

ENTERGY'S RESILIENCE PLAN



**DOE Partnership for Energy Sector Climate Resilience
December 2016**



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I. Introduction, Purpose, and Scope

Entergy Corporation defines resiliency as the ability to prepare for, adapt to, and recover from non-normal events. As an electricity generator and provider, Entergy plays a key role in the communities that it serves, since the electrical system contributes substantially to withstanding and recovering from such events.

The scope of this plan includes all of Entergy's assets, operations, and service territories, as described in the report below. The overall purpose of this report is to examine Entergy's assets operations, risks, vulnerabilities, and role in overall community resiliency^{1*}, to examine risks and vulnerabilities, to describe the historical/existing portfolio of resiliency measures and Entergy's vision of the future in terms of community resiliency in the areas the company serves, and to explore and describe potential future resiliency measures.

Entergy has a long history of strong environmental performance and commitment. Beginning in 2001, Entergy established a corporate environmental strategy, which has been renewed and expanded twice in the past 15 years. The current environmental strategy extends through 2020 and focuses on environmental footprint reduction, proactive adaptation, compliance leadership, energy efficiency, clean generation, and stakeholder engagement. More on Entergy's overall environmental strategy can be found at www.entergy.com/environment/^{2*}.

II. Entergy's Operations and Assets

Entergy Corporation^{3*} is an integrated energy company engaged primarily in electric power production and retail distribution operations. Entergy owns and operates power plants with approximately 30,000 megawatts of electric generating capacity, including nearly 10,000 megawatts of nuclear power.

Entergy delivers electricity to 2.8 million utility customers in Arkansas, Louisiana, Mississippi, and Texas. Entergy has annual revenues of approximately \$11.5 billion and more than 13,000 employees.

Providing excellent service is the foundation of the company's success. Entergy is investing to enhance reliability, improve efficiency, and lower its environmental impact, while exploring new technologies to improve customers' experience. The company also continually seeks out opportunities to improve productivity and promote economic growth, which helps maintain low rates and enhances the communities where it operates.

The utility business provides power at favorable rates to residential, commercial, industrial, and governmental customers in Arkansas, Louisiana, Mississippi, and Texas. The company also delivers natural gas to customers in New Orleans and parts of Baton Rouge, Louisiana. One of the company's strategic imperatives is to grow the utility business



aggressively. The company is executing a plan to invest to deliver power safely, reliably, and efficiently, align with its stakeholders' expectations, and serve its customers with excellence.

Entergy Wholesale Commodities' (EWC) generation fleet provides safe, reliable power for wholesale customers. In recent years, wholesale power generators have been challenged by persistent low prices due to abundant shale gas. EWC's strategic imperative is to transition to a smaller merchant fleet while properly managing all risks and safely and reliably operating these facilities. The company is managing the EWC transition while continuing to engage stakeholders.

Entergy's physical assets include large central station generation plants of many types, including fossil-fired, nuclear, and renewable. These plants generate the electricity necessary to support utility grid operations and to provide service for wholesale customers for EWC. Several of EWC's generation assets are located outside of Entergy's utility service territory—primarily in Massachusetts, New York, and Michigan. Additionally, the utility owns and operates over 15,000 miles of high voltage transmission lines operated at 69 kV to 500 kV interconnecting over 1,500 substations and two transmission control centers.

The utility also owns and operates distribution lines that deliver retail power to residential, commercial, agricultural, and industrial customers throughout its service territory. In Baton Rouge and New Orleans, Louisiana, Entergy owns distribution infrastructure delivering natural gas to customers. Entergy owns a gas storage facility near Beaumont, Texas and pipeline infrastructure that transmits that gas to other providers' assets, as well as one of Entergy's fossil plants in southeast Texas. Finally, Entergy owns or leases space for support facilities, including office buildings, data centers, telecommunications facilities, supply chain facilities, and an airport hangar.

III. Risks and Vulnerabilities

Entergy's assets and the communities it serves are at risk from various physical and environmental factors, including:

- a. Sea Level Rise^{4*}
- b. Subsidence^{5*}
- c. Coastal Erosion^{6*}
- d. Extreme Weather
 - i. Ice Storms^{7*}
 - ii. Hurricanes/Tornadoes ^{8*}
 - iii. Flooding^{9*}

The physical and environmental risks to which a particular asset is subject are highly dependent on its physical location. For example, assets in south Louisiana are rarely subjected to ice storms, but are more likely subject to coastal erosion and subsidence, while the converse is true for assets located further north.

With respect to overall community resiliency, Entergy's primary acute vulnerability is to extreme weather events that result in outages. A community's ability to withstand an extreme weather event is sometimes linked to Entergy's ability to provide electricity to keep electric-powered flood control infrastructure operational (i.e., flood control pumps) and the ability of emergency services to remain operational. Likewise, electrical power is often critical in supporting an efficient and timely post-event recovery^{10*}.

IV. Resiliency Measures

For decades, Entergy has evaluated risks to its operations and assets, including the physical risks described above. Each of these resiliency measures is established after a rigorous evaluation of the costs and benefits of establishing a new process, investing in infrastructure, or establishing organizational and/or management structures.

The sections below identify Entergy's historical and active portfolio of resiliency measures, as well as potential future actions that the company is evaluating to further enhance its role of providing reliable electrical service in order to improve the resiliency of the communities the company serves.

- a. **Enterprise Risk Management and the Investment Approval Process** - Entergy promotes a risk management culture with responsibility for risk identification and assessment within the business units. Our Chief Financial Officer (CFO) provides risk oversight and, if needed, quantification through the enterprise risk management (ERM) process. Entergy's ERM process and investment approval process (IAP) are comprehensive companywide processes used to identify material issues and strategic imperatives and to analyze and prioritize environmental, weather, and climate risks and opportunities for all businesses. The scope of the analysis includes climate change legislative/regulatory proposals, climate change adaptation issues, customer impacts, physical risks (including those related to climate change), economic impacts, and litigation issues.

Entergy's Internal Audit Services facilitates risk analysis, including risks posed by climate change, for all businesses and support groups. Risks are described, evaluated and scored based on probability of occurrence and severity of outcome. Controls are established for priority items and needed testing is conducted periodically to ensure priorities are addressed. This information is reviewed and updated on a periodic basis.

Entergy's IAP requires all projects of sufficient materiality to include scenarios reflecting the costs and/or benefits of carbon regulation using the company's CO₂ point of view, which is developed in consultation with ICF International. This includes a range of estimates of the future cost of carbon regulation/legislation and uses outside forecasts that are updated at least annually. Entergy performs sensitivity analysis and stress testing, including climate change risks, on each investment. Entergy performs extensive modeling and analysis regarding the various legislative and regulatory scenarios for carbon. From this analysis, Entergy has derived its CO₂ Point of View. Capital project evaluations include costs of compliance for all options across compliance scenarios. For

*URLs for the underlined links can be found in Appendix C

example, the Union Power Project acquisition completed in March 2016 was assessed for future cost of carbon.

- b. **Hardening Studies** – In 2005, Hurricanes Katrina and Rita damaged hundreds of acres of coastal wetlands, transmission towers, distribution poles and lines, substations, and generating facilities, leaving millions of Entergy customers without power. Hurricane Katrina alone led to nearly \$300 million in facility improvements and \$1.7 billion in hardening investments at Entergy^{11*}.

However, Entergy’s hardening strategy actually began 40 years earlier when Hurricane Betsy pummeled the region, causing widespread flooding and extensive power outages in the New Orleans area. Afterward, the company took stock of measures necessary to sustain transmission lines and other facilities during such damaging events. The goal was to keep storm outage frequency and duration to a minimum. Because Hurricane Betsy’s wind speeds topped 140 mph, the company hardened its transmission system well beyond National Electrical Safety Code (NESC) requirements.

The decision to take this action decades ago proved justified when Hurricanes Katrina and Rita struck the coastline. Although Entergy sustained significant system damage, a 2007 hardening study commissioned by the company indicated that 99 percent of the structures located within 20 miles of the Louisiana and Texas coastlines survived the winds. In total, of more than 90,000 structures along that stretch of coast exposed to the high winds of both hurricanes, only 770 sustained structural damage such as breaks in utility poles. National news photos showed leaning poles, but many of those structures were able to be straightened and did not require additional repairs.

Major storms like these are not just coastal events. Although NESC changed the codes in 2007 to require structures to withstand 140 mph winds along the Louisiana and Texas coastlines, Entergy exceeds these requirements further inland than codes require by hardening our structures to withstand strong winds that accompany hurricanes long after landfall.

Data collected for the 2007 study gave engineers information needed to develop a number of strategies, including investments that reduce costs to customers over the life of the facilities. Steps Entergy has taken include building transmission lines using concrete or steel poles within 20 miles of the coast, replacing transmission and distribution crossing structures over major highways with concrete or steel poles, and building new substations to elevations above the 100-year flood plain, as established by the U.S. Geological Survey. The current design standards for transmission line construction on Entergy’s system do not allow the use of wood poles. Entergy also has studied its distribution system and other structures along the coast^{12*} and farther inland and has taken steps to harden and protect those properties from high winds and potential floodwaters a hurricane can cause. Distribution services centers in New Orleans East, Chalmette, and St. Rosalie were elevated to provide protection from storm surge inundation during severe weather events. (See Appendix A – Entergy’s climate resiliency chapter in Electric Power Research Institute’s sustainable electricity book)

- c. **Generation Portfolio Transition** – As Entergy designs and builds new generation, the site selection process involves reviewing the site for access, transmission interconnection, fuel supply, and flood potential. To address flooding, the site is reviewed against 100-year floodplain data and specific data associated with the site. All of the current new generation builds are located at existing Entergy sites where there exists an understanding of how the site is impacted by flooding. The determination of the site elevation takes into account the flooding data to provide reasonable assurance that the major power block equipment is not impacted by flood waters. The major power block equipment includes the gas turbines, steam turbines, transformers, and electrical switch gear rooms. Also, the site elevation takes into account construction impact and costs. In some cases, the site elevation is above the ground water level, which eases the installation of underground components.

During the design phase, wind loading on structures is in accordance with IBC (International Building Code) and ASCE 7 (American Society of Civil Engineering – Minimum Design Loads for Buildings and other structures) standards. ASCE 7 provides users with site-specific wind speeds used in the determination of the design of wind loads for the buildings and structures. ASCE 7 also addresses design loads for seismic, rain, and ice impacts. The IBC addresses the design and installation of building systems and provides regulations that safeguard the public health and safety in all communities, large and small.

- d. **Nuclear Flood Hazard Evaluation** - Flooding hazards have been re-evaluated systematically at each of Entergy’s nuclear plants using the latest methodology and information beyond original design requirements set by NEI 12-08 Overview of Flooding Reevaluations regulations. Sources and standards of methodology and information are from national laboratories, national weather service, US Army Corps of Engineers, Federal Emergency Management Agency, Federal Energy Regulatory Commission, Department of Energy, cutting edge researchers and scientists, and other federal and international agencies and institutions.

Flooding Hazard mechanisms assessed include extreme hurricanes, tsunami, intense rainfall, flooding rivers, dam failures, ice jams, seiche, and combinations of these. Extremely conservative methods were used when substantial plant margins existed. Refinements of conservatism were used where less margins were available.

Entergy’s nuclear fleet generally was found to have margins beyond design basis re-evaluation providing protection of important plant structures, systems, and components. One plant required a strategy to prepare for an extreme hurricane surge during the advance warning time from the National Hurricane Center. Plant staff is prepared and able to execute the strategy.

- e. **Grid Infrastructure Investments and Upgrades** – Improvements in transmission infrastructure provide resilience by updating the physical strength of the overall grid and by creating more efficient ways to move power throughout the system. Entergy’s move to Midcontinent Independent System operator (MISO) enhanced system reliability by informing all market participants about the state of grid conditions and market operations through the public posting of electricity prices and other key system information. MISO mitigates transmission congestion on a least-cost basis, allowing for timely and efficient congestion management. Integrating MISO into the company’s business model has resulted in different flow patterns on the transmission system and has identified where new transmission facilities and upgrades are economically advantageous. In 2015, Entergy invested more than \$630 million in transmission infrastructure.

Entergy Arkansas, Inc. (EAI) began construction on a 24-mile transmission line in northeast Arkansas to improve reliability. The \$63 million investment is in addition to a \$43 million investment in a 25-mile transmission line and a \$29 million investment in a 22-mile transmission line, both already underway in southeast Arkansas.

Entergy Louisiana, LLC (ELL) received certification for the Lake Charles Transmission Project, a \$159 million project (excluding contingency) that includes the construction of two new substations, the expansion of a third, and the addition of about 25 miles of high-voltage transmission lines to move power reliably and efficiently into this fast-growing region. Construction began in 2016. Entergy Louisiana has also begun construction of the Louisiana Economic Transmission Project, a \$67 million portfolio of projects that includes a new substation, construction of a new 11-mile transmission line, and the reconfiguration of existing transmission lines in order to reduce congestion in the Baton Rouge industrial corridor and, generally, to increase the amount of economic power that can flow into the Amite South region, projected to result in substantial economic benefits in the form of lower cost of service for ELL’s retail and wholesale customers.

Entergy Mississippi, Inc. (EMI) began construction of the \$132 million Southwest Mississippi Reliability Improvement Project in the spring of 2016, which includes a new 65-mile transmission line and the rebuilding of several sections of existing transmission lines. The project is needed to maintain compliance with industry standards and support growth in the Natchez area.

In early 2016, Entergy New Orleans, Inc. (ENO) completed a \$30 million transmission upgrade to enhance reliability and increase capacity. This is an important step in preparation for its future generation landscape, such as the recent retirement of its Michoud generating facility.

Three important projects went into service in Entergy Texas, Inc. (ETI) in mid-2016. The Ponderosa–Grimes 230 kV line, the Orange County Project, and the China–Amelia 230 kV line together represent nearly \$150 million of transmission investment and provide reliability benefits throughout the Entergy Texas footprint.

Two new transmission control centers were completed in 2016 in Arkansas and Mississippi. Each center represents a \$23 million investment and was built to withstand an EF5 tornado. The centers share sophisticated communications technology that enables close coordination of operations and enhances training and development.

- f. **CO₂ Stabilization Commitment and the Environmental Initiatives Fund** – On May 3, 2001, Entergy made history when it became the first U.S. electric utility to announce a greenhouse gas emissions target. Partnering with Environmental Defense, Entergy pledged to take voluntary actions to stabilize its domestic carbon dioxide (CO₂) emissions at year-2000 levels through 2005 and to develop a long-term target to include additional reductions that would help combat climate change.

To help accomplish its emissions-reduction goal, Entergy dedicated \$25 million in supplemental funding through an Environmental Initiatives Fund (EIF), with 80% allocated for changes in Entergy-owned assets and 20% for the purchase of CO₂ offsets.

From 2002-2005, Entergy exceeded its stabilization commitment and further reduced CO₂ emissions by 23% under the established target while simultaneously increasing electrical sales by 21%. Entergy achieved its goal through both internal and external greenhouse gas reduction strategies, including 61 internal projects and 13 external projects that encompassed carbon sequestration on company-owned property and greenhouse gas emission trades.

In May 2006, Entergy announced a second five-year commitment to stabilize CO₂ emissions from its owned facilities at a level 20% below year 2000 from 2006-2010. Entergy also included controllable purchases as part of the commitment, since they had become a significant portion of its portfolio. The commitment included \$3.25 million in funding to participate actively in GHG offset markets and to help develop new markets, products, and innovations to address emission reductions. Entergy's cumulative CO₂ emissions through the years 2006, 2007, and 2008 were 122.9 million tons, 4% better than its stabilization goal of 127.7 million tons.

Through 2015, since the first stabilization commitment in 2001, Entergy has emitted 629.9 million tons of CO₂ (including controllable purchases emissions), which is nearly 9% below its cumulative stabilization goal of 691.6 million tons of CO₂ for the 15-year period. Entergy's emissions in 2015 were approximately 30% below 2000 levels.

The EIF currently is funded by an annual appropriation of shareholder dollars used to fund a variety of environmentally beneficial projects. Through the EIF, Entergy has made emission-reduction improvements to its existing fossil fleet, including coal plants, to improve efficiency, and has funded projects such as wetland and coastal restoration that should increase the sustainability of both Entergy's assets and the communities served by Entergy. (See Appendix B contains for details on the various types of projects supported^{13*} by the EIF.)

- g. Dow Jones Sustainability Index** - In 2016, Entergy was once again named to the Dow Jones Sustainability North America Index. The index measures performance in economic, environmental, and social dimensions against industry peers around the globe. Entergy was one of only four U.S. electric utilities named to the index. The company achieved perfect scores of 100 in the focus areas of Corporate Citizenship and Philanthropy, Biodiversity, Climate Strategy, and Water-Related Risks. This is the 15th consecutive year Entergy has been included on either the World or North America index or both.
- h. Resiliency Governance and Organization** – Entergy’s resiliency governance and organization is spread throughout the organization in various business functions and planning processes. These various functions and processes, further described below, are designed to:
1. Reduce the likelihood of an outage;
 2. Minimize the impact of an outage on customers and company operations;
 3. Plan for outage response/conduct drills; and,
 4. Safely recover as quickly as possible from an outage.

Transmission Planning, Engineering, and Operations - Entergy's Transmission Organization consists of the employees and assets used to plan, operate, and maintain Entergy’s transmission system. The Entergy transmission system is comprised of the transmission systems of Entergy's operating companies (EOCs): Entergy Arkansas, Inc.; Entergy Louisiana, LLC; Entergy Mississippi, Inc.; Entergy New Orleans, Inc.; and Entergy Texas, Inc. The Entergy transmission system is comprised of over 15,000 circuit miles of transmission lines operated at 69 kV to 500 kV interconnecting over 1,500 substations. The transmission system spans portions of Arkansas, Louisiana, Mississippi, Missouri, and Texas, covering 114,000 square miles. This system is regulated by FERC and retail regulators, including the Arkansas Public Service Commission, the Louisiana Public Service Commission, the Mississippi Public Service Commission, the City Council for the City of New Orleans, and the Public Utility Commission of Texas.

The Entergy transmission system moves high voltage bulk electric power from generating plants of the EOCs and third parties across an interconnected system of transmission lines and substations. The power is delivered to wholesale customers such as municipalities and cooperatives, as well as to approximately 2.8 million retail customers. The system also delivers power directly to large commercial and industrial retail customers. These customers include refineries, chemical plants, oil and gas processing facilities, pumping stations, and large manufacturing sites vital to the region and nation.

Business Continuity – Entergy initially launched efforts to address business continuity needs in early 2004. However, in the aftermath of Hurricanes Katrina and Rita in 2005, a dedicated Business Continuity Team was formed to ensure that Entergy’s business units could provide service for essential business functions, either through normal or alternate operations. Today’s business continuity challenges can come from almost

anywhere — hurricanes in the Gulf, ice storms, terrorist events, or health pandemics. Entergy recognizes the need to be able to respond accordingly in order to prevent and minimize impacts of these types of events.

Entergy conducts business continuity drills twice a year that simulate different types of emergencies. Teams complete tabletop drills involving various emergency response scenarios, including attacks and storm-related emergencies. The event leader is responsible for coordinating Entergy's overall business continuity effort, including sharing business continuity information with employees, business partners, and customers. The leader also works with each business unit to resolve issues impacting the ongoing operations of the business as well as people issues such as acquiring temporary employee housing and addressing family-care issues in any event that could disrupt Entergy's operations.

Entergy's Incident Management System – Entergy's incident management organization conducts at least one storm exercise annually to keep personnel educated and adept in their storm roles and responsibilities. Generally, an exercise is conducted in the spring and is focused on preparation and response for a hurricane scenario. Periodically, another exercise is conducted in the late fall and focuses on a winter storm scenario. Additional exercises are sometimes conducted within an individual Office or Section group of the incident management organization to ensure preparedness of new personnel in key storm assignments or for exercising new or enhanced processes. Exercises are developed to simulate potential situations expected during the various scenarios and are intended to allow for demonstration of proficiency in process understanding and execution. The leadership of the incident management organization also conducts monthly incident commander steering committee calls that allow for routine discussion and follow-up on items associated with process development and preparedness.

