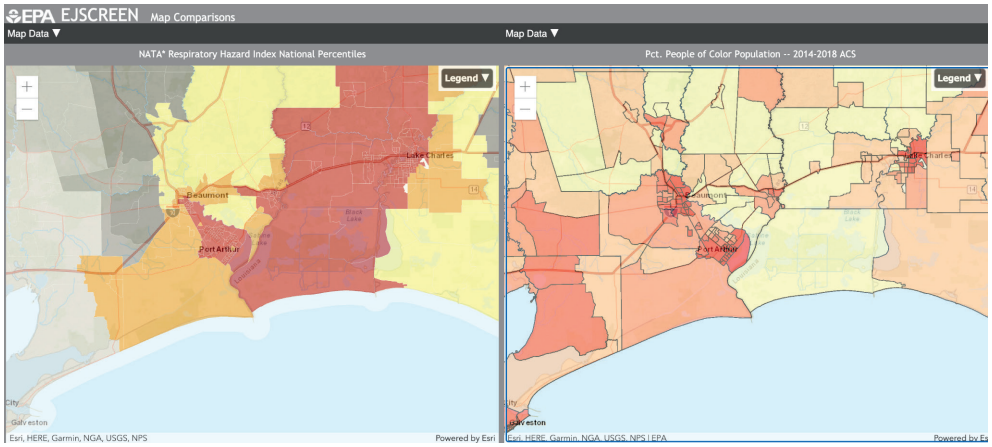
This longstanding and disproportionate exposure to toxic pollution represents one motivation for the federal government's Justice40 initiative, which aims to ensure that at least 40% of the benefits of environmental investments go to such fenceline communities. These benefits include "investments in the areas of clean energy and energy efficiency; clean transit; affordable and sustainable housing; training and workforce development; the remediation and reduction of legacy pollution; and the development of critical clean water infrastructure," as set forth in Executive Order 14008 (Sec. 223).

Figure 12: The Distribution of Petrochemical Facilities from Baton Rouge to New Orleans[11]



The White House Environmental Justice Advisory Council (WHEJAC) recently released its interim recommendations for the implementation of Justice40.[12] Their recommendations, while not binding in law, represent helpful guideposts for the integration of environmental justice and energy transitions. Most relevant to this aspect of environmental justice is the WHEJAC's development of a user-friendly screening tool for just investments. We see opportunities for the screening tool to build upon the foundation provided by the Environmental Protection Agency's EJSCREEN tool, which allows the user to compare demographic maps with maps of pollution.

Figure 13: Respiratory Health Hazard Exposure and Percentage of People of Color



This tool thus allows for the identification of fenceline neighborhoods, which often—but not always—follow the color line. For example, the maps above show that the Port Arthur area combines a high level of respiratory hazard exposure with a high proportion of the population who identify as people of color. Nonetheless, the majority white population across the border experiences the highest levels of respiratory risk.

Screening tools such as these can be adapted to make informed energy investments that align with the goal of promoting environmental justice. Specifically, several of the indicators recommended by WHEJAC (pp. 68–76) for environmental justice screening can be used to help identify energy investments that support just transitions, tap into underserved markets, and address energy poverty:

1. Energy shutoff data
2. Low- and middle-income households with access to energy efficiency programs
3. Weatherization investment for low- and middle-income households
4. Energy burden: percentage of gross household income spent on energy
5. Community access to renewable energy sources for household energy needs
6. Take-up rate for the Low Income Home Energy Assistance Program (LIHEAP)
7. Local energy resiliency: mapping of microgrid locations and services
8. Local energy resiliency: data on battery storage capacity and locations
9. Home heating method (gas, electric, wood, propane)
10. Home cooking fuel (gas, electric, etc.)

We note that WHEJAC was tasked with defining the types of environment-related projects that may, and may not, benefit communities interested in environmental justice. The first of these recommendations are “clean energy projects, including renewable energy and energy efficiency projects” (p. 56). Energy also features in their second, third, sixth, seventh, eighth, ninth, thirteenth, and fourteenth proposals, which to us signals the centrality of energy transitions to environmental justice, and vice versa. Some examples (using their numbering) include:

1. Clean energy projects, including renewable energy and energy efficiency projects
2. Regenerative agriculture and green infrastructure projects

3. Clean energy jobs training
6. Programs that both reduce greenhouse gases and promote economic, social, and environmental benefits
7. Public transportation: operational and capital improvements
8. Community microgrids
9. Community and green housing
13. Transit hubs that promote sustainability and small business development in EJ communities
14. Future Energy Jobs Act from Illinois (worked on by LVEJO [Little Village Environmental Justice Organization]) helped to secure worker benefits and investments that prioritized EJ communities and further those most impacted or marginalized within EJ communities

Conversely, the WHEJAC also identified the "types of projects that *will not* benefit a community." It should be noted that many of these are policies recommended in our case study, or in the Roosevelt Synthesis Document:

2. CCS or CCUS
3. Direct air capture
5. Research and development
6. The establishment or advancement of carbon markets, including cap and trade
14. Pipeline creation, expansion, or maintenance

Such policies were included in Jacqueline Patterson's "Memo to the Biden Administration: What Not to Do on Climate," which makes a case as to why such practices and policies might not be beneficial:

1. Carbon pricing—Carbon-pricing allows polluters to pay a nominal fee for the right to emit greenhouse gases. Too often, this results in polluters increasing emissions in places where it is cheapest to pollute, intensifying the lethal poisoning of BIPOC communities.
2. Propping up polluters—Strategies that support harmful natural gas, nuclear, biomass, biofuels, and carbon capture and sequestration are largely driven by the need to pacify powerful constituencies. Efforts to address the climate crisis will fail if they are counterbalanced by coddling of polluters.
5. Single-issue solutions—In the words of Audre Lorde, "There is no such thing as a single-issue struggle because we do not live single-issue lives." Solutions that address multiple problems at once—for example, creating well-paid jobs while building efficient, resilient homes—are both effective and politically popular.
12. Incrementalism/low ambition–This is no time to make small changes to a fundamentally flawed system. To change systemically rooted problems, we need, bold, ambitious, transformational policymaking.[13]

We found the WHEJAC report very helpful in specifying the pathways toward a just transition, which, to anticipate the interview results below, was a priority for many residents within the case study region. Clearly there is a divide with respect to the merits of carbon capture and storage (CCS). Any group concerned with advancing equitable energy transitions must reconcile the substantial enthusiasm for CCS within the oil and gas industry with the WHEJAC's support of "programs that both reduce greenhouse gases and promote economic, social and environmental benefits." The very definition of CCS is still evolving, and we see opportunities here.

Sea Level Rise, Coastal Erosion, Flooding, and Hurricanes

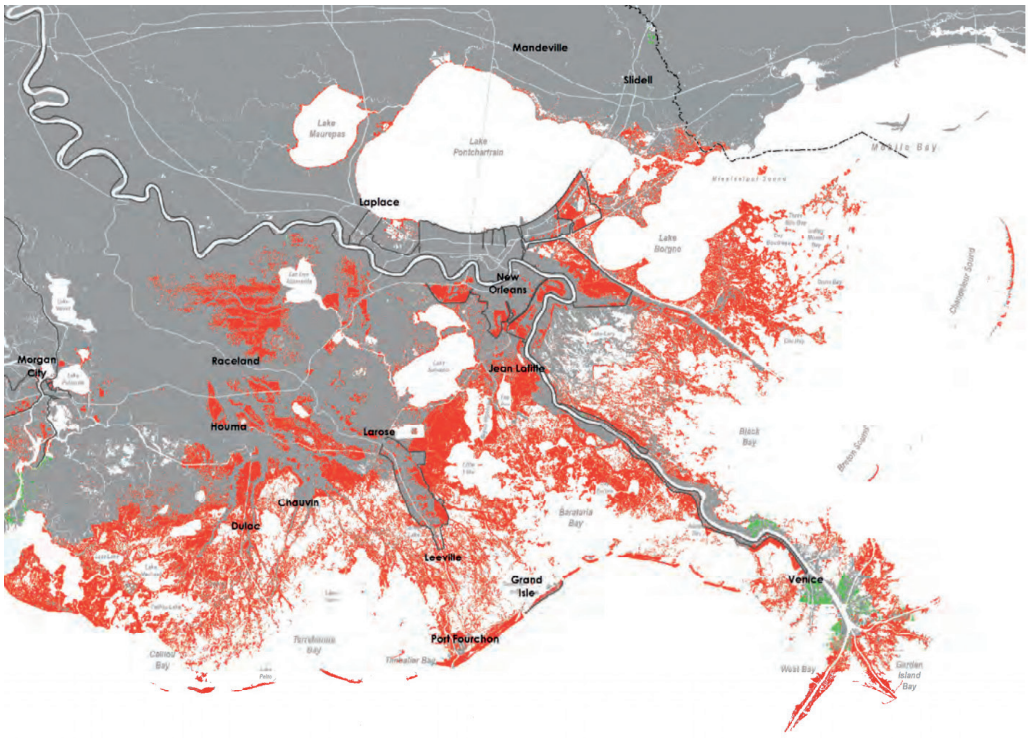
As a low-lying coastal area, the Gulf Coast region is especially vulnerable to climatic hazards, as we saw again at the time of this report's writing with Hurricane Ida—an event that resulted in deaths, property destruction, and widespread power outages. According to the International Panel on Climate Change (IPCC), low-lying coastal areas like the Gulf Coast are especially vulnerable to flooding, land loss, subsidence, worsening hurricanes, and higher rainfall totals. In the absence of major adaptation efforts, alongside trends in coastal development, annual flood damages are expected to increase two- to threefold by 2100[14]. These hazards compound the continuing legacy of toxic pollution in the region.

The Fourth National Climate Assessment is in alignment with the IPCC, foreseeing similarly worrisome climate change impacts throughout the Gulf Coast region. Rising temperatures and sea levels, paired with more extreme heat events and stronger hurricanes, stress infrastructure throughout the Gulf that is already stretched thin by the storms, water levels, and erratic temperatures of the present day.[15] Coastal erosion, in particular, is already occurring at alarming rates. In Louisiana, the complex coastal ecosystem is disappearing. From 1932 to 2010, more than 1,800 square miles of land disappeared.[16]

The combination of natural subsidence and human intervention has exposed coastal Louisianan communities to storm surges and rising seas. The Louisiana Coastal Master Plan has projected that an additional 4,000 square miles of land could be lost over the next 50 years if substantial investments in coastal restoration and protection are not made. A similar fate faces the Texas coast, where subsidence and flooding risk are exacerbated by groundwater pumping.[17] In general, many communities in the case study region face the highest exposure risk to floods and hurricanes throughout the country.

Extreme rainfall and water stress also loom large in the region.[18] Acute shocks and chronic stressors from climatic events are expected to exacerbate preexisting environmental burdens. The potential losses under a situation in which no adaptations are made are striking. Land and ecosystem restoration, particularly along coastal areas, will therefore remain an integral strategy in the Gulf Coast's adaptive management and resilience planning moving forward.[19]

Figure 14: 50-Year Prediction of Land Loss under Conditions of Moderate Climate Change under Scenario with No Adaptations[20]



The burdens of climatic hazards, water pollution, flooding, and housing damage are also disproportionately experienced by Black and Native American residents. As of this writing in July 2021, months after Hurricanes Laura (August 2020) and Delta (October 2020), Native American communities continued to struggle with finding shelter, a struggle that has been exacerbated by 2021's extreme winter storms.

There are a number of organizations in the region that have worked to combat environmental injustices over recent decades. These organizations have laid the groundwork for the discussion around successful energy transitions in the Gulf Coast region today. We see strong potential for productive deliberation amongst these and other groups interested in the future of the region:

1. Deep South Center for Environmental Justice
2. The Lowlander Center
3. The Water Institute of the Gulf
4. Gulf Coast Center for Law and Policy
5. Greater Houston Partnership
6. Houston Advanced Research Center
7. Greater New Orleans, Inc.
8. Southwest Louisiana Chamber of Commerce
9. Lake Area Industrial Alliance
10. Louisiana Mid-Continent Oil and Gas Association
11. LSU Center for Energy Studies
12. Rice University Center for Energy Studies
13. The Nature Conservancy
14. Environmental Defense Fund
15. Foundation for Louisiana

To anticipate our recommendations below, we think there is significant upside to generating region-level deliberation about how the region can lead the nation in energy transitions. One possibility is a Gulf Coast energy leadership council, which could convene representatives from these and other public-private partnerships. This would serve the same coordinating and strategic functions as the Greater Houston Partnership does for the Houston area. Such an effort could make the thoughtful conversations about energy transition planning more inclusive by strengthening the voices of those who have borne the risks of the energy sector thus far.

Chapter 3. Energy Transitions Today: Where Does the Gulf Coast Energy System Stand?

The Gulf Coast is one of the most prolific and dense energy regions in the country. Offshore oil production along the coast accounts for 17% of total U.S. crude oil production, and nearly half of the nation's petroleum refining and natural gas processing capacity is located in the region.[21] Additionally, large stationary facilities such as refineries and power plants are responsible for over 240 million metric tons of carbon dioxide equivalent.[22]

In Texas, energy-related emissions have risen over the past two decades. The industrial and transportation sectors in Texas account for nearly two-thirds of fossil-fuel-related carbon dioxide emissions.[23] The top five largest emitting facilities in the case study region are all located in Texas, in Fort Bend, Harris, Galveston, and Jefferson Counties. Louisiana's energy-related carbon dioxide emissions have stabilized in recent years, and the state's industrial sector continues to account for the majority of statewide greenhouse gasses (GHGs). A 2021 report by the Louisiana Governor's Office of Coastal Activities found that the industrial sector produced 66% of the total GHGs emitted within Louisiana.[24]

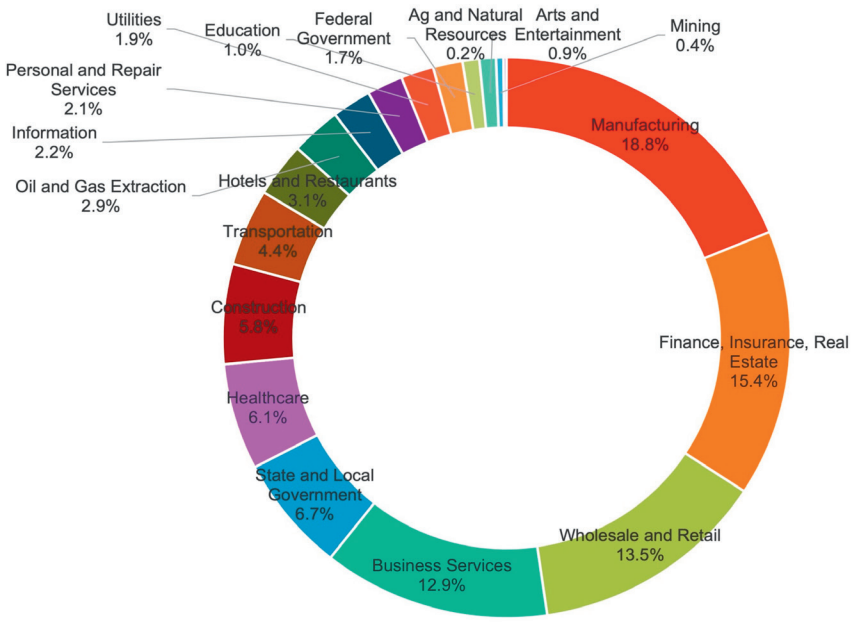
The region is characterized by a dense network of oil and gas infrastructure, the result of decades of industry exploration and development along the continental shelf's gradual slope. Over the 20th century, the petroleum industry expanded from primarily onshore to near-shore and eventually deep-water activities. Today, hundreds of miles of pipelines connect about 3,500 offshore platforms, rigs, and structures. On land, gas processing plants, storage facilities, refineries, waste handling sites, petrochemical suppliers, and fuel ports render the Gulf Coast one of the country's most critical energy regions. In the past decade, the expansion of shale gas production and crude oil in the Gulf Coast have channeled billions of dollars into capital investments and infrastructure improvements, including the additions of liquified natural gas (LNG) export terminals, petrochemical plants, and new pipelines.

Oil and gas products from the Gulf Coast contribute significantly to the country's presence in international energy markets. For example, since the 40-year ban on crude oil exports was lifted in 2016, the Gulf Coast has become the primary energy hub for American crude oil products leaving for international markets: nearly 85% of all U.S. crude oil exports left a Gulf Coast port, including the Louisiana Offshore Oil Port and the Port of Houston.[25] The rise in LNG exports has also gravitated to the region, particularly in southern Louisiana.[26] Since 2015, the volume of exported natural gas liquids, liquified petroleum gases, and renewable fuels from the Gulf Coast region has dramatically increased.[27] The table and figure below place this dominant industry in context.

Table 7: Gulf Coast Study Region: Top 15 Industries by Contribution to GDP (2019)[28]

Industry	GDP (Million Fixed 2021$)
Real estate	$ 65,019
Wholesale trade	$ 58,143
Professional, scientific, and technical services	$ 56,775
Petroleum and coal products manufacturing	$ 56,006
State and local government	$ 48,258
Chemical manufacturing	$ 41,546
Construction	$ 41,447
Retail trade	$ 38,758
Ambulatory health care services	$ 23,766
Administrative and support services	$ 21,797
Oil and gas extraction	$ 20,506
Food services and drinking places	$ 16,915
Hospitals; private	$ 14,841
Utilities	$ 13,404
Insurance carriers and related activities	$ 12,316

Figure 15: Gulf Study Region: GDP by Sector (2019)[29]



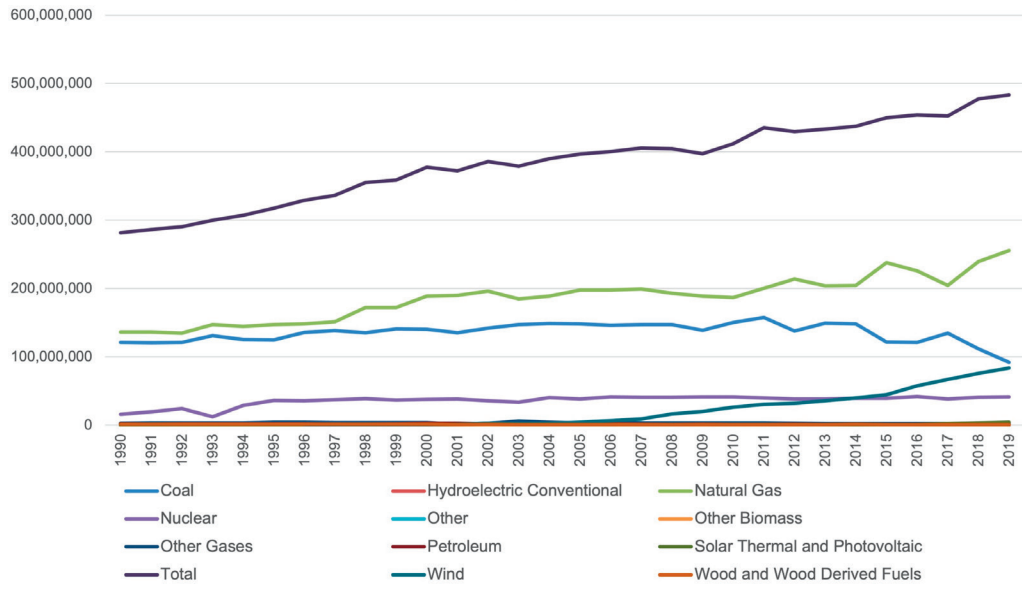
The region is served by an equally vast transportation system, including major marine ports and airports, passenger and freight rails, highways, commercial trucking depots, bridges, marine facilities, and waterways. This complex, multimodal infrastructure supports the movement of goods, people, and services throughout the entire southeast and connects the region to international markets. The Gulf Coast is home to the largest concentration of freight-handling ports in the United States based on tonnage, New Orleans serves as the gateway for the U.S. interior's agricultural production, and the region hosts the important inland waterways of the Mississippi River and the Gulf Intercoastal.[30]

The Ports of South Louisiana, Houston, Beaumont, and Corpus Christie rank amongst the five largest American water ports based on tonnage. According to the U.S. Department of Transportation, each of these ports registered double-digit growth in cargo volume between 2008 and 2018.[31] The Port of South Louisiana, which spans 54 miles across St. Charles, St. John the Baptiste, and St. James Parishes, is an important energy transfer location, where fossil fuel products account for over 70% of total imports. The Port of Houston, the largest in the Gulf Coast region, houses nearly 200 facilities, including the country's largest petrochemical complex.

The density of the critical infrastructure in the case study region renders it especially vulnerable to the effects of climate change, including predicted changes in precipitation patterns and temperature, tropical storms, and sea level rise. In 2008, the U.S. Department of Transportation, in coordination with the U.S. Geological Survey and the U.S. Climate Change Science Program, studied the risks posed by climate change to the coastal infrastructure systems in the region. Researchers found that four feet of local sea level rise would permanently inundate over 25% of the roads within the region and an astonishing 72% of its ports, while more intense rainfall and higher temperatures would increase maintenance costs and hasten the deterioration of infrastructure.[32] The region's energy assets are also at risk. Its natural gas processing plants, in particular, are especially vulnerable due to their proximity to the coast.[33] Disruptions to critical energy infrastructure can have cascading impacts across society, the effects of which are likely to be unevenly distributed amongst communities.[34] The breakdown of Texas's electric grid in February 2021, as a result of severe winter storms, demonstrates the need to plan for extreme weather events that will likely become more common in the near future.

