FIRST Louisiana 2030

Fostering Innovation through Research in Science & Technology in Louisiana

Approved January 2024

FIRST Louisiana 2030 Science and Technology Plan, a statewide document responding to federal funding agency requirements and adopted by the Louisiana Board of Regents, the State's coordinating authority for higher education, was updated based on collaborative discussion from members of the Louisiana Established Program for Competitive Research (LA EPSCoR) Committee and Advisory Committee for Advancement of Research in Louisiana (ACARL), comprised of representatives of public and private institutions across Louisiana, as well as state agencies interested in research and private-sector business and industry. 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.

INTRODUCTION

Fostering Innovation through Research in Science and Technology in Louisiana (FIRST Louisiana 2030) is the second, updated statewide plan that will help chart directions for institutional planning and update the foundation for a comprehensive statewide approach to science and technology research, development and innovation. This framework, rooted in the success of the previous iteration, continues to guide Louisiana's postsecondary 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.

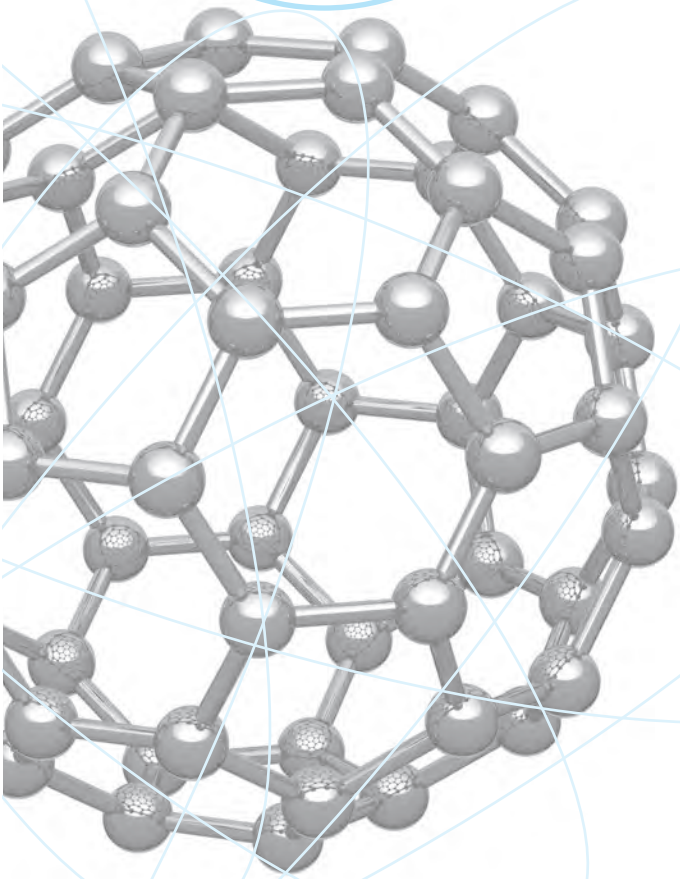
VISION

Louisiana's higher education institutions will catalyze new technology-based investments, educate a highly skilled and diverse workforce, and drive the State's technology-based innovation ecosystem.

The plan, developed in collaboration with research leadership across all Louisiana research institutions, public and private, 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 have been crucial in laying 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 manufacturing, information technology and biotechnology, known for cutting-edge research and innovation that significantly impact research competitiveness as well as attract existing and emerging industries. The research landscape presented in this plan is further rooted in comprehensive education and recruitment practices that will ensure expanded 21st-century opportunities for Louisiana.

Building on the advances made since the first Louisiana S&T plan, this plan includes strategies to enhance national competitiveness in use-inspired research that relate to both enabling science and technology and addressing State and federal priorities. 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 the Louisiana Department of Economic Development. The Plan's outcomes will be monitored to assess successes in building research capacity at Louisiana institutions, developing industry-university partnerships, and growing research-related start-ups in the State.

Science & Technology Framework



Foundations

Lay and maintain the foundations for sustained delivery and innovation by attracting and retaining world-class research talent.

Building Blocks

Continue to assemble a network of shared infrastructure for STEM research, education, and workforce development.

Networks of Excellence

Grow statewide networks of multidisciplinary excellence, expertise, and skills in core technology areas.

