

**OFFICE OF RESEARCH AND ECONOMIC DEVELOPMENT  
2017 STRATEGIC PLAN  
Conventional and Renewable Energy (CR&E)**

LSU has a unique opportunity to transform itself into a nationally recognized leader in energy research with the objective of providing innovative and fundamental insights into the challenges that new energy resources and their applications play across the entire energy value chain (production, transportation, processing/storage, distribution and usage). LSU's goal should be to "place a stake in the ground" as the leading university that truly understands the continued nexus between traditional fossil fuel resources, emerging renewable and efficiency resources, and the environment: not one that focuses on the current "clean energy" flavor of the month.

In order to achieve this goal, LSU will need to define a framework and a base level of investment to establish the University as a recognized institution of higher learning. The university needs to demonstrate a design that advances and communicates the fundamental changes in energy and energy use that recognizes the continued role and importance of fossil energy resources from a consumption and production perspective. One challenge in establishing this research leadership position is setting a realistic, focused and distinct research agenda that (a) is not in direct competition with many leading research universities that have considerable funding advantages relative to LSU, (b) plays to LSU's strengths in past/current energy research, and (c) will likely lead to direct economic development benefits for the state.

At the ORED Retreat, held October 27, 2016, faculty participants identified specific areas in the energy research space that were further discussed in town hall meetings. These discussions identified four key areas for further development at LSU.

**Natural Gas Manufacturing Center:** the shale revolution is one of the most important technological innovations of our century. Louisiana is a logical beneficiary of this development, and the investment of intellectual and physical resources into LSU for an initiative of this nature will add value and prestige to the University and the State. Industry is making a multi-billion, if not trillion-dollar bet on these changes and LSU needs to be an essential partner to assist industry achieving these benefits through advanced manufacturing processes, process optimization, and the role of catalysis. LSU is in a key position to provide research, training, and education for a new generation of professionals and researchers that industry will need to continue to harness this revolution and communicate its importance.

**Enhanced and Optimal Hydrocarbon Recovery Systems in Conventional and Unconventional Basins:** Over the past decade, technological innovations within the oil and gas industry provided the necessary tools for the optimization of fossil fuels production in the United States. The combination of extended reach horizontal drilling and multi-stage hydraulic fracturing has allowed improved access to enormous volumes of natural gas originally trapped in low permeability formations. These activities, however, utilize an extensive amount of water, in some instances as much as 8 million gallons per well, to drill, fracture, and re-fracture. There is a unique opportunity to bring together a multidisciplinary framework for the design and operation of an optimal supply chain network for shale gas and an adaptable water management structure to address this combined environmental and energy production concern.

At the same time, there are numerous historic conventional fields located throughout the U.S. that a consider level of remaining oil in place, in some instances, as much as 60 percent of the original oil in place associated with these formations. LSU has unique experience and expertise in tapping this considerable resource opportunity through enhanced oil recovery, or "EOR." This processes uses captured high quality CO<sub>2</sub>, a greenhouse gas, to stimulate potentially as much as several billion barrels of crude oil production in historically prolific basins, like South Louisiana.

**Smart Manufacturing:** sets as its goal the adaptability and resource efficiency, as well as the integration of customers and business partners in business and value processes. Its technological foundation is comprised of cyber-physical systems. Cyber physical systems are a basis for the increase in manufacturing flexibility that results in shorter time to market. Cyber physical systems combine communications, IT, data, and physical elements using core technologies, including sensor networks; Internet communication infrastructure; intelligent, real-time processing and event management; big data and data provisioning. In cyber-physical systems, physical and software components are deeply intertwined, each operating on different spatial and temporal scales. This line of research should focus on intelligent real time processing, event management and data analysis for the process industry with a particular emphasis of the role of energy and energy use in these processes.

**Energy Policy, Market Intelligence, and Forecasting:** LSU easily has, within its grasp, the ability to establish a nationally recognized center of excellence in energy policy, economics, and legal research, with the objective of providing innovative and fundamental insights into the challenges and role that the environment plays across the entire energy value chain (production, transportation, processing/storage, distribution and usage). Such an institute would provide expertise on all aspects of energy development with a particular emphasis on the ongoing role that fossil fuels play in our world, particularly unconventional resources, and their relationship to large consuming sectors such as industrial energy use and power generation.