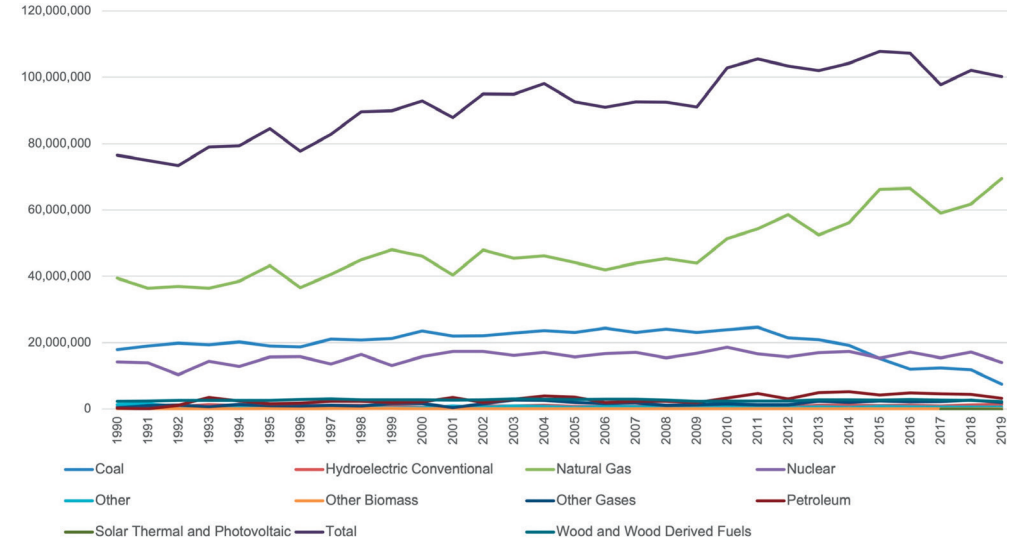
Turning to power generation, our analysis of long-term trends shows ample evidence of recent growth in natural gas and renewable electricity. Here, Texas's leadership in wind power generation, in particular, stands out:

Figure 16: Texas Electric Generation by Source, 1990–2019, FERC Data (see note 35)



In Louisiana, renewable sources make up a far smaller proportion of total power generation:

Figure 17: Louisiana Electric Generation by Source, 1990–2019, FERC Data (see note 35)



Of course, the above are annual data, ending in 2019. More recently, new power generation signals that future growth is in wind and solar:

Figure 18: New Power Capacity (Megawatts) Added in USA, January to March 2021[35]

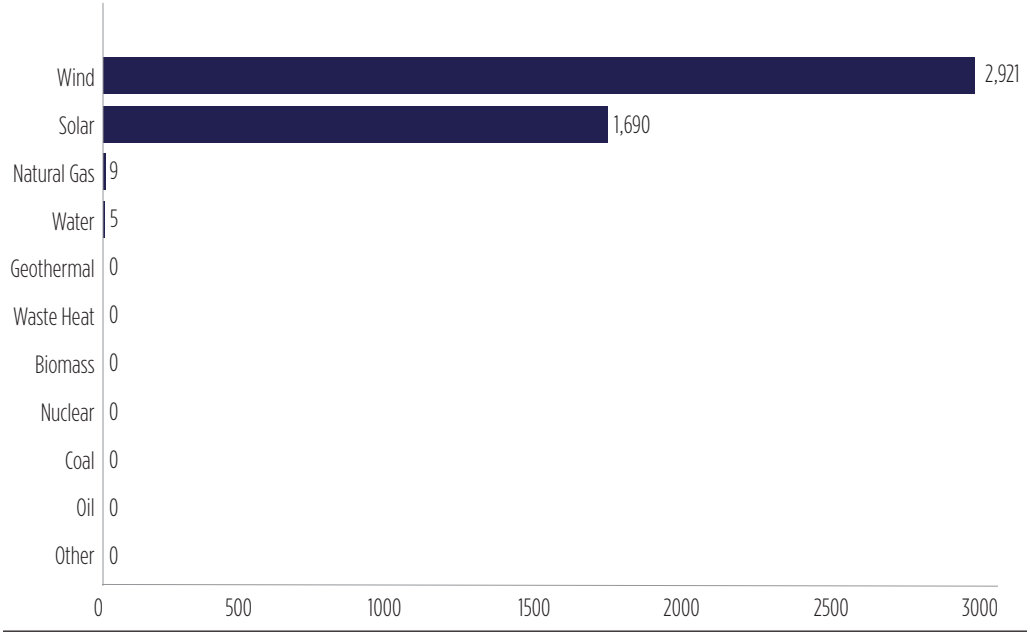


Chart: Zach Shahan, CleanTechnica, Source: FERC

Determining the relative importance of the fossil fuel sector within the broader political economy of the Gulf Coast region is partially dependent upon an assessment of the geographical distribution and density of fossil fuel companies

within the region. And while measures such as the absolute number of fossil fuel companies operating within the region may be informative, the insights gained would be insufficient if the complexities of corporate ownership structures were not accounted for. In particular, the capital-intensive nature of fossil fuel exploration, extraction, refinement, and distribution has produced highly integrated supply chains, in which most regional companies belong to the corporate families of larger conglomerates. Consequently, strategic planning decisions and the accumulation of profits often occur in locations far from the communities where industrial activity occurs. As such, subregions within the Louisiana-Texas Gulf Coast may dominate the regional political economy to a far greater extent than naïve measures would indicate.

A more effective and sophisticated approach to evaluating the economic dependence of the Gulf Coast on the fossil fuel and associated sectors takes such complexities into account. Network analysis is an ideal tool for accomplishing this task as it permits investigations of both the structure of corporate affiliations and the geographical distribution of each company's constituent parts. A network consists of any set of entities (i.e., nodes) that are affiliated with one another through various types of relationships (i.e., ties). As such, network analysis serves as a means of examining the distribution and structure of ties amongst nodes within a network. Thus, by focusing on ownership networks of parent and subsidiary corporations, important insight into the structure of corporate affiliations within the region can be gained, thereby helping to identify regional centers of political and economic power within the Louisiana-Texas Gulf Coast.

To this end, original network data was collected from the LexisNexis Directory of Corporate Affiliations (DCA) Historical Data set for 2016. The DCA contains identifying and descriptive data on more than 228,000 international, private, and public companies, which themselves can be grouped according to the corporate families they belong to.[36] For the purpose of conducting a network analysis of the fossil fuel industry, the cities and towns within the case study region can be conceptualized as constituting a set of nodes. However, because visualization and interpretation can be difficult with large numbers of nodes, the cities and towns within the region were then grouped according to their respective metropolitan statistical areas (MSAs) as defined by the U.S. Office of Management and Budget. The ties connecting these MSAs are formed by relationships between the heads of corporate families (i.e., parents) and their various subsidiaries. The network thus consists of MSAs in the coastal regions of Louisiana and Texas that are connected to one another (and others) through the corporations that are located within them. Thus, a tie with an arrow emanating from an origin location and pointing toward a separate location indicates that the terminus possesses a subsidiary from a parent company based in the MSA represented by the origin point.

The structure of corporate affiliations amongst all economic sectors in the Louisiana-Texas Gulf Coast region is presented in Figure 19. In general, it reveals the significant presence of the fossil fuel sector, which constitutes approximately 11.2% of all corporations within the region. The size of the node denoting the Houston-The Woodlands-Sugar Land, TX MSA highlights its role as the preeminent hub of economic activity in the Gulf Coast region. Of all the corporate locations in the coastal regions of Louisiana and Texas (i.e., parent or subsidiary companies), 38.1% are located within the Houston-The Woodlands-Sugar Land, TX MSA.37 The Beaumont-Port Arthur, TX MSA is the second largest in the Texas Gulf Coast region with 2% of the total corporate locations, and the Corpus Christi, TX

MSA is the third with 1.4%. Figure 19 demonstrates that the geographical distribution of subsidiaries in the Louisiana Gulf Coast region, unlike Texas, is far more balanced. The New Orleans-Metairie, LA and the Lafayette, LA MSAs are the two largest with respect to the number of corporate locations they possess, at 4.5% and 3.4%, respectively. Combined, these five metropolitan statistical areas possess approximately 49.4% of all corporate locations in the Gulf Coast regions of Louisiana and Texas.

Figure 19: All Corporations in the Gulf Coast Regions of Louisiana and Texas[38]: MSA Scaled by Total Number of Parent and Subsidiary Companies

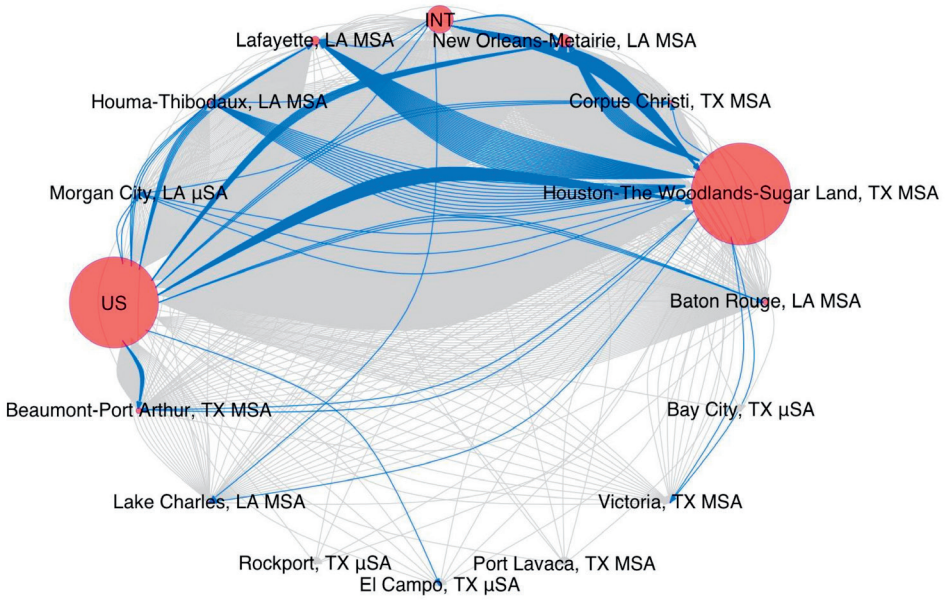


Figure 19 also illustrates the sources of corporate investment for the Louisiana-Texas Gulf Coast region. Of the subsidiaries located within the coastal regions of Louisiana and Texas, 68.2% belong to corporate families that are based in the United States but outside of the Louisiana-Texas Gulf Coast, whereas 20.5% belong to internationally based corporate families. Of the remaining 11.3% of subsidiaries in the region, 8.5% are members of corporate families with headquarters in the Houston-The Woodlands-Sugar Land, TX MSA. In other words, the Houston-The Woodlands-Sugar Land, TX MSA possesses 75.6% of all parent companies in the Louisiana-Texas Gulf Coast. Of the parent companies based in the Houston-The Woodlands-Sugar Land, TX MSA, 21.5% are in the fossil fuels sector.

Table 8: Largest Companies in the Louisiana Gulf Coast Region[39]

Ranking	Company Name	Locations	Sector	Ownership
1	LHC Group, Inc.	24	Healthcare	Public
2	HCA Holdings, Inc.	18	Healthcare	Public
3	Bollinger Shipyards, Inc.	17	Shipbuilding	Private
4	Turner Industries Group, L.L.C.	15	Oil & Gas	Private
5	The Newtron Group Inc.	14	Oil & Gas	Private
6	Schlumberger Limited	13	Oil & Gas	Public
7	Lamar Advertising Company	10	Professional Services	Public
7	Tidewater Inc.	10	Oil & Gas	Public
9	Superior Energy Services, Inc.	9	Oil & Gas	Public
10	Eatelcorp Inc.	8	Telecommunications	Private
10	Solar Supply, Inc.	8	Retail & Wholesale	Private
10	Entergy Corporation	8	Utilities	Public

Table 9: Largest Companies in the Texas Gulf Coast Region[40]

Ranking	Company Name	Locations	Sector	Ownership
1	Schlumberger Limited	91	Oil & Gas	Public
2	Exxon Mobil Corporation	51	Oil & Gas	Public
3	HCA Holdings, Inc.	49	Healthcare	Public
4	Kinder Morgan, Inc.	43	Oil & Gas	Public
5	Energy Transfer Equity, L.P.	38	Oil & Gas	Public
6	National Oilwell Varco, Inc.	34	Oil & Gas	Public
7	Targa Resources Corp.	31	Oil & Gas	Public
8	Baker Hughes Incorporated	24	Oil & Gas	Public
8	Occidental Petroleum Corporation	24	Oil & Gas	Public
10	Enterprise Products Partners, L.P.	23	Oil & Gas	Public

The oil and gas industry in the Texas Gulf Coast region is highly concentrated amongst a relatively small number of corporations. As Table 9 demonstrates, nine out of the ten most numerous companies are associated with fossil fuels. On the other hand, Table 8 indicates that the sectoral composition of the Louisiana Gulf Coast economy is significantly more diversified, where a more modest 50% of the most numerous companies operate within fossil fuel and fossil-fuel-adjacent industries. Consistent with Figure 20, the largest fossil fuel companies operating within the Gulf Coast region of Texas possess a far greater number of locations relative to Louisiana. Notably, Schlumberger Limited—the largest fossil fuel company in the Texas Gulf Coast—possesses more locations in the Texas Gulf Coast region alone than the ten largest fossil fuel companies in the Louisiana Gulf Coast region combined.

Table 10: Fossil Fuel Corporations in the Gulf Coast Region of Louisiana and Texas[41]

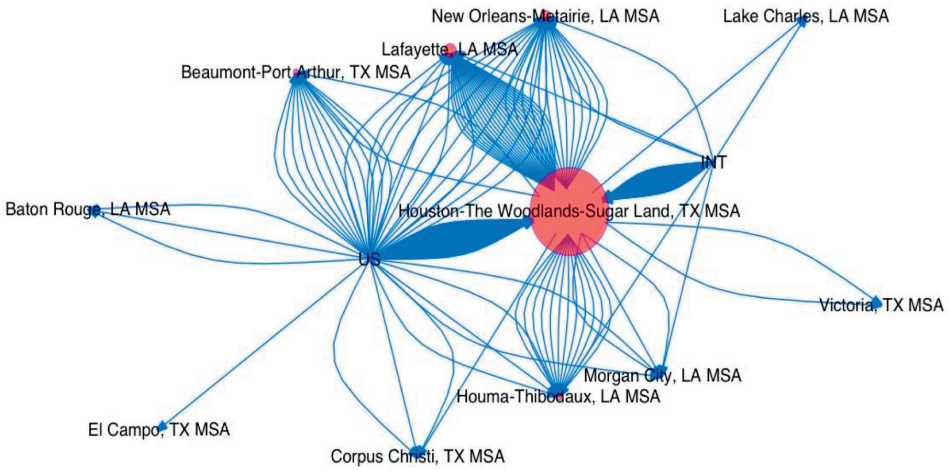
Louisiana			
Ranking	Company Name	Locations	Ownership
1	Turner Industries Group, L.L.C.	15	Private
2	The Newtron Group Inc.	14	Private
3	Schlumberger Limited	13	Public
4	Tidewater Inc.	10	Public
5	Superior Energy Services, Inc.	9	Public
6	Entergy Corporation	8	Public
7	Exxon Mobil Corporation	5	Public
7	Gibson Energy Inc.	5	International
9	PetroQuest Energy, Inc.	4	Public
10	Parker Drilling Company	3	Public
10	Freeport-McMoRan Inc.	3	Public
10	Targa Resources Corp.	3	Public

Texas			
Ranking	Company Name	Locations	Ownership
1	Schlumberger Limited	91	Public
2	Exxon Mobil Corporation	51	Public
3	Kinder Morgan, Inc.	43	Public
4	Energy Transfer Equity, L.P.	38	Public
5	National Oilwell Varco, Inc.	34	Public
6	Targa Resources Corp.	31	Public
7	Baker Hughes Incorporated	24	Public
7	Occidental Petroleum Corporation	24	Public
9	Enterprise Products Partners, L.P.	23	Public
10	Superior Energy Services, Inc.	21	Public

Focusing upon the fossil fuel and adjacent sectors, the general dynamics from the previous analysis continue to hold. In 2016, 19.5% of all parent companies associated with the fossil fuel industry were located in the coastal regions of Louisiana and Texas. Of these, 100% were based in the Houston-The Woodlands-Sugar Land, TX MSA. Moreover, the Houston-The Woodlands-Sugar Land, TX MSA possessed 65.6% of all subsidiary companies in the fossil fuels and other related sectors operating on the Louisiana-Texas Gulf Coast. Combined, these few simple measures demonstrate the central role of the Houston-The Woodlands-Sugar Land, TX metropolitan statistical area in the fossil fuel sector of the case study region, as well as its political economy more broadly.

The heavy concentration of fossil fuel and adjacent industries within the Houston-The Woodlands- Sugar Land, TX MSA is also evident in the number of subsidiaries that it sends to other MSAs in the region. The Lafayette, LA MSA has an especially strong relationship with the Houston-The Woodlands-Sugar Land, TX MSA, which is represented by the relative density of ties between their respective nodes in Figure 20. Recall that the Lafayette, LA MSA possesses a relatively modest 3.4% of all corporate locations in the Louisiana-Texas Gulf Coast region. However, of the total number of companies in the fossil fuels and adjacent industries operating within the case study region, 5% are in the Lafayette, LA MSA—81% of which come from parent companies based in the Houston-The Woodlands-Sugar Land, TX MSA. Moreover, 19% of all companies located within the Lafayette, LA MSA are associated with fossil fuels and adjacent industries—a proportion that is significantly larger than the 14.3% of the Houston-The Woodlands-Sugar Land, TX MSA.

Figure 20: Fossil Fuel Corporations in the Coastal Regions of Louisiana and Texas: MSA Scaled by Total Subsidiaries Received[42]



Similarly, the Houma-Thibodaux, LA MSA is also dominated by subsidiaries in the fossil fuel and associated industries—the majority of which emanate from the Houston-The Woodlands-Sugar Land, TX MSA. Whereas the Houma-Thibodaux, LA MSA only possesses 1.6% of the total corporations in the case study region, it's home to 2.7% of the fossil fuel and associated industries in the Louisiana-Texas Gulf Coast. While the absolute number of fossil fuel subsidiaries in the Houma-Thibodaux, LA MSA region is relatively small, they nonetheless comprise 23.2% of the corporations located within it. Troublingly, previous industrial transitions in other regions of the United States have demonstrated that the residents of less economically diversified communities, such as the Lafayette, LA and Houma-Thibodaux, LA metropolitan statistical areas, are especially vulnerable to drastic changes in the economic landscape—particularly the lesser educated and racial minorities.[43]

The New Orleans, LA and Beaumont-Port Arthur, TX MSAs are the second-largest metropolitan statistical areas in the coastal regions of Louisiana and Texas with respect to the total number of companies they possess in the fossil fuels sector. While subsidiaries with parent companies based in the Houston-The Woodlands-Sugar Land, TX MSA are especially prevalent in the New Orleans-Metairie, LA MSA, the opposite is the case in the Beaumont-Port Arthur, TX MSA, where most companies are subsidiaries sent from other regions of the United States. Moreover, the New Orleans, LA MSA contains 4% of the fossil fuel industry within the case study region, whereas the Beaumont-Port Arthur, TX MSA possesses 2.3% of the sector. Finally, fossil fuels and adjacent sectors comprise a slightly larger proportion of the corporations in the Beaumont-Port Arthur, TX MSA than they do in the New Orleans-Metairie, LA MSA at 12.7% compared to 9.3%. The relatively lower levels of fossil fuel and related companies within these two metropolitan areas places them at an advantage as the energy sector shifts in favor of renewables.

While useful, these macroeconomic or mesostructural indicators do not capture the experiences of individuals with respect to energy transitions. For a deeper

sense of what these questions mean to people, we turn back to analysis of the interview data.

The political and economic dominance of the energy sector is well known by individuals within communities and is most often manifested through expressions of fear. Leaders of nonprofit organizations, for example, often fear being labeled as unpatriotic if they advocate for an energy transition (summarized from interview with Dr. Monica Mancuso, Advocate Leader, St. Mary Excel). Moreover, residents and local government officials often fear criticizing nearby petrochemical plants due to their political and economic power within the community. As a result, crucial matters facing residents often go unaddressed. In St. John Parish, many residents are dependent upon such plants for their income. Yet the same residents are also reluctant to drink their tap water because they fear that it's unsafe due to pollution from the plant. Nonetheless, because of their reliance upon the plant as a vital source of income, residents do not press for clean water as they fear that doing so would cause the plant to relocate (summarized from interview with Devin Foil, Planner III, HNTB).

Chapter 4. Turning Constraints into Opportunities

How should we think about an energy transition in a region where the conventional energy sector is so vital to the wellbeing of local communities and their economies? We aim to draw upon and synthesize a diversity of data to provide an answer to this question. As with the entirety of the case study, we seek to highlight the perspectives of local residents so as to promote an equitable and inclusive planning process. Moreover, we believe that it's equally important to understand the difficulties encountered by local leaders within both the public and private sectors in order to ensure that the energy transition is not only just but also effective.

The Gulf Coast region's long and justly proud tradition of finding, extracting, refining, and distributing oil and gas to domestic and international markets should be acknowledged and respected by people whose very lives are made possible by such efforts. For instance, we are writing this report on computers with plastic keys, plastic wiring insulators and harnesses, plastic screen frames, composite motherboards, and batteries charged by electricity, much of it from oil and gas products. We are grateful to energy producers who have endured and creatively innovated through previous transitions, including oil field discoveries in the early 1900s, the opening to offshore drilling in 1947, the OPEC crisis of the 1970s, and later deepwater drilling and natural gas hydraulic fracturing. The people here are no strangers to energy transitions.

To gain the insights of local communities regarding the extant barriers to and possible pathways for promoting a successful energy transition, we drew upon the knowledge of local stakeholders and community members within the case study region. Interviews were designed in an open-ended format, where participants could express their previous and current experiences with economic and climate-based change. These interviews were then analyzed according to their insights about the barriers and pathways to a successful energy transition that currently exist in their communities. The excerpts presented throughout this section represent common thematic issues that arose during our interviews.

We have identified several potential barriers to the current round of energy transitions, but we are also optimistic that these constraints can be transformed into opportunities, given the substantial comparative advantages that exist on the Gulf Coast. While the physical, environmental, and social impacts of climate change present serious challenges to Gulf Coast communities, most folks on the Gulf Coast are concerned with more practical, everyday challenges. We believe that the absence or subpar quality of many daily essentials has contributed to the lack of diversified investment along the coast. Such community concerns mean that coalitions can be built for energy transitions if the energy system adapts in a way that addresses these pressing problems.

Before delving into the specifics, however, there are two obvious questions that we have yet to address thus far: How do the residents of the region define the energy transition, and what would a successful energy transition look like to them? Participants understand the energy transition as a shift away from fossil fuel exploration and the use of fossil fuels as an energy source in favor of industries that reduce carbon emissions through the use of renewable resources. They also explained that reducing carbon emissions does not necessarily imply scaling back operations or divesting entirely—existing energy companies can

transition to harnessing new sources of energy, as they have always done. One participant voiced the views of many when he noted:

> We are moving [toward decarbonization] and most people agree that this will continue. Let's focus on what the transition looks like . . . [T]he economic approach should be: we know we are going to have to use sources that produce less carbon and that can be more renewable. —Matt Rookard, CEO, Terrebonne Economic Development Authority

The general sentiment amongst residents was that the energy transition presents an opportunity to promote healthier living and economic conditions for energy-producing communities. However, our participants were also aware that there will be costs associated with the transition. Recognizing the disproportionate number of burdens that have been borne by marginalized communities, they emphasized that these costs should be equitably distributed within the region. Many independently raised the issue of a "just transition." One participant, defining a just transition in broad terms, foreshadowed many of the constraints and opportunities that will be discussed below:

> We will have to figure out how to transition our economy. We need to base our economy not in exploitation but in collective public good. . . . If you have the foundations of clean air, water, food, and shelter, then maybe some of the problems of our democracy aren't so bad. A just transition includes basic human rights, dignified wages, and collective decision-making. —Jane Patton, Campaign Manager, Center for International Environmental Law, Louisiana

The core barriers and constraints are listed below, along with the potential opportunities most closely associated with each. Following this summary list, we discuss the level of consensus/dissensus our research revealed in each domain, along with our evaluation of some of the strongest tailwinds and headwinds affecting each opportunity. Our primary focus is on near- to medium-term action items, with the hope that these insights will be immediately useful to the residents of the case study region.

