

FIRST LOUISIANA

FOSTERING INNOVATION THROUGH RESEARCH IN
SCIENCE & TECHNOLOGY IN LOUISIANA



Based on unanimous recommendations of representatives from research campuses statewide, FIRST Louisiana has been adopted by the Board of Regents, the coordinating and planning authority for higher education. FIRST Louisiana provides the organizing framework for the research component of the Regents Master Plan for Higher Education, which will target research foci and investment for the coming decade. The plan is also an integral part of the research and economic development component of the Louisiana Gaining Resources and Autonomies for Diplomas (GRAD) Act, a law proposed by the Governor and enacted by the legislature in 2010 to measure campus performance and success.



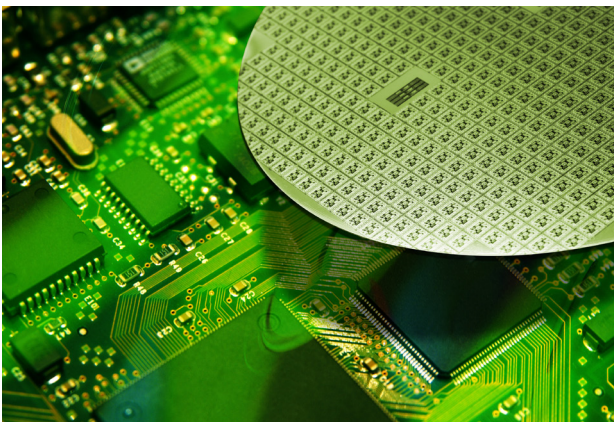
INTRODUCTION

Fostering Innovation through Research in Science and Technology in Louisiana (FIRST Louisiana) is a statewide plan that will help chart directions for institutional planning and provide a foundation for a comprehensive statewide approach to science and technology research, development and innovation. This framework will guide Louisiana's post-secondary education research community and industrial and public-sector partners to strategically increase research productivity and build capacity in areas of long-term importance to the State.

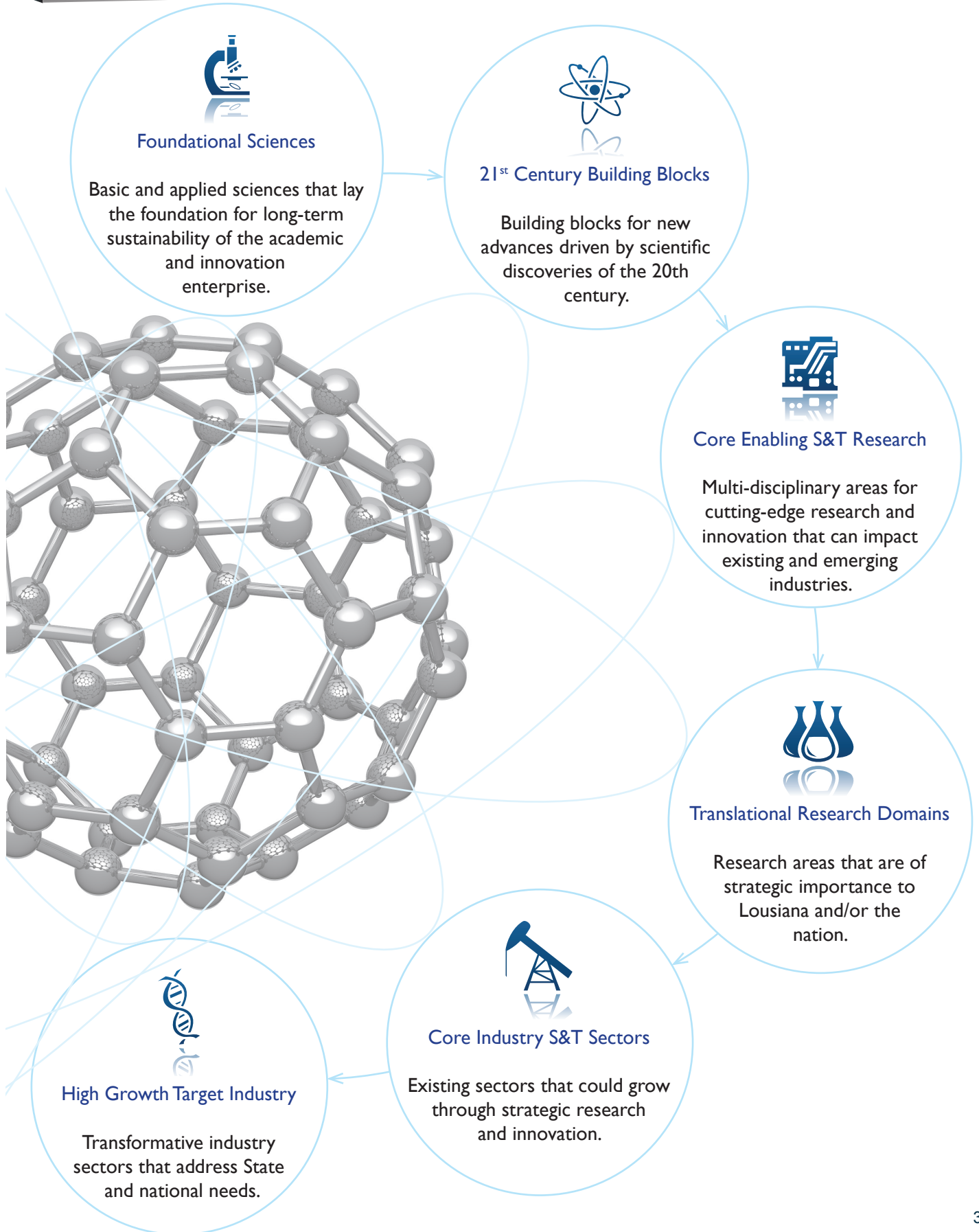
By 2025, Louisiana's universities will lead the State's dynamic innovation economy through the advancement of Science and Technology research and education.