Mutual Assistance is a voluntary partnership of investor-owned electric companies across the country committed to helping restore power whenever and wherever assistance is needed. Municipal utilities and electric cooperatives also have their own mutual aid programs that provide restoration support to their participating utilities. Mutual Assistance provides a formal yet flexible process for electric companies to request support from other electric companies in parts of the country that have not been affected by major outage events.

Entergy maintains membership and active participation in the following Mutual Assistance organizations:

- Edison Electric Institute Mutual Assistance-Emergency Planning Committee
- Midwest Regional Mutual Assistance Group
- Southeastern Electric Exchange Regional Mutual Assistance Group
- Texas Regional Mutual Assistance Group

Regardless of the timing or location of a major storm, Entergy's team stays ready to restore power safely and quickly to our customers. Entergy's storm response team and process are recognized as being among the best in the business.

- i. **Adaptation Study** – In 2010, Entergy worked to develop a framework and fact base to quantify climate risks along the U.S. Gulf Coast and to help inform economically sensible approaches for addressing this risk and building a resilient Gulf Coast.

This project was strengthened and enriched by contributions from many stakeholders and participants. Entergy primarily worked with America's Energy Coast, America's WETLAND Foundation, and Swiss Re, which was a lead contributor to the research and brought its natural catastrophe and climate risk assessment knowledge to bear on the challenge of quantifying climate risks. The methodology used in the study previously was devised and tested by a consortium of public and private partners, including Swiss Re, in a project on the Economics of Climate Adaptation (ECA). The methodology developed a framework for the facts for decision-makers to build a portfolio of economically suitable adaptation measures.

The [executive report](#)^{14*} for the study and a [summary presentation](#)^{15*} were both published in 2010. The publication of these results was followed by extensive stakeholder outreach. The stakeholder outreach initiative sought to assess local vulnerabilities along the Gulf Coast and empower the region to envision, plan, and act to ensure resiliency and to sustain cultural, economic, and ecological values in the face of growing coastal degradation.

- j. **The Blue Ribbon Resilient Communities Project** – This effort, sponsored by Entergy and others, consisted of a series of [leadership forums](#)^{16*} held in 11 communities that engaged more than 1,100 stakeholders across the five Gulf States of Texas, Louisiana, Mississippi, Alabama, and Florida.

At the end of the process, the America's WETLAND Foundation released a report based on the forums entitled [Beyond Unintended Consequences: Adaptation for Gulf Coast Resiliency and Sustainability](#)^{17*}. The report offers 30 recommendations for Gulf Coast sustainability based on research and testimony from the forums.

The report's recommendations fall into five distinct categories.

1. Seek urgent federal action by resolving conflicting federal policies and practices. Contradictory rules, regulations, and agency priorities impede coastal restoration by delaying projects and increasing costs. A more orderly, efficient process must be established to meet urgent needs.
2. Deploy multiple lines of offense by decreasing regional vulnerabilities through cooperative action. Short-term thinking has led to consequence planning defined by inadequate, piecemeal fixes – mainly in the wake of disasters. The focus must shift to a long-term vision for the future that emphasizes adaptation by using innovative, systemic approaches that incorporate non-structural and structural elements.

3. Allow innovation and enterprise to flourish by supporting strategies to facilitate regional stewardship. Bureaucratic barriers and a lack of smart incentives hinder the development of creative, efficient coastal restoration strategies. Unless policies and plans harness the power of new technologies, visionary research, market forces, and local ingenuity, environmental degradation will continue to outpace restoration and protection efforts.
4. Revitalize regional strengths and pride by empowering communities to practice self-determination. Coastal degradation and mounting vulnerabilities threaten entire communities, cultures, and valued ways of life. Local citizens must adapt to changing circumstances to preserve their cultural heritage and to build the foundation for a stronger future.
5. Sustain action based on recommendations by communicating regional visions for resiliency. The degradation of the Gulf Coast will continue to accelerate without a robust, coordinated response that enlists all interested parties and every level of government.

As a follow-up to the outreach described above, Entergy is co-sponsoring several roundtable discussion workshops in October 2016 and a summit in January 2017 to continue the discussion with stakeholders regarding overall coastal resiliency and efforts to protect the fragile Gulf Coast environment. See stakeholder engagement description, below.

- k. **Advanced Meter Infrastructure (AMI)** – As Entergy fulfills its mission to power life, it is continually preparing for the future to meet its customers’ expectations, transform its business in step with the pace of the change in the world today, and improve resiliency of grid operations. Entergy has modernized its power plants over the last decade, adding both cleaner and more efficient energy sources, in order to provide our customers with reliable, safe, and low-cost energy. Entergy also has invested significantly in its high-voltage power grid to expand for growth and to comply with increasing federal reliability requirements.

Accordingly, as the foundation of an advanced grid, Entergy’s utility operating companies are deploying AMI. This investment will deliver significant benefits to all of Entergy’s stakeholders, customers in particular. AMI will communicate more accurate outage locations, which enables quicker and more accurate detection of problems, improved outage communications with customers, and overall faster outage restoration. AMI also will provide customers with more control over their energy usage by offering them more detailed and timely information on their accounts and energy saving tools.

Overall, AMI will enhance the Company’s operations significantly and improve reliability and resiliency, while also providing new capabilities for EAI’s customers to gain a deeper understanding of their energy usage to enable them to make more informed decisions to manage their usage. Entergy believes that these capabilities and new customer-focused tools will result in better service and ultimately in lower bills. Additionally, greater grid resiliency could be accomplished in the distribution network. By deploying

additional automated devices on the distribution grid connected to the AMI communication system, and combined with the data from advanced meters, automatic rerouting of power due to an outage would allow for fewer overall outages and interruptions.

Examples of benefits include faster outage identification and restoration with improved overall systems reliability, enhanced customer service quality, increased customer energy conservation, safer field operations, and enhanced ability to offer new products and service to meet evolving customer needs and expectations. In addition, with the new information and connectivity available through AMI, an integrated OMS and DMS will enhance the Company's ability to identify the location and scope of outages more quickly and to provide enhanced information for devices throughout the distribution network.

- l. Partnership for Energy Sector Climate Resilience** – Entergy was a charter member of this partnership and continues its involvement. This initiative focuses on enhancing U.S. energy security by improving the resilience of energy infrastructure after extreme weather and climate change impacts. The goal is to accelerate investment in technologies, practices, and policies that will enable a resilient 21st century energy system. Under this partnership, owners and operators of energy assets will develop and pursue strategies to reduce climate and weather-related vulnerabilities. Collectively, these partners and the Department of Energy (DOE) will develop resources to facilitate risk-based decision-making and pursue cost-effective strategies for a more climate-resilient U.S. energy infrastructure.
- m. City of New Orleans Resilience Strategy** – Entergy is a participant in the City of New Orleans' efforts to establish and implement a [resilience strategy](#)^{18*}. City resilience is about more than building stronger infrastructure to hold back the water and withstand the wind. It also focuses on the city's capacity to adapt, and is founded on knowledge and learning from past experiences with shocks and stresses.
- n. DOE's Grid Analysis and Design for Energy and Infrastructure Resiliency for New Orleans** - Entergy is a member of this project along with the City of New Orleans, Sandia National Laboratories, Los Alamos National Laboratory, the Rockefeller Foundation and its 100 Resilient Cities Initiative, and the US Army Corps of Engineers. The project will perform infrastructure impact modeling and analysis and resilient power distribution modeling and analysis in order to provide a set of options and conceptual designs for enhancing grid resilience. The recommendations for grid resilience enhancements will be delivered in the form of conceptual designs that can then be utilized by the City of New Orleans, Entergy, and state and federal agencies.

- o. **Council of the City of New Orleans Resolution R-15-31** - On September 29, 2016, Entergy New Orleans, Inc. (ENO) submitted its third filing in response to the Council of the City of New Orleans Resolution R-15-31. In the filing, ENO is planning to spend \$30 million on infrastructure resilience in New Orleans and Algiers. The activities could include enhanced pole inspections/excavations, pole replacements, circuit reconfiguration, grid sectionalizing and automation, and targeted hardening work.
- p. **United State Business Council for Sustainable Development (USBCSD) Water Synergy Project** – Entergy is a founding member of this project, aimed at bringing watershed users together to develop sustainable water management practices that foster mutually beneficial solutions rather than competitive tensions. The project goals are to achieve tangible water synergy benefits for participating companies and the communities, establish a long-term water collaboration plan for this region, and develop a replicable work process that can be applied in other watersheds/regions.
- q. **USBCSD Watershed Simulation - “A Serious Simulation Game for the Gulf Coast of Louisiana”** - Given the complexities of the rapidly changing world, it is difficult, if not impossible, to grasp and appreciate the often-unpredictable consequences of the many independent choices and decisions that persons and organizations make as they pursue their individual goals. Such large-scale complex systems defy static mathematical and statistical analysis. However, they can be approximated with computer-based simulation models where the myriad human choices and decisions are represented by random variables and probability distributions. However, when a system of interest involves a wide range of human choice and decision-making, even the most carefully designed simulation model might not capture the most realistic (and often changeable) outcomes.

A promising approach to this situation is the creation of a serious game, or participatory simulation model, based on a validated and verified predictive model. Such games allow human decision-makers, playing carefully designed roles, to introduce realism into system behavior. Human players bring their individual knowledge, experience, and values to the simulation model, something impossible to do with equations.

Entergy’s support of the project developed a front-end user interface to allow participants to make decisions that feed into an underlying predictive model, which together form a participatory simulation for the Louisiana Gulf Coast. The predictive model is based on a spatial model of the land use/land cover change of the coastal area over a specified time period. The spatial model will be at 30m resolution using USGS LandSat imagery. Each 30m x 30m cell is classified into one of 20 different land cover types. The resulting simulation model is used to forecast future trends and changes under various scenarios and assumptions about key parameters. In this form, the simulation model is a standalone tool and does not permit direct human interaction with the model other than through the construction of simulation experiments.

V. Evaluating Future Actions

- a. **Resiliency Peer Group** – Entergy establishes subject matter expert “peer groups” and “lead teams” for various issues requiring coordination across multiple business functions and support groups. Given the decentralized nature of the organization, and the multiple business functions and support groups either impacted by, involved in, or responsible for resiliency actions, Entergy currently is evaluating establishment of a Resiliency Peer Group.

Peer groups pull together subject matter experts and representatives of various business functions/support groups throughout the company. The function of these groups with respect to the given topic is to:

- i. Share information and operational experience;
- ii. Identify and leverage best practices;
- iii. Develop a consistent point of view for the company;
- iv. Coordinate on internal and external actions; and,
- v. Ensure consistent application of guidance and laws/regulations.

Entergy will evaluate this opportunity, and if appropriate, identify an executive sponsor, identify the appropriate SMEs/participants, develop a charter for the group, and establish a meeting schedule. Entergy expects to complete the evaluation of this opportunity by the end of 2017.

- b. **Stakeholder Engagement** – Entergy evaluated and is sponsoring/participating in the Louisiana Coastal Protection & Restoration Authority (CPRA) and America’s WETLAND Foundation (AWF) [leadership roundtables](#)^{19*} this fall and a culminating coastal summit in February 2017 to discuss the state’s 2017 Coastal Master Plan, bringing together diverse coastal interests to address challenges to and opportunities for moving restoration forward through the plan.

On the table for discussion at the meetings are issues that address how the plan will effect commercial, community, and cultural interests, the move toward altering an engineered levee system to allow greater sediment delivery from the Mississippi River, the development of insurance programs for communities threatened with retreat from low lying areas, the science used to prioritize projects in the plan, creative financing for restoration to encourage private sector investment, and innovative approaches to cost and time effective solutions.

Results from the two leadership roundtables conducted on October 24 and 25 in Baton Rouge will inform the agenda for the February 2017 Coastal Solutions Summit, timed to coincide with release of the 2017 Master Plan and its consideration by the legislature in the first quarter of 2017.

*URLs for the underlined links can be found in Appendix C

- c. **Technology Innovation and Implementation** – Entergy will continue to work with stakeholders to evaluate investment opportunities in technologies that improve reliability and overall resiliency of the electrical grid and community. AMI (described above) is just the first step in a fully integrated energy network. Entergy’s Commercial Development and Innovation team is continuously evaluating technologies, developing company points of view on how these technologies can be integrated into the system, quantifying the costs and benefits of the technologies, and evaluating the business case for investment.

Appendix A

Chapter 8

Energy: Climate Change Resilience and Adaptation

Chapter 8

Entergy: Climate Change Resiliency and Adaptation

Brent Dorsey

Abstract Effectively managing environmental risks is essential to Entergy's ability to create long-term, sustainable value for owners, customers, employees, and communities. Given the utility's first-hand experience with hurricanes, storm surges, and a disappearing coastline, Entergy leaders have strived to gain an understanding of short-term and long-term implications to the region from climate change. Entergy has put its high-level commitments into very specific actions by driving major initiatives to address climate-change adaptation and resilience from a regional perspective. Entergy also is working to improve the resilience of its generation, transmission, and distribution infrastructure. An example of an infrastructure improvement project is the rebuilding of Entergy's gas system in New Orleans following Hurricane Katrina—one of the world's largest gas-rebuild effort in history resulting from a catastrophic event. Entergy believes that stakeholder outreach is instrumental in developing effective strategies to protect and strengthen infrastructure. In collaboration with local universities, Entergy has hosted technical conferences with customers to learn how to prioritize infrastructure investments in ways that align with actions being taken at local levels. These and other outreach efforts demonstrate the importance of working collectively with stakeholders to build resilient communities in a responsible, sustainable, and cost-effective manner.

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8.1 Our Risks Down on the Bayou

As residents prepared for a relaxing season of music and crawfish for the summer of 2005, unrelenting weather was brewing off the Gulf Coast. That year's storm season proved to be the most active Atlantic/Gulf of Mexico hurricane season on record. The National Weather Service even ran out of storm names, resorting to the use of Greek names (Alpha–Gamma) for the last seven storms of the season.

Even today, images of damage caused by hurricanes Katrina and Rita are burned into the mind's eye of people across the country, most especially, residents of the Gulf Coast. Katrina caused loss of power for over 1.1 million people and destroyed 275,000 homes. Rita put nearly 800,000 people in the dark while another 175,000 in Texas dealt with rolling blackouts.

In the Gulf Coast region, where a large portion of Entergy's customer base and the majority of its utility infrastructure are located, serious environmental, social, and economic consequences are resulting from the effects of climate change. Extreme weather events of 2005 revealed that no longer was a build and rebuild approach for storm management viable. The storms and their aftermath provided a clear business case for Entergy to forecast and mitigate climate-related risks (Fig. 8.1).

Coastal Louisiana suffers one of the fastest rates of wetlands loss in the world, and restoration costs are estimated in the tens to hundreds of billions of dollars. According to the U.S. Geological Survey, an average of 34 square miles of south Louisiana land, mostly marsh, has disappeared each year for the past five decades. From 1932 to 2000, the state lost 1,900 square miles of land to the Gulf of Mexico, an area roughly the size of Delaware. By 2050, if nothing is done to stop this process, the state could lose another 700 square miles, and a third of the 1930s coastal Louisiana will have vanished (Fig. 8.2). New Orleans and surrounding areas will become more vulnerable to future storms through loss of this natural storm surge buffer (Fig. 8.3).

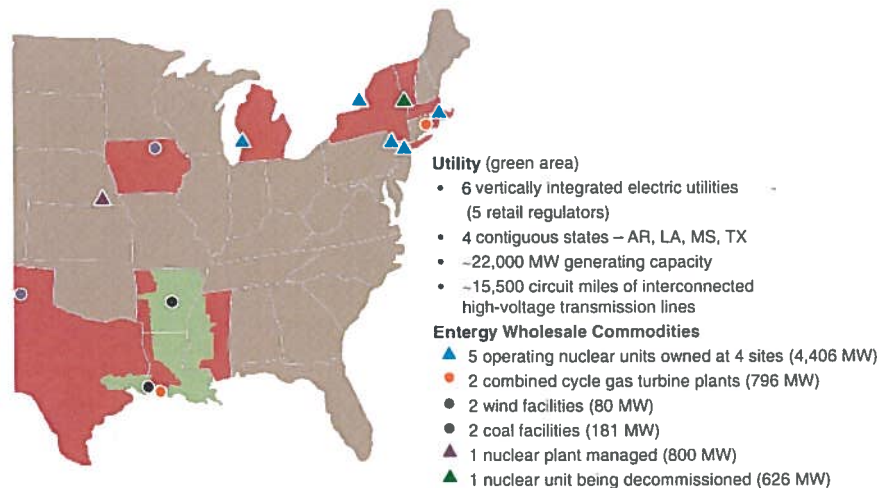


Fig. 8.1 Entergy Corporation operating areas (2015)

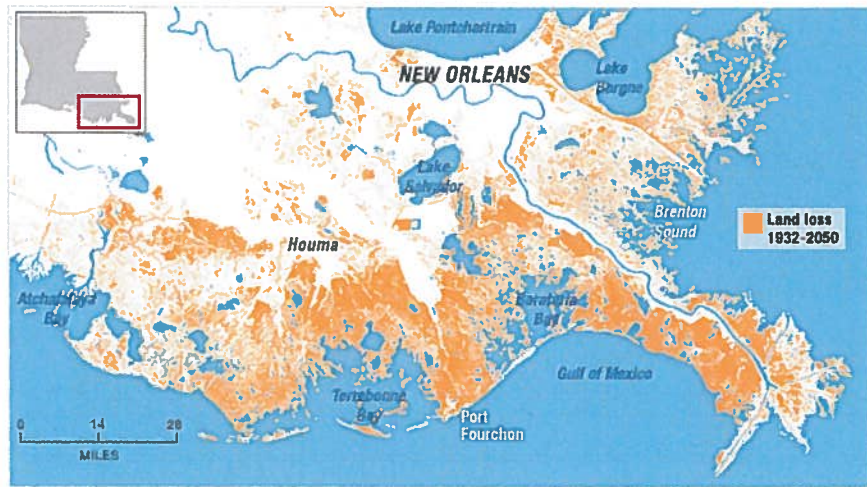


Fig. 8.2 Projected land loss through 2050. Source Louisiana Coastal Wetlands Planning Protection and Restoration Act Program



Fig. 8.3 New Orleans areas at risk of inundation. Source Stratus Consulting, Inc.

Since 2005, a series of catastrophic events marked by hurricanes Katrina, Rita, and Ike, as well as the Deepwater Horizon oil spill, have further devastated one of the most fragile landscapes on the planet. Such events also highlighted the region's significance and exposed its vulnerabilities. In this rapidly changing physical environment, industries and communities must be resilient to survive.

8.2 Entergy's Approach to Climate Change, a Legacy of Stewardship

Effectively managing environmental risks is essential to Entergy's ability to create long-term, sustainable value for owners, customers, employees, and communities. Given the utility's first-hand experience with hurricanes, storm surges, and a disappearing coastline, Entergy leaders have strived to gain an understanding of short-term and long-term implications to the region from climate change. Driven by real risks and exposure, Entergy's challenges in addressing climate-change resiliency and adaptation are virtually unrivaled in the U.S. utility industry.

Entergy has put its high-level commitments into very specific actions by driving major initiatives to address climate-change adaptation and resilience regionally. Entergy helped fund a landmark adaptation study presented during America's Energy Coast policy forum in 2010 that was the first comprehensive analysis of climate risks and adaptation economics for the Gulf Coast region. In 2012, Entergy partnered with America's WETLAND Foundation on the Blue Ribbon Resilient Communities initiative, which helped vulnerable communities identify key parameters for proactive and reactive dimensions to storm readiness and recovery.