Table 11: Constraints and Opportunities in Gulf Coast Energy Transitions

Topic	Constraints	Opportunities
Community, Culture, and Employment	Energy sector as a primary employer.	Long track record of creative problem solving and adapting to market shifts.
	Strong attachment to industry.	Industry attachment is not to oil and gas per se, but rather the economic opportunities and sense of identity that the energy sector provides.
	Concerns regarding the longevity of jobs in renewables, as well as pay parity and benefits.	Expansive opportunities for long term-employment growth using the region's natural resources while maintaining profitability.
	Conflict between the need to acquire income and new skills.	Current energy workers possess many skillsets that are transferable to work in renewables.
	Requires coordination of industry needs, curricula and education policy.	Extensive network of local educational institutions with experience in preparing workers for employment in energy sector.
Transition technologies	Uncertainty surrounding new technologies acts as a barrier to business.	Innovation incubators contribute significantly to growth.
	Residents face concerns regarding unforeseen, potentially negative consequences of emerging technologies.	Demonstrations for businesses and the public can highlight the potential of new technologies while alleviating the concerns of residents.
Industrial Production	Sunk cost logic.	Carbon capture, utilization and storage.
	Resistance from environmental justice communities.	CCUS is profitable under 45Q and practical with current infrastructure.
	Difficulties with leasing and licensing.	CCUS reduces oil and gas GHG emissions.
Energy Infrastructure	Lack of federal infrastructure support makes planning infrastructure development difficult.	The region can act as a national hydrogen hub by repurposing existing infrastructure for hydrogen blending.
	The technology is unproven.	Hydrogen may solve renewable energy storage needs.
	Hesitancy and resistance from environmental justice community.	Grid modernization.
	New projects may not reduce GHG emissions.	Hydrogen may help to decarbonize industry and transportation, while also reducing rare earth metal dependency.
Transit System	Automobile-centric transit system.	People are tired of traffic and needing a car can limit opportunities.
	People like their vehicles and cars mean freedom.	It's hard to drive cars through flooded streets.
	Last-mile challenges of public transit (i.e., getting from transit stop to destination location).	Walking and biking are good for health.
		Public, rapid transit can benefit communities and reduce GHG emissions from transportation

Topic	Constraints	Opportunities
Climate and Environment	Legal uncertainties, history of political conflict, mistrust, fear	Demand for EJ community engagement, popular support for resilience investment Training in resilient construction, demand for coastal restoration, reuse wells for ecology and geothermal energy
Politics and Institutions	Political Polarization Differences in political access Lack of inclusivity Institutional distrust Requires well-resourced and trusted convenors, building working consensus is hard	Regional organizations with energy interests are already up and running, and there are effective local models like GHP and CITF, plus it worked for Pittsburgh Regional Energy Transitions Assembly, Gulf Energy Transitions Council, etc.
Social Inequalities	Inequalities in resources Feeling of social marginality	Public concern about inequalities, social movement organizations, ESG movement within industry Generate creative solutions by hearing new voices and making new connections, distributed entrepreneurship in renewables and efficiency retrofits

Always in Transition: Community, Culture, and Employment

The importance of the petrochemical sector to the regional economy is broadly recognized by its residents. The significance of the sector is perhaps most apparent during the boom-bust cycles that are endemic to the oil and gas industry, where its workers become exposed to layoffs and the economic precarity that such layoffs entail. Owing to such realities, many residents framed the energy transition as both a necessity as well as a potential solution to the economic crises that their communities encounter as a result of market fluctuations. As one participant aptly put it: "As go oil and gas, so goes the community."

> When oil and gas goes up, you see a prosperous community. . . . Whether you are working in the industry or own a support service company that services the community. As oil and gas grew, there was a growth in all of the typical community infrastructure (hotels, restaurants, sales). There is this whole economic life chain that is interconnected to this industry. What we saw in the '80s bust and subsequently what we have seen in the 6-to-7-year recent downturn, the ripple effects have been layoffs, people moving out of the community to other areas of the U.S. We are seeing restaurants close, retail sales businesses that can't be supported; we were in this cycle before COVID already. —Dr. Kristine Strickland, Chancellor, Fletcher Technical Community College, Terrebonne Parish

In coastal Louisiana, petrochemical job losses over the past decade have outpaced the creation of jobs in other economic sectors. Communities that have been heavily dependent upon the petrochemical sector as a leading source of employment have been especially impacted by this trend in employment. Owing to this economic dependency, residents within these communities often yearn for

the return of the fossil fuel industry and the economic opportunities that it had once provided:

> My family has been deeply involved in oil and gas. . . . I worked [in the industry] for 3 years out of high school. . . . Oil and gas is [the residents'] lifeline and a way to produce for their descendants. —Seth Moncrief, Public Involvement Coordinator, Barataria-Terrebonne National Estuary Program

Our research participants are well aware of the negative impacts that energy transitions in other regions of the country have had on communities and are concerned that the same types of problems will arise in the coastal regions of Louisiana and Texas:

> We are a micro version of what Kentucky and West Virginia saw in the coal industry. My concern as an economic developer is that we are on a path to recreate all of the problems they had in Kentucky and West Virginia to transition from coal. Even in 2016, it was clear that coal was not economically feasible, but there was still national conversations about how we subsidize and bring those people back to work. Because of the cultural ties—there wasn't a willingness to transition to anything. You didn't embrace a transition; you fought a transition. Because you didn't do anything, now where do we go. —Matt Rookard, CEO, Terrebonne Economic Development Authority

This potent combination of economic dependency upon, and family heritage within, the oil and gas industry, in addition to the negative experiences of other regions with energy transitions, has produced a climate of hesitancy and resistance amongst the region's residents. When some oil and gas workers hear outsiders speak of the need for a transition to renewable sources of energy, it's perceived negatively. To many, this is interpreted as: "You're attempting to impoverish me and my community." As one scientist who grew up within the region put it:

> My perspectives changed really quickly the more I learned about renewable resources. But the gut reaction for most people with my background before college is fear. It is fear that somehow our livelihoods will be taken from us, and we will not be able to provide for our family. This is the immediate reaction to oil and gas being replaced by any other sources. It is very difficult when you go to talk about renewable energy; people get very defensive. —Seth Moncrief, Public Involvement Coordinator, Barataria-Terrebonne National Estuary Program

Purchases related to energy transitions—especially capital-intensive commodities such as solar panels and electric vehicles—may be unaffordable for many when these do not offer sufficient incentives. This more specific theme is consistent with the previous sentiments:

> If you put everyone out of business, you can't afford eco-friendly products. It costs money. If you take away people's jobs. Now you are increasing the number of jobless. You are increasing the poverty level. —Anonymous oil and gas employer, Terrebonne Parish

Individuals who work within the petrochemical sector have made substantial sacrifices in order to maintain their employment. But they do so because these jobs allow them to obtain salaries and benefits that enable them to adequately provide for their families, something that is not always possible given the relative stagnation of other economic sectors within the region:

> The transition is undoubtedly very scary to those folks who are making a very good wage doing hard work most of the time . . . being out on a rig for multiple days away from their family. That is difficult, but they do that to provide for their family or themselves. It is going to be difficult to get a lot of buy-in for the majority of the people here. —Jonathan Foret, Executive Director, South Louisiana Wetlands Discovery Center, Terrebonne Parish

The economic benefits produced by the petrochemical sector alone amount to a substantial impediment to the energy transition. However, we also encountered a second and related constraint involving petrochemical workers that pertains to their sense of identity. On the one hand, oil and gas workers (broadly defined) take substantial patriotic pride in the fact that their labor directly and significantly contributes to the energy needs of the nation. As one respondent put it, "It's almost unpatriotic to say we need to change to something else." On the other hand, however, many expressed that they often feel vilified by those outside of the industry and the region. At the root of the issue are deeply held feelings of being disrespected, of being perceived as less than, even of being perceived as immoral. Here we quote one participant at some length to support this complex point:

> A lot of it has to do with how you drive that conversation in . . . communities. . . . The problem is partly not respecting the industry. . . . No one was trying to harm the environment. It wasn't done with the technology and the knowledge that we have today. . . . We can't downplay the scars that we have from the [British Petroleum] oil spill and other major environmental issues that have occurred. . . . However, what is missed when you move into this community—everyone may have been railing about BP and the oil spill—but down here that was your neighbor and your brother-in-law who were a part of that spill. And you know in your heart of hearts that your neighbor was not trying to harm the environment. —Dr. Kristine Strickland, Chancellor, Fletcher Technical Community College, Terrebonne Parish

While we acknowledge the validity of their perspectives, the alleged vilification by industry outsiders is not entirely accurate. When we spoke to individuals outside of the industry, respondents expressed sympathy for petrochemical workers and acknowledged their dependency upon the industry:

> I think that [resistance] is largely motivated by money . . . and I get that. I hope and feel like there will be more of a focus on humanity moving forward. —Jonathan Foret, Executive Director, South Louisiana Wetlands Discovery Center, Terrebonne Parish

Consequently, the siege mentality possessed by individuals associated with the petrochemical industry may be the result of the intermingling of professional and personal identity as individuals come to associate what they do with who they are. Consequently, criticism of the oil and gas industry may be perceived by petrochemical workers as personal slights. Thus, discourse regarding energy transitions needs to acknowledge the dignity of petrochemical workers, that these individuals have made substantial contributions to the nation, and that their concerns regarding the effects of the transition on their social and economic wellbeing are valid.

We highlight this contentious topic not to disparage the culture of the region but rather to illustrate that effective policy needs to acknowledge these cultural sensitivities in order to build a broad-based coalition in support of such policies. In

fact, we believe that the region's rich culture is a valuable resource that can be drawn upon. This is supported by several study participants, who remarked that the vibrant regional culture can be leveraged to promote the ultimate success of the transition:

> To mourn an industry that provided a great livelihood for so many people. . . . It takes a strong-willed, and -minded, and -bodied person to work out there. There is going to be a need to mourn that as it transitions, if that can be facilitated. How do you facilitate mourning? Because you will have to. At the end of the day, the right choices are being made. Why not celebrate instead of tear down? In southern Louisiana we always have a party. —Jonathan Foret, Executive Director, South Louisiana Wetlands Discovery Center, Terrebonne Parish

Perhaps "party" is too optimistic, but perhaps not. The region's Shrimp and Petroleum Festival is a good example of the kind of creativity and spirit people in the region can bring to bear on tough situations. Its people have long and deep experience with solving the problems of energy production.

The picture needn't be bleak considering that the region's culture of innovation and resilience with respect to energy is very strong. In fact, the people of the Gulf Coast possess all the necessary tools to lead 21st-century energy transitions. Specifically, the region is wealthy in the prerequisites needed to make the most of its vast natural resources:

- Onshore energy exploration
- Underground extraction and storage
- Offshore energy production
- Energy transmission
- Chemical production
- Petrochemical exports and supply chain management
- Land stewardship
- Right-of-way management

Indeed, this has been supported by the 2020 U.S. Energy & Employment Report. According to the report, Texas and Louisiana already host a large and growing number of jobs in energy efficiency, solar electricity generation, wind electricity generation, hydroelectric generation, and nuclear electricity generation.

In Texas in 2019, 169,398 people reported working in energy efficiency, 12,242 in solar, 25,507 in wind, 1,756 in hydroelectric, and 3,311 in nuclear. In Louisiana, 23,261 people reported working in energy efficiency, 3,750 in solar, 327 in wind, 102 in hydroelectric, and 1,325 in nuclear. There is also evidence of unmet labor demand: 39.9% of energy employers in Texas and 37.9% of energy employers in Louisiana reported that it was "very difficult" to make hires in emerging energy sectors. In both states, there are far more jobs in electricity generation from renewable sources than there are in coal-, oil-, and gas-powered electricity generation combined. The figures below show the data, which are taken from the state-specific reports.[44]

While renewably sourced electricity generation is already advanced in the Gulf Coast region, there remains potential for major growth in this sector. For instance, the Bureau of Ocean Energy Management, which handles leases and permitting in federal waters, recently reported that over 500 gigawatts of commercially capturable wind energy exist off the U.S. Gulf Coast. As Mike Celata, Gulf of Mexico regional director, noted:

Offshore wind could be developed into a 500GW-plus power network, spread across the waters of all Gulf of Mexico states, with Texas and Louisiana showing the highest overall technical resource potential . . . [and] there is also some potential for other marine renewable technologies in the Gulf of Mexico, including wave, tidal, and ocean thermal energy conversion (as quoted in Snieckus 2021).[45]

Figure 21: Electric Power Generation Employment by Technology Application: Louisiana[46]

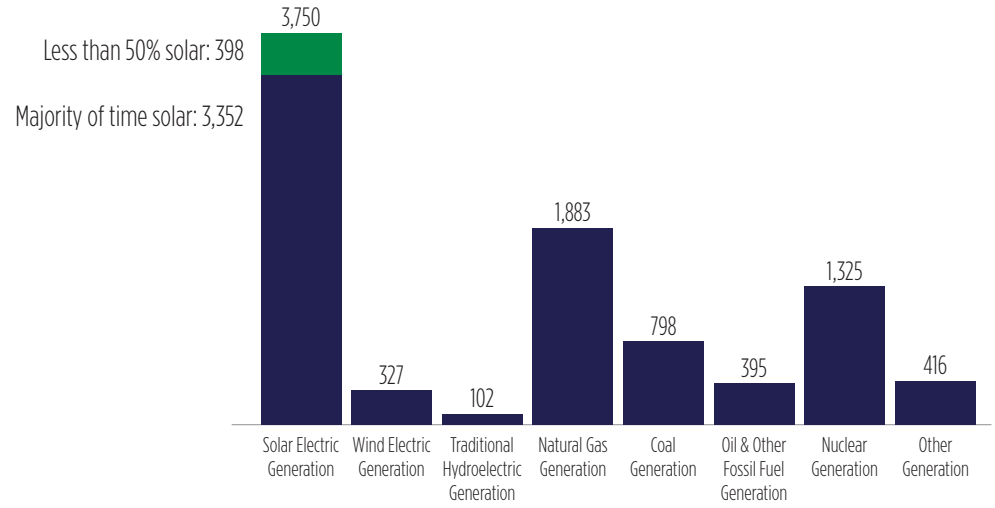
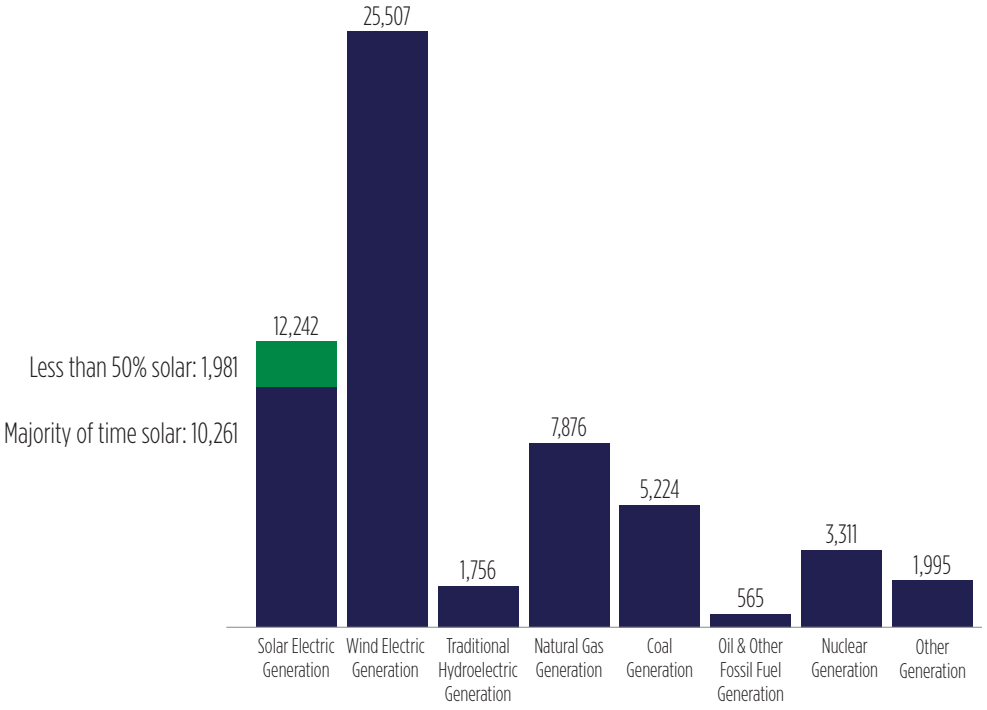


Figure 22: Electric Power Generation Employment by Technology Application: Texas[47]



Offshore energy production skills are already here and, indeed, we learned of Gulf Coast companies installing energy off the East Coast, providing a clear example of how the Gulf Coast can lead from a position of strength given its comparative advantage of a strong offshore energy sector. While the natural and human resources are ready, our data suggests that there is also some cultural skepticism about the potential of wind energy. Were oil and gas companies to use wind to power oil and gas rigs, as in new projects off the Norwegian and British coasts, such skepticism might be reduced and valuable coalitions built. While in the short term more oil and gas would be produced from harder-to-access fields, in the medium and longer term, offshore wind development would be accelerated, further improving the market position of wind energy.

The experience, expertise, and creativity of the region's energy workers would also be necessary were the region to develop offshore hydrogen production, perhaps as part of a broader hydrogen hub strategy. With the right mix of people, wind energy, offshore energy development expertise, and gas pipelines that could be repurposed to transmit hydrogen, wind energy could be used to harvest hydrogen from seawater in a zero-carbon way and pump it back to the onshore energy-intensive petrochemical corridor. As Snieckus writes in *Recharge*:

> Oil & gas companies could instead repurpose their production platforms as offshore substations or for wind-powered hydrogen—using electrolysers that split purified sea water molecules into hydrogen and oxygen. They could even add captured CO_2 to produce synthetic fuels on site. Then the H_2 or so-called "e-fuel" could be pumped to shore using existing gas and oil pipelines. Excipio Energy is already working with the Gulf Offshore Research Institute on behalf of Houston-based oil & gas operator Peregrine on engineering to convert oil platforms into renewable-energy hubs in the US Gulf, while in the Dutch North Sea, Shell is moving forward with its CrossWind offshore wind/hydrogen project. Coupling offshore wind with green hydrogen production offers "huge potential" for the region to reinvent itself, says Erik Rijkers, market development and strategy director at floating wind data analyst Quest.

How can such potential be realized in ways that build in opportunities for good jobs while overcoming the opposition of oil and gas workers? In broad terms, a few clear concerns emerged from our data. First, residents are unsure whether the renewables industry could provide the same kind of wages and benefits that they currently enjoy. Moreover, there is also serious concern amongst residents regarding the longevity of jobs in the renewables sector. It is simply unfair and unreasonable to ask oil and gas workers to abandon their jobs and pursue retraining if new employment opportunities will be of relatively short duration. Third, the creation of new jobs needs to be synchronized with the attrition of old ones. As one respondent explained, "Residents are more worried about providing for their families. . . . People would be a lot more receptive if the energy transition was here now with jobs here now to support their livelihood." Finally, there are concerns regarding the locations of jobs in the emerging energy sector. Many residents have lived within the same communities for generations, and leaving such places involves far more than simply following the employment opportunities. If jobs are not created in the same places that they are lost, many residents will either be unable or unwilling to abandon everything in order to follow the opportunities.

We see thus the problem as fourfold: ensuring that newly created jobs offer parity to existing jobs with respect to pay, benefits, and stability; aligning education and

training with labor demand from an industry in transition; synchronizing the opening of new jobs with the attrition of existing jobs; and ensuring that the communities that experience the greatest losses as a result of the transition also gain access to its benefits.

The energy transition will inevitably involve new forms of work, and workers need to acquire the skills necessary to thrive in the emerging economic environment. The region has a rich network of community and technical colleges that can be leveraged for the purpose of retraining and connecting workers to emerging industries that value their newly acquired skills. Major companies such as Chevron and Shell already have collaborative relationships with technical colleges to ensure that their students are on a successful path to employment in the industry. For instance, an administrator at a technical college in the region explained:

> I have been in sessions with Shell about energy diversification and where they are heading. Part of the request [at Fletcher Technical Community College] for GWO [Global Wind Organization] and wind certifications came from major oil and gas operators; they are seeing an uptick in that arena. The governor's announcement a couple of months ago for wind development on the Gulf—this will spur some of that activity. We are training people that would normally have gone to the Gulf of Mexico [for offshore oil drilling]. —Dr. Kristine Strickland, Chancellor, Fletcher Technical Community College, Terrebonne Parish

Certificate programs should also be encouraged as they tend to be the most affordable and streamlined option for individuals to acquire and/or confirm that they have a specific skill set. Such programs may be especially useful for individuals seeking to enter emerging markets quickly, as well as workers who are in later stages of their careers and may therefore not have time to attend more lengthy training programs. Finally, while acknowledging that access to broadband Internet may be limited within certain communities, many of these programs are online and may be more accessible to individuals who would like to begin their retraining while remaining in their current jobs.

One potential model is Project TEAM, a consortium of employers, universities, and policymakers in Ohio, Pennsylvania, and West Virginia, which has had success in developing curricula, matching labor demand to supply, and modifying state-level regulations in a way that supports new training opportunities and regional economic development. We were unable to identify such a regional consortium along the Gulf Coast, though we did learn of early-stage efforts, including an LNG training program in development by the Lake Area Industrial Alliance, in the heart of our geographic region.

Such efforts would help, we think, in developing and retaining local talent in the parts of the region where young people perceive a lack of opportunities.

Innovating on skill development can also address some of the region's long-standing and arguably worsening problems, including vulnerability to strong storms, and environmental injustices.

To demonstrate the feasibility of a project combining community-defined priorities, training innovation to meet new labor demands, and accelerating energy transition, the Roosevelt Project entered into a partnership with the Lowlander Center. Based in the bayous of Louisiana, the Lowlander Center is a 501(c)3 nonprofit organization supporting lowland people and places through

education, research, and advocacy. A central work area for the Lowlander Center is the environmental and human impact of the region's petrochemical industry, so a key strategic goal of the partnership was to show how communities that are sometimes opposed can work together to promote community wellbeing. More concretely, we hoped the partnership would illustrate an answer to the question that was posed to us from many people in the region: What's in it for us?

Our partnership worked to develop new green, sustainable housing construction methods that can accelerate the adoption of renewable energy at the local level, as well as entrepreneurship and labor force opportunities on the Gulf. Specifically, this partnership engaged lowland local communities in the Gulf Coast region in developing an innovative training program for the sustainable, green, and renewable construction of storm-safe small dwellings that can be quickly and efficiently built.

Innovative approaches had to be developed amidst the myriad of disasters in the Lake Charles region and the challenge of social distancing and facility closures. The stress on people being displaced and the lack of local/regional housing options also complicated both professional and volunteer efforts to rebuild homes. The lack of government assistance due to complications of FEMA's and insurance companies' allocations has layered another burden on the community that is trying to recover. People are still living in cars, tents and makeshift facilities. Imports needed in the building trades have been halted by the COVID-19 pandemic, and available craftspeople are few. Labor, financing, and materials are in very short supply and, when available, prove to be expensive and out of reach to the average community member.