The plan is guided by a vision that places higher education as the leader in driving the State's dynamic innovation economy through the advancement of science and technology research and education. It is grounded in the basic and applied sciences that lay the foundation for sustained innovation. It leverages the State's investments in people, tools and ideas across targeted multi-disciplinary areas, including materials science and information technology and biotechnology, known for cutting-edge research and innovation that significantly impact research competitiveness as well as attracting existing and emerging industries.

The plan includes strategies to enhance national competitiveness in translational research domains that relate to both enabling science and technology and State and federal priorities including the environment, biomedicine, agriculture and the digital world. Strategies are also identified to enhance the competitiveness of existing industries in the State and to foster the growth of new and emerging industry sectors in cooperation with Louisiana Economic Development.



SCIENCE & TECHNOLOGY FRAMEWORK



STRATEGIC FOCUS AREAS

FOUNDATIONAL SCIENCES



Foundational science and engineering research provides critical basic knowledge and understanding out of which translational innovations can grow. Advances in basic science provide avenues to of new, potentially useful applications. These applications, in turn, can result in innovative products and processes, even entire industries.

Basic scientific research is largely funded by the federal government. To be competitive for this funding, faculty must develop their research programs and laboratories over years of consistent focus and investment. Science and engineering departments, usually organized by discipline, provide the structure through which new research faculty are hired, supported, and evaluated.

FIRST Louisiana’s engagement of a broad array of scientific and engineering disciplines is critically important to shaping Louisiana’s future intellectual capacity and talent for innovation. Without a stable, broad and engaged foundation in fundamental and applied scientific research, the sustainability of innovation over the long term is impossible. *The recruitment and retention of top research talent in the foundational sciences are the most essential activities of any innovation ecosystem.*

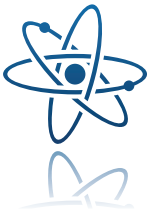
FIRST Louisiana focuses broadly on the foundational science disciplines that feed the State’s industrial and translational research targets: physical sciences, mathematics, engineering, computational science, earth sciences, agricultural sciences, biological sciences, biomedical science, and the social, behavioral and economic sciences.