Entergy also is working to improve the resilience of its generation, transmission, and distribution infrastructure. One example of infrastructure improvement is the rebuilding of Entergy's gas system in New Orleans—one of the world's largest gas-rebuild effort in history resulting from a catastrophic event. After the gas system was flooded by saltwater from Hurricane Katrina, Entergy began converting 844 miles of piping in the city's low-pressure system to a high-pressure system made of high-density polyethylene, which is virtually impervious to saltwater corrosion. In 2009, it was named Platts' Global Infrastructure Project of the Year.

Entergy believes that stakeholder outreach is instrumental in developing effective strategies to protect and strengthen infrastructure. In collaboration with local universities, Entergy has hosted technical conferences with customers to better prioritize infrastructure investments in ways that align with actions being taken at local levels. These and other outreach efforts demonstrate the importance of working collectively with stakeholders to build resilient communities in a responsible, sustainable, and cost-effective manner.

Entergy's regional efforts to address climate-change resiliency and adaptation have been a natural evolution for the company. In 2001, Entergy became the first U.S. electric company to publicly announce a voluntary greenhouse gas emission target and to develop long-term targets to help combat climate change.

The company's commitment was initiated by the leadership of its board of directors and then-Chief Executive Officer J. Wayne Leonard. Entergy was the first U.S. electric company to publicly establish such a greenhouse gas emission target. To implement this target, the New Orleans-based company partnered with Environmental Defense, a national advocacy group, to develop a program to reduce carbon dioxide emissions from Entergy's plants that generate electricity through burning fossil fuels. Entergy was the first U.S. electric company accepted for membership in the Partnership for Climate Action (PCA), a collaboration of international business and environmental leaders dedicated to climate protection established by Environmental Defense.

"Limiting greenhouse gas emissions as a company, as a nation, and globally had to start somewhere. Entergy's management decided that this company could provide that starting point," said Chuck Barlow, Entergy's vice president of environmental strategy and policy. "Neither our company nor our industry can solve what will be a global issue for decades to come, but we can provide an example of responsible steps in the right direction."

To support its voluntary GHG emission goal in 2001, Entergy dedicated \$25 million in supplemental funding through a new Environmental Initiatives Fund (EIF). Five years later, after exceeding its stabilization commitment and reducing greenhouse gas emissions by 23 percent, Entergy made a second GHG commitment. In 2011, Entergy's third commitment, based on principles embodied in its Environment²⁰²⁰ strategy, became effective. Since 2001, Entergy's EIF has purchased more than \$6 million in carbon dioxide equivalents (CO₂e), or GHG offsets.

In tandem with renewed commitments to reduce greenhouse gas emissions, considerable support through the EIF continued. At the end of the first commitment in 2005, emissions had been reduced 21 percent while sales had increased 23 percent. The majority of the sales increase came from the low-GHG emitting merchant nuclear fleet, producing a good result. Management needed assurance that the second and third reduction commitments could be accomplished without putting the company at risk. To ensure this, GHG offset banks purchased during the first commitment were used to cover any overages. In addition, the "head room" gained from the first commitment was also applied. This head room reflected the savings between the actual emissions and the commitment to stabilize emissions at year 2000 levels during the period 2000–2005.

Ultimately, the EIF was funded at \$1 million per year to focus on community environmental improvement projects. Internal projects would still be contemplated but funded through other means.

In 2002, Entergy's board of directors articulated the company's commitment to the environment with adoption of an environmental vision statement that sets expectations in areas of sustainable development, performance excellence, and environmental advocacy. In 2011, Entergy updated its commitment with the Environment²⁰²⁰ plan, a six-plank strategy emphasizing proactive adaptation measures to mitigate physical risks to Entergy's operating area. This was necessary not only to minimize overall business-interruption losses from extreme weather, but also to preserve economic prosperity of local communities and protect the safety of customers.

Operating business in an environmentally responsible way produces environmental, economic, and social benefits for all of Entergy's stakeholders. For owners, it helps avoid costs associated with noncompliance and mitigates business risks posed by climate change and other environmental issues. For customers, environmentally sound operations protect public health and safety, and energy-efficiency efforts result in lower electricity usage. For communities, Entergy's adaptation measures help protect water, air, and biodiversity and improve quality of life. For employees, Entergy encourages direct involvement by sponsoring volunteer opportunities that support environmental and community-improvement projects. The company is focused on developing and implementing charitable giving, volunteerism, and low-income customer service strategies that position both the company and communities for sustainable growth (Fig. 8.4).

Managing risks of climate change involves anticipating regulatory and physical risks, testing business decisions against scenarios of potential change, identifying where Entergy is vulnerable, and devising sound, cost-effective business strategies to manage risks and recognize opportunities to prosper in a changing world. This includes processes that address business continuity, storm-recovery readiness, and storm hardening to prioritize investments that reduce business-interruption losses. Storm hardening is the process of design and implementation of new or retrofitted infrastructure such as transmission and distribution facilities (lines, substations, poles, and conductors) capable of withstanding more extreme weather events. Managing risk also includes stakeholder outreach to ensure that resiliency investments complement actions customers and communities are taking to uphold prosperity, safety, and quality of life. Entergy's management approach to address and adapt to environmental risks includes engaging with regional, state, and local governments, universities, nongovernmental organizations, and businesses that share similar interests in building resilience.



Fig. 8.4 More than 100 Entergy volunteers helped launch floating islands in a demonstration project of a new technology to protect the Gulf Coast south of Houma, La., considered to be ground zero for coastal land loss in America. The floating islands are man-made ecosystems anchored in place in open water that mimic naturally occurring wetlands. They provide nature a starting point to help jump start wetland restoration.

8.3 Adaptation Study: Building a Resilient Gulf Coast

Following devastating hurricanes in 2005 and 2008, Entergy recognized the need to focus not only on business continuity, but also on prosperity and resilience for communities. The company's \$1.5 billion loss as a result of hurricanes Katrina and Rita in 2005 reflects only a fraction of the \$150 billion loss that communities suffered from Katrina alone.

Entergy set out to develop a comprehensive, objective, consistent fact base to quantify climate risks in the Gulf Coast region and inform economically sensible approaches for addressing this risk. In 2010, Entergy and America's WETLAND Foundation released a landmark study that estimated the physical and financial risks to the energy coast of the Gulf of Mexico, as well as the impacts of sea level rise, subsidence, storm surge, and wind impacts for 77 counties and parishes in Texas, Louisiana, Mississippi, and Alabama at the zip code level. It also identified adaptive measures that could help reduce growth in these risks on a sector-by-sector basis.

Data from the \$4.2 million adaptation study quantified the economic value at stake: the livelihoods of 12 million people; natural resources that support \$634 billion in annual gross domestic product; and assets and critical infrastructure valued at more than \$2 trillion that are increasingly vulnerable to storm surge, flooding, wind damage, and the effects of sea level rise (Fig. 8.5).

The adaptation study was presented during America's Energy Coast policy forum in New Orleans at the conclusion of the DELTAS2010: World Deltas Dialogue (<http://www.deltas2010.com>) in October 2010. It showed that without

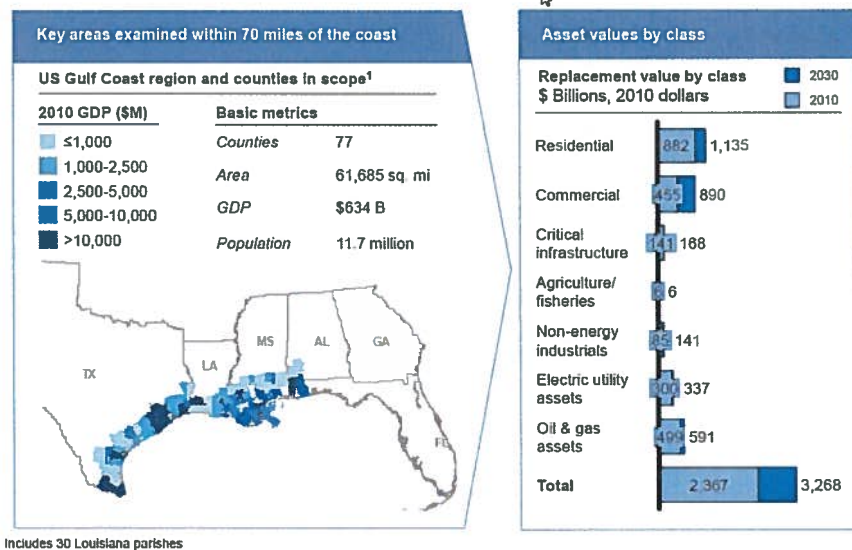


Fig. 8.5 Adaptation study area. Source ESRI, energy velocity

large-scale adaptation efforts, the region's gross domestic product may be unable to keep up with costs of protecting nationally critical assets. These critical assets include oil and gas pipeline networks, refineries, chemical plants from the Gulf of Mexico and production within the Gulf South region, as well as transportation hubs of the ports, intercostal waterways. This study was greatly strengthened and enriched by contributions from many participants, including Swiss Re, which brought its natural catastrophe and climate risk assessment research and knowledge to bear on the challenge of quantifying climate risks. Methodology used in the study was devised and tested by a consortium of public and private partners who helped develop a factual framework for decision makers to build a portfolio of economically suitable adaptation measures.

Addressing assets in 23 different classes (commercial, residential, industrial, and infrastructure), the study included a detailed assessment of more than 500,000 miles of electric transmission and distribution assets and approximately 300 generation facilities. Three scenarios were considered for 2030 and 2050 representing low, average, and extreme climate change. Results showed that the Gulf Coast region faces \$14 billion in average annual asset losses from today's climate, increasing to \$23 billion with the high scenario. Cumulative losses over the next 20 years likely will exceed \$350 billion, representing two to three percent of the region's gross domestic product. Extreme-loss years may get worse and occur more frequently.

Fifty different adaptation measures were evaluated to determine their applicability, cost, and the estimated asset loss that could be avoided. This work identified a set of potentially attractive measures that can address almost all of the increase in loss going forward, including actions to mitigate an approximate \$7 billion per year in annual expected loss in the 2030 timeframe. Measures translate to nine broad efforts to reduce risk across all sectors:

1. Improved building codes,
2. Beach nourishment,
3. Wetlands restoration,
4. Levee systems,
5. Improved standards for offshore platforms,
6. Floating production systems,
7. Replacing semi-subs with drill ships,
8. Levees for refineries and petrochemical plants,
9. Improving resilience of electric utility systems.

The project assembled a supply curve of adaptive measures for consideration within the study area. As shown in Fig. 8.6, these measures were expressed in terms of their cost/benefit reductions to casualty loss.

For example, the first measure, "resilience, new distribution," has a cost/benefit of 0.17, which means that for an investment of \$0.17, one can expect a reduction in casualty loss of \$1. If we accept all measures that are less than or equal to 1.0, the cumulative loss reduction would be between \$4.5 billion and \$5 billion per year. The one-to-one breakeven point on the supply curve falls between "higher

Potentially attractive measures can address the increase in annual loss between today and 2030 and keep the risk profile of the region constant

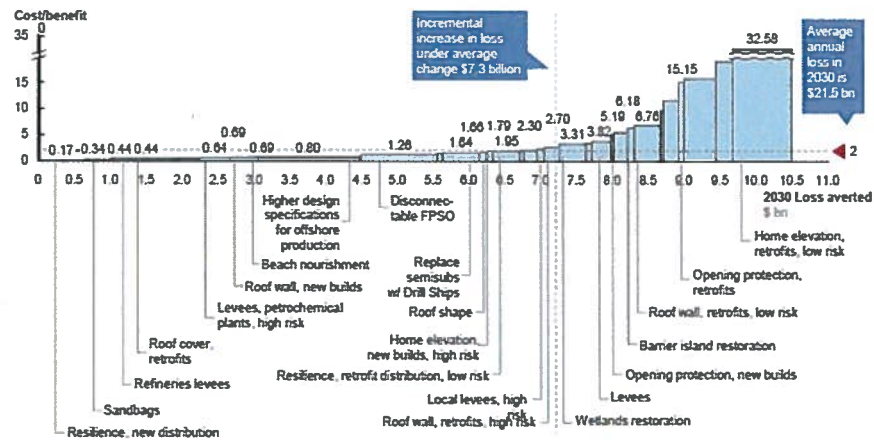


Fig. 8.6 Supply curve of adaptive measures

design specifications for offshore production” and “disconnectable FPSO” (floating production storage and offloading).

Co-benefits of measures were not included in the initial analysis, but could be used to provide additional benefits for comparison to costs. In other words, if the cost/benefit level is expanded to 2.0, loss reduction would be almost \$7 billion per year. Cost/benefit is derived by looking strictly at reduction in casualty loss. If the scope were broadened to include other benefits beyond casualty loss, more measures would achieve cost/benefit parity. For example, “wetlands restoration” produces a cost/benefit of 3.31, which means \$3.31 would be spent to reduce casualty loss by \$1. But when other co-benefits are added to the equation, such as increased biodiversity or wetlands-based revenue activities (eco-tourism, hunting, etc.), then wetlands restoration would come closer to clearing economic hurdles (Fig. 8.7).

Similarly, a subset of the overall supply curve of adaptive measures was assembled for utility-specific alternatives (Fig. 8.8). These measures have been estimated for utilities within the four-state, 77-county/parish study area and are not specific to Entergy. If the industry were to invest in each cost-effective measure, one could expect a reduction of casualty loss of more than \$800 million.

The study estimated that public funding of \$44 billion will be required over the next 20 years for key infrastructure projects, including wetlands and levees. Some \$76 billion in private funding will also be required. Policy makers may need to support and offer incentives for private capital investment, such as subsidizing homes built to meet higher building codes in low-income areas.

The primary focus was on assessing measures that are known and executable today instead of assessing future innovations in technology. This choice has the

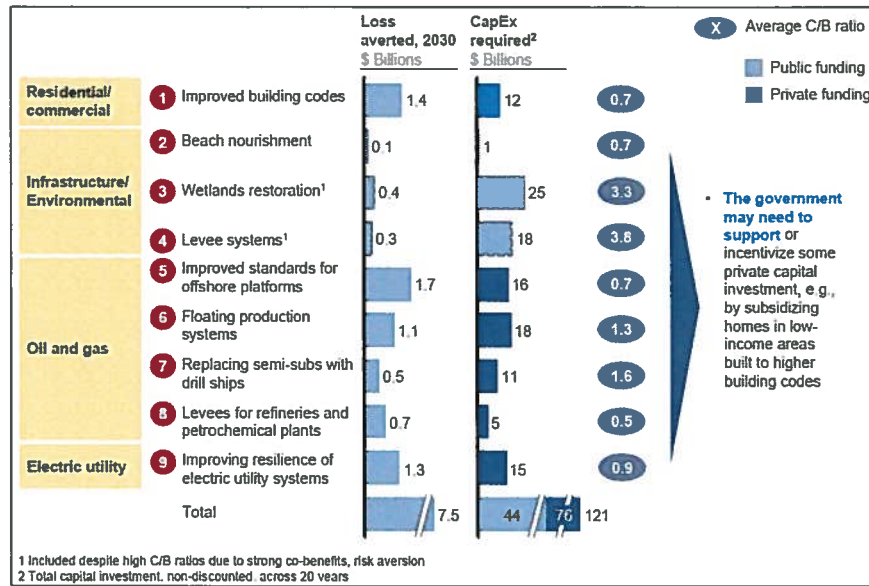


Fig. 8.7 Cost/benefit ratios of adaptive measures

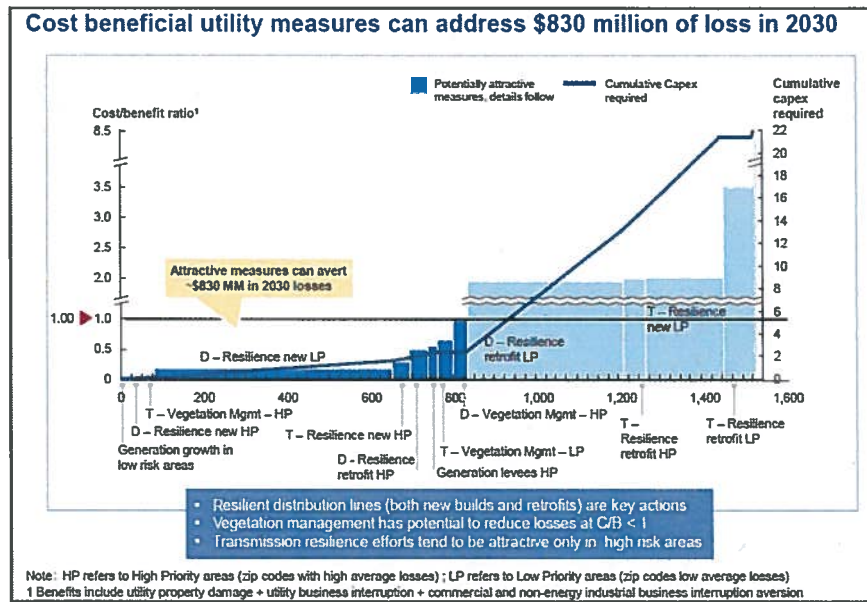


Fig. 8.8 Supply curve of adaptive measures for utility-specific alternatives. Source Swiss Re

benefit of making measures more tangible to decision makers, but results of the analyses must be considered from the point of view that future developments (i.e., new building materials or methods that may be more hurricane-resilient) can be incorporated. Correspondingly, the analyses should be repeated periodically—ideally every five years—to incorporate new innovations in adaptation.

Read the adaptation study report: http://www.entergy.com/content/our_community/environment/GulfCoastAdaptation/report.pdf.

Read the executive report: http://www.entergy.com/content/our_community/environment/GulfCoastAdaptation/Building_a_Resilient_Gulf_Coast.pdf.

8.4 Blue Ribbon Resilient Communities Initiative

As an extension of the adaptation study, in 2011, Entergy and America's WETLAND Foundation (AWF) launched 11 outreach forums in coastal communities addressed in the study. Spanning 14 months and five states, the forums brought together more than 1,100 leaders and community representatives for a dialogue on local coastal issues and specific vulnerabilities.

Forums identified eight key parameters for proactive and reactive dimensions to storm readiness and recovery, known as “Combined Resiliency Indexes:”

1. Governance,
2. Society and economy,
3. Coastal restoration and protection,
4. Land use and structural design,
5. Risk knowledge,
6. Warning and evacuation,
7. Disaster recovery and emergency response,
8. Transparency, public education, and awareness.

In advance of each Blue Ribbon forum, AWF conducted community research through local focus groups and interviews. Respondents were asked to discuss their community's values and to rate their community's performance on a number of resiliency indicators. Combined responses generated a resiliency index for each community. Entergy contributed results of a study on Gulf Coast resiliency and sustainability, quantifying the economic value of what was at stake for each community and establishing the magnitude of risk.

Figure 8.9 is a spider-web graph summary of combined resiliency indexes with detail from each forum. If a community were assessed as fully prepared and resilient, it would receive a perfect score of “5” for each of the eight dimensions. This analysis provided a simple, easily understood graphic approach to evaluate each community, with strengths and weaknesses helping identify which gaps are most prevalent.