While innovating training, with the goal of reducing carbon footprints and providing safer housing for low- and moderate-income families, another challenge had to be overcome. The building of trust was necessary for open public discourse and problem-solving, and the challenge of building trust was only greater in a pandemic context that contributed to displacement and raised social distance.

In this case study of the Lake Charles region, it is important to understand the social disarticulation that was created by cascading and layered catastrophic events that had little or no response. Response agencies and volunteer groups were few and far between, which meant that the emergency phase lasted many times longer than what is usual in a major disaster. The same homes/communities were impacted by multiple storms, wind, water and freezing, weakening infrastructure and the structural integrity of many buildings and homes. What may have been repairable after the first hit became more difficult or impossible to repair after the second and subsequent hits. In fact, some homes still have not been gutted from the first storms, Laura and Delta, in 2020. With increasing mold and termite damage, people are discouraged, and many feel abandoned by their government and by nongovernmental organizations.

The Lowlander Center mobilized its faith-based network of people on the ground, both the laity and clergy, who are working with their congregations and wider constituencies to respond to immediate and long-term needs. So doing results in the hearing of needs, the response to which can then engender trust within a building relationship. We on the outside had to show we were willing to put aside our agendas and take the risk of learning what and how the folks living these dislocations needed and wanted to use. The following are some of the Lowlander Center's responses to the community-defined needs:

1. President Biden's visit: Lowlander Center worked to secure a presence at Biden's visit to Lake Charles, when Rev. Dr. Samuel Tolbert was one of 10 people present with the President and the Governor. The message of a just, equitable and resilient rebuild was delivered personally.
2. Supplying immediately needed materials, emotional support and national resource network connections: everything from tents to blankets to doctoral students to do research on issues such as water contamination, safety measures around toxins, and multiple ways of doing energy efficiency in rebuilding (in collaboration with Texas Southern University's Architectural School).
3. Addressing water contamination and water testing: Sulphur is testing high in Iron and in Lead plus other contaminants, and a group of scholars and water experts from across the country are supporting testing, analysis, and remediation measures for the immediate safety of the population as well as long-term water solutions for their water supply systems.
4. Monitoring industrial flares and air quality: Through partnerships with multiple environmental groups, the immediate aftermaths of the various storms were monitored for the appropriate type of safety protection of the general public as people were concerned about petrochemical facilities neighboring EJ communities.
5. Providing PPE and help with vaccinations: The continued provision of masks, gloves and other protection from COVID, mold and other contaminants has been an ongoing concern. The project also provided information about vaccination locations.
6. Providing housing and school and emergency supplies: Hotel rooms for respite from "living rough" conditions, which include the habitation of cars, tents and makeshift shelters at the time of various impact events, was critical for health and safety of people. School and emergency supplies were provided and are still needed.
7. Building ideas of sustainability: Portable solar packs and solar powered generators were demonstrated as alternatives to gas generators and as a way of using less grid power on a regular basis. Two locations that have heavy usage are now utilizing the Himcen battery/solar generator for their own use and for others to see an alternative to emergency gas generators.
8. Prepositioning of needed items for a hazard event: Working with the White House Office on Faith Communities for assistance of "pre-positioned" resources in communities of color and difficult to reach rural areas.
9. Finding early adapters: Via conversations, interviews, fieldwork, and Zoom/phone calls, we were able to discern who were the people who could take a message of transition and innovation forward into action. We have seen some success, with proclamations from the pulpit to praise for resilient rebuilding and ongoing establishment of tool resource centers and local gathering places.
10. Creating systems to support the adapters: Adapters are often breaking new ground, thus supporting them through multiple means is necessary. Professional, community and/or agency recognition, support of their local projects, and intellectual and social resources help.
11. Building the network of validators of the adapters: As the first adapters have surfaced as the local advocates, others within their circles are becoming interested and wanting to participate. This is an expanding virtuous circle of influence which has to be respected with accurate and appropriate resources in order to maintain validity and trust.

12. Gaining local traditional media attention via a TV event: The ability to do two major time slots on the local channel was important, especially being in the targeted community, reflecting the talent and passion of local leadership. Several news articles have also been generated through the Disaster Justice Network, and we expect more coverage will take place as we move towards the anniversaries of Laura and Delta.
13. Engaging social media and writing pulpit pitches for resilient building techniques: Tweets, websites, Facebook and other mechanisms are being used to get the word out about sustainable, green and fortified building. Three volunteers help keep this information out in the public. Fliers with the QR codes are being distributed at all the resource centers, congregations and resource fairs.
14. Gaining national media attention: We utilized a national media group to help messaging to the Biden administration to focus infrastructure monies on green/fortified rebuilding and a job economy based on green/fortified housing businesses that will be the future as sea level continues to rise and we experience more episodes of extreme heat stress.
15. Lobbying Congress on the infrastructure bills: Efforts to push for allocation and appropriations that would give timely assistance for resilient/green/fortified rebuilding is currently taking place in partnership with NLIHC.
16. Hosting videos by local leaders/validators: Five videos are in production, to communicate and reify the information contained in the fliers. The videos will reflect best practices and be narrated by local validators/leaders in the Lake Charles/DeQuincy region.
17. Creating access to the needed tools for the people responding to the videos: four tool centers, two of which are already created, to provide the necessary equipment and protection for people needed to rebuild/repair their homes. Through the method of tool lending libraries, the ability to do mutual aid is increased with folks teaching folks and giving assistance with the knowledge that has been passed on through the network.
18. Training tool lending library coordinators: four tool sites with different management for each depending on the locale and the coordination available at the site. The tools are basic for a person to gut, prepare and repair their house and/or to help others to do so.
19. Starting the building of four houses designed by Texas Southern University architects.
20. Working with community stakeholder groups to learn how communities respond to such opportunities and how such groups can participate in ongoing plans to revise the curricula. The groups included: Episcopal Disaster Services, South West LA Responds, St. Mary's Outreach, Presbytery of South Louisiana (PCUSA), St. Andrews Presbyterian Church, Baptist Fellowship, True Light Baptist Church, Prairie View A&M University, Vessel Project, Micah 6:8 Project, Sunrise Movement, United Way of Southwest Louisiana, Fuller Project, Louisiana Interchurch Conference, and five dislocated families.

We note that training also carries environmental justice implications, as noted by the White House Environmental Justice Advisory Council's recommendation to:

> Increase funding for the NIEHS [National Institute of Environmental Health Sciences] Environmental Career Worker Training Program. Expand this program to provide grants to support nonprofits, labor, academic institutions, etc. in establishing worker training programs, in particular for

un- and underemployed individuals, that prepare people for careers in renewable solar and wind energy infrastructure, installment and maintenance; as well as green infrastructure development and maintenance for community resilience, flood mitigation, and storm surge defense.

This is another way that investments in training for energy innovation and efficient construction are also win-win and readily doable propositions, combining as they could the interests of EJ communities, petrochemical employers, the energy industry, economic development professionals, and educators.

Transition Technologies: From Uncertainty and Risk to Demonstration and Initiation

Uncertainty about policy is a major barrier to business investment. We think proposals that can outlive one or two election cycles and have bipartisan support are the most likely to provide the sort of certainty investors would want to see. The hard part is that it is politically difficult to combine consensus with the sort of clear, strong commitment required to accelerate transitions. But the stakes are high. As one report notes: "Clear and sustained commitment from regulators and elected officials to resolve legal and regulatory uncertainties and provide supportive commercial frameworks will determine the extent to which Texas will capture a leadership position in both engineered and natural carbon reduction solutions."[48] The same holds for Louisiana.

Demonstrating new technology, including new processes—as the Lowlander Center is doing with its innovative pilot program on resilient and green construction training—helps in coalition-building and supporting new policies. Our data indicate that respondents who have previously experienced the effects of exposure to toxic environments were uncertain about new technologies and the unforeseen effects that such technologies would have on the local environment and their health. Additionally, as one participant with high-level experience in policymaking noted: "It is easier to move policy when people make connections to new technology." For these and other reasons, we think technology incubators, like Greentown Labs, have a crucial role to play in providing opportunities to demonstrate how new green technologies work while also helping to assuage the very real concerns of residents.

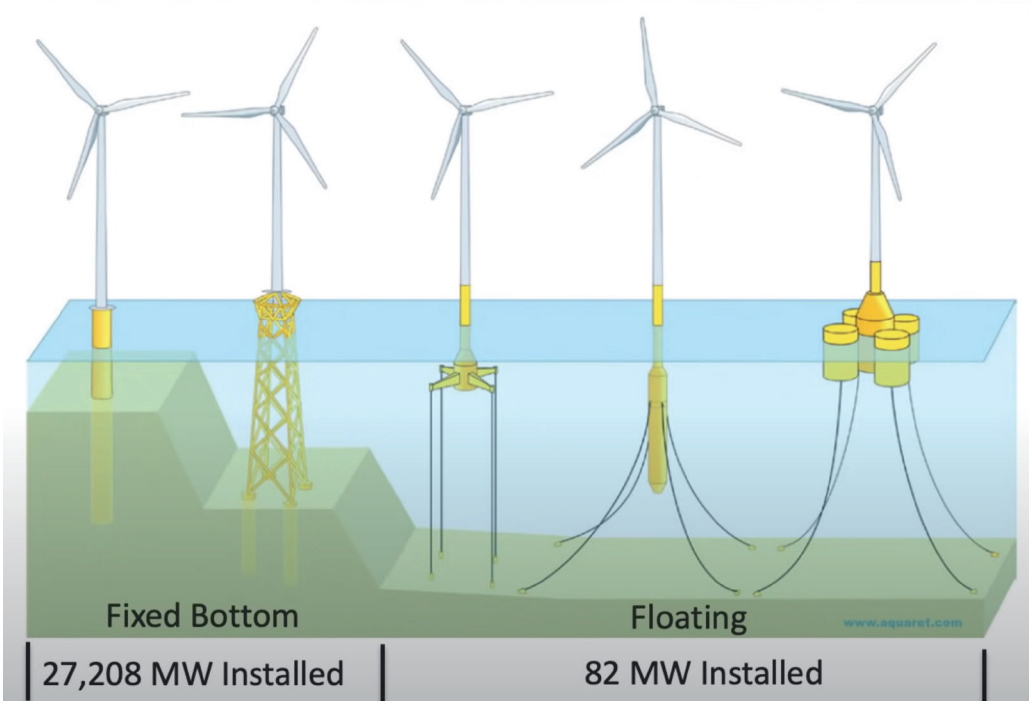
Such demonstrations can happen at all parts of energy development, from upstream oil and gas exploration activities, to midstream refining and transmission, to downstream industrial hydrocarbon use and exports. For example, in the upstream, demonstrating how to reduce routine flaring and venting so that "the lowest of the low-hanging fruit" (EIA) can be harvested to reduce GHG emissions is already being done.[49]

The federal Department of Energy—especially the Bureau of Ocean Energy Management Gulf of Mexico OCS Region & Atlantic OCS Region office in New Orleans and the National Renewable Energy Laboratory (NREL) in Golden, Colorado—has a key role to play in demonstrating energy transition technologies. An example is the feasibility of offshore floating wind turbines. At least one independent oil and gas exploration company in southwest Louisiana explored the feasibility of offshore wind power decades ago and concluded at the time that the technical barriers—torque handling, electricity generation, and saltwater corrosion—were too high for a profitable project. This proves the openness of "traditional energy" producers to renewable power generation. The technical barriers are being addressed by the R&D community, as demonstrated below.

Figure 23: NREL Webinar on Floating Wind Turbines[50]

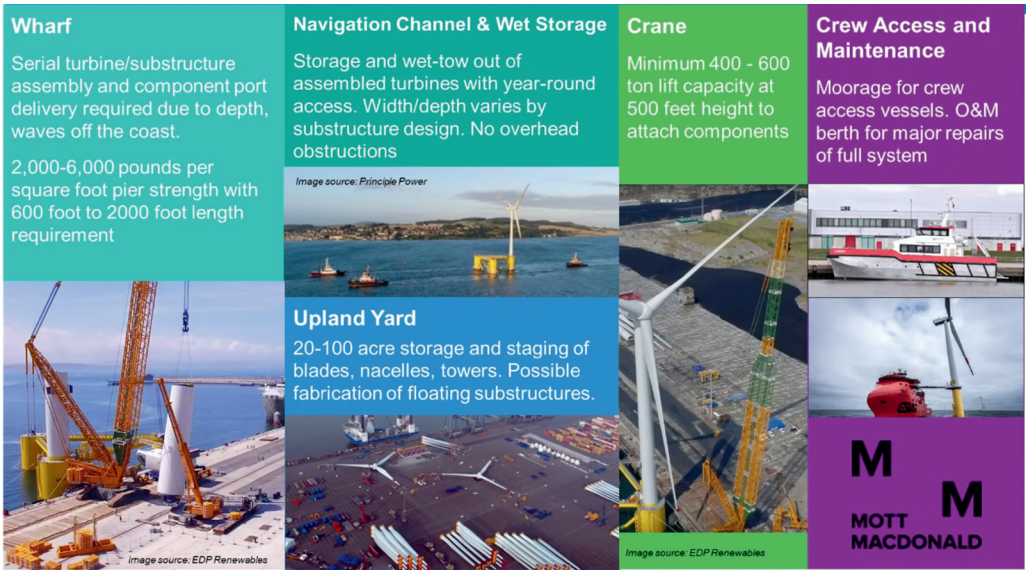
Such technology is only recently advanced far enough for installation, as shown below.

Figure 24: Image Taken from NREL Webinar on Floating Wind Turbines[51]



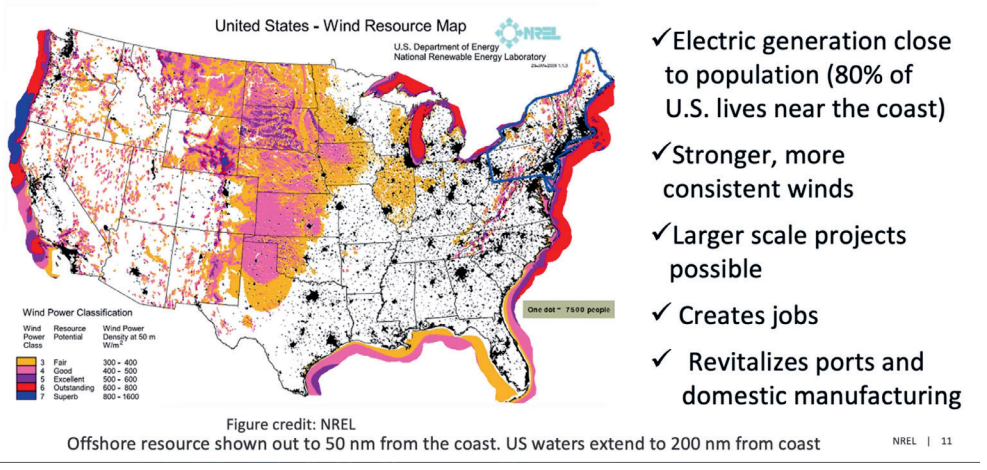
The Gulf Coast region has all the prerequisites for commercial floating wind:

Figure 25: Floating Offshore Wind Port and Infrastructure Requirements[52]



The National Energy Technology Laboratory (NETL) in Pittsburgh, Pennsylvania, would also have roles to play, given that the southwest Pennsylvania region faces some of the same challenges as the Gulf Coast. One of the differences between the two regions, of course, is the closer proximity of Gulf Coast population centers to significant offshore wind energy resources, as shown in the map below, again taken from the NREL presentation. Notably, the total wind power generation potential in the United States as a whole sums to more than twice current total U.S. electricity usage.

Figure 26: Why Pursue Offshore Wind Energy?[53]



Given economic realities, private-industry demonstrations of currently profitable technologies are perhaps the most compelling. Several such projects exist today. Arguably, NET Power's successful combination of natural-gas-fired electricity generation with carbon capture and zero emissions is one example. Indeed, other

businesses are engaging NET Power for their own innovations, including the G2 net-zero LNG export effort. Currently, there are several commercial-scale facilities in late stages of planning.

Figure 27: NET Power's Pilot Plant Completed in 2018[54]

The extensive pipeline infrastructure is one of the region's key comparative advantages. One potentially GHG-storing technological demonstration was Denbury's retrofit of the 50-mile West Gwinville natural gas pipeline to become a carbon dioxide pipeline, which has stored over 5 million tons of carbon dioxide in the Cranfield oilfield in Mississippi.[55]

Industrial Production: From Carbon Boomers to Carbon Busters

Across the Gulf Coast case study region, there are over 420 facilities that emit more than 25,000 metric tons of CO_2 equivalent per year, totaling over 243 mmt of CO_2 equivalent (CO_2e) in 2019, according to the latest data from EPA's Greenhouse Gas Reporting Program. Harris County, Texas, tops the list as the jurisdiction with the largest number of large stationary emitters (109), followed by Calcasieu, Louisiana (32), and Jefferson County, Texas (32). The U.S. Department of the Interior's Bureau of Ocean Energy Management (BOEM) estimated nearly 26 million tons per year (tpy) of CO_2 equivalent along the outer continental shelf of the Gulf of Mexico, from both oil and gas production sources and other sources that are not associated with fossil fuel production.[56] Recent research suggests, however, that existing inventories are underestimating the amount of offshore GHGs, particularly methane, in the region.[57] Offshore production of oil and gas represents about one third of global production and is a major source of methane venting and leaking. Additionally, the rapid buildout of infrastructure such as LNG terminals and petrochemical facilities in the Gulf of Mexico may contribute over 540 mmt of CO_2 equivalent by 2030, roughly 8% of total U.S. emissions in 2017, from midstream and downstream sources.[58]

Figure 28: CO_2e Emissions by Source/Equipment Category along the Outer Continental Shelf of the Gulf of Mexico[59]

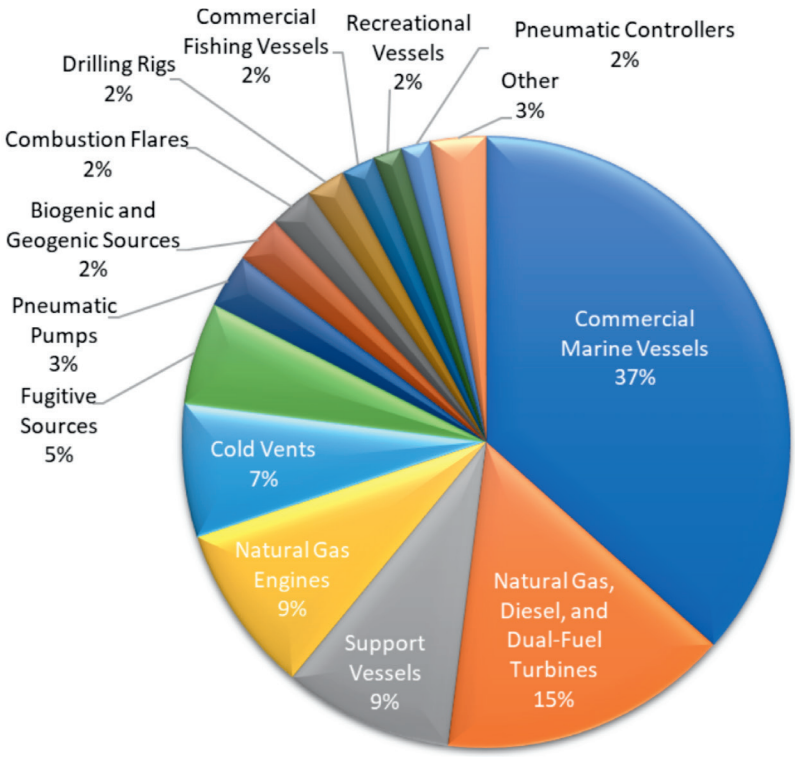


Figure 29: CO_2 Emissions from Fossil Fuel Combustion in Texas, in Million Metric Tons CO_2 ($MMTCO_2$) in 2018[60]

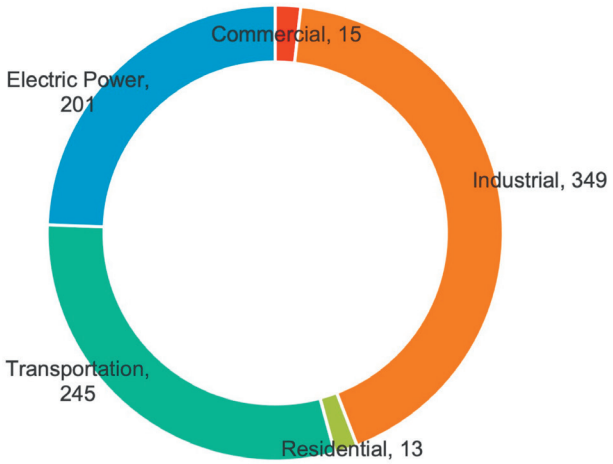
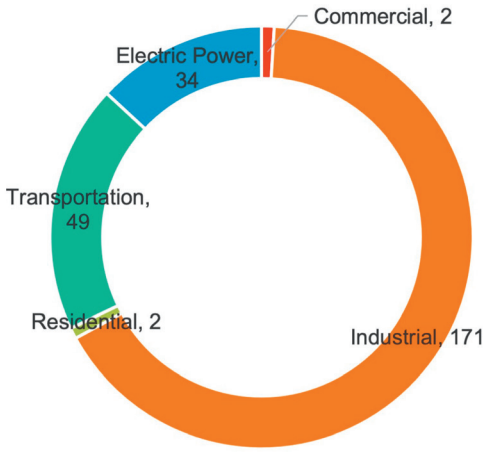
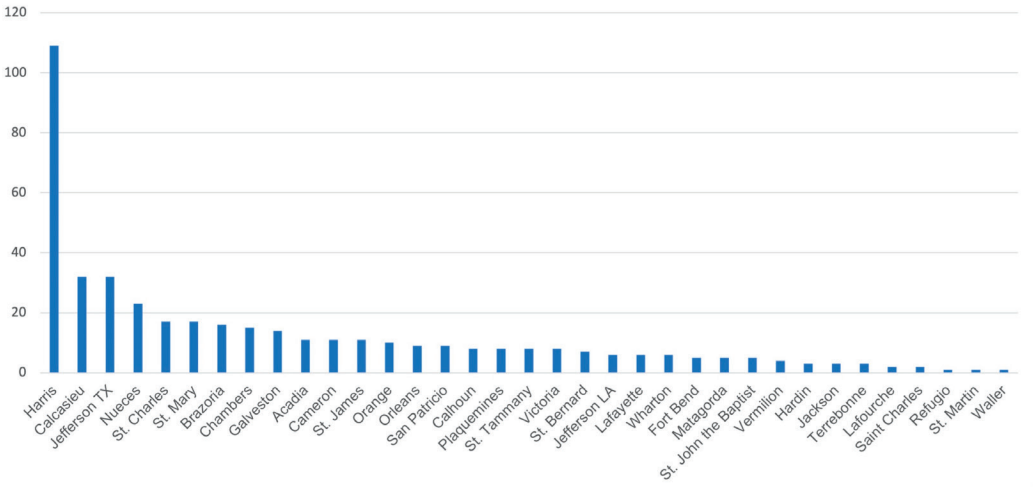


Figure 30: CO_2 Emissions from Fossil Fuel Combustion in Louisiana, in Million Metric Tons CO_2 ($MMTCO_2$) in 2018[61]



In 2018, Texas produced over 820 million metric tons of carbon dioxide from the combustion of fossil fuels, while Louisiana produced over 250 million metric tons.[62] The industrial sector is the largest emitter of CO_2 in both states, accounting for 42% (349 mmt) in Texas and 66% (170 mmt) in Louisiana. The transportation sector produces the largest amount of emissions in both states, but its share is significantly larger in Texas (nearly 30%). Finally, electric power accounts for 24% (201 mmt) and 13% (34 mmt) of total fossil-fuel-related CO_2 in Texas and Louisiana, respectively.