Louisiana’s research universities have already built a strong foundation of academic programs in each of these disciplines. These existing programs, bolstered by continued infusions of research talent, provide an essential platform to support FIRST Louisiana’s success.

TARGETED FOUNDATIONAL SCIENCES

- | | |
|------------------------|---------------------|
| Physical sciences | Biological sciences |
| Mathematics | Biomedical science |
| Engineering | Social sciences |
| Computational sciences | Behavioral sciences |
| Earth sciences | Economic sciences |
| Agricultural sciences | |

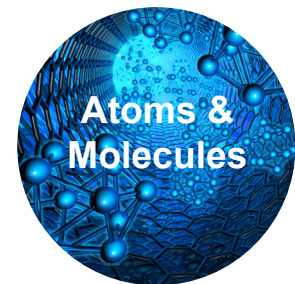




Atoms and molecules, genes and proteins, and bits and bytes, all major advancements of the 20th century, are the building blocks for innovation in this new century. Recent scientific discoveries and advancements in equipment and facilities have spurred scientists and engineers around the world to deploy these building blocks to impact every aspect of life today. And the possibilities for the future are unlimited.

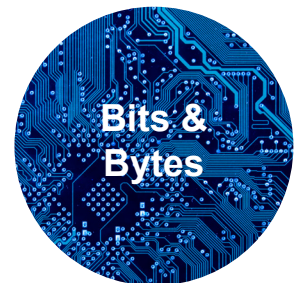
Louisiana researchers from many disciplines and institutions are already actively engaged in research that is leveraging these building blocks. Through a combination of federal, state, and private investments over the past two decades, Louisiana is well positioned with cutting-edge infrastructure to effectively compete in these areas. Continued success in securing funding and talent at the highest levels is dependent on maintaining existing infrastructure and keeping pace with constant and rapid advancements in tools and technologies.

Major research facilities including the Center for Advanced Microstructures and Devices at Louisiana State University, the Institute for Micromanufacturing at Louisiana Tech University, and the Advanced Materials Research Institute at the University of New Orleans provide high-tech tools for Louisiana's materials science and nanotechnology researchers.



Louisiana has excelled in Biosciences research, resulting in the expansion of outstanding basic, applied, and translational research facilities at Louisiana State University, Pennington Biomedical Research Center, the Health Science Centers, Tulane University, and at other institutions across the State. The Louisiana Gene Therapy Research Consortium, Tulane Center for Gene Therapy, Louisiana Therapeutic Peptides Center, South Louisiana Institute for Infectious Disease Research, Louisiana Vaccine Center, LSU Agricultural Center, Louisiana Tech Biomedical Engineering Center, and Feist-Weiller Cancer Center are just some of the related units that provide core infrastructure for biomedical and biotechnology research.

The Louisiana Optical Network Initiative provides Louisiana's researchers with one of the most powerful and robust cyberinfrastructures in the world. The high-speed optical network connects all universities to high-performance computers in Louisiana as well as to leadership-class computers on the National Science Foundation's Teragrid. The Louisiana Immersive Technologies Enterprise makes a world-class visualization environment available to researchers and industry.



While the existing collective materials, bio- and cyber-infrastructure in Louisiana provides a world-class scientific research environment, it could be quickly outdated without significant and persistent investment. It is imperative that Louisiana continue to maintain, upgrade and expand this infrastructure so our faculty and partners have access to state-of-the-art tools that allow them to advance both fundamental and applied research.

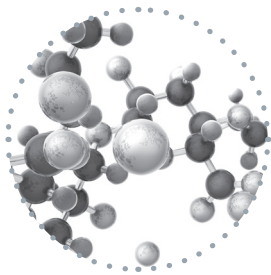
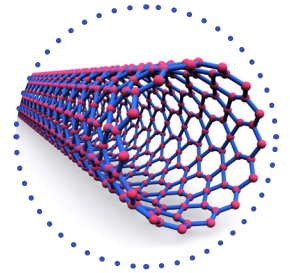
CORE ENABLING SCIENCE & TECHNOLOGY RESEARCH



Major scientific advancements of the 21st century are leading us deeper and deeper into miraculously tiny and complex environments: microchips, genes and genomes, atomic components and subcomponents. Our recently discovered ability to understand, see, measure, manipulate, and build objects at very small scales has led engineers and scientists to design and develop innovative materials, devices, and systems never before imagined and in high demand in the marketplace. The fields of materials science and nanotechnology, biosciences and biotechnology, and information sciences and information technology have provided essential advances to enable innovations at these scales.