These layers of local feedback, combined with detailed research, gave forum participants a groundbreaking opportunity to assess their communities' vulnerabilities and outline steps to improve resiliency. Input gathered over the course of

Blue Ribbon Resilient Communities: Combined Resiliency Indexes*

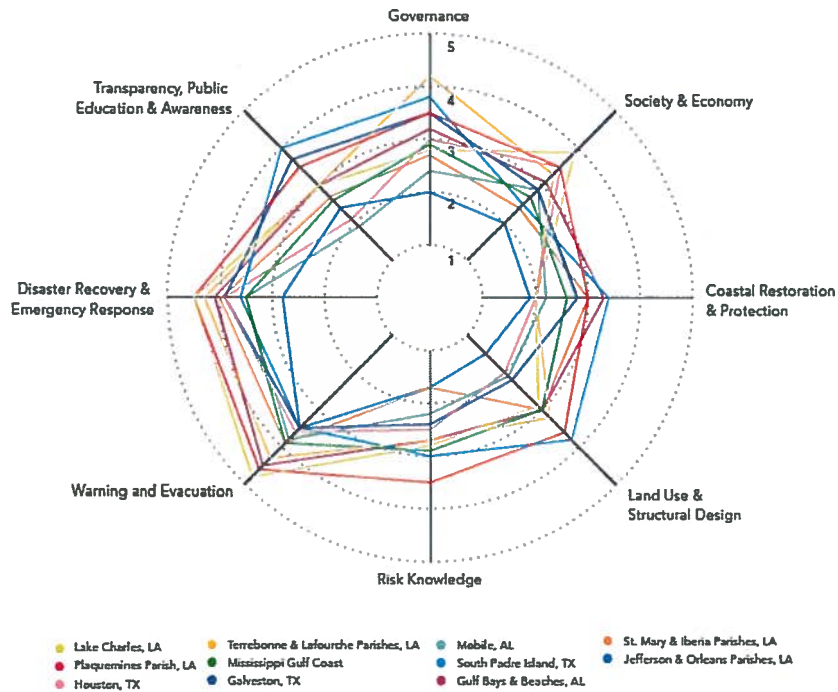


Fig. 8.9 Spider-web graph of combined utility indexes

the forums came from policy makers, agency officials, business leaders, concerned citizens, and the gamut of professionals on the front lines—environmental managers from all fields, engineers, energy sector workers, farmers, fishermen, public works officials, and community activists, among others.

Participants' insights generated dozens of recommendations impacting state and federal policies. The most important impact of the Blue Ribbon initiative, however, was community empowerment. Forums helped mobilize the collective energy, expertise, and long-term planning and problem-solving skills of an entire region to protect its heritage and secure its future.

Working in collaboration with partners, Entergy continues to assess environmental risks, identify possible solutions, and make adaptation a high-priority local issue.

8.5 Blue Ribbon Congressional Briefing in Washington, D.C.

In September 2012, AWF and its partners, including Entergy, presented the final Blue Ribbon Resilient Communities report to legislators on Capitol Hill.

Fig. 8.10 Sponsors of the report including Chuck Barlow, Entergy's Vice President of environmental strategy and policy, presented the final Blue Ribbon Resilient Communities report at a Capitol Hill briefing on September 12, 2012



“Beyond Unintended Consequences” provided 30 recommendations for Gulf Coast adaptation and was supported by congressional leadership from the Gulf Coast region. The presentation also highlighted Louisiana’s Comprehensive Master Plan for a Sustainable Coast (<http://www.lacpra.org/index.cfm?md=pagebuilder&tmp=home&nid=24&pnid=0&pid=28&fmid=0&catid=0&elid=0>) (Fig. 8.10).

The Louisiana master plan was developed and approved by the state legislature and itemizes \$50 billion in investments over 50 years aimed at restoring wetlands habitat and building flood protection through restoration of natural buffers (marshes and barrier islands) to hurricanes and storm surges.

Actions included in the Louisiana master plan represent a far-sighted and proactive solution that will help safeguard the citizens and industries of the Gulf Coast from consequences of human actions, both historic and ongoing. The plan also provides economic opportunity for thousands through job creation and development investments, all while strengthening communities.

Read the final Blue Ribbon report: http://futureofthegulfcoast.org/AmericasWETLANDFoundation_Beyond.pdf.

8.6 Coastal Resilience Technical Forums

Partnering with Louisiana State University and Lamar University, Entergy organized two technical conferences to extend the coastal resilience dialogue to academic and industry audiences. Conferences were independent of Entergy’s work with AWF, but were regarded as complementary efforts to strengthen community engagement.

Participants’ input was sought to help prioritize system-hardening investments to minimize economic impacts from business-interruption losses. Entergy developed the conference agenda from data gathered during customer interviews about perceived vulnerabilities, actions taken to improve resiliency, and expectations of their utility service providers.

Entergy asked participants to focus on storm-hardening strategies in two areas in Louisiana and Texas and proposed three additional phases of system hardening that would take place over the next ten years. In addition to estimating the hardening-strategy cost, participants used the Gulf Coast adaptation study to estimate avoided-loss benefits to the area from hardening investments.

Economists from the University of Texas and Louisiana State University then estimated the extent of economic losses to the region from projected wind damage, flooding, and storm surge, emphasizing how losses rippled through the economy. They also estimated the benefit in avoided losses that would result from the pilot hardening initiatives. In both pilot cases, independent economists estimated the benefit-to-cost ratio for hardening investments at 5 to 1, meaning each dollar invested in hardening assets would produce five dollars' worth of benefits to the regional economy.

8.7 Building Coalitions, Driving Innovation for the Future

Entergy's adaptation and resiliency efforts also leverage the funding of projects from the shareholder-funded EIF program, which seeks partnership projects to provide registered greenhouse gas offsets, develop innovative solutions to climate-change impacts, and support coastal and wetlands restoration. The EIF identifies projects that help support greenhouse gas reductions, wetland restoration, adaptation, and other projects aimed to reduce environmental footprint and reduce physical risks.

Through the EIF, Entergy funded development of the first carbon-offset methodology for emission reductions from deltaic wetlands restoration, which was approved for use by the American Carbon Registry in 2012. Developed by Tierra Resources, the carbon-offset methodology tool created a potentially self-sustaining revenue source for wetlands restoration through the sale of carbon offsets. When Mississippi River delta wetlands are restored, landowners can use the methodology to calculate the amount of greenhouse gases the rebuilt wetlands will absorb over time. The result is registered carbon credits, which landowners can sell to companies seeking to offset their greenhouse gas emissions. Proceeds from the sale help offset landowners' cost of wetlands restoration. In 2013, Entergy received an Innovation Award from American Carbon Registry for this work.

Entergy provided additional funding to pilot the first wetlands restoration offset project in the nation applying American Carbon Registry's methodology. The Luling Oxidation Pond Wetlands Assimilation project, 19 miles west of New Orleans discharges treated municipal wastewater into an adjacent 950-acre wetland property to help restore the wetlands' function and increase carbon sequestration.

Also in 2012, Entergy completed registration of a reforestation project in Arkansas and Louisiana that will remove an estimated 460,000 tons of carbon dioxide from the atmosphere over the next 40 years. The project restored nearly

3,000 acres of marginal agricultural land to native bottomland hardwood forests, which are forested wetlands that originally covered more than 30 million acres in the Lower Mississippi Valley. Most of these forests were destroyed by logging in the early 1900s and further reduced by conversion to agriculture in the 1960s and 1970s. Reforested lands were replanted with native species, primarily bald cypress and bottomland oaks in the Tensas, Red River, Overflow, and Pond Creek National Wildlife Refuges. By registering the reforestation project with the American Carbon Registry, Entergy further strengthened its ability to operate in a carbon-constrained environment using innovative, market-based approaches.

Other projects supported by the EIF include the Coastal Bayou Segnette Cypress Reforestation project (in partnership with Restore America's Estuaries, the Coalition to Restore Coastal Louisiana, and Jefferson Parish, La.), a marsh-restoration terracing project near Lafitte, La. (in partnership with Ducks Unlimited), and a pilot program of 17 electric vehicle-charging stations on four Texas college campuses and elsewhere in Entergy's service territory. Photos of the Bayou Segnette and Lafitte projects are in Figs. 8.11, 8.12 and 8.13.

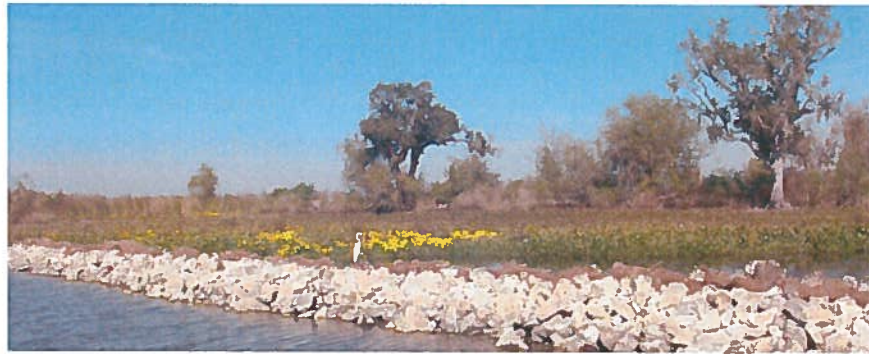


Fig. 8.11 The Bayou Segnette Cypress Reforestation project in the Barataria Preserve included construction of protective rock jetties to reduce erosion



Fig. 8.12 Water hyacinths planted in Bayou Segnette provide natural marsh restoration



Fig. 8.13 A year after terraces were built to restore marshland near Lafitte, La., submerged aquatic vegetation (*inset*) had begun to flourish

In 2013, Entergy identified and funded three additional projects with support from the EIF. Two are registered with the American Carbon Registry—IdleAir truck stop electrification technology and a low-methane rice farming system. The third is a marsh-restoration project that also provides carbon-offset opportunities.

In Mississippi, a truck stop equipped with IdleAir technology allows truck drivers to turn off their engines while maintaining a comfortable cabin temperature and enjoying the use of television, internet, and other electronics. In addition to reducing carbon emissions, IdleAir helps fleet operators reduce costs by conserving fuel and reducing engine wear. Entergy funded the opening of an IdleAir site in Pearl, Miss., with other potential sites in Arkansas and Texas.

In Arkansas, Entergy partners with Terra Global Capital, White River Irrigation District, and USDA Agricultural Research Service to test new rice-cultivation practices that can reduce methane emissions while providing savings to farmers and ecological benefits.

In Louisiana, Entergy supports marsh restoration in the Chef Menteur Pass Wetland Mitigation Bank in Orleans Parish. The Chef Menteur Pass property provides critical ecological and risk-reduction functions for the Gulf Coast of Louisiana and was identified in Louisiana's 2012 Coastal Master Plan as a priority for the state's marshland restoration activities.

Entergy also has created opportunities for people to get involved on an individual level. In 2009, Entergy and the Pew Center on Global Climate Change launched the Make an Impact program to help individuals take action to reduce their carbon footprint. In recognition of Earth Day the following year, Entergy launched Double Your Difference, an initiative that allowed individuals to purchase high-quality carbon offsets and double the impact of their purchases through Entergy's dollar-for-dollar match. By signing up for the program, participants could support specific projects to reduce greenhouse gases while maximizing their own efforts to go carbon neutral.

8.8 Lessons and Transferability

Entergy's approach to resiliency and adaptation focuses on sea level rise, subsidence, storm surge, and wind—hazards with the greatest potential for occurrence in the analysis study area based on historical data.

For the analysis to be transferred to other entities, such as utilities, industries, or communities, these entities must first identify primary hazards and risks for their study areas. These could include droughts and the associated fires or famines they can induce, floods, volatile changes in weather, extreme cold, ice and snow, mud slides, and avalanches, heat waves, tornados and other extreme weather events. Once hazards are established, an analysis including estimated impacts and benefits can be conducted. Clearly, each application of an analysis will involve different sets of hazards, measures, and impacts.

In its analysis and application, Entergy recognizes several opportunities for expansion. As previously observed, the analysis could estimate not only the direct casualty loss reductions provided by investments in measures, but also co-benefits. The example in Sect. 8.3 noted co-benefits of wetlands restoration in enhancing biodiversity and recreational opportunities. Expanding the analysis could modify benefits significantly for each measure and yield a more comprehensive cost/benefit ratio.

The Blue Ribbon Resilient Communities meetings provided interesting insights into public perceptions regarding perceived vulnerabilities and potential impacts of climate change. For example, many Texas participants thought of Texas as a state with a coast, but not a coastal state. Many Houston residents did not consider their home a coastal city, despite the fact that Houston's port is the busiest in the United States in terms of foreign tonnage and second busiest in overall tonnage. Had Hurricane Ike made landfall 30 miles farther west in 2008, the storm surge likely would have flooded downtown Houston and resulted in even more catastrophic damage and loss for Texas.

Community meetings also shed some light on attitudes regarding climate change and its political implications, including resistance that may be encountered when attempting to build the case for public investment in proactive adaptation strategies.

Technical conferences were equally productive and enlightening for participants. Entergy's environmental lead team became more aware of the need to establish partnerships with key industrial customers to prepare for weather-related hazards. Comparing service-restoration activities after hurricanes Rita and Ike revealed the range of damage scenarios that can result from different storms. Hurricane Rita was primarily a wind event that significantly impacted Entergy's transmission system. Repairs and service restoration for customers lasted several weeks. In contrast, Ike was primarily a flooding event that did not seriously damage Entergy's system; however, flood waters caused significant damage to industrial customers' facilities. When Entergy was ready to restore power, many of these customers were not able to receive service. This example demonstrates the need for both suppliers and customers to be more aligned on strategies and tactics to improve adaptation and resilience.

The company's support of the adaptation study allowed Entergy to communicate the impacts of a changing climate in terms that communities could understand and implement as actions. By focusing on resiliency, the company has effectively engaged its stakeholders on a new meaningful and important industry and community issue.

The EIF provides support to community adaptation and resiliency projects and programs by purchasing offsets and investing in wetlands restoration and reforestation. What started as a leap of faith has resulted in significant improvements for the company and its communities.

8.9 The Next Decade and Beyond

In addressing the effects of climate change, the utility industry is at a crossroads, with adaptation and resiliency at the center of the industry's potential transformation.

The traditional utility paradigm of central station generation has one set of adaptation and resiliency measures, while new and evolving utility constructs (e.g., smart grid, micro grid, distributed energy resources, renewables, new electrification technologies) may have to rely on alternative adaptive measures.

In addition to the electric system, regulation also is evolving and adapting to changes. Regulatory systems will need to identify and develop rate structures to recover adaptation and resiliency costs. Utilities and regulators should continue efforts to establish expectations for reliability, resilience, and adaptation, as well as other evolutionary transformations underway.

"Entergy's service area has experienced the impacts of coastal erosion, wetlands loss, and storm surge," said Barlow. "It really doesn't matter whether you believe that these impacts are from climate change or just mother nature at her worst; you can see the land loss, and you know there will be a future hurricane. The Gulf South is identifying adaptive measures to cope with these impacts, and Entergy will continue to be a leading part of that effort, whether you are talking about protecting the environment or protecting the electric grid. Both are important to our stakeholders. Both are important to Entergy."

For more information on Entergy's environmental initiatives and climate-change resiliency and adaptation efforts, visit. <http://www.entergy.com/environment>

Appendix B

DRAFT - Historical EIF Document



Entergy's Environmental Initiatives Fund: 15 Years

HISTORY AND HIGHLIGHTS | 2001-2015



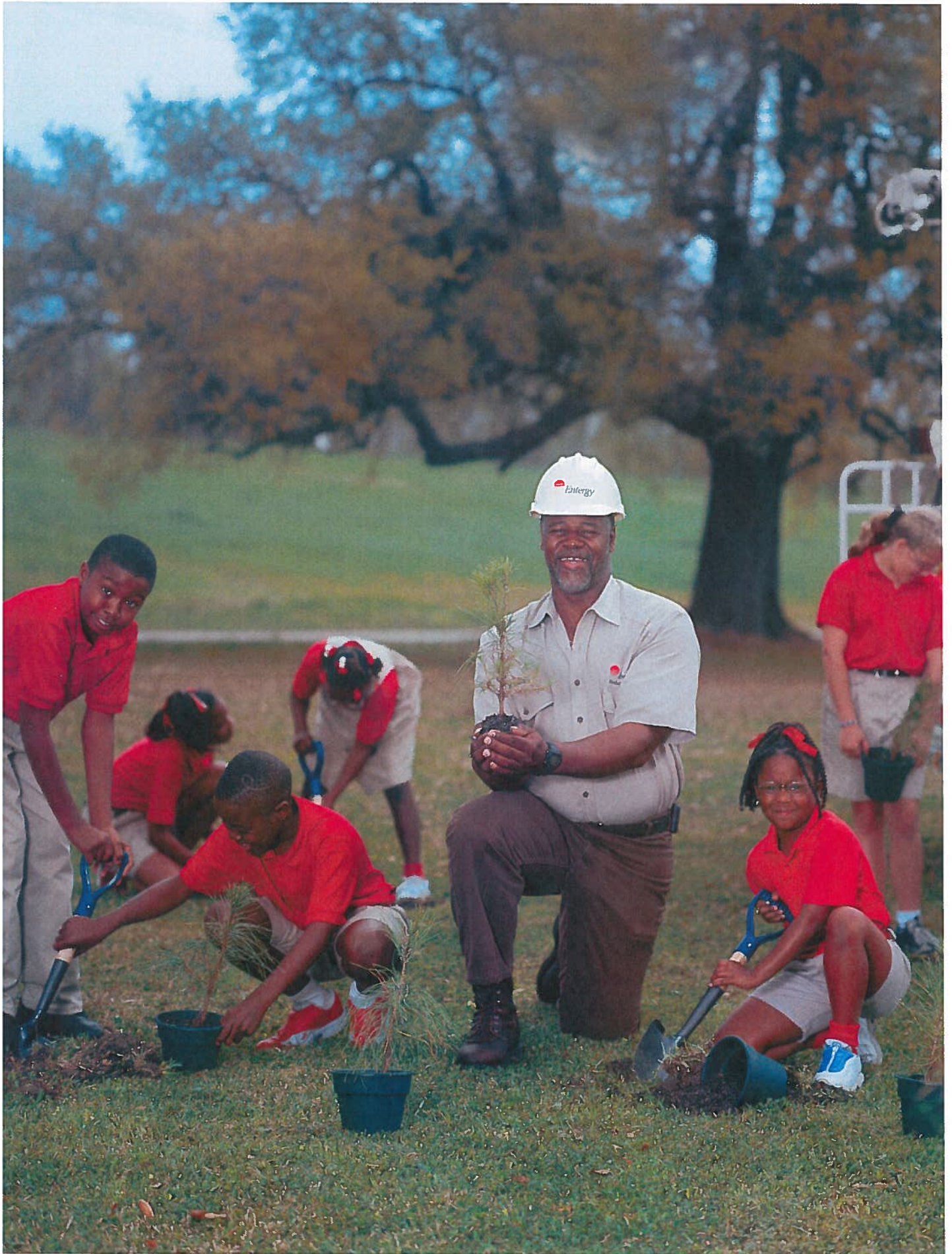


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Introduction

On May 3, 2001, Entergy made history when it became the first U.S. electric utility to announce a greenhouse gas emissions target. Partnering with Environmental Defense, Entergy pledged to take voluntary actions to stabilize its domestic carbon dioxide (CO₂) emissions at year-2000 levels through 2005 and to develop a long-term target to include additional reductions that would help combat climate change.

To help accomplish its emissions-reduction goal, Entergy dedicated \$25 million in supplemental funding through an Environmental Initiatives Fund (EIF), with 80% allocated for changes in Entergy-owned assets and 20% for the purchase of CO₂ offsets.

From 2002-2005, Entergy exceeded its stabilization commitment and reduced CO₂ emissions by 23% under the established target while simultaneously increasing electrical sales by 21% over the same period. Entergy achieved its goal through both internal and external greenhouse gas reduction strategies, including 61 internal projects and 13 external projects that encompassed carbon sequestration on company-owned property and greenhouse gas emission trades.

In May 2006, Entergy announced a second five-year commitment to stabilize CO₂ emissions from its owned facilities at a level 20% below year 2000 from 2006-2010. Entergy also included controllable purchases as part of the commitment since they had become a significant portion of its portfolio. The commitment included \$3.25 million in funding to participate actively in GHG offset markets and to help develop new markets, products, and innovations to address emission reductions. Entergy's cumulative CO₂ emissions through the years 2006, 2007, and 2008 were 122.9 million tons, 4% better than its stabilization goal of 127.7 million tons.

Through 2015, since the first stabilization commitment in 2001, Entergy has emitted 629.9 million tons of CO₂

(including controllable purchases emissions), which is nearly 9% below its cumulative stabilization goal of 691.6 for the 15-year period.