Figure 31: Number of Facilities That Emit >25,000 CO_2e by Gulf Coast County[63]



Carbon capture, utilization, and storage (CCUS) represents a technology that can reduce barriers to transition opportunities. Under current tax law, the 45Q provision prices carbon between $24 and $36 depending upon the form that usage/storage takes and is indexed to inflation in future years. As a result, we believe that it offers significant market opportunities for innovative employers. For example, the presence of large facilities with relatively pure and concentrated sources of carbon dioxide means that even at the current carbon price, several locations in the case study region are profitable with today's technology. However,

an unpredictable, variable, and fluctuating carbon price can be detrimental to investors. Consequently, we suggest that this is a crucial area for community deliberation and action.

It's important to note that the White House Environmental Justice Advisory Council has issued an objection to CCUS, arguing that it may enable continued usage of fossil fuels. We agree with this objection to CCUS, and so we see it as a transitional technology. In particular, we believe that CCUS can limit the negative effects of difficult-to-decarbonize emitters—such as long-life fossil-fuel power plants, heavy transportation, and industrial manufacturing—on the global climate. There is also a case to be made that CCUS helps to normalize the idea that carbon has a price and potential value. This normalization would help to ease the implementation of a necessary carbon tax-and-dividend system, while also broadening support for reducing carbon emissions by creating positive economic incentives that would be attractive to those who do not see climate change as a problem. Of course, carbon management using power generated by GHG-emitting sources would defeat the purpose of capturing and storing carbon in the first place. Thus, the adoption of CCUS would need to occur at a rate comparable to the adoption of low- or no-carbon-emitting power energy, if it is to achieve its carbon-reducing aims.

While we found relatively few energy-related nongovernmental organizations with a Gulf Coast regional focus, the Gulf Coast Carbon Center at the University of Texas at Austin is an exception to that. This center, founded in 1998 and supported by BP's Advancing Low Carbon program, is a multidisciplinary group of scientists studying deep subsurface carbon storage, sequestration risks and monitoring, and economic viability of commercial carbon storage in the Gulf Coast region.

Researchers at the Gulf Coast Carbon Center recently published an analysis of the region's potential for CCUS. They highlight the closed-loop, potentially near-zero-carbon, natural-gas-fueled Allam Cycle power generation station in La Porte, Texas:

> The most recent development in the region related to emissions capture from an industrial source involves the demonstration of the Allam Cycle in electricity generation from natural gas, which is currently being developed by Net Power in La Porte (southeast of Houston). This novel project uses CO_2 as the working fluid in the turbine cycle, resulting in a large proportion of recycled CO_2, and emission of a small proportion of high-pressure and high-purity CO_2, currently released to the atmosphere. The emitted CO_2 is in ideal conditions for capture and use for EOR or storage. If captured (it was not in the demonstration project), *it would be a notable example of emission-free electric power generation using abundant locally-available natural gas*, and could be a globally significant technology for emissions reduction from power generation (Meckel et al. 2021, p. 5; italics ours).

A task for community deliberation would be to determine how environmental justice principles could be integrated into such projects, so that the promising near-zero natural-gas-fired electricity generation could best serve communities. If environmental justice could be integrated into the planning for such projects, this would be a win-win, creating an unusual coalition of natural gas companies, environmental justice organizations, and other groups. Such incorporation would seem especially important to integrate into the development of new ethane cracker facilities, which could emit very large quantities of greenhouse gases.

Of course, underground storage space is itself a non-renewable resource, so carbon storage can't go on forever. Meckel et al. (2021), for instance, cite estimates in the range of 129 gigatons of offshore storage capacity, which is enough to store locally emitted carbon dioxide, even assuming growth in emissions, for decades, but not forever. The Global CCS Institute, headquartered in Melbourne and online at https://www.globalccsinstitute.com/, provides an array of practical resources to help accelerate deployment of CCS technologies.

Energy Infrastructure: From Vulnerability to Advanced Hydrogen Hub

Amongst the residents in the region, there is a recognition that "we are all in this together," that we need energy, and that opportunities exist in transitions. To anticipate our discussion within this section, we rely on an insightful comment from one of our interview participants:

> The oil companies do something very well: they provide energy. There is no reason that they can't continue to provide energy in a different way. Maybe there is a way to use the existing infrastructure. —Jonathan Foret, Executive Director, South Louisiana Wetlands Discovery Center, Terrebonne Parish

Communities along the Gulf Coast will need to develop strategies, plans, and programming to leverage the region's vast fossil fuel infrastructure to ensure successful energy transitions. The region, however, is not capable of going it alone in planning a successful energy transition. The residents of the region have endured high levels of pollution and dangerous work in oil and gas exploration in order to meet the energy needs of the nation; it's not a stretch to say that the country is indebted to them. One way to help resolve this debt is through national investment in the region's infrastructure. As one participant noted:

> Louisiana has historically been divested in. The number of dollars that go to [other regions] compared to the Gulf South is really sad. . . . Louisianans are carrying the weight of energy across the country. To me this feels like a divestment. We are not getting an adequate amount of funding to support infrastructure decisions that affect the entire United States. —Rachelle Sanderson, Regional Watershed Coordinator (Region 7), Capital Region Planning Commission, 13 southeast parishes

With that said, repurposing existing assets is an important, actionable, and cost-effective strategy. Specifically, this strategy could help meet the region's decarbonization goals while simultaneously providing economic opportunities in emerging energy sectors in a manner that exploits the region's existing competitive advantages, while also creating considerable economic growth at relatively inexpensive rates. The list below contains viable opportunities, of which we will discuss the first three:

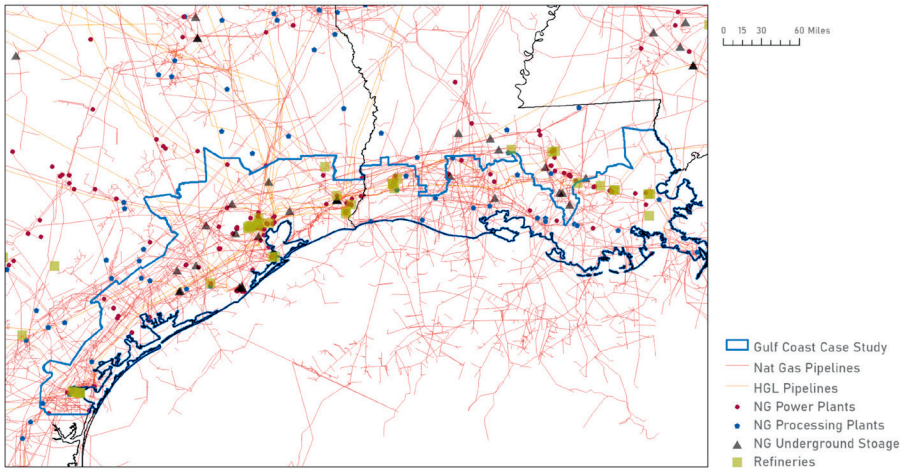
- Build out a low- or zero-carbon hydrogen energy hub
- Increase electric grid resilience
- Support port development by reducing GHG emissions related to LNG exports
- Develop a methane monitoring and abatement infrastructure
- Use offshore pipelines and power lines to develop offshore wind
- Capture geothermal energy by reusing abandoned wells
- Upgrade existing pipelines to move CO_2 from source to storage (including imports)

Hydrogen, a flexible fuel that can be produced from a variety of sources, has received growing attention for its versatility and potential as an energy source in hard-to-decarbonize sectors such as heavy industry and long-range transportation. The Gulf Coast region is already home to a network of nearly 50 hydrogen production plants and over 900 miles of hydrogen pipelines, and it accounts for about a third of total U.S. hydrogen gas production. Much of the hydrogen in the area serves refineries and petrochemical production plants and is referred to as "grey" hydrogen, which is produced via steam-methane reforming (SMR) and produces carbon dioxide as a byproduct. A 2020 report by the DOE's National Renewable Energy Laboratory found that the domestic hydrogen market could expand two- to fourfold if transition barriers are overcome and research and development targets are met.[64]

There is ample opportunity for the Gulf Coast region to be a leader in lower- or zero-carbon hydrogen development. For example, pilot studies are underway across the country to explore the potential of existing gas infrastructure to integrate hydrogen. The Gulf Coast's extensive network of natural gas pipelines may thus play an important role in transporting hydrogen (see Figure 32). Pipeline transportation remains the most cost-effective way to move hydrogen, but technical and safety challenges remain, and more detailed risk assessments are needed to evaluate the viability of individual assets to carry hydrogen.65 The region's ample wind resources present another opportunity, where they can be utilized to produce low-cost electricity that powers electrolyzers for "green" hydrogen. Finally, the Gulf Coast's geology, including salt deposits and depleted oil and gas reservoirs, is also prime for underground hydrogen storage.

Important first steps have recently been taken. In 2020, Entergy, an integrated energy company with customers in Arkansas, Mississippi, Louisiana, and Texas, announced a partnership with Mitsubishi Power to develop hydrogen-capable gas turbine combined cycle facilities and to blend hydrogen into its gas plants. Separately, the Center for Houston's Future has recently advocated for the development of a hydrogen hub centered around Greater Houston, with initial priority in heavy trucking and connecting existing SMR systems to CCUS for the production of "blue" hydrogen.[66]

Figure 32: Gas Infrastructure: Natural Gas Pipelines, Natural Gas Power Plants, Natural Gas Processing Plants, Natural Gas Underground Storage, and Refineries[67]



The repurposing of existing energy infrastructure may strain the region's electrical grids, and so grid resilience is a major public issue. The Environmental and Energy Study Institute, a nonpartisan think tank, is one resource for identifying pathways to grid resilience, which is currently a big issue in Texas given the failure of the electric grid in the winter storm of 2021. At a June 2021 event, EESI noted:

> The energy system is rapidly transforming, especially at the "grid edge" where "smart" building technologies, electric vehicles, and distributed energy generation combine and interact in new ways. These innovations provide opportunities to re-envision the nation's energy system and how we use, store, and move energy around the country. They also create new ways to increase the resilience of people, communities, and the system itself without increasing greenhouse gas emissions. Briefing panelists [discussed] policy opportunities such as a federal energy efficiency resource standard, state level efforts, and the nexus between buildings, transportation, energy storage, and the grid.[68]

In Texas, the state of the electrical grid currently works as a barrier to energy transitions, considering its evident fragility. Such brittleness and vulnerability is not, of course, a permanent problem and hopefully will motivate improvements that accelerate energy transitions by supporting the large investments that companies and communities are either currently making or planning to make.

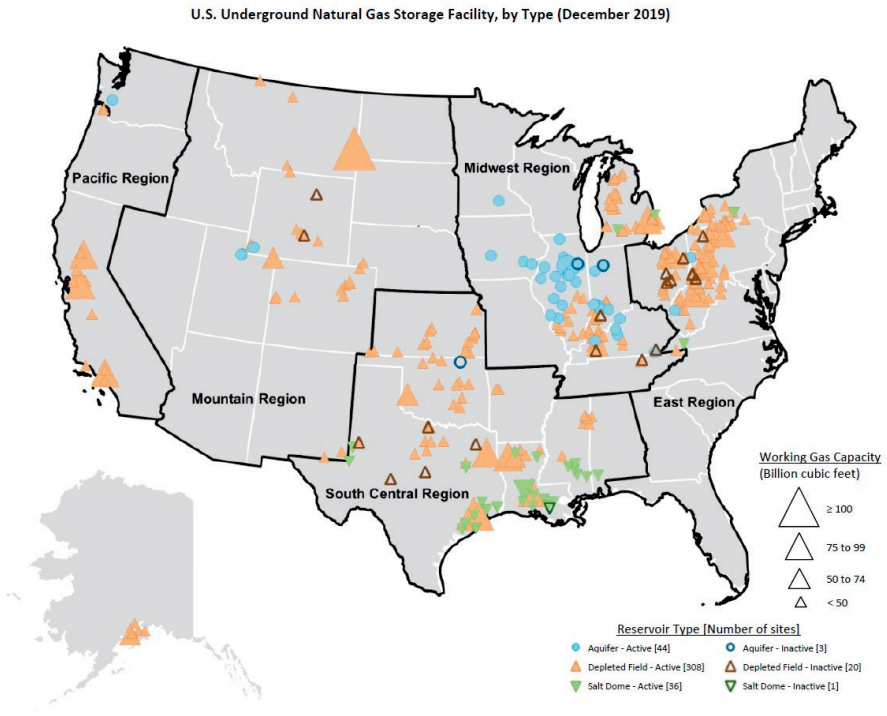
The region has already become a hub for LNG exports, which, if attendant methane emissions could be curbed, would contribute greatly to reducing the carbon footprint while meeting the energy demands of growing populations in developing countries that now depend on coal and other legacy technologies.

As Meckel et al. (2021, p. 6) note:

> Longer-term CCS development possibilities related to LNG include return shipment of CO_2 from foreign LNG import terminals for local storage in the Gulf of Mexico and carbon credit accrual (possibly related to Article 6 of the Paris Agreement), making economic use of currently empty vessels on their return voyage.

Such developments would also continue to make good use of the region's impressive port infrastructure, adding to the win-win-win coalition.

Figure 33: U.S. Underground Natural Gas Storage Facilities by Type[69]



While we hesitate to draw too many lessons from the experiences of other countries, in our interviews we encountered a real hunger for information from other regions of the United States and the world, and so we think it is valuable to discuss the example of Rotterdam. This year, the Port of Rotterdam is taking the final steps toward launching a major construction project that would position it as an international hydrogen hub. As the Institute for Energy Economics and Financial Analysis notes:

> Industrial ports will likely be places where the carbon-free hydrogen economy first comes together in a complete system. . . . A recent policy brief from the Atlantic Council Global Energy Center puts focus on existing clusters of hydrogen production in the United States. It suggests the Port of Los Angeles, and the region along the Texas Gulf coast, as advantageous locales for the initial rise of low-carbon hydrogen. . . . Among the leaders is the Port of Rotterdam in the Netherlands. Emboldened by the European Union's new Hydrogen Strategy, the port is taking significant first steps to becoming Europe's "hydrogen hub" and one of the most advanced centers of green hydrogen production in the world.[70]

While the Gulf Coast is not the Netherlands, a similar regional strategy, building on the work of the Greater Houston Partnership, the Louisiana Climate Change Task Force, the Lake Area Industrial Alliance, the Gulf Ports Association, and other stakeholders, could enable a nimble catch-up or even a leapfrogging of Rotterdam's position.

The Transportation System: From Liabilities to Assets

While continuing dependence on automobiles for private transport seems like the

most probable future, the opportunities created by energy transitions could also be expanded by diversifying the transit portfolio. Especially with the currently probable investment of billions if not trillions of federal dollars in infrastructure, the causes of community well-being in the form of less commuting stress, environmental justice in the form of inclusion in decision-making, reducing carbon emissions in the form of more efficient means of travel, and economic development in the form of transit hub effects could all be served by public rapid transit.

The Houston and New Orleans metropolitan areas present perhaps the region's best opportunities. Indeed, voters in Houston in 2019 passed the Metro Next bond authorization, which would support the very expensive, large-scale expansion of the public transit system, including a new light-rail extension to the Houston Hobby airport, a Southwest Airlines hub.[71]

The New Orleans Regional Transit Authority recently announced its New Links plan, which would expand public transit in an effort to put more (than the current 12%) of the region's jobs within reach of public transit and reduce (from the current 44-minute average) public transit commute times to those jobs that are reachable.[72] New Links, "a collaborative project led by the planning staff of the Regional Planning Commission (RPC), which is a transportation policy organization made up of elected officials, transportation agencies, and citizen representatives from the eight parishes in the greater New Orleans region," has formally recommended the following expanded transit network, following a two-year community-engaged planning process.[73]

The plan is estimated to increase access to 83,334 additional residents, who would newly have public transit access to the New Orleans CBD. Additionally, 61,975 jobs could newly be accessed by public transit, again by New Links' estimates.

Figure 34: Planned Light-Rail Extensions and System Map[74]

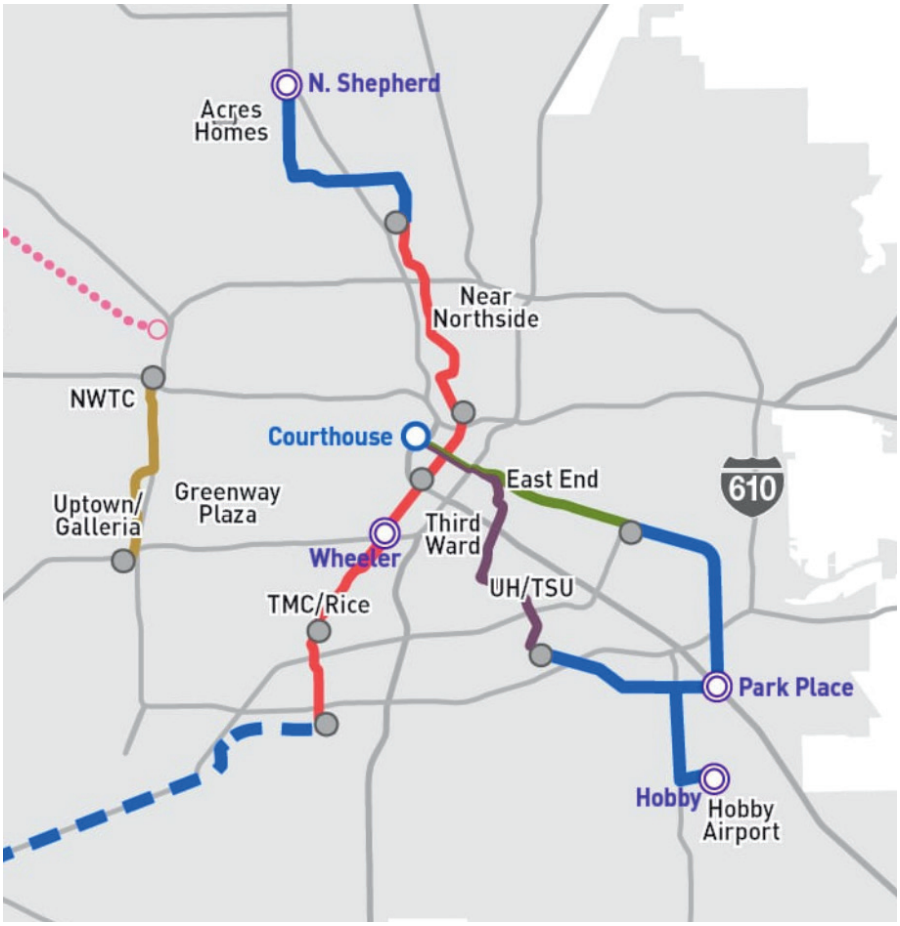
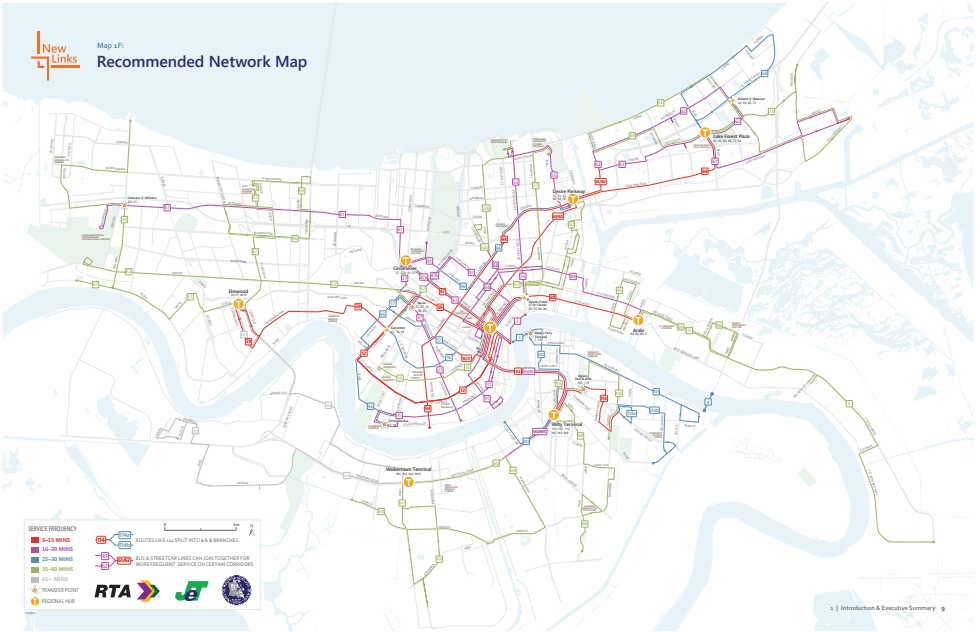


Figure 35: Airport Map



In addition to its proposed transit network, New Links also published its community engagement process, which offers another promising local model. The process had three phases:

1. Trade-offs: Engaging community members in discussions about tradeoffs via 12 public meetings, over 2,000 survey participants, 63 stakeholder meetings, and 41 tabling events.
2. Concepts: Collecting feedback on three different service concepts, via 6 public meetings, 372 survey participants, 18 virtual meetings, and 21 stakeholder meetings.
3. Proposal: Presenting the proposed network to the public, via 1,800+ social media engagements, 60+ digital meetings, and 2,500+ surveys and flyers.