Materials Science and Nanotechnology

The National Nanotechnology Initiative is currently investing almost \$2 billion per year in research and development across multiple Federal agencies, reflecting both the importance and the impact that nanotechnology is expected to have in virtually every sector of the economy. New materials developed through nanoassembly or nanofabrication can improve the performance and functionality of many manufactured products or enable the development of new products.

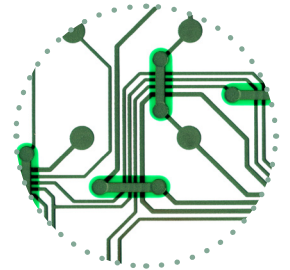


Biosciences and Biotechnology

Our ability to manipulate genes and proteins is generating new advances in bioscience and biotechnology. Medical researchers are developing new tools for the prevention, detection and diagnosis of diseases for improving general health and well-being. Biologists are creating new plant species with improved resistance to disease and micro-organisms for prevention of harmful effects, as well as essential new products like biofuels.

Information Sciences and Information Technology

High performance computers provide scientists with new tools for investigating endless hypotheses, and accelerating discovery and innovation across science and technology. Through virtual modeling, simulation, analysis, and visualization of complex phenomena, researchers are able to explore more options in shorter periods of time than could be done experimentally. And through high-speed networks, researchers can transmit vast amounts of data to share the discovery process with collaborators globally.



Most significant innovations occur at the interface of traditional disciplines, and frequently have applications across multiple domains. These innovations are sometimes referred to as core enabling science and technologies. Research led by Louisiana scientists and engineers provides several real-world examples: a novel process for nanoassembly of molecules generating new technologies for biomedicine, biofuels and specialty coatings; research into a particular protein leading to vaccines for humans as well as applications in veterinary medicine; and the development of new “cybertools” enabling advances in biotechnology and materials science.

Core enabling technologies are high-impact, high-yield, so fostering interdisciplinary research that leads to such discoveries is a priority for Louisiana. FIRST Louisiana places a major emphasis on the growth of multi-disciplinary research centers of excellence with potential to develop these cross-cutting ideas and results in the context of Louisiana’s existing investments and strengths in materials science and nanotechnology, bioscience and biotechnology, and information science and information technology. Research that emerges from these centers of excellence will play an essential role in driving innovation for Louisiana’s existing and emerging industry sectors.

TRANSLATIONAL RESEARCH DOMAINS



Like most areas, Louisiana has particular research needs that grow out of its unique location, history, culture and opportunities. FIRST Louisiana focuses on research domains that are of strategic importance to Louisiana, but also align with the existing and prospective needs of business and industry. This dual focus ensures that FIRST Louisiana serves the State and its citizens while and by focusing on business and industry needs. It enables Louisiana's research community and industry base to be more competitive now and in the future through applications of enabling science and technologies emerging from Louisiana's centers of excellence.

FIRST Louisiana's translational research is focused in the energy, coastal, environmental, digital, biomedical and agricultural domains. These areas represent Louisiana's traditional industrial strengths (energy and agriculture), recent growth industries (digital and biomedical), and high-priority issues (coastal and environmental) for the State.

ENERGY

Louisiana is one of the nation's leading energy states and a major global supplier of oil and gas. The challenge of recovering oil and gas from deep reservoirs has created new needs for research and innovation. Louisiana also recognizes the importance of alternative sources of energy such as nuclear materials and biofuels. In the future, it will not only be important for Louisiana to be a major supplier of biomass for fuel but also to use its intellectual capacity to be a leader in biofuel production, distribution, and innovation.