Innovation & Incubation

Build an ecosystem in which promising innovations are rapidly recognized and nurtured.

Target Industry Sectors

Drive translation of academic R&D innovations to practice into use, generating opportunities for all.

Strategic Focus Areas

FOUNDATIONS

Foundational science and engineering research provide critical basic knowledge and understanding out of which translational innovations can grow. Advances in basic science provide avenues to 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 federal support, 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. Louisiana has a long history of driving innovation and competitiveness through support for basic sciences, via both EPSCoR and State research funding.

FIRST Louisiana's engagement of a broad array of scientific and engineering disciplines has been 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. Also critical is a pipeline of support staff to provide the STEM skills necessary to support high-level R&D across the state.

FIRST Louisiana focuses broadly on the foundational science disciplines that form the core of 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 and workforce talent, provide an essential platform to support FIRST Louisiana's success growing its national competitiveness.

TARGETED FOUNDATIONAL SCIENCES

STEM Disciplines

Computer and Information Sciences

Social, Behavioral, and Economic Sciences

STEM Workforce Development

BUILDING BLOCKS

Among the building blocks that support major advances in science and technology are sophisticated research equipment and facilities. The high cost of acquiring, managing, and maintaining these building blocks can be offset by their shared use. Using this strategy and through a combination of federal, state, and private investments over the past two decades, Louisiana has positioned its innovation assets and cutting-edge research infrastructure to compete effectively in many 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.

Shared Experimental R&D Infrastructure

Accessible shared research facilities to serve the faculty statewide is critical for research competitiveness. A model of a successful framework is the Core User Facilities (CUF) for materials and manufacturing R&D - a network of cost-recovery centers with common access policies built with coordinated federal and state investments. Similar strategic and coordinated statewide investments in multiple research areas will propel Louisiana forward in other areas of science and technology.

Shared Computing & Data Infrastructure

The Louisiana Optical Network Infrastructure (LONI) 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 ACCESS network. The State should continue to maintain and update infrastructure for computing, communications, and data management.

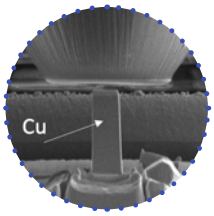
Shared Data & Research Libraries

World-class research requires access to databases and scientific literature, but the associated costs are prohibitive for most public institutions of higher education. However, duplicating databases and journals at multiple academic libraries is unnecessary in the age of electronic access, and the State has the LOUIS library consortium to leverage scale towards lowering costs. The State's limited resources yield greater impact by consolidating data and library services to serve all researchers, in much the same way LOUIS, CUF, and LONI resources are available to researchers statewide.

While Louisiana's existing collective materials, bio- and cyber-infrastructure provides a world-class scientific research environment, it could be quickly outdated without significant and persistent investment. It is imperative that Louisiana continues 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.

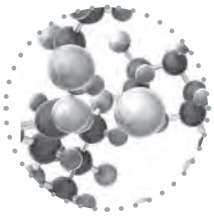
NETWORKS OF EXCELLENCE

Most significant innovations in the future will occur at the interface of traditional disciplines and have applications across multiple domains. No single institution of higher education in Louisiana is large enough to have critical masses of experts across all disciplines. Therefore, fostering interdisciplinary research and collaboration among the institutions in these Networks of Excellence is a priority for Louisiana. FIRST Louisiana places a major emphasis on the growth of multi-disciplinary networks of research centers with potential to bring together diverse areas of expertise and develop sustainable excellence in these cross-cutting areas. Research that emerges from these centers of excellence will play an essential role in driving innovation for Louisiana's existing and emerging industry sectors.



Materials & Manufacturing

Recent strategic investments have catalyzed a growing network of research centers with advanced tools to investigate the complex interdependence between materials, processing, and properties of the finished product. This gives Louisiana researchers the capability to design new materials tailored for the manufacturing process and application. The latest advances in artificial intelligence and machine learning will accelerate the discovery of emergent materials.