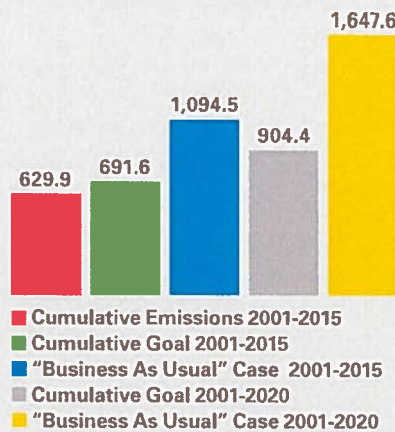
The EIF is currently funded by an annual appropriation of shareholder dollars used to fund a variety of environmentally beneficial projects. Through the EIF, Entergy has made emission-reduction

improvements on its existing fossil fleet, including coal plants, to improve efficiency. The variety of other projects funded by the EIF over the years is highlighted below.









In 2013, the process utilized to identify potential projects and approve selected projects for funding from the EIF was modified. A formal request for proposals (RFP) was developed and sent to organizations external to Entergy for their consideration. After the initial use of the RFP process, it was expanded to include potential projects internal to Entergy. Once the

proposals are received, an initial review is conducted by Environmental Strategy & Policy to determine which projects will move to the next level in the approval process. The proposed list of projects nominated for funding each year is reviewed by the environmental lead team, Vice Presidents of Public Affairs, State Presidents, and Entergy Wholesale Commodities (EWC). The final list of projects is presented to the EIF approval committee, which is comprised of Entergy senior executives, for authorization to proceed with funding.

Cumulative CO₂ Emissions from Entergy-Owned Plants and Controllable Purchases



The following are summaries of EIF program highlights by year. The final section includes environmental initiatives and accomplishments not affiliated with EIF.

-  Alternative Energy/Solar
-  Coastal & Wetlands Restoration
-  Energy Efficiency
-  Tree Planting/Reforestation
-  Beautification/Cleaning/Recycling
-  Education
-  Greenhouse Gas Reduction
-  Wildlife/Environmental

2001 

Trees Planted at Company Facilities

Entergy planted more than 20,000 trees at two of its facilities in Louisiana — Little Gypsy in LaPlace and Willow Glen in St. Gabriel — to improve the removal of carbon dioxide from the atmosphere and provide natural habitat for local wildlife.

By reducing the amount of grassland area to maintain, the facilities also benefitted from a reduction in operating expenses. Planting projects were funded by a \$100,000 grant from the EIF.

The 23,500 saplings and seedlings included Nuttal's oak, cypress, willow oak, green ash, and pecan, all species that are indigenous to the area. Trees were chosen for soil suitability, high growth potential, and ecological value.



2001 

Entergy, Elsam Conduct First Trade in Danish GHG Allowances

Entergy and Danish electricity supplier Elsam SA executed the first-ever international trade in greenhouse gas allowances under the Danish climate change program. Elsam is a Danish electricity supply company that owns generation plants in the Nordic region, including wind-powered facilities. At the time, Denmark and the United Kingdom were the only nations that had developed formal greenhouse gas trading programs.

Under the transaction, Elsam sold 10,000 Danish allowances to Entergy, which removed the allowances from the market and thereby eliminated 10,000 metric tons of emissions. Natsource LLC brokered the transaction. The purchase of Elsam's allowances helped demonstrate that global trading markets were an efficient and economical way to reduce greenhouse gas emissions.

2001 

Toromont Energy Waterloo Landfill Methane Plant

Entergy purchased 50,000 metric tons of CO₂e equivalent (e) emission reductions from Toromont Energy in Ontario, Canada with \$107,000 provided by the EIF. Reductions were derived from the combustion of methane gas from Toromont Energy's Waterloo Landfill Gas Power Plant.

2001 

Du Pont N₂O Abatement Project in Orange, Texas

Entergy purchased 100,000 metric tons of vintage CO₂e emission reductions from E. I. du Pont de Nemours and Company that was generated from its nitrous oxide (N₂O) abatement project at Sabine River Works in Orange, Texas. Because N₂O has a global-warming potential 310 times that of CO₂, emissions of approximately 366 metric tons of N₂O were actively reduced to support this transaction, which totaled \$200,000 from the EIF.

2002 

Entergy Partnerships Create Red River National Wildlife Refuge

Entergy, The Conservation Fund, and the U.S. Fish & Wildlife Service unveiled a carbon sequestration project in Louisiana designed to offset the environmental impacts of fossil fuel emissions, provide new fish and wildlife habitat, and bring recreation-driven economic benefits to the region of northwest Louisiana along the Red River Valley in Natchitoches Parish, near Shreveport. It would also create America's newest wildlife refuge — Red River National Wildlife Refuge.

Interior Secretary Gale Norton, U.S. Senator Mary Landrieu and U.S. Representative Jim McCrery, whose district included the refuge, addressed the success of the public-private partnership at the dedication ceremony attended by representatives of Entergy, The Conservation Fund, and the U.S. Fish & Wildlife Service.

"The dedication of Red River National Wildlife Refuge represents a triumph of cooperation and partnership in the service of conservation," said Norton. "Thanks to the contributions of Entergy and The Conservation Fund, the new refuge will provide habitat for fish and wildlife while offering the citizens of Louisiana recreational opportunities. At the same time, the restoration of the bottomland hardwood forest will remove 240 tons of carbon from the atmosphere each year, providing cleaner air. Together we are restoring the rich biological diversity of the floodplain forest that once characterized the Red River Valley as a legacy for future generations of Americans to enjoy."

The Conservation Fund purchased 600 acres of non-productive agricultural acreage along the Red River with \$732,000 from the EIF. After reforestation, Entergy donated the property, along with a management endowment, to the U.S. Fish & Wildlife Service. This gift was to become the first tract of land in the Red River National Wildlife Refuge.



Entergy, in partnership with Environmental Synergy, Inc., had already planted more than 180,000 native trees on the property. Over the next 70 years, the trees will sequester 275,000 tons of atmospheric carbon dioxide, as well as provide important bottomland hardwood habitat benefiting migratory birds, turkey, white-tailed deer, and other wildlife.

The Red River Valley represents a historic corridor for migratory birds funneling out of North America to the Gulf Coast. An important tributary of the Mississippi River, the Red River is one of the most degraded watersheds in Louisiana. Eventually, the refuge will encompass 50,000 acres and, in addition to protecting wildlife habitat and enhancing air quality, will offer public recreation opportunities such as hunting, fishing, hiking, and educational outreach programs.

2002 

Entergy Funds TransAlta Coal Mine Methane Offset Project

Entergy undertook a coal mine methane offset project based in the eastern U.S. that was designed to reduce greenhouse gas emissions by approximately 400,000 metric tonnes through 2005. Entergy developed an agreement to provide funding to TransAlta Corp. to manage the project and deliver a schedule of CO₂e reductions to Entergy over a five-year period. The project represented a total investment of \$650,000 from the EIF.

In offsets involving coal mine methane, methane vented from abandoned underground coal mines is captured and converted into electricity or upgraded to pipeline quality for use with natural gas. Methane is 23 times more potent

than carbon dioxide as a greenhouse gas and contributes to the accumulation of greenhouse gases in the atmosphere and to the risk of climate change.

Portland-based North West Fuel Development, a leading developer of technologies for coal mine methane, executed and managed the projects under a long-term contract. Trexler and Associates, also of Portland and a leading climate change mitigation services provider and project developer, advised Entergy on evaluation and selection of the project and on the selection of North West Fuel Development to implement the project.

2002 

Environmental Resources Trust Greenhouse Gas Reduction

Created in 1996 as an offshoot of Environmental Defense Fund, Environmental Resources Trust (ERT) is a nonprofit organization that harnesses economic forces to protect the environment, specifically to promote markets for renewable energy and climate change protection.

The goal of ERT's EcoRegistry® program is to reduce greenhouse gas emissions and climate change by measuring and registering emission reductions of companies and governments. Entergy purchased 50,000 metric tons of validated CO₂e emission reductions with \$50,000 from the EIF.

2002 

Winrock Supports Entergy Carbon Sequestration Project in Arkansas

Winrock International is a nonprofit organization that works with people in the United States and around the world to empower the disadvantaged, increase economic opportunity, and sustain natural resources. In 2002, Entergy contracted Winrock International Institute for Agricultural Development on the Entergy Carbon Sequestration Project, which also involved the Central Arkansas Resource Conservation and Development Council. The goal was to acquire easements from eligible landowners in the Arkansas Delta to convert 500 acres of marginal cropland to bottomland hardwood forest in a two-year period.

The tree-planting project, which was supported by \$500,000 from the EIF, is projected to offset approximately 210,800 tons of CO₂ over an 80-year period. The Entergy Carbon Sequestration Project became an important component of a broader Winrock-led Arkansas Carbon Initiative that will develop innovative approaches to reforest thousands of acres and stimulate economic development in the Arkansas Delta.

2002 

United Kingdom Emissions Trading Scheme and Shell

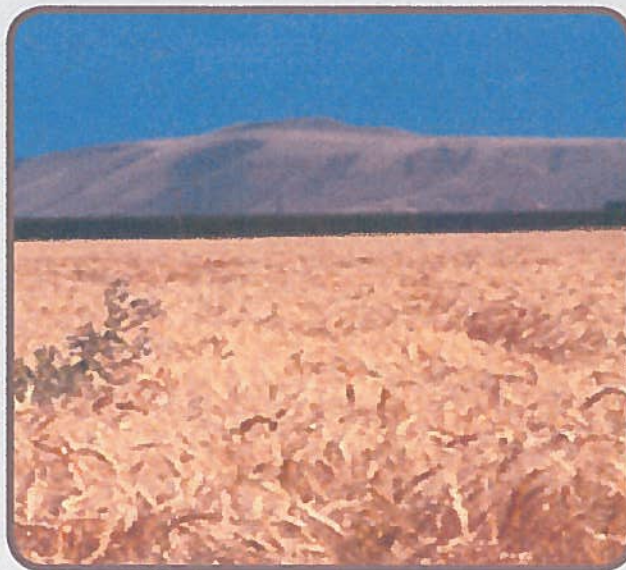
The UK Emissions Trading Scheme was a voluntary emissions-trading system created as a pilot before the mandatory European Union Emissions Trading Scheme. It also was the first multi-industry carbon trading system in the world, recruiting 34 participants from UK industries, including Shell. Entergy purchased a total of \$60,000 in GHG emissions allowances from Shell International Trading with support from the EIF.

2003 

Entergy Works with Direct-Seed Farmers to Slow Global Warming

Entergy and the Pacific Northwest Direct Seed Association (PNDSA) combined efforts to help reduce global warming through environmentally beneficial farming practices. The Letter of Intent called for participating farmers of the PNDSA to implement new direct-seed agricultural techniques in the Pacific Northwest.

The plan enabled Entergy to receive credit for carbon dioxide and emissions reductions achieved through direct-seed agriculture to help offset CO₂ emissions from the company's U.S. power plants. With Entergy's support, the direct seed project was expected to reduce more than 30,000 tons of CO₂ emissions over a 10-year period. PNDSA and Environmental Defense also entered a cooperative agreement to investigate and encourage the adoption of environmentally beneficial farming practices.



Traditional agricultural practices, in which top layers of soil are turned over and exposed, allow carbon sequestered in the soil to be oxidized and released into the atmosphere. The new direct-seed technique involves cultivation and fertilization using "no-till" direct-injection methods that leave soil undisturbed and avoid associated CO₂ emissions. Additional emissions of CO₂ also are eliminated permanently by reducing the amount of fossil fuel burned in farm equipment during the agreement period.

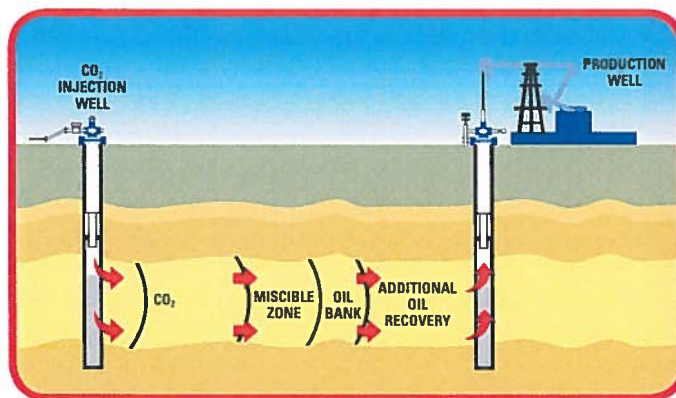
2003 

Entergy First U.S. Utility to Buy Geologic Carbon Sequestration Credits

Entergy entered into an agreement with Blue Source, Inc. to purchase geologic carbon sequestration, becoming the first U.S. utility to seek carbon emissions credits from a geological sequestration project.

The Blue Source agreement included three transactions: Merit Energy's Geologic Sequestration for Enhanced Oil Recovery project, 400,000 metric tons CO₂e; International Paper's Combined Cycle Cogeneration Project, 135,250 metric tons CO₂e; and International Paper's Combined Cycle Cogeneration project, 164,750 metric tons CO₂e.

Traditional sequestration projects sought by Entergy and other American utilities had centered on carbon sequestration through reforestation. This project, however, directly deposited the carbon emissions into dormant oil wells to ferret out oil deposits currently untapped by conventional extraction techniques. The total amount of carbon credits will equal 100,000 metric tons.



The new type of emissions trade not only contributed to overall environmental improvement, but also to the domestic energy supply. Carbon dioxide emissions captured in geologic sequestration enable the recovery of petroleum reserves that typically would not be recovered by conventional means. Transactions were supported by \$350,000 from the EIF.

2003 

Fannie Mae Emissions Reduction Trade

Entergy purchased 6,250 metric tons of CO₂e Verified Emission Reductions from a greenhouse gas emissions reduction account administered by Fannie Mae.

Companies participating in certain Fannie Mae-sponsored residential energy-efficiency programs agreed to measure, document, and pool Verified Emission Reductions for sale to parties interested in acquiring reductions to offset emissions or meeting GHG reduction targets. NatSource was the emissions broker for the trade, which was supported with \$12,500 from the EIF.

2004 

Entergy Purchases One Million CO₂ Credits Through Blue Source

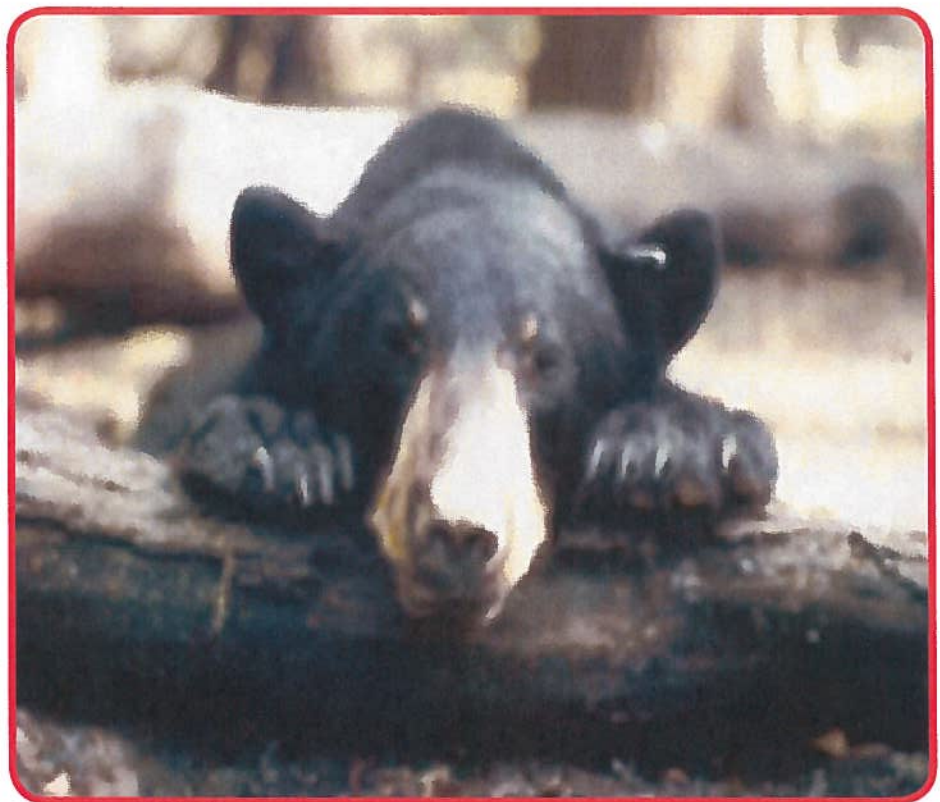
Entergy announced its purchase of one million CO₂ emission reduction credits, representing the largest geologic CO₂ sequestration purchase within the United States. This purchase was an extension of the initial transaction between Entergy and Blue Source completed in December 2003 and was supported by \$500,000 from the EIF.

This carbon credit option increased Entergy's balance of carbon credits from its current amount of 872,363 metric tons to a total of 2,872,363 metric tons by the end of 2005 — a 230% increase.

The actual emission reduction credits generated and used in this exchange were intended for use in enhanced oil recovery by Denbury Resources for tertiary oil recovery in Western Mississippi within Entergy's service territory. Leveraged benefits included an economic boost through increased local oil production, royalties, production tax revenues, and associated oil field and petro-chemical jobs.

2004 

Tensas National Wildlife Refuge Reforestation Project



This project, completed in a joint public-private partnership with the U.S. Fish & Wildlife Service, the Trust for Public Land, and Entergy, involved the acquisition of 1,500 acres of land adjacent to the Tensas River Wildlife Refuge and the planting of indigenous trees for carbon sequestration.

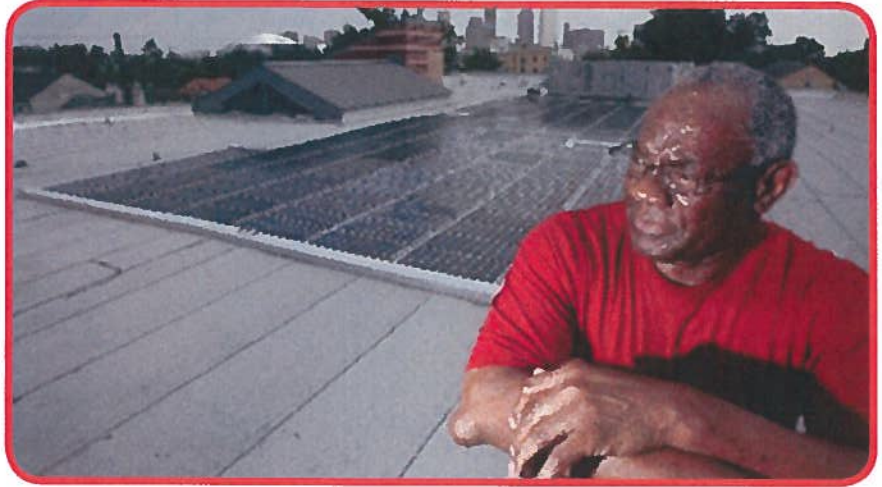
The refuge in Louisiana is home to one of the largest continuous blocks of bottomland hardwoods remaining in the United States and it also is home to one of the last concentrations of the Louisiana black bear, which is a threatened and endangered species.

2005 

Dryades YMCA Solar Energy System in New Orleans

After a major fire destroyed the YMCA's historic home on Dryades Street in New Orleans in 2000, a Capital Fundraising Leadership Team was formed. The YMCA re-opened on November 14, 2005, and a year later, a new feature was added — a 2,000-square-foot, 20-kW photovoltaic (PV) solar energy system donated by Entergy.

Entergy, Dryades YMCA, Direct Global Power, and the project architect joined forces and formed the YMCA Solar Power Initiative to make installment of the PV system possible. The energy-saving initiative was designed to provide emergency power to light the facility's 3,000-square-foot multi-purpose room, which can be used by both students on a daily basis and the community in the event of an emergency.



Doug Evans, Dryades YMCA chief executive officer, surveys the solar energy system on the roof of the Central City New Orleans building.