COASTAL

Louisiana has one of the nation's longest coastlines and the world's most navigable waterways. These features have provided the State with economic opportunities from recreation and tourism to seafood and aquaculture to shipping and ports. The coast also presents special challenges as it is subject to hurricanes, inundation, erosion, and environmental attacks. Research of coastal phenomena is not only essential for the continued viability of dependent industries, but for the protection of Louisiana's land mass and future economic growth.



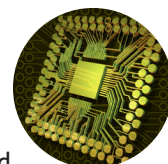
ENVIRONMENTAL

Louisiana is one of the world's largest petrochemical producers largely because of its proximity to the Gulf of Mexico's coast and its large petroleum and natural gas reservoirs. As was manifested in the Deepwater Horizon oil spill, a delicate balance must be maintained between tapping Louisiana's natural resources and the impacts of related industries on the environment. Louisiana has much at stake and much to gain by being a national leader in environmental research and development.



DIGITAL

The digital domain is Louisiana's most recent research frontier. It has been bolstered by Louisiana's major investments in advanced materials, cyberinfrastructure and related academic programs. Computers, storage devices, networks and software are transforming every industry sector and creating new sectors never before envisioned. Louisiana has the ability and momentum to make major contributions in the digital domain.



BIOMEDICAL

Louisiana has a high percentage of citizens who suffer from obesity, diabetes, cancer and related diseases. Significant health care costs are imposed on our citizens and the nation as a result of these diseases. It is imperative for Louisiana researchers to discover cures, develop treatments, and promote health and quality of life for our citizens, and in so doing, to improve health care for all.



AGRICULTURAL

Agriculture has been a driver for Louisiana's economy for more than 200 years. Louisiana has a rich soil, an abundance of water, a favorable climate, and convenient distribution systems for agricultural produce and timber. The state will continue to supply the nation with agricultural products throughout the 21st century. Louisiana researchers have and will continue to play important roles in improving the productivity of agribusiness and the value of agricultural products.



CORE INDUSTRY SCIENCE & TECHNOLOGY SECTORS



Louisiana's existing industry sectors are largely an outgrowth of the state's natural resources and location. These sectors are in different stages of growth or decline, but all retain a critical mass for economic viability. Very few of these sectors have a significant focus on science and technology research and even fewer have corporate research and development operations in Louisiana. It is important that FIRST Louisiana recognize, encourage, and support research and innovation that could impact the long-term viability and growth of these industries.



CORE INDUSTRY SCIENCE & TECHNOLOGY SECTORS

Information Technology and Services
Agriculture and Bio-products
Energy and Environment
Healthcare

Petrochemical
Transportation, Construction and Manufacturing
Aerospace
Arts and Media

HIGH GROWTH TARGET INDUSTRY

Louisiana's higher education institutions and economic development organizations recognize the need to target the development of industry sectors that offer new opportunities for rapid growth and high wages for our citizens. These sectors are typically knowledge-based and born from or attracted by innovations resulting from academic research. They may also include spin-outs from existing companies with high levels of innovation activity. Such companies are highly dependent upon a ready supply of highly skilled knowledge workers associated with research universities, as well as experienced entrepreneurs and access to early-stage and venture capital.



HIGH GROWTH TARGET INDUSTRY

Materials & Chemicals
Energy Production
Coastal Resilience
Digital Media

Cyber Security
Biomedical
Bioengineered Solutions

**High Growth
Target Industry**

Materials & Chemicals
Energy Production
Coastal Resilience
Digital Media
Cyber Security
Biomedical
Bioengineered Solutions



**Core Industry
S&T Sectors**

Petrochemical
Energy & Environmental
Information Technology & Services
Arts & Media
Healthcare
Agriculture & Wood Products
Transportation, Construction & Manufacturing



**Translational
Research Domains**

Energy
Coastal
Environmental
Digital
Biomedical
Agricultural



**Core Enabling
S&T Research**

Materials Science & Nanotechnology
Computational Science &
Information Technology
Bioscience & Biotechnology



**21st Century
Building Blocks**

Atoms & Molecules
Bits & Bytes
Nucleic & Amino Acids



**Foundational
Sciences**

Physics
Chemistry
Math
Engineering
Computer Science
Earth Science
Agricultural Science
Biology
Biomedical Science
Economic & Social Science



GOALS & STRATEGIES

The goals, strategies and potential means of support for FIRST Louisiana initiatives differ by focus area, and are summarized below.