Climate and Environment: Ecological Damage to Renewal, Restoration, and Adaptation

Our respondents frequently expressed that it's a privilege to take part in the planning of the energy future. Low-income residents, concerned with the pollution that impacts the quality of their housing, air, and drinking water, saw participation in the process as a means of eliminating many of the environmental injustices that they currently face. Recognition of these issues, however, has often been difficult to obtain for many individuals. In some instances, residents living in Louisiana River Parishes (notably St. James and St. John) have had to draw upon support from out-of-state politicians in order to gain publicity. Moving forward, policymakers should seek to remediate these environmental hazards within the broader context of ecological renewal. Rather than framing the conversation within the relatively abstract, seemingly distant, and politically charged narrative of "climate change," individuals and organizations should stress the importance of renewing, restoring, and adapting the ecology of the region as a means of protecting both the environment and the culture that is dependent upon it for future generations:

> The people who won't buy into the word "climate," if you talk to them about land, community conservation efforts, and understanding the importance of keeping the earth that we live on for future generations, they totally get that. —Dr. Kristine Strickland, Chancellor, Fletcher Technical Community College, Terrebonne Parish

Ecological renewal, restoration, and adaptation present a large array of win-win-win solutions to accelerating energy transitions successfully. Many are readily doable using today's technology and available resources, and they are urgent given the vulnerability of the area to increasingly strong or slow-moving tropical storms. To the Indigenous peoples living within the region, coastal renewal and restoration represent important steps toward preserving their rich and diverse cultures for future generations by enabling them to remain within their ancestral homelands.[75] To industry, coastal restoration represents one way of reducing the physical risk dimension of climate risks.

The Gulf Coast Ecosystem Restoration Council, established by the RESTORE Act and funded by $3.196 billion in Clean Water Act penalties related to the Deepwater Horizon oil spill, today supports restoration projects according to the terms set out in its Comprehensive Plan.[76] For instance, its Funded Priorities List 3b, approved on April 28, 2021, includes support for the Texas Commission of Environmental Quality's land acquisition program for coastal conservation and the

U.S. government's Tribal Youth Coastal Restoration Program to plan and implement training activities, which will contribute to the restoration of about 1,000 acres of tribal land natural habitat.

The region's plentiful wetlands—especially along the 7,721-mile Louisiana coastline, with its many canals and inlets—represent an immense resource for thousands of species, fisherfolk, ecotourism, and nature-based carbon storage. The same applies to sustainable afforestation of thousands of acres of Texas wildlands, where native bald cypress trees and pine trees were harvested during the sawmill boom of the late 19th and early 20th centuries or removed for oil exploration and production. Today, the Big Thicket National Preserve in Liberty and Hardin Counties of southeast Texas is one example of how ecological restoration and carbon storage can create surprising coalitions.

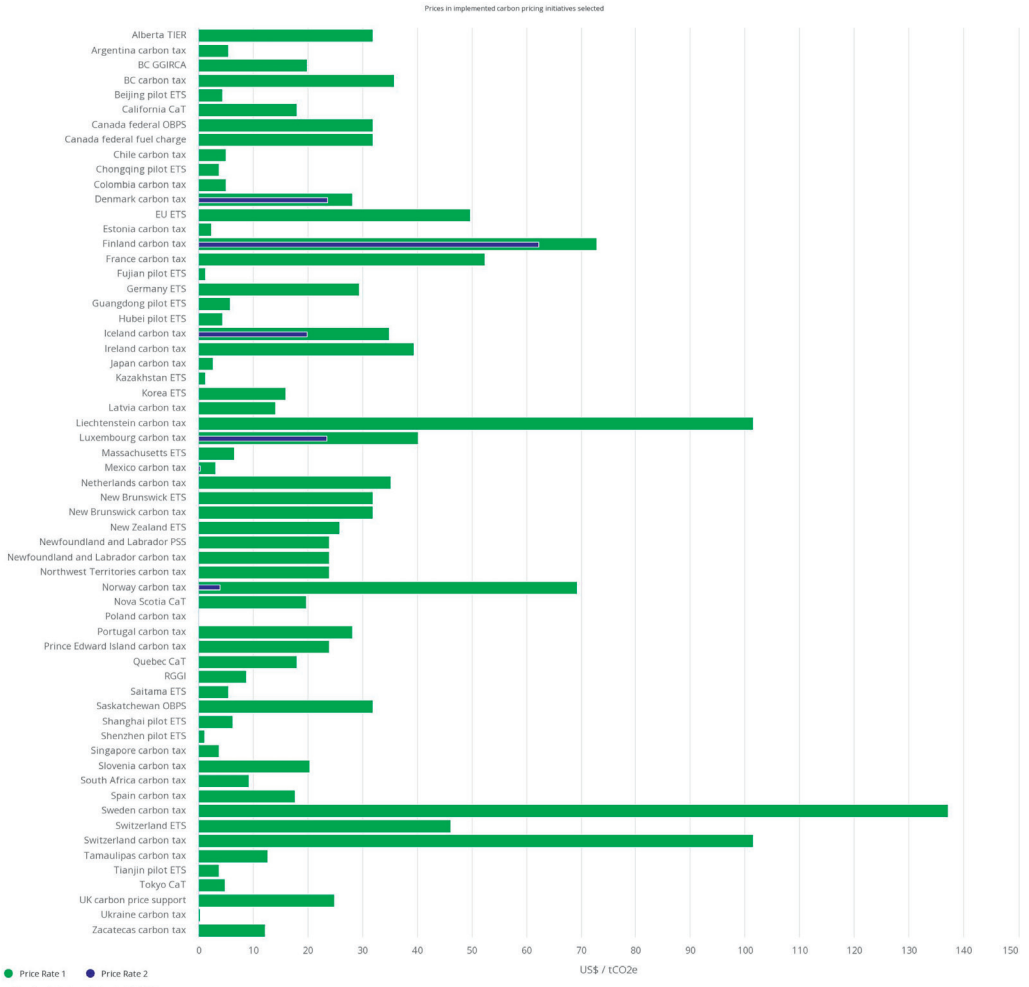
In upstream energy production processes, ending routine methane flaring and venting is a win-win solution that can be accomplished in the short term. A large number of small flares and vents make an outsize contribution to the region's GHG emissions, so eliminating them would carry not only environmental benefits but also economic benefits, since LNG exports associated with high levels of flaring and venting are unattractive in international markets.[77] As Mark Agerton and Ben Gilbert note in writing for Rice University's Baker Institute: "To make ANY of these methane reduction incentives truly effective, they need to target measured methane emissions directly."[78]

Measurement and certification are not just issues for methane emissions, of course. Nature-based carbon storage solutions also confront the problem of how to make a market for the carbon that is claimed to be stored. One solution to this problem in the context of soil-based carbon storage is the BCarbon standard, led by researchers at Rice University. Jim Blackburn, coleader of the project, notes:

> This effort has the potential to transform ranching and farming in the U.S., restore ecological systems in one of the largest land conservation and restoration programs in United States history and help carbon emitters by providing lower-cost carbon capture and storage options. It is a win-win-win concept.[79]

But the challenge of how to price carbon remains. The in-effect 45Q tax credit law effectively sets a carbon price—a publicly funded payment for stored carbon in the form of a tax credit—that increases to $50 per metric ton over time and is higher for saline and other forms of storage compared to enhanced oil recovery. But it is currently set to expire after 75 million metric tons have been sequestered or, for more recent installations, for 12 years after startup, according to the Congressional Research Service.[80] Worse, from a business perspective, is that there is currently massive global variation in carbon prices.

Figure 36: Global Variation in Carbon Prices[81]



The White House Environmental Justice Advisory Council's interim final recommendations are also supportive of ecological renewal, restoration, and adaptation, insofar as these entail investment in "sustainable infrastructure, including clean water, transportation, and the built environment" (WHEJAC 2021, p. 10). Their report notes:

> Community resilience projects, including sustainable and regenerative agriculture, other nature based solutions (e.g., green roofs for mitigation of extreme heat, mangroves/wetlands, porous roads for flood mitigation), clean water infrastructure (e.g., sewage management and drinking water access), and broadband installation projects would provide significant benefits to frontline and low-income communities (p. 14).

While their recommendations are pitched at the federal level, given their remit from the White House, many of their recommendations would seem to apply equally well at the state level, especially in a state like Louisiana that has an active Coastal Master Plan. For instance, one recommendation is to:

> Establish a policy for disaster recovery dollars to fund healthy land restoration in environmental justice communities.

On a smaller scale, the region's successful Rigs-to-Reefs program represents another win-win practice, by saving oil and gas companies decommissioning costs while preventing the GHG emissions that come from offshore well transportation for onshore disposal. Currently, there are over 500 such platforms on the Continental Shelf.[82]

From Polarization and Distrust to Public Engagement in Energy Innovation

It's important to note that energy transitions are not a primary concern for many residents, who often described these issues as "everyone else's problem." Residents are not isolated and are aware of how energy is used in other regions and countries. They are being asked to fundamentally alter their way of life and their source of income while also reading about the use of coal-fired power plants in China. This creates resistance and a sense of exclusion as residents feel that they would be forced to make sacrifices while others are not. Such factors contribute to the broader trend of political polarization, which represents another major barrier to a successful energy transition. As one respondent explained:

> The energy transition at this point, no matter how it goes or how the best intentions are, people believe that it is a liberal left agenda, and they just can't get there. —Dr. Kristine Strickland, Chancellor, Fletcher Technical Community College, Terrebonne Parish

As with the rest of the country, there is also a significant urban/rural political divide within the region. New Orleans is a blue city in a predominantly red state. Parts of Houston relate in the same way to the rural coastal regions of Texas. The solution to this barrier is far less clear, but we believe that ensuring the economic vitality of both urban and rural communities as the energy transition accelerates may help to depoliticize the issue. The key, however, is to ensure that the social, economic, and environmental benefits of the transition are distributed equitably across class, racial, and geographical boundaries.

We found openness to new energy opportunities across the political spectrum. Framing, presentation, and narrative matter. For example, one politically conservative elected official told us that he strongly supports "moving forward in a way that is based on science and making use of America's resources." This study participant also noted that "it scares the hell out of me to plow forward without thinking about the consequences." Thus, we think support for broadly inclusive community group deliberation on energy transitions could be widespread.

In the contexts of such polarization and very real worries, inclusion in policy- and decision-making processes is crucial. Inclusion in these processes, we believe, can be accomplished by deliberately incorporating a diverse range of perspectives in important conferences, meetings, and working groups, as well as ensuring that the leaders of various local communities are included in governmental decision-making processes. However, social and economic factors can complicate this task, and steps should be taken to make participation as easy as possible for those who wish to be included in the process. As one community organizer insightfully explained:

> We have a whole host of barriers that we have to accommodate to bring people to the table. . . . The kinds of meetings that are held—are there child services during meetings? . . . What time of the day is it? You have to pay attention to cultural norms. You could never have a meeting at 10:00 a.m. on a Saturday because of Bible study and choir

> rehearsal. . . . We have to rely on community people to decide what is best for that community. . . . You have to know those nuances of your community. —Angela Chalk, Founder & Executive Director, Healthy Community Services, Orleans Parish

So how can inclusivity in transition discussions be accomplished? We think a citizens' transition assembly could begin to build the conversations and connections required by durable coalitions. On this, we align with the WHEJAC's recommendation of "community engagement towards participatory community decision making," supported by a dedicated budget and accountable public officials.

One task of such a group would be to gather public opinion data on attitudes toward the tradeoffs involved in energy transitions. The Louisiana Climate Task Force is currently engaged in identifying and analyzing the tradeoffs involved in climate policies, and local survey evidence would be helpful in informing their efforts, as well as the efforts of a Gulf Energy Transitions Advisory Council. Our research found some relevant data from Pew Research, but the policy questions seem too general to inform deliberation on energy transitions.

The most helpful items we found were on the relationship between environmental regulations and jobs, where increasingly many (from 2007 to 2014, at least) Louisianans and Texans see a conflict. The figures below show the data, which are based on representative samples of the entire state, rather than just our 39-county/parish region.

Figure 37: Perceived Effects of Environmental Regulation on Employment among Adults in Texas

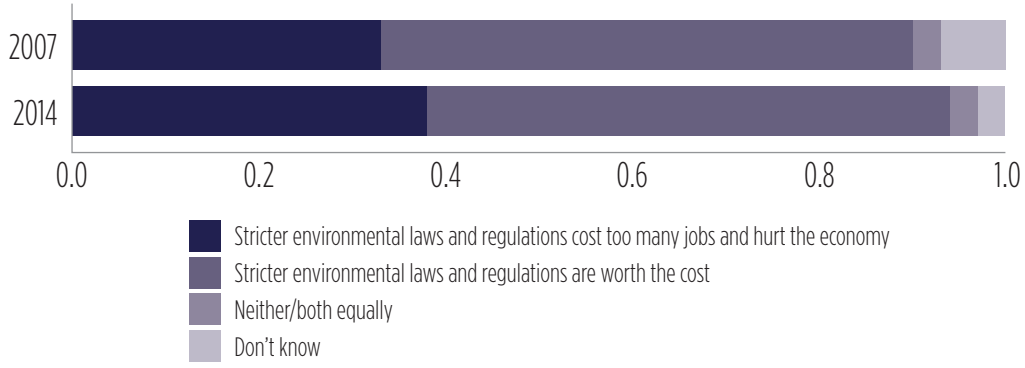
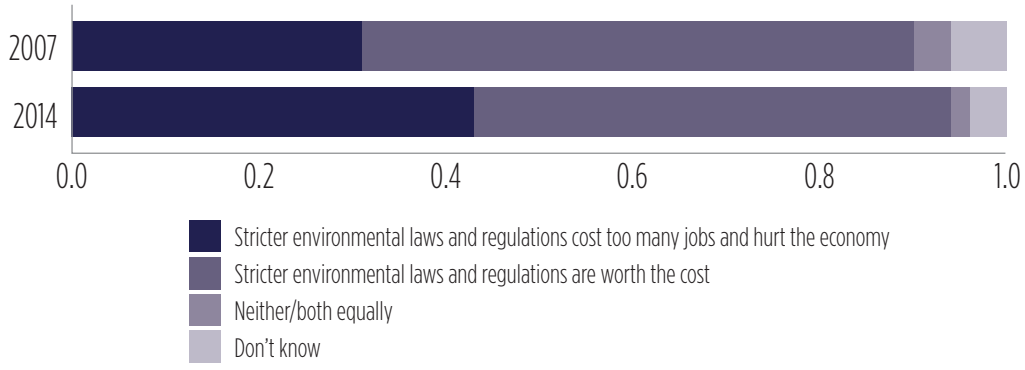


Figure 38: Perceived Effects of Environmental Regulation on Employment among Adults in Louisiana



Resources for such a body could come from the region's strong NGO community, including the Louisiana Foundation, Greater Houston Partnership, leading universities, and the Gulf Research Program at the National Academy of Sciences, funded by Deepwater Horizon settlement funds. Getting people to trust each other enough to engage in real dialogue is a challenge, as the Lowlander Center's work vividly demonstrates. The Louisiana Foundation's convening of community groups to identify solutions to water-related problems strikes us as one success story and one potential model. The Greater Houston Partnership's ability to convene broadly inclusive events and coordinate strategic planning is another.

We underscore that there is a big gap between how political and economic elites in the region see energy transitions and how everyday people just trying to get by and make ends meet see energy transitions. For elites, many see transitions happening already and seem genuinely excited about the opportunities. For others, "energy transition" means "white people talk." We note that such skepticism toward the possibility of real change extends to the research community, who are perceived, as one participant put it, as having "studied [us] ad nauseum."

One of our aims is thus to demonstrate what's at stake and to specify what the value of energy transitions is to communities, many of whom are long-suffering and long-marginalized. One value is the value of stable, dignified work. Efficiency jobs, for instance, are much needed by community members who do not have extra money lying around to spend on energy and also carry a 38% wage premium, according to one recent analysis.[83]Another is the value of adaptation. Housing resilience to flooding is a third.

Moreover, transition pathways at the short, medium, and longer terms need to be consensus-driven so that they may survive presidential, gubernatorial, and legislative transitions from one party to another.

One piece of low-hanging (and low-cost!) policy fruit we identify is an Energy Entrepreneurship Intern program, which could connect young people interested in careers in the sector (for instance, the Deep South Center for Environmental Justice's large network of HBCU students) to entrepreneurs (for instance, those engaged by Greentown Labs in Texas and by the Southwest Louisiana Development Alliance).

Such community collaboration is already producing plans for accelerating energy transition, as in the recently released "Houston Leading the Transition to a Low-Carbon World," the product of the Greater Houston Partnership.[84]The recommendations of this report are very much in line with many of ours; indeed, our research finds ample support for the GHP blueprint, which we summarize as:

1. Advance emerging technologies in areas where Houston has a natural comparative advantage, including CCUS, hydrogen of many colors, and energy storage technologies.
2. Attract and support renewable-energy and carbon-reducing companies.
3. Create cross-sectoral connections among innovative pilot projects, other regional organizations, and reskilling and upskilling initiatives.

The Texas Climate Jobs Project report "Combatting Climate Change, Reversing Inequality: A Climate Jobs Program for Texas," released in July 2021, specifically supports the establishment of a stakeholder group, which their report calls a "Just Transition Commission." The authors frame the need for such a deliberative body this way:

> Texas's transition to a low-carbon economy will have significant labor, employment and economic impacts that need to be carefully examined and taken into consideration as Texas strives to meet its climate protection and renewable energy goals. This transition should not come on the backs of the thousands of workers and communities that have powered Texas's economy for decades. To provide support for workers and communities as fossil fuel activities and internal combustion engine manufacturing decline, a multi-stakeholder Just Transition Commission should be established to understand the scope of transition, supports needed, and potential new industries. These efforts must have meaningful labor, environmental justice, and community representation. The Commission could take the form of the Just Transition Task Force created in New York State or the Office of Just Transition created in Colorado. The Commission should be fully-resourced and hold public meetings across the state to hear from impacted workers and communities.[85]

The same argument applies to Louisiana, of course. Additionally, we hold that leadership—not just participation—by private business seems essential to making such analysis and deliberation both possible and productive. Many of the region's largest oil and gas companies are very interested in carbon capture and storage. At the same time, many of the region's environmental justice groups resist CCS. In much the same way that the Deepwater Horizon settlement funds research and community building through the Gulf Research Program at the National Academy of Sciences and funds coastal restoration activities through the multistate regional RESTORE Council, oil and gas companies could enable the work of a Gulf Energy Transitions Advisory Council by providing substantial resources as a very small share of the profits from oil and gas fields at risk of stranding. Such a commitment could also help to strengthen ties to communities, an important part of many companies' ESG agendas and published reports.

Ample research shows what processes and organizations work best in shared decision-making about shared resources. In Elinor Ostrom's evocative phrase, energy transitions involve conversations and decisions about how best to govern the commons. From careful study of successful and unsuccessful practices aimed at supporting collective action, Ostrom identified eight principles, which we recommend to Gulf Coast leaders:

1. Define clear group boundaries.
2. Match rules governing use of common goods to local needs and conditions.
3. Ensure that those affected by the rules can participate in modifying the rules.
4. Make sure the rule-making rights of community members are respected by outside authorities.
5. Develop a system, carried out by community members, for monitoring members' behavior.
6. Use graduated sanctions for rule violators.
7. Provide accessible, low-cost means for dispute resolution.
8. Build responsibility for governing the common resource in nested tiers from the lowest level up to the entire interconnected system.[86]

These eight principles would constitute a good agenda for early conversations about how best to create something like a Gulf Energy Transitions Council. Innovative practices to support such conversations include "smarter crowdsourcing[:] a method that combines rigorous problem definition with crowdsourcing to attract diverse ideas from global experts and rapidly develop

those ideas into actionable proposals," as well as gamifying public engagement. Examples of the latter are the Bay Area's nine-county regional planning process and the EU's Scenario Exploration System.[87]

Besides ensuring that residents are afforded the opportunity to participate in decision-making processes, many emphasized that the process should also be transparent. Finding common ground with those one disagrees with is an important aspect in the process of overcoming polarization. In order to find this common ground, individuals must possess the same information, which cannot be accomplished unless there is adequate transparency.

Amongst our non-industry respondents, we found that many individuals resented the dominance of the private sector in public agenda-setting. Owing to a lack of transparency, residents cannot identify the purpose of various policies and ultimately conclude that corporate greed supersedes the desires of the community, thereby producing a lack of trust in government—even if a policy is in the community's best interests. This sense of distrust in local government is reflected in the comments of one research participant, who noted that:

> We are stuck in this perpetual cycle of prioritizing industry and prioritizing corporate profit over anything else. . . . Look at the list of the main [Louisiana Climate] task force members and all the committee members: they are people directly employed in the industry. . . . This is the problem about letting corporations dictate policy: corporations care about making money, not about labor. Making money for their shareholders and their executives. It is a wildly perverse incentive that is directly contradictory to the public good. Allowing those corporations to set public policy, especially around the economy, [is problematic] because corporations do not create jobs; they create profit for a small and exclusive group of people. Government incentives [are] the only thing that has required the corporations to create jobs. —Jane Patton, Campaign Manager, Center for International Environmental Law, Louisiana

The same quasi-public group was criticized by other study participants on grounds of:

- Insufficient inclusion of Indigenous communities
- Insufficient inclusion of local NGOs
- Overrepresentation of a single industry
- Exclusion of concerns about environmental justice
- Blaming decarbonization policies for job losses from technology and automation
- Scheduling meetings at times difficult for working people to attend
- Lack of clarity on which state agencies are accountable for which actions

Such concerns underscore the importance of procedural justice in designing inclusive and transparent deliberation about energy transitions. We found ample interest in participation as people appreciate how important it is to avoid the negative impacts of an unplanned, haphazard transition. Public agencies can work to improve their transparency by making their inspection and enforcement efforts, as well as the public materials that they release, more visible to and interpretable by community members with limited scientific or economic knowledge. Moreover, information in the following areas should be made available: notices for all air emissions permits, jobs and contracts available for displaced oil and gas workers, and the primary agencies responsible for implementing particular projects.

How, then, can lost trust be rebuilt?

Our research made clear that deliberation and planning for successful energy transitions in this region should include:

- Energy providers
- Residents
- Small business owners
- NGO and faith-community leaders
- Educational institutions
- Local and state government agencies
- Large corporations

Specifically, participants spoke of the need to improve trust in relations between:

- Utilities and low-income residents (poverty reduction and support of utility initiatives)
- Citizens and their governments (procedural inclusion and transparency)
- Parents and the public school systems (energy learning and innovation)
- Renewable energy entrepreneurs and development agencies (broken promises)

Our qualitative data indicate that there are also political differences related to a number of practicalities pertaining to the energy transition. These differences include: whether shifts in the power sector should come with shifts in ownership structures (called community solar); whether hydrogen and nuclear power are viable, responsible energy sources; who is most responsible for making the biggest change (consumer behavioral change versus industrial policy change); whether the government, the energy sector, or consumers bear the economic costs of the transition; whether carbon capture should be included or considered as progress; and whether the government or individuals should be responsible for workforce development and retraining.

Perhaps the most contentious point of disagreement amongst our respondents pertains to the question of whether Gulf Coast energy transitions entail a partial or full move away from fossil fuels. We see strong arguments on both sides of this particular topic, but this is a question for Gulf Coast residents to decide for themselves, as part of a broadly inclusive regional deliberation project.

Finally, we note that a desire for affordable electricity was a central concern amongst respondents. In both states, energy bills are often more expensive than rent. This is especially true during the summer months and for residents living in older homes. In Texas, many residents were shocked by extremely high bills following the 2021 winter storm, which often reached into the thousands of dollars. Many residents also expressed the need for assurances that adverse weather events will not seriously interrupt their service and that they will not be forced to bear the economic costs when such events occur. These issues have led to distrust amongst residents with respect to energy companies, particularly amongst residents who have experienced disconnections for non-payment. If energy companies wish to enhance buy-in for their energy efficiency programs, they will need to rehabilitate their relationships with the communities they serve.