Bioscience & Biotechnology

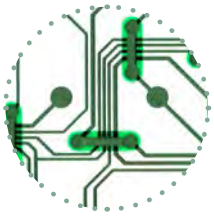
Louisiana has multiple centers of excellence focused on bioscience and biotechnology, which provide the foundation for competitive and potentially transformative advances in agriculture, biomedical sciences, forestry products, and healthcare solutions. A statewide effort to achieve greater collaboration and coordination between these entities will yield rich dividends.

Energy Solutions

Net zero carbon production of hydrogen, biofuels, specialty chemicals, carbon capture and sequestration are areas in which Louisiana is well-positioned to lead. The transition to cleaner energy sources for industrial production, power generation, and transportation requires broad multi-disciplinary collaborations to overcome not only technological barriers (e.g., storage, embrittlement, corrosion, etc.) but also economic and social barriers.

Environmental Solutions

Protection of the State's natural resources is essential for improving the quality of life for Louisiana's citizens. Innovative approaches to environmental monitoring, remediation and restoration are needed to reduce the impact of industrial development, mitigate the effects of natural disasters, and promote biodiversity.



Cross-cutting: Data, Computational Science, and Cybersecurity

The capabilities provided by the Louisiana Optical Network Infrastructure (LONI) to Louisiana researchers are vital for nearly all of the research directions identified above. Ongoing investments since 2005 in LONI's network and computing capabilities have helped maintain Louisiana's competitiveness for federal grants that support research in computational science and cybersecurity. The return on future LONI investments, and the value the network provides to diverse research areas, may be significantly enhanced by establishing well-coordinated statewide data management infrastructure.

INNOVATION & INCUBATION

Louisiana has a particular research footprint that has grown out of its unique location, history, culture and opportunities. FIRST Louisiana focuses on research domains that are of strategic importance to the State, 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 its business and industry. 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.

ADVANCED MANUFACTURING

Leveraging previous NSF investments in advanced manufacturing and materials, as well as the State's investments in cyberinfrastructure and human resources, Louisiana is poised to achieve sustainable excellence in Advanced Manufacturing materials research and education.

CLEAN ENERGY

Louisiana is one of the nation's leading energy producers of oil and gas. The challenge of recovering oil and gas from deep reservoirs has motivated much research and innovation. As the world reduces its dependence on fossil fuels, the efficient generation of hydrogen from natural gas, as well as its transportation and storage are expected to be major drivers of future energy research.

RESILIENCE & DISASTER RECOVERY

Given Louisiana's proximity to the Gulf of Mexico's coast, its large petroleum and natural gas reservoirs, and its vulnerability to natural disasters such as hurricanes and flooding, the State has much at stake and much to gain by being a national leader in research and development into resilient infrastructure and disaster recovery strategies.

BIOMEDICAL & HEALTH CARE SOLUTIONS

Louisiana has a high percentage of citizens who suffer from obesity, diabetes, cancer and related diseases. Significant healthcare costs are borne by 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, thus, improving health care for all. Louisiana's pursuit of the National Cancer Institute designation reflects this priority.

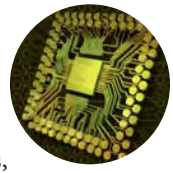
STRUCTURAL INTEGRITY ASSURANCE

Research in structural integrity assurance helps Louisiana's infrastructure, oil and gas, aerospace, marine and maritime, construction, advanced manufacturing, chemical, petrochemical, and energy processing industries by lessening the financial and human impacts of mechanical and structural failure through advanced technology development in monitoring, prediction, characterization, and testing.

COASTAL RESTORATION

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 shipping and ports. The coast presents special challenges as it is subject to hurricanes, inundation, erosion, and environmental attacks. Research is essential to the continued viability of dependent industries, the protection of Louisiana's land mass, and future economic growth.

CYBER-PHYSICAL SYSTEMS



Cyber research in Louisiana has been bolstered by major investments in infrastructure and academic programs in cyber-related fields. Computers, sensors, networks, and artificial intelligence are transforming every industry sector and creating new sectors never before envisioned. Louisiana has the resources and momentum to make major contributions in the digital domain.

AGRICULTURE & FORESTRY PRODUCTS

Agriculture and forestry have been drivers for Louisiana's economy for more than 200 years. Louisiana has 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 and forestry products throughout the 21st century. Louisiana researchers have played and will continue to play important roles in improving the productivity of agri-business and the value of agricultural products.