GOAL 1 Foundational Sciences

To retain, cultivate and attract world-class talent.

Primary Strategies

- Increase the number of eminently qualified research faculty
- Increase the number of STEM doctoral graduates
- Increase the pipeline of highly trained STEM students

Implementing Strategies

- Establish research mentoring programs for junior faculty
- Provide competitive start-up packages for faculty
- Plan and expand initiatives for recruiting endowed super-chairs
- Provide supplemental institutional doctoral fellowships
- Expand undergraduate research experiences

Investment Strategies

- Institutional investments
- BoRSF competitive opportunities: Endowed Chairs, Professorships, Graduate Fellowships, and R&D programs
- Competitive federal grants

Foundational Sciences



GOAL 2 21st Century Building Blocks

To lay the foundation for sustained innovation by developing and maintaining leadership-class infrastructure and facilities for fundamental research.

Primary Strategies

- Plan expansion of shared-use infrastructure resources across institutions
- Maintain leadership-class research infrastructure

Implementing Strategies

- Identify needs and funding sources for developing and maintaining critical infrastructure/instrumentation and renovating facilities
- Build major new shared-use research facilities

Investment Strategies

- Statewide infrastructure investments
- Major shared equipment enhancements

21st Century Building Blocks





GOAL 3 Core Enabling Science & Technology Research

To accelerate the growth of research and innovation centers of excellence in core technology areas that are applicable to existing and emerging industry sectors.

Primary Strategies

- Stimulate high-levels of innovation
- Pursue multi-institutional center grants

Implementing Strategies

- Provide incentives for high levels of innovation
- Create clusters of innovation on and across campuses
- Promote innovative models for technology transfer and commercialization
- Establish collaborative multi-institutional R&D centers including industry partners

Investment Strategies

- Institutional investments
- BoRSF enhancement
- Competitive federal grants

Core Enabling
S&T Research



GOAL 4 Translational Research Domains

To link, leverage and build upon statewide R&D resources in areas that are of strategic importance to Louisiana and the nation.

Primary Strategies

- Target niche areas aligned with resources, strengths, needs and opportunities
- Invest resources to build capacity in areas of competitive advantage

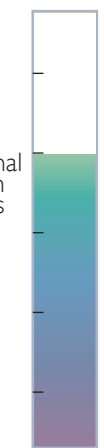
Implementing Strategies

- Organize State, regional and national conferences in target areas
- Provide matching funding for major grant opportunities in target areas
- Promote multi-institution and multi-state R&D initiatives

Investment Strategies

- EPSCoR/IDeA and other competitive Federal grants
- BoRSF special initiatives
- Designated Federal, State and industry funding
- Cluster hires

Translational
Research
Domains





GOAL 5 Core Industry Science & Technology Sectors

To enhance the competitiveness of core industry sectors through innovations from Louisiana's R&D enterprise.

Primary Strategies

- Foster U/I/G collaborative R&D and stimulate innovation
- Encourage small-business formation to accelerate technology development

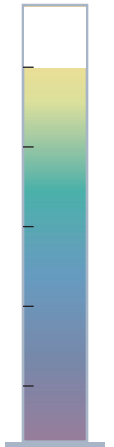
Implementing Strategies

- Establish a statewide entity for promoting and integrating U/I/G R&D
- Expand upon networking environments for academia and industry
- Institute an industry ties R&D grant program

Investment Strategies

- Industry R&D funding
- State industrial ties funding and tax credits
- Federal technology transfer funds

Core Industry
S&T Sectors



GOAL 6 High Growth Target Industry

To foster the growth of technology-based businesses in targeted areas aligned with university R&D strengths.