From Social Inequalities to Entrepreneurship Opportunities

A key driver of socioeconomic inequality within the region is the concentration of resources and power into a few very large firms. Such corporations employ thousands of people and control projects that scale in the tens of billions of dollars. In a previous section, we explained that the jobs offered by these firms provide their lesser-educated employees with good pay and benefits. This is in stark contrast to the large service sector within the region, which offers non-college-educated workers low wages and few, if any, fringe benefits. Finding ways to maintain, and even expand, employment opportunities that offer a dignified wage and meaningful benefits for lesser-educated workers should be a key goal for promoting a successful energy transition. In what follows, we discuss the ways in which this may be accomplished.

From our interviews, we learned that the kind of work involved in installing and maintaining household and commercial renewable energy tends to be less concentrated, more broadly distributed, smaller in scale but profitable, and bespoke rather than assembly-line or large-scale production. With its strong tradition of small-business entrepreneurship, we think the region's energy transitions could support a very large number of small (<10 employees) sole-proprietor businesses, in the model of owner-operated general contractors. Such a shift in the social organization of ownership and control could benefit local communities and broaden the distribution of wealth through wealth creation. Internship programs can help in connecting established entrepreneurs with new entrants and expanding innovation opportunities.

We have learned that the region already hosts a large number of smaller businesses, many of which support the oil and gas activities of larger firms. Ship repair docks, catering businesses, offshore transport companies, machine shops, cleaning companies, health clinics, business services, and technical schools—to name just a few—all work directly with the region's dominant petrochemical companies. Many people also work in so-called "induced jobs," which result from the consumption and investment activities of direct employees and subcontractors. Many of those jobs are in the lower-wage, non-unionized service sectors of retail and food services.

While political inclusion, union expansion, and progressive fiscal policy are the most reliable and highest-impact routes to reducing income inequalities, even their impacts on *wealth* inequality are slow and small, which is why we see building opportunities for sole-proprietor or small-scale businesses as a better way to advance social equity while also accelerating innovation. Economists debate whether there is a general tendency for markets to encourage the dominance of large firms over time, but we would note that even the largest enterprises started life as small ones, and many of the successful firms being acquired by supermajor petrochemical companies today to expand the renewables holdings of their energy portfolios started life as small enterprises.

Community-based organizations, such as Thrive NOLA, have put considerable effort into identifying models for small business development that work well within the local context. However, it's important to note that the specific models implemented will differ according to the location and demographic groups under consideration. In some instances, this may mean courses on entrepreneurialism. In others, small businesses may already be in place and may simply require increased access to financing.

> THRIVE New Orleans' green infrastructure training is helping people re-enter the workforce with jobs that help with weatherization and decreasing the temperature in certain locations. The goal is to get people involved in the energy economy by helping them find jobs with sustainable living wages and build expertise in energy programs, energy smart measures and changing energy sources. —Chuck Morse, Executive Director, THRIVE New Orleans, Orleans Parish

We found that the greater New Orleans area is teeming with such organizations:

> We work with Groundworks NOLA. This allows our youth organization and workforce development team to have real hands-on experience. The other component is collaborating with Waterwise Gulf South—they have 150 neighborhood champions who learn about green infrastructure and stormwater management. They provide opportunities and scholarships to folks. Her organization each year provides three scholarships a year. One gentleman has established his own company. He is a maintenance guy for the trees that are planted; he has watered the trees, inspected the trees; he does this before he goes to his full-time job. If you are earning an extra $800 a month (for 3 days a week), it is a lot on top of your regular job. —Angela Chalk, Founder & Executive Director, Healthy Community Services, Orleans Parish

Incumbent small enterprises in the automobile industry, which are fixtures in many communities, also have a lot to gain from the region's energy transitions and should also be included in planning deliberations. In some ways, automobile dealerships represent a hard-to-decarbonize slice of economic activity, but several of their existing strengths could be leveraged to profit from lower-carbon or zero-carbon energy production and consumption. Many dealers have expressed skepticism about their ability to remain viable businesses since electric vehicles have simpler underlying mechanics than internal combustion engine vehicles. While it is true that an electric motor is simpler than an internal combustion engine, we would argue that the motor is just one of many thousands of individual parts that comprise the typical passenger vehicle, as *Car and Driver* learned in their long-term test of one electric vehicle, which, over about 35,000 miles and 20 months of service, racked up over $1,500 in maintenance costs and over $2,400 in other repairs (such as windshield replacement). The currently ongoing multi-billion-dollar recall of another electric vehicle is another data point supporting this conclusion: cars are complicated.

Beyond such inherent complexity, which supports ongoing profitability of car dealerships even as electric vehicles become more numerous, many car dealerships have other important assets that could be leveraged in energy transitions. For example, many facilities already have the high-amperage electrical service needed for charging stations, sufficient parking spaces for electric cars, locations convenient to other retail establishments and community services, and treeless property suited to solar photovoltaic power generation. With younger cohorts more interested in battery electric vehicles and less interested in the traditional car-buying process, diversifying the dealership model to include charging stations could be a win-win. Customers could also be presented with a maintenance menu of smaller tasks that could be completed during charging, like changing wiper blades, replacing that broken plastic bracket, fitting a new fuse, replacing light bulbs, etc. The same kind of opportunities exist for service stations, though their smaller average footprint would limit scope.

Chapter 5. Evaluating Transition Pathways

As noted in the synthesis document, there is a growing literature evaluating the economic effects of national-level decarbonization in the United States. The goal of the Roosevelt Project's power sector and regional economic modeling is to shift the analysis from broad assessments of decarbonization to an evaluation of how major policy interventions can mitigate and help manage the disruptive impacts of the energy transition. Moreover, this analysis illuminates the distributive effects of decarbonization by assessing its effects across economic sectors and geographies and how structural factors like workforce dynamics and demographics respond to the implementation of climate and energy policies. The Roosevelt Project hired FTI Consulting to perform an economic impact study assessing three possible energy and economic futures for the U.S. economy and for four focus regions. National-level results and a detailed modeling methodology are available via the Roosevelt Project online portal.

Scenarios

FTI's analysis considers three different scenarios. The first scenario ("Base Case") uses Annual Energy Outlook 2020 assumptions and would not achieve Paris Climate Agreement goals of 80 percent emissions reductions until 2098. The second scenario ("Decarbonized") includes a set of updated technology assumptions—for example, renewable capital cost reductions—and new policy programs, including a nationwide renewable portfolio standard and escalating carbon price that together achieve a net-zero economy by 2050. The final scenario ("Roosevelt") maintains all of the net-zero assumptions but layers on a set of federal policy recommendations that we have identified as critical to enabling effective transitions in the regions under consideration. Those recommendations, noted here through the lens of modeled assumptions, include:

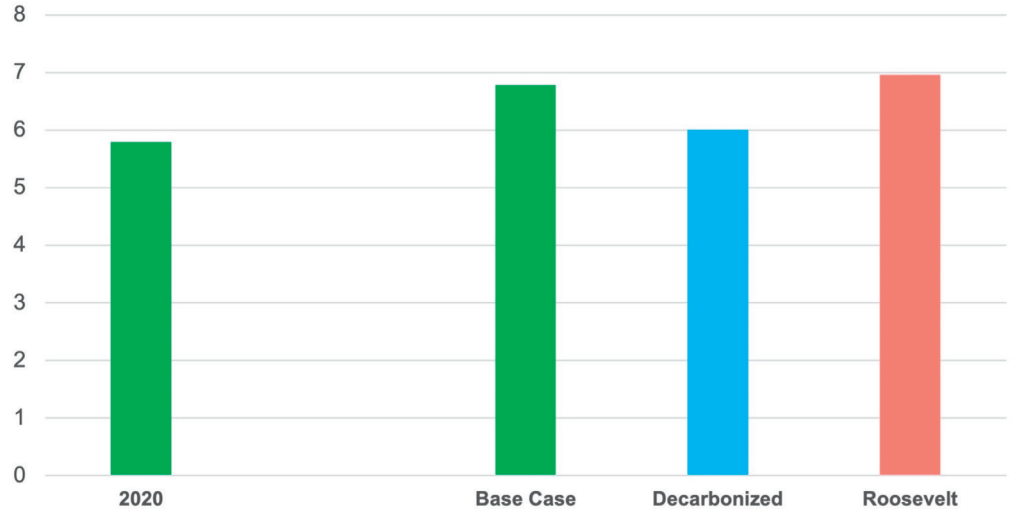
- Recycling carbon price revenues according to regional carbon intensity, rather than on a per-capita basis;
- Implementation of a border adjustment for energy-intensive trade-exposed industries;
- $1.5 trillion in infrastructure investments over a 10-year period beginning in 2025, distributed based on regional emissions and projected population growth;
- 1 percent of carbon tax revenues set aside for regionally targeted impacted worker retraining;
- Exogenous bump in domestic battery production, from, for example, Buy America or from increased incentives for domestic manufacturing in a strategic industry;
- 50 percent decrease in the cost of direct air capture, resulting from substantial federal and private R&D support; and
- 25 percent reduced carbon intensity of liquid fuels by 2050, to simulate the potential emergence of a hydrogen economy.

Results

The FTI modeling exercise suggests that, relative to a Base Case, a Decarbonized pathway with no accompanying policy support would lead to a 11.6 percent decline in total employment in the Gulf Coast region, or around 786,000 jobs lost, by 2050 (Figure 39). In fact, of all the Roosevelt Project case studies, the Gulf Coast experiences the largest employment contraction under the Decarbonization

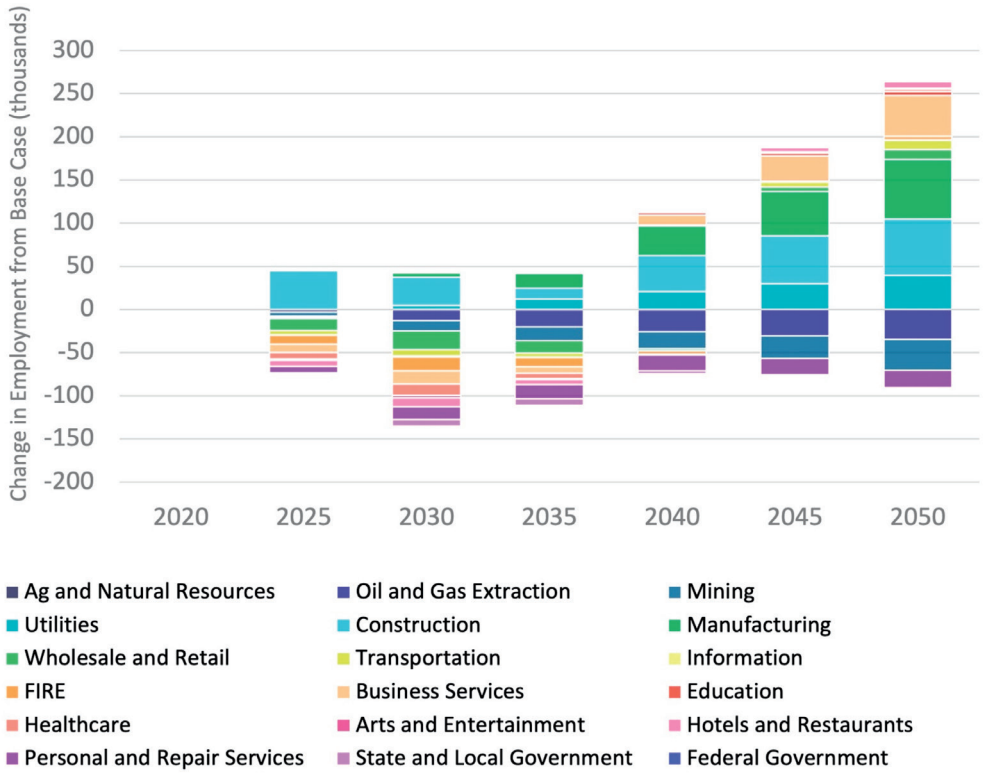
scenario, demonstrating the extent to which Texas and Louisiana jurisdictions are reliant on fossil-based sectors. For the United States as a whole, the Decarbonization scenario leads to a 2.3% decline in total employment relative to the Base Case in 2050. By contrast, the Roosevelt scenario, which represents a comprehensive set of federal policies, mitigates those losses. By 2050, under the Roosevelt case, the Gulf Coast experiences an increase in overall employment of 2.6 percent, or around 175,000 jobs. Net employment in 2050 under Roosevelt is higher in the Gulf Coast when compared to the three other case study areas, which suggests that the Gulf Coast in particular could benefit from policies such as border adjustments and targeted carbon dividends and infrastructure investments.

Figure 39: Gulf Coast Employment in the Base Case, Decarbonized & Roosevelt Scenarios, 2020 & 2050



Under the Roosevelt scenario, employment and other macroeconomic growth is concentrated in the final period of the study. In the first decade of analysis, the Gulf Coast sees an initial decline before reaping the benefits from the transition to a clean economy (see Figure 40). Early employment losses are primarily concentrated in wholesale and retail, business services, and personal and repair services. By contrast, the construction sector sees continued growth throughout the model period under Roosevelt. By 2050, the only sectors that continue to contract in terms of employment are personal and repair services, mining, and oil and gas. These three sectors constitute important segments of the Gulf Coast economy—employing nearly half a million in 2020—and are particularly vulnerable to the energy transition. Additional policy intervention will be needed to manage the economic losses and restructuring and respond to affected communities.

Figure 40: Gulf Coast Change in U.S. Employment from the Base Case Under Roosevelt Scenario by Sector, 2020–2050



Given the potentially positive economics, we see many opportunities for coalition-building around the opportunities presented by energy transitions. Coalitions, like tables, need at least three legs for support and stability. Here, we outline potential win-win-wins for regional community consideration and potential action:

Table 12: Tripartite Coalitions for Faster Winning

Potential Action:	Winner 1:	Winner 2:	Winner 3:
Just Carbon Storage	Coastal residents with skills required for offshore and onshore CCS	Oil and gas companies, who would earn 45Q tax credits	EJ communities, who would be included in decision-making
Low- or Zero-Carbon Hydrogen	Coastal residents, who would benefit from economic opportunities and energy storage	Infrastructure companies, who would benefit from increased demand for pipelines	Domestic transportation sector, which would benefit from renewable energy source that demands less foreign precious metal
Resilient Construction Training	Coastal residents, who would gain new skills and pay less for energy	Oil, gas, and utility companies, who would continue producing	Education and training innovators, who would connect needs to skills
GHG-Storing Coastal Restoration	Coastal residents, who would enjoy better water, air, and fishing	Coal, oil and gas companies, who would earn GHG storage offsets	NGOs with environmental conservation agendas

Potential Action:	Winner 1:	Winner 2:	Winner 3:
Agricultural GHG Storage	Landowners, who could benefit from new stewardship opportunities	Coal, oil and gas companies, who could buy GHG storage offsets	Conservation NGOs, and mitigation firms, who could consult on sustainability
Energy Transitions Internship Program	Coastal residents, who would benefit from equitable economic innovation	Governments and organizations with net-zero goals, who need innovation	EJ communities, who could be included in decision-making and recruitment
Rapid Transit	Coastal residents, who would have new transportation choices	Power producers, who would have expanded markets for electricity	EJ communities, who could be included in decision-making
Gulf Energy Transitions Council	Coastal residents, who could benefit from equitable economic innovation	Petrochemical companies and governments, who could benefit from engagement and strategic planning	EJ communities, who could be included in decision-making
Incubation of New Market Entrants	Coastal residents, who would benefit from equitable economic innovation	Governments and organizations with net-zero goals, who need innovation	EJ communities, who could be included in goal-setting and recruitment
Demonstration of New Solutions	Coastal residents, who could benefit from equitable economic innovation and educational opportunities	Organizations with net-zero goals, who need innovation to meet their targets, and benefit from outside perspectives	EJ communities, who could be included in goal-setting, recruitment, and demonstration activities

Chapter 6. New Developments

As one study participant noted, "Every day there is a new announcement about how businesses are adapting." We think the same could be said for community organizations and state and local governments. In that spirit, we conclude this report with recent examples of how Gulf Coast communities are leading energy transitions.

We have found that one of the most impressive qualities of the people who work and live the region's energy system is their proven ability to meet the nation's and the world's needs while enduring the risks of difficult and dangerous work.[88] People we spoke with—even the toughest skeptics—are well aware that external demands are changing, as investors, policymakers, and the public become more interested in reducing greenhouse gas emissions while advancing a diversified and just energy transition.

As we have noted, uncertainty about the policy future is extremely costly for energy transitions. We see signs that the uncertainties are being reduced, as more and more governments and organizations announce carbon-neutral, zero-carbon, or even carbon-negative policies and practices.

For example, in 2020 and 2021:

Louisiana governor's goal: net zero greenhouse gases by 2050

August 19, 2020

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Louisiana

NEW ORLEANS (AP) — Louisiana's governor has signed an executive order setting a state goal for net zero greenhouse gas emissions by 2050, drawing swift praise from environmental groups.

At least 23 other states and the District of Columbia have set greenhouse gas targets, though specifics vary, according to the Center for Climate and Energy Solutions.

"The real unique part about it is this is a fossil fuel-driven state," said Natalie Snider, senior director of coastal resilience for the Environmental Defense Fund.

LOCAL // HOUSTON

Without fanfare, Houston unveils Climate Action Plan, shooting for carbon neutrality by 2050

Dylan McGuinness, Staff writer
April 22, 2020 | Updated: April 22, 2020 6:23 p.m.

BUSINESS // ENERGY

Occidental is first U.S. oil major to target net zero emissions

Kevin Crowley, Bloomberg
Nov. 11, 2020

BUSINESS // ENERGY

Enbridge pledges net zero by 2050

James Osborne

Nov. 6, 2020

Oil industry banker urges Houston to embrace clean energy

Bobby Tudor adds powerful voice to those warning fossil fuel hub must prepare for a transition

Bobby Tudor, founder of Tudor, Pickering, Holt & Co: the oil industry is 'highly unlikely to be contributing to Houston's growth in the next decade or two in the way that it has in the last decade or two' © Bloomberg

After receiving years of criticism for "greenwashing" GHG-emitting activities by making small or symbolic commitments to energy transitions, several companies are now investing—or at least proposing to invest—real money and time into expanding the energy portfolio and reducing carbon emissions.[89] For example:

- ExxonMobil is proposing a $100 billion CCS project (which would require public money);
- BP is spending $220 million on solar energy projects; and
- Occidental's Oxy Low Carbon Ventures is collaborating with the Cemvita startup on construction of a bioethylene pilot plant.

Writing for Oilprice.com, Irina Slav notes that the move of large oil companies into renewable energy production through acquisitions and opening renewables divisions is even putting competitive pressure on some of the largest renewables companies. She notes that from an economics perspective, this is the natural order of things: "The influx of competitors in the wind and solar space is bound to sooner or later result in partnerships of mutual benefit. This would help Big Oil morph into Big Energy. Like it or not, it would be the natural way" (Slav 2021).[90]

Already by January 2020, industry analyst James Murray reported about $6 billion in new investments in renewables by supermajors, mostly European companies.[91]

One recent example of such an acquisition:

BP in biggest green power swoop yet, buying huge US solar pipeline

Supermajor snaps up 9GW PV portfolio across 12 states as it piles on capacity to meet ambitious goal

1 June 2021 10:48 GMT *UPDATED 1 June 2021 10:48 GMT*

By **Andrew Lee** in **London**

Another recent example of such collaboration:

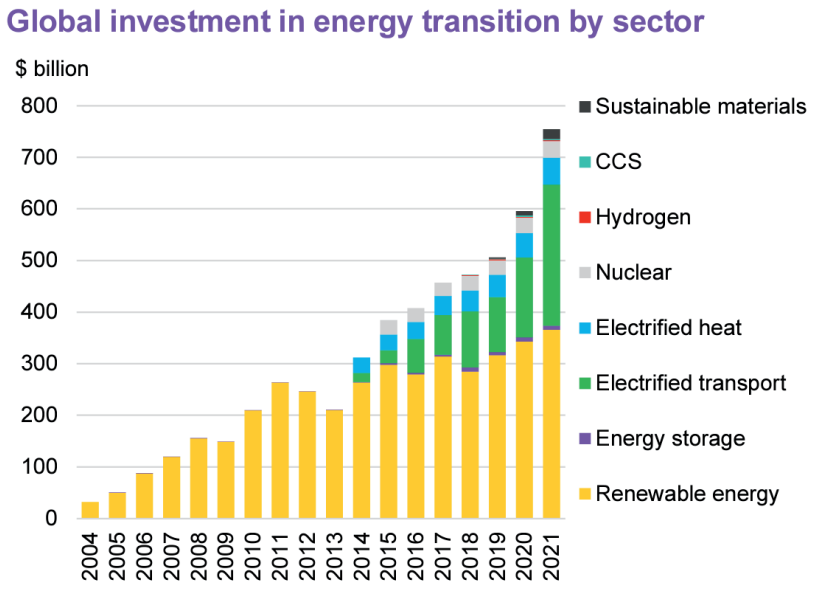
Shell and Orsted hail 'perfect opportunity' for Gulf of Mexico offshore wind

Development giants talk up prospects in boost to region after low-key feedback to federal interest call

17 August 2021 12:18 GMT *UPDATED 23 August 2021 15:52 GMT*

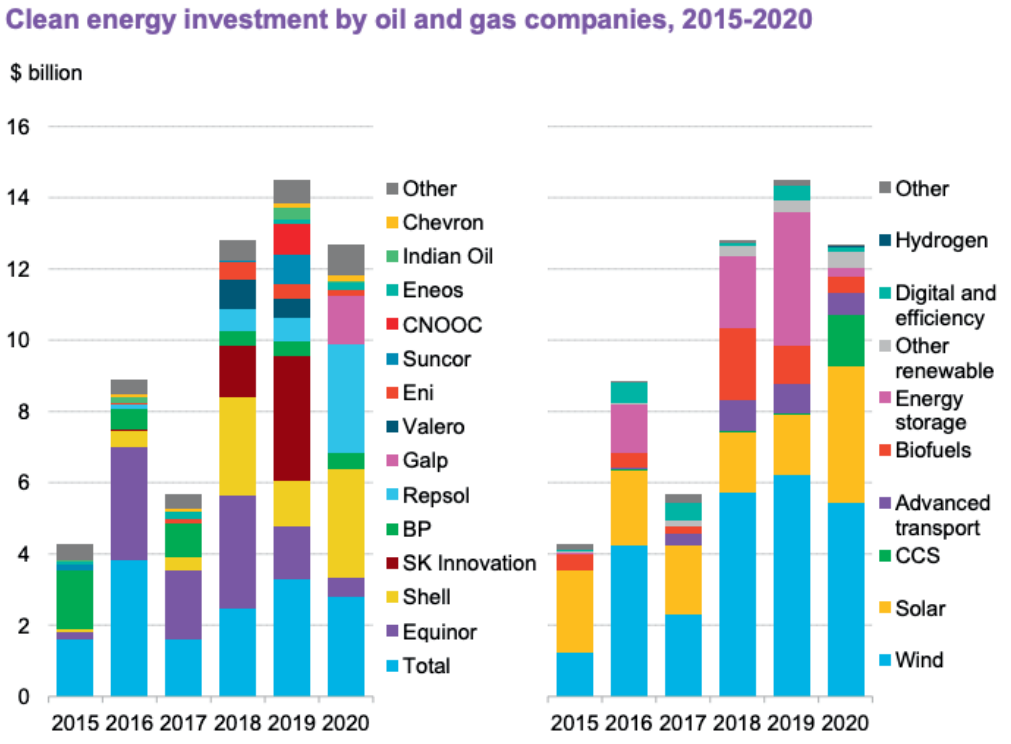
By **Andrew Lee**

Zooming out to the global scale, there is a clear trend toward increasing investment in renewables:



Source: BloombergNEF. Note: start-years differ by sector but all sectors are present from 2019 onward; see Appendix for more detail.