2005 

Nike Purchase Offsets 100,000 Metric Tons of Carbon Emissions

Taking advantage of an opportunity to mitigate greenhouse gas emissions and work toward the company's voluntary greenhouse gas reduction commitment, Entergy purchased emission-reduction credits totaling 100,000 metric tons with \$200,000 from the EIF. The purchase was made available through Environmental Resources Trust by Nike Inc., which verified and registered the credit as a result of exceeding its carbon footprint goals with the World Wildlife Fund's Climate Savers program.

Nike redesigned its Air athletic shoes to use an inert gas that replaces sulfur hexafluoride (SF6) previously used in the shoes' air cushions. SF6 is a very potent greenhouse gas that has a global warming potential multiplier of approximately 24,000. This means that one unit of SF6 has the equivalency of 24,000 units of CO₂.

2006 

Entergy Purchases Carbon Credits from Anadarko

Entergy purchased 150,000 metric tons of CO₂ emission reduction credits from Anadarko Petroleum Corporation. The credits were verified by an independent third party and registered by Environmental Resources Trust. The verified emission reduction credits were created by capturing CO₂ vent gases from gas liquids production and injecting the CO₂ into oil-bearing formations for geologic storage and enhanced oil recovery.

Through Entergy's purchase of natural gas from Anadarko to generate electricity, this transaction effectively made 270,000 megawatt hours of electricity produced by natural gas-fueled generating plants carbon neutral. It was Entergy's first foray into demonstrating the benefits of mitigating its carbon footprint with a fuel provider.

2007 

Entergy Grants \$150,000 to Ducks Unlimited to Restore Louisiana Wetlands

Entergy made a significant investment to protect Louisiana's coastline from future storms by donating \$150,000 to Ducks Unlimited, Inc. to support an ambitious marsh-restoration project. The project illustrated Entergy's proactive strategy to make a difference in coastal wetlands restoration and hurricane protection. Wetlands are vitally important to the safety, well-being, and quality of life of the Gulf Coast region, and they also provide a natural buffer against hurricane storm surges that directly impact the continued sustainability of Entergy's service territory.

Ducks Unlimited, the world's largest wetland and waterfowl conservation organization, proposed to build approximately 32,000 linear feet of earthen terraces and to provide vegetation for terrace plantings through the Lafitte Terracing Project in the Barataria Waterway south of Lafitte, Louisiana. The ultimate goal was to restore 580 acres of eroded marsh, which would not only reduce the impact of wind and waves but also stimulate growth of submerged aquatic vegetation for waterfowl.



"Approximately 15,000 acres of Louisiana wetlands are converted to open water each year due to both natural causes and human activity," said Bob Dew, regional biologist for Ducks Unlimited. "The successful restoration of these wetlands has a direct effect on Louisiana's ability to withstand future hurricanes and carries a positive impact on wildlife populations that benefit the state's eco-tourism industry. The Mississippi Flyway is home to more than half the waterfowl, and hunting migratory bird adds \$55 million per year to the state economy."



A year after terraces were built to restore marshland near Lafitte, Louisiana, submerged aquatic vegetation (inset) had begun to flourish.

Entergy's donation was part of a collaborative effort between Ducks Unlimited, the North American Wetlands Conservation Council, Camp Club, Inc., the Louisiana Department of Natural Resources, Madison Land Company, and the U.S. Department of Agriculture's Natural Resources Conservation Service.

2007 

Entergy, Restore America's Estuaries Rebuild Louisiana Wetlands

Forty-three percent of threatened and endangered species in the United States depend on wetlands during some stage of their life cycle. Despite their recognized value to the environment, more than 80,000 acres of wetlands continue to be lost in the United States each year.

In an effort to protect Louisiana's coast from future natural disasters and habitat loss, Entergy partnered with Restore America's Estuaries, the Coalition to Restore Coastal Louisiana, and the Jefferson Parish Department of Environmental Affairs on wetlands preservation projects in the Barataria Basin. From 2007 to 2009, Entergy contributed \$280,000 from its EIF to Restore America's Estuaries for Barataria Basin wetlands preservation, including the Grand Isle black mangrove planting project and the Coastal Bayou Segnette cypress planting project. Entergy also provided \$70,000 to develop a National GHG Offset Protocol for tidal wetland restoration and management.

The black mangrove project was designed to plant black mangroves on Fifi Island near Grand Isle in Jefferson Parish, Louisiana, to mitigate significant declines of mangrove habitat and to provide a future protection buffer for storm impacts.

The Coastal Bayou Segnette cypress planting project was undertaken to re-establish cypress trees that



The Bayou Segnette cypress reforestation project in the Barataria Preserve included construction of protective rock jetties to reduce erosion.

provide critical habitat for migratory birds and to provide storm protection for Jefferson Parish residents. The project also was designed to promote coastal protection concepts outlined in Louisiana's Comprehensive Master Plan for a Sustainable Coast. Key benefits of the project included enhanced habitat quality, decreased erosion along Louisiana's coast, and a positive impact on climate change from the sequestration of carbon dioxide.

Bayou Segnette is located in the Barataria Preserve in the Jean Lafitte National Historical Park south of New Orleans. The preserve's 20,000 acres include bayous, swamps, marshes, and forests that are home to alligators, reptiles, amphibians, and a wide variety of other coastal species, including more than 300 species of migratory birds, shore birds, and ducks that will benefit from the Coastal Bayou Segnette cypress planting project.

Over the course of two weekends in March 2010, a large team of local and national volunteers planted more than 3,000 cypress trees, ranging from 4 feet to 5 feet tall, along the banks of Bayou Segnette and along spoil banks within the Jean Lafitte National Historical Park and Preserve. Entergy contributed \$75,000 to the project through the third year of a restoration partnership.



Water hyacinths planted in Bayou Segnette provide natural marsh restoration.

2007 

Entergy Helps Restore Wetlands in Greater New Orleans Area

In partnership with Restore America's Estuaries, Entergy provided more than \$130,000 from the EIF to restore wetlands in the Greater New Orleans area that were damaged by Hurricane Katrina. The project included the planting and restoration of New Orleans City Park and the Louisiana Nature Center and the coordination of eight volunteer planting days.

2007 

Green Light New Orleans

Swiss native Andreas Hoffmann founded Green Light New Orleans in 2006 to assist in the sustainable rebuilding of New Orleans and, at the same time, to offset the pollution of his touring band. What began as one man's "light bulb moment," Green Light New Orleans grew into one of the largest energy-efficiency programs in New Orleans. Green Light's free CFL (compact fluorescent lamp) and installation program was one of the most successful large-scale energy-efficient light bulb distribution programs in the country. In 2007, the EIF supported 3,300 CFL light bulb replacements, and Entergy continued to support Green Light New Orleans in succeeding years with additional EIF grants.

2007 

Southeastern Louisiana University Research Project

Southeastern Louisiana University graduate students were interested in researching several strategies to mitigate the loss of crucial Louisiana wetlands. Their project, supported by a \$15,000 grant from Entergy's EIF, addressed the benefits of using treated sewage effluent to convert marsh and open water into cypress-tupelo swamps to help decrease storm surges.

2008 

Sand County Foundation Land-Management Practices

Sand County Foundation works with private landholders to help them improve the quality of their lands through science, ethics, and incentives and seeks strategies to develop emerging markets for ecosystem services. Sand County Foundation and Environmental Resources worked together to operate and assess a large-scale pilot program to reduce emissions of and to sequester greenhouse gases (GHG) on agricultural lands.

Agriculture is a significant source of GHG emissions. Improvements in the efficiency of farm operations can reduce GHG emissions, and adjustments to farm practices are the most cost-effective ways to sequester large amounts of carbon and CO₂e GHG.

The primary thrust of the project was to assess the amount of GHG reduction achieved by enhanced agricultural management practices. The three-year project was supported by a \$394,000 contribution from the EIF.

2007 

Energy Star Change a Light Campaign

During these campaigns, which received support from the EIF from 2007-09, Entergy asked customers in each of its operating companies to take a pledge and change just one standard light bulb in their homes to an energy-efficient bulb. Entergy's Change a Light, Change the World initiative supported a nationwide effort by the federal Energy Star program aimed at raising environmental awareness by promoting energy-efficient appliances and light bulbs. The program paralleled Entergy's ongoing efforts to help customers manage energy costs more effectively and adopt more responsible environmental practices.

2007 

Lake Pontchartrain Basin Foundation Oyster Reef Building Project

With a \$100,000 grant from the EIF, Entergy supported the Lake Pontchartrain Basin Foundation's efforts to build oyster shell reefs to stabilize shorelines, improve water quality, and create structural habitats. Essentially 100% of carbon in oyster shells is sequestered permanently.

2008 

Arkansas Carbon Offset Project in National Wildlife Refuges

Entergy's agreement with The Conservation Fund, Environmental Synergy, Inc., and the U.S. Fish & Wildlife Service supported carbon sequestration and biodiversity protection through the forestation of bottomland hardwood forests at Pond Creek National Wildlife Refuge and Overflow National Wildlife Refuge in Arkansas. The project was supported by \$425,000 from the EIF.

2009 

Lake Pontchartrain Basin Foundation Annual Beach Sweep

The Annual Beach Sweep to clean up the Lake Pontchartrain Basin is held the third Saturday in September on International Coastal Cleanup Day, which is sponsored by the Ocean Conservancy. During the one-day event, volunteers and sponsors clean up areas that drain into the Pontchartrain Basin. Entergy supported the event with \$5,000 EIF grants from 2007-2012 and also provided employee volunteer support for the annual cleanups.



2009 

Tyson Wastewater Methane Capture and Utilization

Methane-emitting wastewater is a common byproduct in agricultural activities and food-production processes. Tyson, Inc. began managing GHG emissions by installing new methane-capturing equipment and systems in its wastewater treatment facilities. For several years, captured biogas was flared to convert methane to less harmful CO₂. Tyson then implemented biogas-to-boiler projects to transport collected biogas to adjacent processing facilities to be used in boilers, thereby displacing natural gas that would otherwise have been purchased from the distribution pipeline. Blue Source successfully validated and verified the projects' offsets to the Verified Carbon Standard. Entergy's purchase of CO₂e offsets was supported by \$275,000 from the EIF.

2009 

Keep Jackson Beautiful: America Recycles Day E-Waste Recycling

Recycling projects in Jackson, Mississippi, focused on electronic devices and valuable metal and component recovery. Efforts in 2009 and 2012 were supported by \$5,000 contributions from the EIF.

2009 

Tierra Resources Louisiana Wetlands Carbon Sequestration Project

The objective of Tierra Resources' project was to develop a wetland sequestration guidance document to serve as a foundation for a commercial methodology that links to existing standards, such as Climate Action Reserve and Voluntary Carbon Standard. The guidance document provided pertinent information for inclusion in emerging GHG policy regimes and ultimately provided methodology to develop carbon projects in the four million acres of marsh located in the Louisiana coastal zone. The new tool expanded Entergy's ability to invest in low-cost, sustainable offsets in its service territory and to provide the most public benefit to customers. Entergy supported the project with a \$75,000 grant from the EIF.

2009 

Recycling Services at Entergy Work Locations

To encourage employee participation in recycling, Entergy provided collection bins for paper, plastic, and aluminum, along with recycling pick-up services at four locations in New Orleans. Entergy contracted with Legacy Project Recycling, Inc. of Covington, Louisiana, to administer the program with a \$12,400 grant from the EIF.

2010 

Lower Cache River Restoration in Arkansas

Many river channels historically have been straightened to improve navigability or accommodate floodplain development. The goal of The Nature Conservancy's project on the Lower Cache River in Arkansas is to "re-meander" seven river miles that had been straightened and reconnect them to nearly 100,000 acres of land. Entergy supported the project with a \$100,000 grant from the EIF.

The restoration project at Cache River helped improve hydrologic function of the river, thereby improving conditions for bottomland hardwood forests and wetlands that benefit waterfowl and other wildlife dependent on these habitats. By restoring flow to the river's historic meanders, which provide more diverse habitat and cover, the project directly benefited fish and other aquatic species. Likewise, by improving habitat for wildlife and restoring flow (especially during low-water conditions), the project helped the local economy, which is bolstered by outdoor recreation such as fishing, hunting, bird watching, and boating.

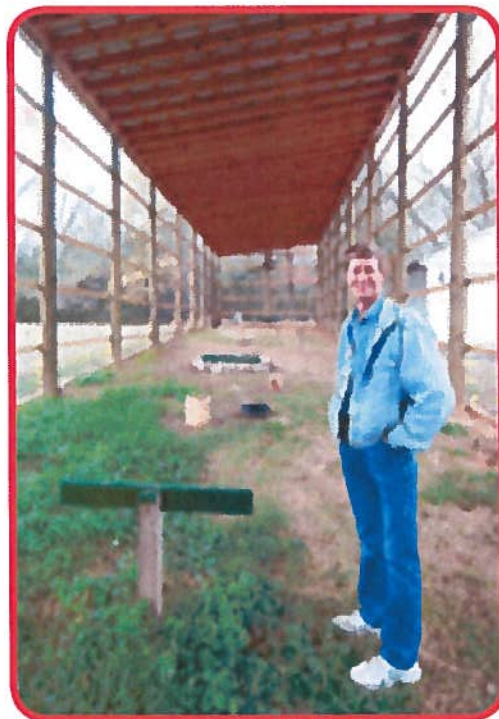
2010 

New White County Facility Helps Return Injured Eagles to the Wild

With a contribution of materials and a grant from Entergy, the dream of raptor rehabilitator Rodney Paul (right) became a reality with the construction of a "flight pen" in El Paso in White County. For the first time in central Arkansas, sick and injured eagles had a safe haven in which to recover from life-threatening injuries. The flight pen project was part of an overall avian protection plan that Entergy submitted to the U.S. Fish & Wildlife Service in 2011.

The pen was constructed using poles and funding supplied by Entergy shareholders in the form of an EIF grant, labor by military volunteers, oversight provided by a local construction company (S and S Home Construction), support by the Arkansas Game and Fish Commission, and the daily work and leadership of Paul.

Entergy Arkansas provided 26 utility poles used to frame the structure. Poles, along with the monetary donation, added up to \$13,000 in support from Entergy. Actual construction of the pen began in June and was completed October 10.



2010 

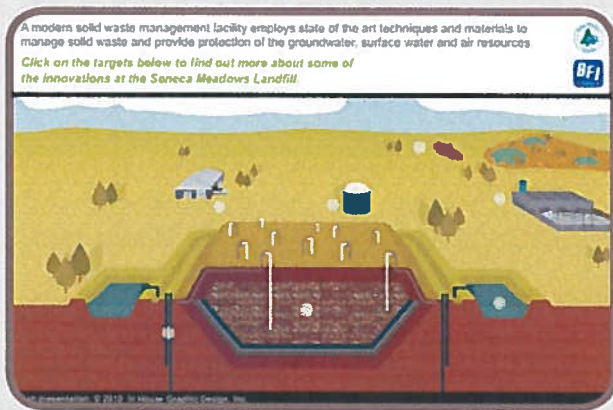
Household Hazardous Material Collection Days

Entergy supported sponsorship and payment for collection and disposal of household hazardous materials in St. Charles Parish and St. John Parish in Louisiana. The effort was supported by a \$3,000 contribution from the EIF in 2010, a \$1,700 grant in 2011, and a \$1,500 grant in 2012.

2010 

Seneca Meadows Landfill Expansion

Seneca Meadows, Inc. is a waste management and recycling facility dedicated to environmental preservation and advancement. Since its inception in 1983, Seneca Meadows has earned the support of national environmental organizations through an exemplary compliance record and successful environmental initiatives. Its operations are centrally located in Seneca Falls, New York, making Seneca Meadows the primary disposal facility for businesses and communities throughout the state, managing 6,500 tons of waste per day on average. In 2007 a construction project began for a 178-acre expansion to include new and expanded leachate collection and active landfill gas collection. Its proximity to Entergy's nuclear facilities in New York and New England made Seneca Meadows a natural partner to link with the company's footprint.



Landfill gas, a byproduct of organic waste decomposition, is collected from the landfill and piped to the gas plant to burn as fuel in the engine generators. Burning landfill gas produces yet another benefit to the environment by destroying 98% of non-methane organic compounds.

Entergy has purchased approximately 211,000 CO₂e tons from the Seneca Meadows landfill expansion in the three transactions outlined below:

2010	\$130,000	35,000 tons CO ₂ e
2011	\$272,000	136,000 tons CO ₂ e
2012	\$40,000	40,000 tons CO ₂ e

Entergy also provided \$13,000 in funding to Winrock for American Carbon Registry fees related to Seneca Meadows transactions.

2010 

Krebs LaSalle Environmental LLC Wetlands Mitigation Bank

Entergy worked with Krebs LaSalle Environmental LLC to create an umbrella mitigation bank that functions as a ledger system whereby credits can be derived from pre-purchase of mitigation from commercial banks, funding of coastal restoration, or environmental initiative funding directed at wetland enhancements. The project was supported by a \$10,500 grant from the EIF.

2010 

Entergy Helps Grow Electric Vehicle Infrastructure with Grant

Using a \$160,000 grant from Entergy's EIF, Entergy partnered with Coulomb Technologies to fund the cost and installation of 17 electric vehicle charging stations at 16 college campuses in and around Entergy's service area. Installation of the charging stations was completed by Verdek, Coulomb's south central regional distributor.



Mike the Tiger charges up the first electric vehicle at Louisiana State University using one of two charging stations installed on campus.

Charging stations were manufactured by Coulomb Technologies and are part of Coulomb's ChargePoint Network, the largest EV driver network in the world. The EV chargers provide free power to students, faculty, and staff who own electric vehicles, and the ChargePoint Network allowed Entergy access to data such as usage reports and greenhouse gas and gasoline savings.

Campuses included Louisiana State University (2), Southern University, Delgado College, Tulane University, University of New Orleans, Jackson State University, Mississippi State Nissan/Cars Facility, University of Mississippi Medical Center, Sam Houston State University, Lamar University, Texas A&M, Lamar Institute of Technology, Clinton Presidential Center, University of Arkansas at Little Rock, University of Arkansas for Medical Sciences, and University of Arkansas at Fayetteville.

2010 University of New Orleans Cypress Tree Directory

A tree directory developed by the University of New Orleans provided a complete list of governmental resources available to Louisiana landowners to plant and restore cypress trees. Having all available programs documented in one place was a helpful step in raising landowners' awareness of opportunities to participate in the regeneration of cypress forests. Entergy supported the directory with a \$10,000 grant from the EIF.

2011

Blue Ribbon Resilient Communities Program

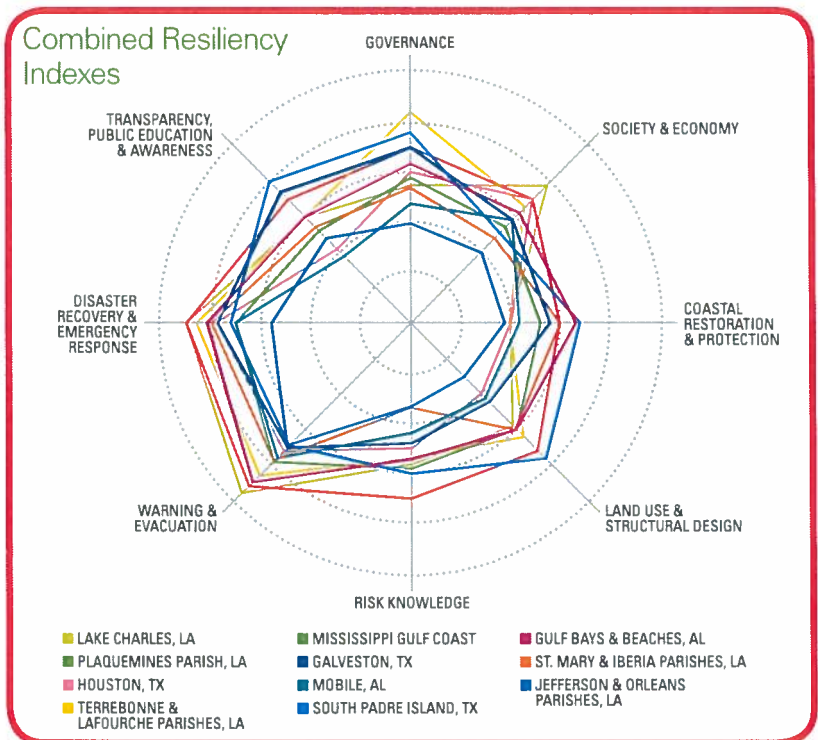
As an extension of the climate-change adaptation study unveiled in 2010, Entergy and America's WETLAND Foundation (AWF) sponsored 11 outreach forums in coastal communities addressed in the study. The EIF provided \$250,000 in 2011 and \$200,000 in 2012 to support the effort.