Primary Strategies

- Establish high-tech industry sectors in emerging areas

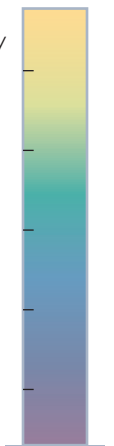
Implementing Strategies

- Recruit early-stage entrepreneurial companies
- Stimulate entrepreneurial activities
- Develop and market intellectual property

Investment Strategies

- State innovation seed funds and tax credits
- Industry and investor funding
- Federal SBIR, STTR and TIP funding

High Growth
Target Industry



TARGETED INVESTMENT STRATEGIES

FIRST Louisiana will leverage funding from federal, state and private sources to accomplish its major goals. The communication of these statewide directions and priorities will lead institutions to align strategic plans, resources, and future investments in ways that support FIRST Louisiana's goals. The focus area strategies and goals will provide direction to campuses in ensuring research activities are within the scope of the statewide plan.



Board of Regents Support Fund programs can play an important role in advancing FIRST Louisiana initiatives as well as in promoting multi-institutional collaborations. In particular, the Endowed Chairs for Eminent Scholars, Endowed Professorships and Graduate Fellowships programs support the recruitment and retention of talented faculty and students to Louisiana institutions. Research & Development and Enhancement programs support new faculty as they develop their research programs and laboratories. The Industrial Ties Research Subprogram supports collaborative research between university faculty and industry partners that is essential for successful transfer of information and technology. Special programs may also be established through the Support Fund for critical FIRST Louisiana priorities not sponsored through the traditional programs. Success in securing Support Fund grants will ensure the competitiveness of Louisiana researchers and help to leverage both federal funds and private-sector investment.

The Louisiana Experimental Program to Stimulate Competitive Research (Louisiana EPSCoR), supported by the National Science Foundation, provides leadership essential for building statewide research and workforce capacity. Louisiana EPSCoR will play a key role in aligning statewide initiatives with the goals of FIRST Louisiana to target and leverage EPSCoR/IDEA and other major federal grants. University faculty should become increasingly competitive for federal funding as research infrastructure and centers in the plan's S&T target areas are enhanced.

Some federal funding is also available to support collaborative industry/university research. Small Business Innovation Research (SBIR) and Small Technology Transfer Research (STTR) grants are supported by most federal agencies. Other agencies such as the National Institute of Standards and Technology (NIST) offer special programs to support Technology Innovation Partnerships. The National Science Foundation has opportunities such as the Grant Opportunities for Academic Liaison with Industry program and the Partnerships for Innovation program which provide direct support for industry/university collaborations.

The Louisiana Legislature and Governor have provided some funding for major strategic infrastructure advancements that have been central to development of FIRST Louisiana's core strengths. The Louisiana Innovation Council is expected to provide additional support in the future. In addition, the State of Louisiana provides strong encouragement of industry research through R&D tax credits.

Blue Ocean Initiative

Louisiana Economic Development conducted a study in 2009 that reviewed national industry characteristics and growth trends, resulting in the Blue Ocean Initiative which targets six "blue ocean" sector themes and twelve growth initiatives for Louisiana. The six sector themes align with Louisiana's traditional strengths and focus on research, innovations, and workforce development that bring new capabilities to the State. The Blue Ocean themes include Next Wave Oil and Gas, Water Management, Renewables and Energy Efficiency, Specialty Healthcare, Next Generation Auto, and Digital Media/Software Development. The growth of companies in these sectors will be enabled by innovations emerging from the research conducted in FIRST Louisiana's Translational Research Domains.

CONCLUSION

FIRST Louisiana is an important step forward for Louisiana, providing a comprehensive framework for science and technology development and investment across universities, private industry and government. Rooted in the State's existing investments and economic and educational priorities, the plan positions higher education institutions in the vanguard of Louisiana's growing high-tech economy, and maps a future which takes traditional strengths in 21st-century directions. This will create critical new opportunities for the State's businesses and industries, its universities, and its citizens. By investing in the comprehensive FIRST Louisiana framework, we are poised not just to join the new century of innovation, but to lead it.