And global renewables investment by oil and gas companies specifically continues to increase:



Source: BlooombergNEF, company disclosures. Note: analysis includes all completed deals, and estimated values for undisclosed deals. CCS data excludes non-commercial projects that have not disclosed investment values. Asset finance data may overstate investment by each company where project equity shares have not been disclosed.

A number of large-scale carbon storage projects are in the planning, permitting, or construction stages, and momentum seems to be building. For example, the state of Texas called for proposals earlier this year:[92]

TEXAS GENERAL LAND OFFICE / SCHOOL LAND BOARD

REQUEST FOR PROPOSALS
for
Lease of Permanent School Fund Land
for Storage of Carbon Dioxide

As Meckel et al. note, the Texas GLO has the authority to lease underwater storage resources off the Texas coast out to 10.35 miles. While Louisiana state waters extend 3.45 miles offshore, the complexity of the Louisiana coastline, with its many inlets, canals, and wetlands, means that the area controlled by the Office of Coastal Management, which is within the Department of Natural Resources, is actually larger than that controlled by the Office of Coastal Management in Texas.

The point is that Texans and Louisianans can take steps today to advance offshore carbon storage:

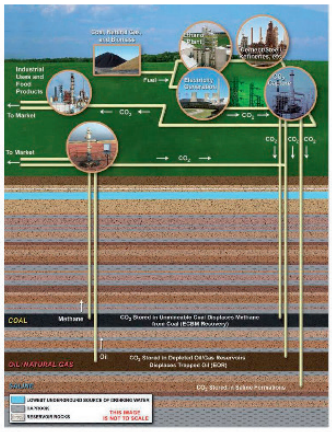
> At present, there are no insurmountable obstacles to transport of CO_2 from inland sources for storage in state coastal waters. . . . Impacts to wetlands must be mitigated or offset, but again there is a well-established process for doing so and it may be avoided entirely by re-using existing drill pads, platforms, and other infrastructure (Meckel et al. 2021, p. 9).

Specific CCS projects in the region include:

https://www.nola.com/news/business/article_1cda1b74-0f2d-11eb-aa0a-03a0484aac1a.html

Lake Charles company to permanently store millions of tons of greenhouse gases 10,000 feet below ground

BY MARK SCHLEIFSTEIN | STAFF WRITER
OCT 18, 2020 - 8:00 PM



This graphic shows various methods for capturing carbon gas underground. The method being used by companies are permanent storage of the carbon gas in saline water at the bottom of the diagram.

U.S. Department of Energy

NextDecade, Oxy Sign Texas CO2 Storage Deal

by Andreas Exarheas | Rigzone Staff | Tuesday, March 30, 2021

Tweet Share 0 Share reddit this!

NextDecade Corporation (NASDAQ: NEXT) and Oxy Low Carbon Ventures sign a term sheet for the offtake and permanent storage of CO2 captured from NextDecade's planned Rio Grande LNG project.

NextDecade Corporation (NASDAQ: NEXT) and Oxy Low Carbon Ventures (OLCV) have signed a term sheet for the offtake and permanent storage of CO_2 captured from NextDecade's planned Rio Grande LNG project in the Port of Brownsville, Texas, NextDecade has revealed.

Hydrogen power, despite longstanding and remaining skepticism about feasibility, could create novel coalitions based on traditional economic interests, including between heat-intensive manufacturers and renewable energy producers.[93]

Entergy
NEWSROOM

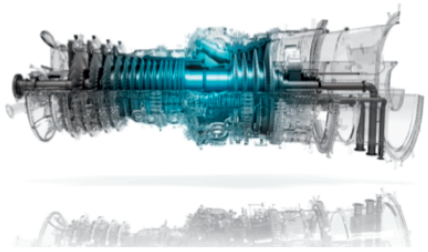
News Center (/news/) > Mitsubishi Power and Entergy to Collaborate and Help Decarbonize Utilities in Four States

For Immediate Release

Mitsubishi Power and Entergy to Collaborate and Help Decarbonize Utilities in Four States

09/23/2020

Entergy has engaged with Mitsubishi Power because of the company's demonstrated ability to provide innovative total solutions leveraging multiple technologies to reach decarbonization goals. Mitsubishi Power is a first mover in hydrogen-enabled gas turbine and long- and short-term storage solutions. It also provides the world's first and only standard integrated green hydrogen packages. The Hydaptive™ and Hystore™ packages optimize integration across renewables, energy storage, and hydrogen-enabled gas turbine power plants, which all work together to create and incorporate green hydrogen — a key to reaching carbonless emissions.



Mitsubishi Power M501JAC hydrogen-enabled gas turbine. (Credit: Mitsubishi Power)

Together Entergy and Mitsubishi Power will focus on

- developing hydrogen-capable gas turbine combined cycle facilities
- developing green hydrogen production, storage and transportation facilities
- creating nuclear-supplied electrolysis facilities with energy storage
- developing utility scale battery storage systems
- enabling economic growth through partnerships with the Entergy utility customers

Forbes

ENERGY

Steel, Hydrogen And Renewables: Strange Bedfellows? Maybe Not...

Baker Institute Contributor
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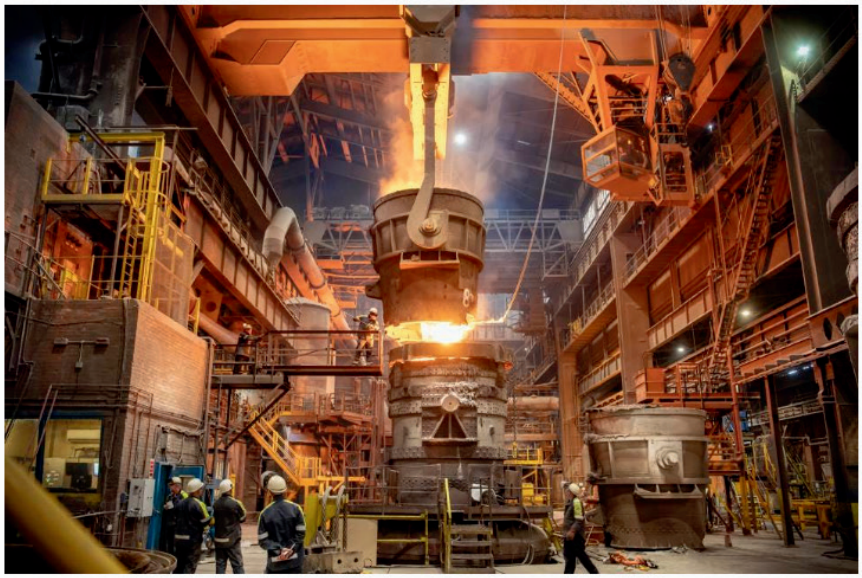


null GETTY

By Dolf Gielen, Kenneth B. Medlock III, and Morgan D. Bazilian

ENERGY

NextEra Energy to Build Its First Green Hydrogen Plant in Florida

Largest U.S. renewables generator "really excited" about green hydrogen, reveals plans for $65 million pilot plant for Florida Power & Light.

KARL-ERIK STROMSTA | JULY 24, 2020

The region's people already have the skills and expertise needed for the new technologies that will support energy transitions, and there are also a number of opportunities for integrating the needs of employers with the local education and training infrastructure.

Model energy building codes that support the housing sector's engagement of renewable energy are currently being debated.[94] As the Lowlander Center's pilot resilient construction training project demonstrates, there is ample opportunity to combine energy efficiency, climatic resilience, and construction training in a way that builds on the ample skills of the region's people. Another new project related to workforce development is Southwest Louisiana's Industry Works workforce development initiative.[95]

Petrochemical companies are well integrated into local communities, sponsoring a wide range of activities, from energy-oriented science fairs and demonstrations in elementary schools; to technical training programs in high schools, technical schools, and colleges; to advanced research in the region's many top universities. While this cultural and political dominance has been criticized, we note that it rests on a social infrastructure of relationships, a network structure that can support innovation, especially when such dense ties bridge into other dense networks. The local nonprofit Greater New Orleans, Inc. (GNO Inc.) is one example of an organization that connects employers to educators, including employers in cutting-edge sectors like offshore wind.

The growing GNO Wind Alliance is just one example of new developments connecting education, training, and employment in transition accelerators:

Michael Hecht: Wind power generation has a great future in the Gulf of Mexico

BY MICHAEL HECHT
JUN 17, 2021 - 6:00 PM

Windmill blades prepared for transportation sit at the Associated Terminals on Weinberger Road in Chalmette, 2019.
STAFF PHOTO BY DAVID GRUNFELD

Such training initiatives to connect labor demand with labor supply are all the more important as new opportunities open up. Synchronizing new labor demand with training and people ready to transition into new jobs is challenging, which is why alliances among labor unions, employers, educators, and policymakers are especially urgent.

BUSINESS // ENERGY

Energy transition could create 1.1 million jobs in Texas, report says

Shelby Webb, Staff writer

Updated: July 27, 2021 1:56 p.m.

There are also signs that community deliberation processes are helpful in finding creative solutions to problems—solutions that can last well beyond an election cycle because they rest on social commitments. One example is Louisiana's Strategic Adaptations for Future Environments initiative, where the Foundation for Louisiana convened 71 local information, deliberation, and decision-making meetings involving over 3,000 people in 2017.

Writing for nextcity.org, Greta Moran describes the nuts and bolts of the process:

> LA SAFE made participation as easy as possible. They offered stipends to those who led the meetings, provided childcare, and helped out with transportation. Translators made the information available in Vietnamese, Cambodian, and Spanish. Organizers made a point of holding meetings in the evenings and on weekends so working people could attend, and offered hot meals. To encourage people to speak freely, trusted community leaders acted as table hosts, leading small discussion groups and summarizing the main points for everyone in the room (Moran 2021).[96]

Currently, a number of projects—developed, designed, and prioritized by community members—are under construction, funded by federal community development block grants.

From Grist

Fix
Solutions Lab

Gulf Coast communities are solving their own flooding crisis. It could be a model for cities nationwide.

Louisiana entrusted its residents to determine the best response to sea level rise and coastal erosion. Other regions should take note.

All that said, large-scale petrochemical plants continue to be planned, permitted, and developed in the region, including the Sunshine Project, a 2,500-acre facility planned to occupy land along the Mississippi River south of Baton Rouge. If such developments happen without significant, permanent, verifiable carbon capture and storage, they would lock in very high levels of GHG emissions for decades to come. One analysis of the Sunshine Project, for example, compared its permitted emissions of 13.6 mmt of carbon dioxide per year to adding 2.6 million ICE cars annually.[97] A more comprehensive analysis of all 88 planned projects in Louisiana and Texas estimated the GHG impacts by facility type, as shown below.[98]

Figure 41: Estimated Annual Emissions by Planned Facility Type, LA and TX

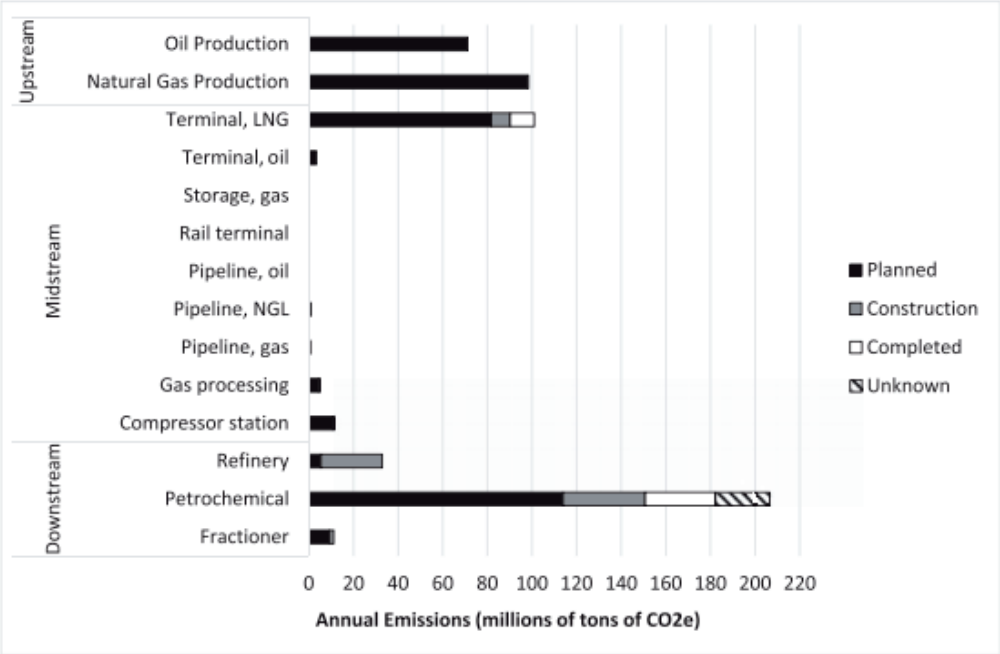
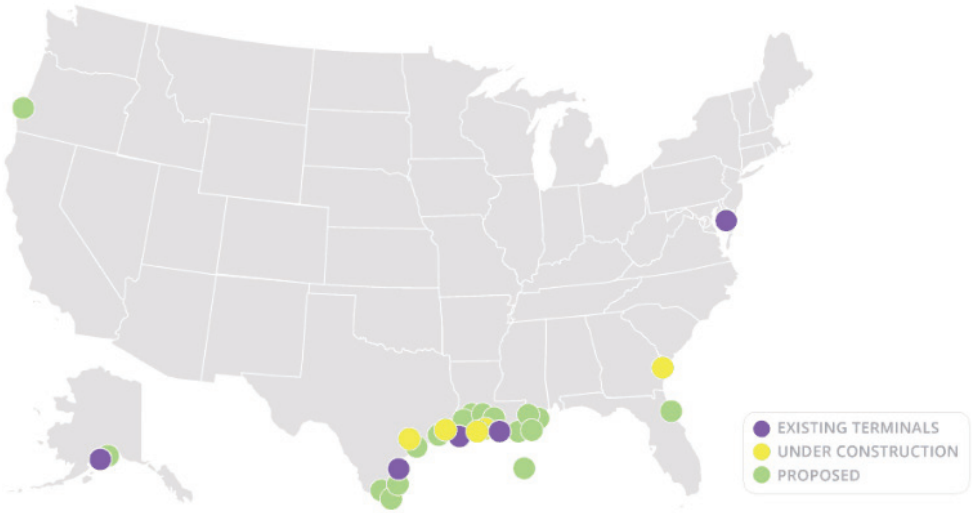


Figure 1. Estimated annual emissions by facility type and project completion status. *Notes*: results in the figure do not include emissions for 17 facilities. For six of them the project is on hold, two are transboundary pipelines, two are pipelines with insufficient data to approximate emissions, and the remaining nine are petrochemical facilities and an NGL storage facility for which we are unable to estimate emissions.

The same holds true for the LNG export sector, which has several large new facilities proposed or under construction, according to a recent story in *E&E News*.[99] Without carbon capture, such facilities would not advance net-zero goals, except in cases where high-efficiency power-generation turbines and robust methane emission mitigation replaced older technologies such as coal-fired power plants.

The map below shows how these new terminals are concentrated along the Gulf Coast:



Fortunately, large-scale carbon-storage projects are also in the early stages of development; for instance, by Gulf Coast Sequestration:

Gulf Coast Sequestration Makes Initial Filing to Obtain EPA Permit for CCS Project
Project Slated to be Largest Geologic Carbon Sequestration Asset in the U.S.

Oct. 13, 2020 – Lake Charles, LA – Gulf Coast Sequestration (GCS) today announced that the company has initiated the process for obtaining a Class VI Underground Injection Control permit from the U.S. Environmental Protection Agency (EPA) by filing a detailed technical submission to delineate its "area of review." This is a significant step in the company's effort to build and operate the country's premier carbon sequestration project, which is designed to permanently store more than 80 million tons of carbon in deep geologic formations.

One development that also represents a way of combining ecological and economic interests is the proposed G2 decarbonized LNG export terminal in Louisiana:

BP in biggest green power swoop yet, buying huge US solar pipeline

Supermajor snaps up 9GW PV portfolio across 12 states as it piles on capacity to meet ambitious goal

1 June 2021 10:48 GMT *UPDATED 1 June 2021 10:48 GMT*

By **Andrew Lee** in **London**

Based on our research, we would argue that for petrochemical projects coming online in the years ahead, the challenges are executing and implementing those projects in a way that helps meet the region's, nation's, and world's needs to reduce greenhouse gas emissions and advance just community development. Win-win-wins are possible.

Research Team

Jason Beckfield is case study lead for the Roosevelt Project's research on the Gulf Coast. He is a professor of sociology at Harvard University. His research investigates the institutional causes and consequences of social inequality, as represented in *Political Sociology and the People's Health* (Oxford, 2018) and *Unequal Europe: How Regional Integration Reshaped the Welfare State and Reversed the Egalitarian Turn* (Oxford, 2019), among other publications. His current research interest is societal adaptation to climate change. He hails from Joplin, Missouri, which started its life as a mining town, and his great-great-grandfather owned a small coal mine in southern Illinois.

Devin Booker works on the research team as a research assistant. She hails from Chandler, Arizona, and is now studying sociology at Xavier University of Louisiana in New Orleans.

Kerry Bowie is managing partner of Msaada Partners and advises the Roosevelt Project on environmental justice. Kerry holds bachelor's and master's degrees in environmental engineering from the Massachusetts Institute of Technology (MIT) and the University of Michigan, respectively, as well as an MBA from the MIT Sloan School of Management.

Brianna Castro is a PhD candidate in sociology at Harvard University. Her research interests include the social dimensions of climate change adaptation, environmental migration, climate change mobilities, and the interplay between individuals and institutions in resilience and adaptation planning. Her dissertation research explores how people do (or do not) adapt to changing climate conditions and how institutional contexts impact people's daily climate-related decisions in urban, peri-urban, and rural environments. Her research sites include Montes de María, Colombia; coastal North Carolina; and Lagos, Nigeria.

Christine DeMyers is an anthropologist formerly with the Water Institute of the Gulf, where she worked with a range of community leaders and stakeholders who are preparing for or responding to water management challenges in southern Louisiana. She is also an elected commissioner in the East Baton Rouge area. DeMyers collects and analyzes primary data (audio, video, or field notes from participant observation, workshops, interviews, or surveys) to understand and aggregate experiences with—and solutions to—environmental risks. She applies systematic summaries of relevant community and stakeholder perspectives to sustainable water management and climate change adaptation plans.

Daniel Alain Evrard is a PhD student in sociology and a James M. and Cathleen D. Stone Scholar in Inequality and Wealth Concentration at Harvard University. D. A. graduated with high honors from the University of Arizona, where he examined the role of deunionization campaigns on the structure of American income inequality. He then applied these findings to the urban context in order to better understand how this process has altered the socioeconomic conditions encountered by the working-class residents of deindustrialized cities. Drawing upon interests in political economy, economic geography, and comparative urban studies, his current research examines the causes behind the divergent developmental trajectories of deindustrialized cities within advanced capitalist countries.

Ayodele (Ayo) Theard-Lewis works on the research team as a research assistant. She hails from Portland, Oregon, and is now studying sociology at Xavier University of Louisiana in New Orleans.

Darryle Ulama holds a master's degree from MIT's Department of Urban Studies and Planning and is a graduate research assistant at MIT's Center for Energy and Environmental Policy Research (CEEPR). He is interested in infrastructure systems, energy policy, and spatial methods and wrote his master's thesis on the political economy of race and New Deal public works.

Appendix on Research Methods

Interview notes and transcripts were analyzed based on participants' (1) definition of a successful energy transition and (2) insights about the barriers and pathways to a successful energy transition. This analysis focuses on the common themes across interview responses (e.g., "How are most participants defining an energy transition?").

Participants are quoted only with permission. In some cases, they are quoted but not named, or anonymously paraphrased. Many of the interviews with economic or political elites were conducted under the Chatham House Rule, allowing for quotation but not attribution.

Description of Interview Participants (Partial List):

Large Employers:

President of global resilience consultancy
CEO, leading landholding company
Director of governmental affairs for ecological restoration company
Petrochemical plant manager (2)
Retired petrochemical plant manager
VP of global business consultancy
VP of leading pipeline operator
VP of leading LNG company
VP of large utility
Former economist, global petrochemical supermajor
Operator, large metals manufacturer
Planner for petrochemical employer
Former head of energy analysis for global bank

Small Businesses:

CEO, renewables incubator
CEO, LNG startup
CEO & principal scientist, consultancy
Founder & engineer, waste solutions startup
Anonymous oil and gas employer (2)
Owner, independent oil and gas exploration
Chief geologist, independent oil and gas exploration
Head engineer, independent oil and gas exploration

Government:

Leader of environmental agency
Leader of restoration agency
Former member of the U.S. House of Representatives
Current member of the U.S. House of Representatives
Local elected official
Staff coordinator, governor's office
Former deputy mayor
Appointed state task force members (2)
Former federal regulators (2)

NGOs:

President & CEO, regional economic development group
President, regional chamber of commerce
Founder & executive director, community services
Executive director, regional environmental justice NGO
Executive director & cofounder, environmental NGO
Leader, climate initiative
CEO, economic development authority
Executive director, energy consumer group
Anthropologist, ecology NGO
Executive director, community development
Volunteer, community health
Staff scientist, Gulf regional organization
Executive director, discovery center
Campaign manager, international environmental law firm
Senior advisor for EJ, research hub
Research scientist, energy and natural resource policy, research hub
Research associate for resilience, research hub
Executive director, community engagement group
Adviser to global membership nonprofit on social investment (2)

Education:

Director of small business incubator
Chancellor of technical college
Watershed coordinator, council of parish governments
Founder and head of regional training consortium
Public involvement coordinator, national estuary program
Education coordinator, anonymous environmental education
Staff scientist, ecology and EJ education organization
Energy scholars (>10)
Political scientists (2)
Public health scholars (2)
Environmental sociologists (2)
Demographers (2)

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