Spanning 14 months and 5 states, the forums brought more than 1,100 leaders and community representatives together for a dialogue on local coastal issues and specific vulnerabilities.

- Brownsville, TX
- Galveston, TX
- Houston, TX
- Lake Charles, LA
- St. Mary/Iberia Parishes, LA
- Lafourche/Terrebonne Parishes, LA
- Jefferson/Orleans Parishes, LA
- Plaquemines Parish, LA
- Mississippi Gulf Coast, MS
- Mobile, AL
- Gulf Bays and Beaches, AL /FL

Forums identified eight key parameters for proactive and reactive dimensions to storm readiness and recovery, known as "Combined Resiliency Indexes."

In advance of each Blue Ribbon forum, AWF conducted community research through local focus groups and interviews. Respondents were asked to discuss their community's values and to rate their community's performance on a number of resiliency indicators. Combined responses generated a resiliency index for each community. Entergy contributed results of a study quantifying the economic value of what was at stake for each community and establishing the magnitude of risk.



Above is a spider-web graph summary of combined resiliency indexes with detail from each forum. If a community were assessed as fully prepared and resilient, it would receive a perfect score of "5" for each of the eight dimensions. This analysis provided a simple, easily understood graphic approach to evaluate each community, using strengths and weaknesses to help identify which gaps are most prevalent.

A final report of the Blue Ribbon Resilient Communities: Envisioning the Future of America's Energy Coast was released on Capitol Hill in late 2012. "Beyond Unintended Consequences" provided 30 recommendations for Gulf Coast adaptation and was supported by congressional leadership from the Gulf Coast region. The final report is available at http://futureofthegulfcoast.org/AmericasWETLANDFoundation_Beyond.pdf

2011 

National Arbor Day Foundation Energy-Saving Trees

Entergy's \$75,000 grant to the National Arbor Day Foundation helped fund Energy-Saving Trees, a community tree-planting program that helps residents save energy by planting the right trees in the right places to shade their homes effectively.

2011 

America's WETLAND Foundation Isle de Jean Charles Planting

Entergy's \$30,000 grant to America's WETLAND Foundation helped support vegetation-planting projects designed to protect existing sections of marsh from further erosion on four sites along Isle de Charles Road in Point Aux Chenes, Louisiana. As shown in the photo below, planting projects were completed with volunteer support from Entergy employees.



2011 

Generation E Earth Day Environmental Grant Contest

Entergy's Generation E initiative, launched in 2007, was designed to promote Entergy's forward-thinking environmental efforts, including reducing greenhouse gas emissions, exploring alternative fuel sources, managing timber and wildlife resources, and developing educational programs. In celebration of Earth Day in 2011, Entergy Mississippi launched the Generation E contest to identify and reward environmental improvement projects that will have a lasting and measurable effect on the community. The contest was supported with a \$25,000 grant from the EIF.

2011 

Acadiana Resource Conservation & Development's Louisiana Envirothon

Louisiana Envirothon is a multidiscipline, environmental problem-solving competition for students in grades 6-12. A total of 10 teams (50 students) competed in 2011, with the winning team advancing to the national Canon Envirothon. Entergy supported the competition with a \$13,000 grant from the EIF.

2011 

Keep Mandeville Beautiful School Recycling Program

Entergy's \$7,000 grant to Keep Mandeville Beautiful's "Mandeville Recycles" initiative helped expand a school recycling program from 4 schools to 14 schools in the local community.

2011 

Pines and Prairies Land Trust Trail Guide

The mission of Pines and Prairies Land Trust is to protect natural and cultural resources and promote sustainable agriculture through education and the preservation of open space in Central Texas. Entergy funded the printing of 5,000 Colorado River Refuge trail guides with a \$6,000 donation from the EIF.

2011 

U.S. Business Council for Sustainable Development Water Synergy Project

The United States Business Council for Sustainable Development (USBCSD) launched the Water Synergy Project in southern Louisiana with funding support from ConocoPhillips, Entergy, and The Walmart Foundation. Participating companies also were contributors.

A \$35,000 contribution from the EIF was used to develop training material for the GEMI Local Water Tool (LWT), complete the LWT external conditions module, and support planning and logistics for three working groups. The project addressed the increasing importance of water management to business sustainability, with goals to:

- Achieve tangible water synergy benefits for participating companies and the communities where they operate.
- Establish a long-term water collaboration plan for the region.
- Develop a replicable work process that can be applied in other watersheds/regions.

Water issues are best addressed locally, but there are few forums where leaders from multiple industries can participate in focused interactions to identify issues, find and prioritize alternative solutions, and craft implementation plans for their watershed/region. Structured forums provided an opportunity for industry representatives collectively to focus their skills and resources to address complex challenges such as coastal resiliency and water management issues such as water quality, quantity, and storm water. Such collaboration can foster:

- Sharing of best practices and technology for water management and sustainability.
- A larger, more visible voice for coastal protection and regional water management to help get the right strategies in place and facilitate better-targeted use of available funding.
- Strategies for wetlands assimilation/restoration.
- Strategies for addressing water quality issues and storm water management.
- Innovative financing alternatives for water treatment and distribution retrofits that reduce energy costs.
- Support of healthy watersheds and sustainable programs to balance water resources.

2011 

Forest Trends Association Carbon Markets Report

Forest Trends is a Washington D.C.-based international non-profit organization created in 1998 by leaders from conservation organizations, forest products firms, research groups, multilateral development banks, private investment funds, and philanthropic foundations. Entergy's \$7,500 grant to the organization helped fund the publication of a "State of the Voluntary Carbon Markets" report.

2011 

Equilibrium - Entergy Park, Hot Springs

Entergy has helped reduce Arkansas invasive species like kudzu using appropriate vegetation management to maintain and promote tree growth and bird habitat. An example of this strategy is Entergy Park near Carpenter Dam and Lake Hamilton, which received a \$14,000 contribution from the EIF. The park contains two playgrounds, hiking and biking trails, seated areas, and a pavilion.

In 2014, Entergy funded a second phase for the continuation of this project that included a controlled burn of invasive species.



Entergy Park – Before (top) and after (bottom) the controlled burn for invasive species

2012 

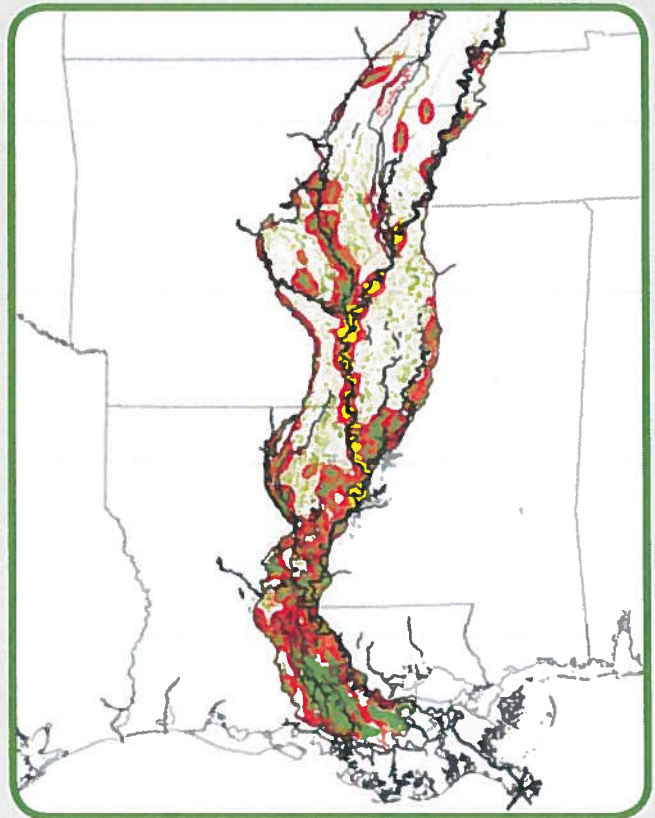
National Audubon Society: Restoring Forests of Lower Mississippi Valley

The National Audubon Society is developing tools to evaluate costs and benefits of management actions, creating peer networks to share successes and challenges, and assisting public and private landowners with sustainable forest management that meets economic, recreational, and conservation uses.

The Audubon project was funded to work with private landowners, communities, and the forest industry to restore bottomland hardwood forests in the Mississippi Alluvial Valley (MAV), the floodplain area below the confluence of the Mississippi and Ohio Rivers and principally located in the states of Arkansas, Mississippi, and Louisiana. Audubon's restoration work in the MAV will preserve, create, and enhance vital bottomland hardwood forests in a manner that is both environmentally and economically sustainable for future generations.

The project's goal is to restore a four-million-acre block of the Mississippi River Valley forest through improved management of existing forest and reforestation of two million acres of frequently flooded agriculture land. The project was funded jointly by a combination of community development, forestry, and conservation leaders, including Southern Bancorp, Anderson Tully Worldwide, and the Nature Conservancy, as well as philanthropic entities such as the Walton Family Foundation.

A \$194,425 contribution from the EIF was provided to fund an economic impact analysis of a restored MAV forest ecosystem and a demand study and value-chain assessment of a restored MAV forest ecosystem. Funding also helped implement sustainable forest practices that support the ecosystem of the MAV, connect a local community to forest resources, and provide positive economic benefits to Entergy's service territory based on eco-tourism generated by the preservation of the MAV.



Mississippi Alluvial Valley with forest bird decision model in red. Map also shows extent of limited partnership hunting clubs in yellow — more than 1 million acres.

Together, the supporters aspired for a broad range of tangible benefits for the project, including acquiring additional acreage of forest in key conservation areas, making improvements to wetlands and water quality, addressing climate change proactively through improving forest health, and developing new skills and markets for foresters and communities related to sustainable forest practices and products.

Bottomland hardwood forests vary from mixed hardwood forests along stream basins to deep-water swamps along major rivers. Approximately 30% of threatened and endangered species in the southeastern United States depend on bottomland hardwoods and about 85% of eastern North American bird species use forests in the MAV. This includes the majestic, iconic swallow-tailed kite, which since the 1900s has suffered the most dramatic reduction in range of any living land bird in eastern North America.

Agriculture, urban expansion, and other human land uses have impacted bottomland forests heavily. Approximately 80% of bottomland hardwood systems in the MAV have been lost. Of the 20% that remain, the vast majority exists as tiny fragments in which only species needing small home ranges persist.

2012 

Tierra Resources Proof-of-Concept Project in Luling and Market Commercialization

The proof-of-concept project in Luling, Louisiana, used the Entergy-funded American Carbon Registry methodology to conduct a wetland restoration project to quantify additional carbon sequestration with the introduction of treated municipal effluent. The project was supported by a \$345,978 contribution from the EIF.

Louisiana's characteristic coastal swamp forests are threatened by subsidence and saltwater intrusion. Wetland assimilation systems use treated wastewater to restore degraded cypress wetlands that are critical to protect the coastal Louisiana region from storm surge. This type of wetland restoration promotes additional carbon sequestration by reversing wetland loss, enhancing storage of carbon in wetland soils, and re-establishing cypress forests. Using natural wetlands to remove nutrients from wastewater integrates sustainability with mitigation measures by enhancing storm surge protection, using natural energies, offsetting sea level rise, and sequestering large amounts of carbon. Neighboring acreage supports expansion of proof-of-concepts to commercial-scale projects.

Market commercialization of wetlands methodology helps develop a scope of potential commercial projects and net benefits along with the expected volume and value of credits produced. Successful wetland restoration enhances carbon sequestration by promoting wetland growth and avoids the release of carbon stored in wetland soils when wetlands degrade. It is estimated that coastal marshes contain 200 to 300 tons of CO₂e per acre in soil.

Currently, however, insufficient information exists on what happens to carbon in soils during wetland loss, so the phenomenon cannot be incorporated into carbon accounting yet. Critical research is needed to determine what happens to stored carbon to optimize the amount of offsets produced from a wetland restoration carbon project. Investment is needed to address gaps in science and to expand the current methodology to transact these offsets.



2012 

University of Houston Three Continent Project

This project provided funds to support The University of Houston's (UH) Three Continent Project and the Gerald D. Hines College of Architecture - Three Continent Studio. It also aligned with the adaptation and resiliency goals of the America's WETLAND Foundation and Blue Ribbon Resilient Communities program. The effort was supported by a \$5,000 contribution from the EIF.

The Three Continents Studio connects the University of Houston's architecture faculty with peers from Argentina, the Netherlands, and Louisiana. Studio participants participated in lectures, workshops, tours, and other activities in Houston.

The Three Continents Studio was a year-long partnership between the College of Architecture and researchers from Tulane University, University of Buenos Aires, and Technical University, Delft. UH hosted an exhibition illustrating the studio's research, as well as proposed solutions for at-risk coastal areas.

2012 

Keep Texas Beautiful

Entergy was a sponsor of the Governor's Community Achievement Awards Dinner organized by Keep Texas Beautiful. Entergy supported the event with a \$15,000 grant from the EIF.

2012 

Restore America's Estuaries: Shipe Woods Shoreline Stabilization Project

This shoreline stabilization project in Texas was conducted in conjunction with the Galveston Bay Foundation and provided volunteer opportunities for Entergy Texas employees in Beaumont and The Woodlands. The project was supported by a \$60,000 contribution from the EIF.

Shipe Woods Habitat Protection and Marsh Restoration project plan was designed to protect a 14.26-acre wooded conservation property adjacent to Trinity Bay in Chambers County, Texas, from continued erosion and to re-establish fringing marsh habitat along its shoreline. Shipe Woods was acquired by the Galveston Bay Foundation as a conservation property in 1991.

Within the past 15 years, approximately 100 feet of Shipe Woods' shoreline has eroded, severely impacting the riparian forest. In the past 40 years, nearly two acres of the property has been lost (see aerial image).

This project proposed the construction of up to 700 linear feet of rock breakwater along the shoreline to reduce wave energy impacting the shoreline from Trinity Bay, halt erosion of the shoreline, and promote deposition of suspended sediments landward of the structure. Breakwater design and construction were intended to mimic previously completed projects along the East Bay shoreline of the Anahuac National Wildlife Refuge.



2013 

IdleAir Truck Stop Electrification Technology

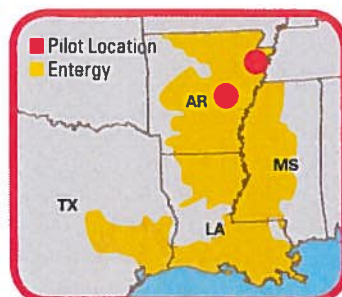
In Mississippi, a truck stop equipped with IdleAir technology allows truck drivers to turn off their engines while maintaining a comfortable cabin temperature and enjoying the use of TV, Internet, and other electronics. In addition to reducing carbon emissions, IdleAir helps fleet operators reduce costs by conserving fuel and reducing engine wear. Entergy is funding the opening of an IdleAir site in Pearl, Mississippi, with other potential sites in Arkansas and Texas. The project is registered with the American Carbon Registry and received approximately \$200,000 in funding from the EIF. Representatives from Entergy Mississippi, including President and CEO Haley Fisackerly, Congressman Gregg Harper (R) Mississippi's 3rd District, and Mississippi Department of Environmental Quality Executive Director Gary Rikard attended the press event launching the effort.



In 2015, Entergy provided \$165,000 to support the installation and the first-year operations of 30 truck stop electrification (TSE) units/spaces at the Flying J Truck Stop, located in the City of New Caney, Montgomery County, Texas, along the Highway 242 and US 59 corridors and \$148,500 to support the installation and the first-year operations of thirty 30 TSE units/spaces at the Phillips 66, located in the City of Bald Knob, White County, Arkansas, along the US 64 and 67 corridors. These sites target long-haul class 8 trucks, supporting idle reduction and alternative fueling options for interstate trucking and protecting human health and the environment by attaining and maintaining health-based air quality standards and reducing the risk from toxic air pollutants and greenhouse gases with specific, measurable, and achievable goals.

2013 

Low-Methane Rice Farming



In Arkansas, Entergy is partnering with Terra Global Capital, White River Irrigation District, and USDA Agricultural Research Service to test new rice-cultivation practices that can reduce methane emissions while providing savings to farmers and ecological benefits.

The project is registered with the American Carbon Registry and received \$200,000 in funding from the EIF.

Entergy Corporation Awards \$500K Grant to The Nature Conservancy

In recognition of Earth Day on April 22, Entergy announced a \$500,000 grant to The Nature Conservancy to fund projects that are engineered to make a positive difference in habitat, water purification, and climate through coastal and wetlands restoration in Entergy's four-state utility service area. The funds to support this effort came from the EIF and Entergy Charitable Foundation funds from each utility operating company.

In Arkansas, The Nature Conservancy will use funding to restore 500 acres of bottomland hardwood forest over the next two years. This will create wildlife habitat, sequester carbon, and reduce harmful sediment and nutrients entering the Cache and White rivers. At more than 550,000 acres, The Big Woods of Arkansas is the Mississippi River Delta's largest corridor of bottomland hardwood forest north of Louisiana. It reduces the impacts of flooding, provides wintering habitat for one of the largest populations of waterfowl in the world, and improves water quality by filtering sediments and nutrients before they enter the Mississippi River.



The Nature Conservancy Project Locations

In Louisiana, Entergy's funding will enable The Nature Conservancy in Louisiana to continue efforts on one of the largest floodplain reconnection projects in North America. The project involves restoration and monitoring work on Mollicy Farms, a 16,000-acre floodplain wetland complex of the Upper Ouachita National Wildlife Refuge in Morehouse Parish. Planting thousands of trees, re-establishing natural river and stream flows, and revitalizing the floodplain wetlands will improve water quality, reduce downstream flooding, and provide enhanced wildlife habitat, in addition to other benefits to people and nature. Lessons learned from the project will benefit similar efforts along the Mississippi River and river systems worldwide.

The Nature Conservancy in Mississippi will use Entergy's funding to leverage up to \$8.4 million in funds from federal, state, and local entities to implement bottomland hardwood and wetland restoration practices on existing cropland. The project has the potential to restore at least 4,000 acres in the lower Yazoo River Basin and support landowners in a region that suffers from significantly high poverty rates. Through this effort, The Nature Conservancy and Entergy are seeking new ways to improve water quality and the quality of life in Mississippi and along the Gulf of Mexico coast for current and future generations.

The Texas chapter of The Nature Conservancy will invest Entergy's funding to improve wetland longleaf pine savanna, low-lying wetlands, and other associated forest habitats on the 5,654 acre Roy E. Larsen Sandyland Sanctuary located near Silsbee in Hardin County. Prescribed burning, woody shrub control, and Chinese tallow tree control will be conducted to foster open forest floor conditions for native grasses and wildflowers to benefit

diverse plant and animal life. Collection of native seed and establishment of a native plant plot for future restoration projects in the region will be established. The Preserve is designated as one of the top 500 Globally Important Birding Sites by the American Bird Conservancy, contains an 8.5-mile section of Village Creek included in the Texas Parks and Wildlife Department's Paddling Trail Program, and is open to the public for hiking and nature study.



Entergy's grant to The Nature Conservancy was announced to cheers at halftime of a New Orleans Pelicans basketball game on April 14, 2014, where a check was presented by Entergy Louisiana President and CEO Phillip May and VP of Environmental Strategy and Policy Chuck Barlow.

2013 

Chef Menteur Pass Wetland Restoration

In Louisiana, Entergy is supporting marsh restoration in the Chef Menteur Pass Wetland Mitigation Bank in Orleans Parish. The Chef Menteur Pass property provides critical ecological and risk-reduction functions for the Gulf Coast of Louisiana and was identified in Louisiana's 2012 Coastal Master Plan as a priority for the state's marshland restoration activities. The project received approximately \$200,000 in funding from the EIF. Entergy produced a video with project participants, including Entergy New Orleans President and CEO Charles Rice, discussing the objectives and benefits of the project.



2014 

Environmental Initiatives Fund Supports Energy Efficiency Improvements for Entergy Facilities

In 2014, the EIF focused on funding internal projects submitted by employees. The program encouraged employees to submit ideas for projects that would help reduce energy use and natural resource consumption.

Lighting efficiency conversion projects were identified in Arkansas plant support offices and the skills center adjacent to the White Bluff plant; Entergy Texas' Chevy Land Service Center, Conroe Service Center parking lot, and the Conroe Fleet Maintenance facility; and the Hammond Equipment Distribution Center. These conversions from fluorescent to light emitting diode (LED) fixtures help reduce the company's impact to the environment in several ways. First, a reduction in consumption reduces the company's environmental footprint (water usage, air emissions, fuel consumption, and other discharges). The conversions also reduce universal waste that is generated from the disposal of the fluorescent light bulbs. Since LED bulbs contain no mercury, there is no need for the special handling that fluorescent bulbs require. There is also a big difference in the fixture/bulb life. LED lights have an estimated life of 50,000 hours, while fluorescent bulbs last only 12,000 hours. Finally, the potential for polychlorinated biphenyl waste from the fluorescent ballast also is eliminated by installing LED fixtures.

In addition to the lighting projects funded by EIF, the Entergy Louisiana Jefferson Highway complex project will reduce the thermal impacts, which in turn will reduce energy consumption. The project proposed covering approximately 46,000 square feet of roof at the main office building using Siplast Parapro (Cool White) roof membrane resin. The application of this product is expected to increase thermal resistance by 148%.

2014 

Entergy Arkansas Native Species and Vegetation Management Project

Transmission and Distribution Environmental Management, on behalf of Entergy Arkansas, Inc., submitted a project dealing with the use of native species and vegetation management.

The project identified alternative vegetation management practices provided for riparian buffer zones on utility rights of way (ROW) parallel or perpendicular to Arkansas waterways inhabited by the newly listed threatened and endangered freshwater mussel species Neosho mucket and Rabbitsfoot mussel. These improved corridors will help provide bank stabilization and act as filter strips, reducing sediments that enter waterways. Sediment is listed as Arkansas' primary pollutant to waterways and is detrimental to aquatic ecosystems, including freshwater mussels. In addition, this improved riparian zone can act as an important corridor for terrestrial organisms in a fragmented environment by creating vegetated passageways along waterways. This project will include a partnership with the Arkansas Game and Fish Commission (AGFC), with help from the Arkansas Natural Heritage Commission (ANHC) and Arkansas Master Naturalists.

In addition to the three Arkansas partners mentioned, Entergy provided \$43,000 to partner Equilibrium, Inc., a local non-profit, to execute the native species and vegetation management project successfully.

2014 

NuRide – Employees Earn Rewards by Commuting Green



Entergy’s Environmental Strategy & Policy group (ESP) estimates that normal commuting to work results in Entergy employees driving over 125 million miles per year – resulting in just over 45,000 tons of CO₂ emissions per year. This fact spurred a proposal to partner with NuRide for a three-year period.

The goal of this project is to reduce the environmental impact associated with employee commuting. This will be accomplished by encouraging and working to increase the number of employees using alternative transportation for their commute to work through a reward point program. Alternative means of transportation will include walking, cycling, carpooling, vanpooling, public transportation, etc.

NuRide offers a rewards program for employees of partner organizations that choose alternative means of transportation for their daily commute to work. Employees join the Entergy NuRide program for free using an Entergy-specific web page and sign-up tool. Alternative transportation trips are logged by the employee (either one at a time or using a recurring trip function) and reward points are earned. These points are used to spend on rewards from national and on-line restaurants, retailers, and events/attractions.

2014 

U.S. Business Council for Sustainable Development Watershed Simulation - “A Serious Simulation Game for the Gulf Coast of Louisiana”

Given the complexities of the rapidly changing world, it is difficult, if not impossible, to grasp and appreciate the often-unpredictable consequences of the many independent choices and decisions that persons and organizations make as they pursue their individual goals. Such large-scale complex systems defy static mathematical and statistical analysis. However, they can be approximated with computer-based simulation models where the myriad human choices and decisions are represented by random variables and probability distributions. However, when a system of interest involves a wide range of human choice and decision-making, even the most carefully designed simulation model might not capture the most realistic (and often changeable) outcomes.

A promising approach to this situation is the creation of a serious game, or participatory simulation model, based on a validated and verified predictive model. Such games allow human decision-makers, playing carefully designed roles, to introduce realism into system behavior.

Human players bring their individual knowledge, experience, and values to the simulation model, something impossible to do with equations.

The funded project will develop a front-end user interface to allow participants to make decisions that feed into an underlying predictive model, which together form a prototype participatory simulation for the Louisiana Gulf Coast. This predictive model would prove to be a useful tool in its own right for forecasting future impacts based only on an analysis of historical trends in land use, land cover, and environmental impacts. The resulting simulation model would be used to forecast future trends and changes under various scenarios and assumptions about key parameters. In this form, the simulation model is a standalone tool and does not permit direct human interaction with the model other than through the construction of simulation experiments.

The predictive model is based on a spatial model of the land use/land cover change of the coastal area over a specified time period. The spatial model will be at 30m resolution using USGS Landsat imagery. Each 30m x 30m cell is classified into one of 20 different land cover types, as shown.



LANDSAT-2001



LANDSAT-2011

NLCD Land Cover Classification Legend	
	11 Open Water
	12 Perennial Ice/Snow
	21 Developed, Open Space
	22 Developed, Low Intensity
	23 Developed, Medium Intensity
	24 Developed, High Intensity
	31 Barren Land (Rock/Sand/Clay)
	41 Deciduous Forest
	42 Evergreen Forest
	43 Mixed Forest
	51 Dwarf Scrub*
	52 Shrub/Scrub
	71 Grassland/Herbaceous
	72 Sedge/Herbaceous*
	73 Lichens*
	74 Moss*
	81 Pasture/Hay
	82 Cultivated Crops
	90 Woody Wetlands
	95 Emergent Herbaceous Wetlands

* Alaska only
The National Land Cover Dataset (NLCD) land use/land cover coloring scheme for the LANDSAT is shown above.

Tierra Resources Commercialization Phase II Project

Entergy has funded research and development activities of Tierra Resources for the last several years. This strategic partnership has resulted in groundbreaking conclusions for wetland restoration. The research provides an intersection for wetland restoration and carbon sequestration and markets for Blue Carbon. The Phase II Commercialization conducted a market assessment of properties and land management regimes in the region that determined the potential to monetize wetland eco-assets, particularly carbon, from ongoing and planned wetland restoration activities and push strategically for methodology adoption by the California Air Resources Board (CARB).

Tierra Resources' study results were published in a report, "Carbon Market Opportunities for Louisiana's Coastal Wetlands." The results revealed that coastal wetland restoration in Louisiana has the potential to produce over 1.6 million offsets per year - almost 92 million offsets over 50 years. Restoration techniques that were identified as having potential as wetland carbon offset projects include river diversions, hydrologic restoration, wetland assimilation, and mangrove plantings. Of the restoration techniques, forested wetlands that receive treated municipal effluent, referred to as wetland assimilation systems, have the highest net offset yield per acre. However, river diversions and mangrove plantings have the potential to generate the largest volume of offsets in Louisiana due to the large amount of acreage upon which these restoration techniques can be implemented (Figure 1). It should also be noted that carbon credits from wetland assimilation systems and river diversions show potential to be stacked with water quality credits, should these markets evolve in Louisiana. The analysis also estimated the wetland potential at different pricing points (Figure 2).

Tierra Resources' findings were released in March 2015 and have received local, national, and international coverage.

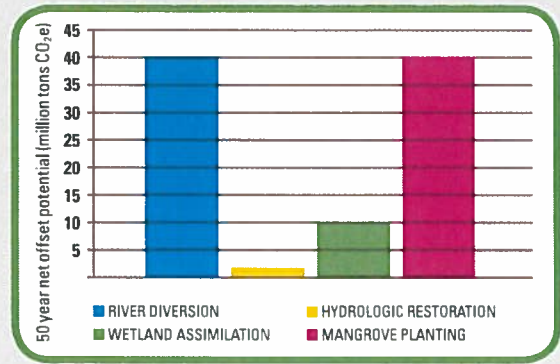


Figure 1: Net offset potential in Louisiana by wetland restoration type including a 20% buffer deduction.

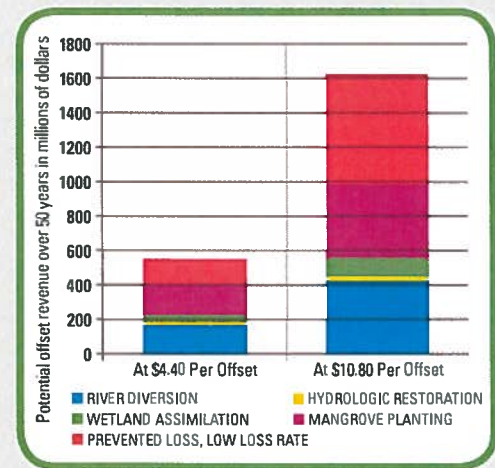


Figure 2: Total projected revenue potential of wetland carbon offsets in Louisiana from wetland restoration and prevented wetland loss including a 20% buffer deduction.

Contributions to Civic/Environmental Organization Projects

In 2014, the EIF funded several civic, environmental, and educational organizations. These included projects with the New England Aquarium (partnership with Pilgrim Nuclear Power Station), Rock the Boat (estuary project), the South Shore YMCA (Atlantic Coastal Pine Barrens Ecoregion – habitat restoration for threatened/endangered species), and Southeastern Louisiana University (Turtle Cove Wetlands Restoration Project). These four projects positively impacted the states of Louisiana, New York, and Massachusetts, providing environmental education and hands-on volunteer projects for the communities, as well as Entergy employees, in the respective states.

2015 

Lowlander Center – Adaptation and Resiliency Revisited

Entergy's report, *Building a Resilient Energy Gulf Coast*, was released in 2010. America's Wetland Foundation then followed up with regional meetings and detailed action items to support the utilization of the study. This \$100,000 project will revisit the *Building a Resilient Energy Gulf Coast* report, as well as the background information from the meetings hosted in partnership with America's Wetland Foundation, in order to ascertain the impacts of the previous effort and address the remaining gaps and opportunities for Entergy to promote resilience. As part of this effort, other recent reports and data on businesses in coastal communities will be reviewed. For this project, the team is focusing on one of the key groups that has been underrepresented in previous reports, small- and medium-sized businesses.

The project will result in recommendations for improving the resilience of these businesses, as well as recommendations on follow-up steps that Entergy may wish to take, including updating the previous report and working with small- and medium- sized businesses and communities in other ways. The Lowlander Center is co-founded and co-led by Shirley Laska, PhD, and Kristina Peterson, PhD, both of whom are national mitigation specialists.

2015 

Tierra Resources – Ariel Planting of Black Mangroves for Wetlands Restoration

In partnership with ConocoPhillips, which owns 640,000 acres of wetlands in coastal Louisiana, Tierra Resources did a three-year pilot program in Terrebonne and Lafourche Parishes. The program was to test the theory that planting mangroves by air could be a cost-effective alternative to traditional methods such as planting by hand on long boat trips. Hand-planting is time-consuming, labor-intensive, and almost impossible to do in more remote areas of the coastline. Mangroves help stabilize salt marsh areas, provide the same habitat quality as marsh grass, and are popular for bird rookeries. Entergy provided \$150,000 to assist in the next step of the program, which is to plant a 60-acre parcel of salt marsh. "If the idea can be proven at this larger scale, it could open up a restoration technology that even small landowners could take part in," said Steve Tullos, senior manager for Entergy's Environmental Strategy & Policy group. Finding a way to make coastal restoration more feasible for smaller landowners is a way to help protect the communities Entergy serves.



2015 

Southwest Michigan Land Conservancy, Inc. – Black River Preserve Enhancements

The Southwest Michigan Land Conservancy (SWMLC) received \$57,000 from the EIF to undertake the restoration of a tributary ravine in the Black River Preserve. This restoration will reduce erosion, improve habitat quality, and develop public access with interpretive signage. The SWMLC acquired the Black River Preserve in 2011. The preserve is located along the Lake Michigan coast area, which makes it a premier migratory songbird stopover site. There is also great biological diversity in the preserve. The preserve contains three tributary streams that provide clean water to the Black River while maintaining cool humid microclimates in the ravine. A record storm and flood event in 2013 caused severe erosion in one of the ravines, washing out the trail crossing that provided access from the northern 1/3 of the property to the southern 2/3 of the property, which is critical to both public use and habitat management work.

2015 

Coastal Conservation Association of Louisiana – Floating Island Project on LA-1 in Leeville, Louisiana

The Coastal Conservation Association of Louisiana was given \$60,000 to conduct the LA-1 Floating Island Project in Leeville, LA. This project will be a community partnership with participation from local volunteers and approximately 100 Lafourche Parish students.

The event will consist of planting approximately 12,000 native plants and marsh grass over 5,600 square feet of floating islands along LA-1 (the only access to Grand Isle) to restore critical habitat and protection for fish, water fowl, and wildlife; provide infrastructural erosion protection of LA-1; and benefit the residents of Lafourche Parish and Grand Isle. Thousands of people visit Grand Isle annually for recreational and commercial purposes, and this project will provide an educational learning experience for many local students and volunteers on a new coastal restoration method and its benefits.

2015 

Mississippi Wildlife Rehabilitation Inc. – North Mississippi “Outdoor Classroom” Conservation Pavilion

Mississippi Wildlife Rehabilitation, Inc. (MWR) is a nonprofit.org dedicated to caring for state and federally protected indigenous wildlife species, conducting public environmental/conservation education, and fostering the protection and appreciation of our environment. Partnerships with the U.S. Army Corps of Engineers and DeSoto County Greenways have led to the provision of 154 acres for a planned Environmental Education/Rehabilitation facility at Arkabutla Lake (the ARK). Entergy funding from the EIF (\$125,000) and the Entergy Charitable Foundation (\$25,000) supported the construction of an outdoor pavilion for public environmental/conservation education programs at the ARK in DeSoto County, Mississippi. This area is one of the fastest-growing areas in the country, and this facility would increase the amount of area visitor spending and make the center a tourist destination for North Mississippi, while providing accessible, affordable, innovative, engaging, and entertaining wildlife education to children and adults in an area of Mississippi that is often impoverished and underserved.



2015 

Friends of Westchester County Parks Inc. – Croton Point Park

The Friends of Westchester County Parks (FWCP) is a nonprofit.org dedicated to supporting and advocating for the Westchester Department of Parks, Recreation and Conservation. It is committed to the preservation, conservation, use, and enjoyment of the 18,000 acres of parks, trails, and open spaces within the Westchester County Parks system. FWCP received \$57,875 of EIF funding for its Croton Point Solar & Rain Garden Project, which would add solar power capabilities to the Croton Point Park regional office, install two rain gardens, and educate the public about solar power and storm water

management. Croton Point Park is one of Westchester County's largest and most frequented parks and is located on the banks of the Hudson River. The project would reduce energy costs through the use of solar power, utilize storm water management to lessen the pollution in the Hudson River that results during periods of heavy rainfall, educate the public about solar power, and inform the public about the benefits of storm water management and how to apply storm water management techniques in their communities.

2015 

Friends of Lafitte Corridor Inc. – Lafitte Greenway Stormwater Management Walking Workshops

The Lafitte Greenway is a new 2.6-mile bicycle and pedestrian path and linear park in the heart of New Orleans. Originally a canal connecting Bayou St. John to the edge of the French Quarter, this 2.6-mile vacant strip of land has been transformed into an environmentally sustainable Greenway, connecting neighborhoods from Treme to Mid-City, creating an urban green corridor from the French Quarter to the City Park, and featuring a 12-foot asphalt trail, LED lighting, over 500 new trees, and over six acres of rain gardens, bioswales, and native meadows to advance sustainable storm water management.

The Friends of Lafitte Corridor received \$25,000 from the EIF to develop a regular Walking Tour Workshop series on the Lafitte Greenway. The goals of the tours are to educate the community about sustainable storm water management, to show that rain gardens can be beautiful and easy to maintain, and to encourage residents to implement sustainable water design on their properties.

2015 

Alliance Media Partners, LLC – In America TV Series on Wetlands Restoration

Through the EIF, Entergy provided \$22,900 for the video production of a segment of *In America*, a short-form educational documentary series airing on Public Broadcasting television stations. Hosted by James Earl Jones, the short educational segment focuses on Entergy's role in wetlands restoration. A one-minute version also was created for commercial television use. The production focused on the Luling, Louisiana wastewater wetlands restoration project funded through the EIF. The project showed how science, business, local government, and landowners can work together effectively for positive environmental and economically feasible results by using municipal wastewater to rebuild wetlands, which creates carbon credits that help offset costs.

2015 

Contributions to Civic/Environmental Organization Projects

In 2015, the EIF funded several civic, environmental, and educational organizations. These projects included the Lake Pontchartrain Basin Foundation (tree planting project), Galveston Historical Foundation (climate change and disaster response conference), Urban League of Eastern Massachusetts (inner-city youth learning), Habitat for Humanity of Cape Cod (sustainable homes for low-income families), and Boys and Girls Club of Greater Brockton (youth learning programs). These five projects positively impacted the states of Louisiana, Texas, and Massachusetts, providing environmental education and hands-on volunteer projects for the communities, as well as Entergy employees, in the respective states.

Appendix C

URLs for Videos and Documents

1. Overall community resilience - <https://www.youtube.com/watch?v=RoYJxhgHALA>
 2. Environmental strategy - www.energy.com/environment/
 3. Entergy Corporation -
http://entergy.com/content/investor_relations/pdfs/Entergy_2015_Integrated_Report.pdf
 4. Sea level rise – <https://www.youtube.com/watch?v=aG2Z1Senuk0>
 5. Subsidence – <https://www.youtube.com/watch?v=1JYVSW1Hydw>
 6. Coastal erosion – <https://www.youtube.com/watch?v=zQhrgqaQiwQ>
 7. Ice storms – <https://www.youtube.com/watch?v=97jk5GHSUhw>
 8. Hurricanes/tornadoes – <https://www.youtube.com/watch?v=KaatEROragg>
 9. Flooding – <https://www.youtube.com/watch?v=uWd3uDeAoXk>
 10. Post-event recovery – <https://www.youtube.com/watch?v=wwLlebYOlgk>
 11. Hardening investments – <https://www.youtube.com/watch?v=X3gSjTOPVPM>
 12. Coastal structures – <https://www.youtube.com/watch?v=YsQqWIs7W7s>
 13. EIF projects – <https://vimeo.com/117973095>
 14. Executive report –
[http://entergy.com/content/our_community/environment/GulfCoastAdaptation/Building a Resilient Gulf Coast.pdf](http://entergy.com/content/our_community/environment/GulfCoastAdaptation/Building_a_Resilient_Gulf_Coast.pdf)
 15. Summary presentation –
http://entergy.com/content/our_community/environment/GulfCoastAdaptation/report.pdf
 16. Leadership forums – <https://www.youtube.com/watch?v=Y7spOZqin7g>
 17. *Beyond Unintended Consequences* –
http://www.futureofthegulfcoast.org/AmericasWETLANDFoundation_Beyond.pdf
 18. City of New Orleans' resilience strategy – <https://www.youtube.com/watch?v=-B30BrSAIM4>
 19. AWF leadership roundtables – <http://coastal.la.gov/wp-content/uploads/2016/08/Restoration-Leaders-Master-Plan.pdf>
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