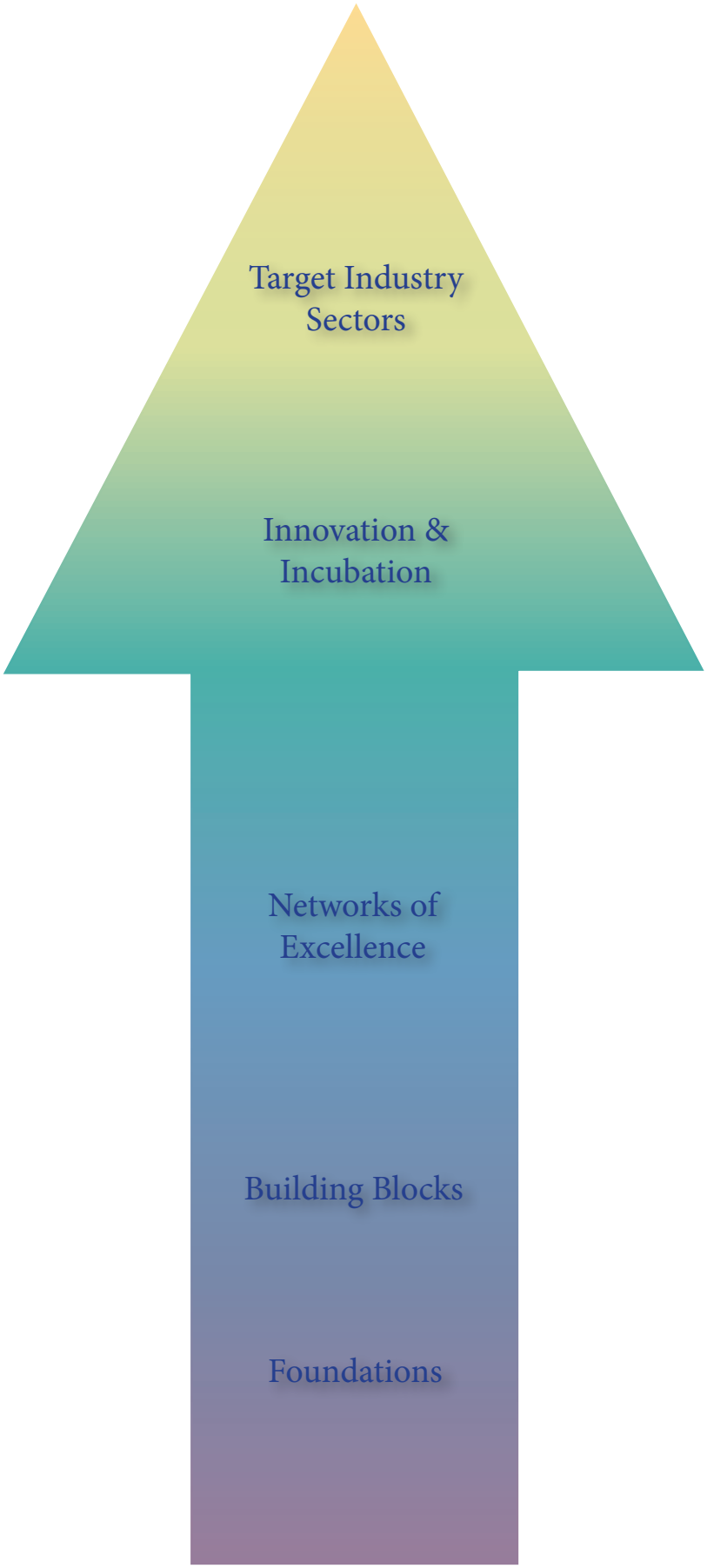
TARGET INDUSTRY SECTORS

- Clean and Renewable Energy
- Advanced Manufacturing
- Healthcare
- Bioengineering
- Resilient Infrastructure

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 located corporate research and development operations in Louisiana. It is important that FIRST Louisiana recognizes, encourages, and supports research and innovation that could impact the long-term viability and growth of these industries.

Since the first statewide S&T plan, Louisiana's higher education institutions and economic development organizations have embraced 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. University-industry partnerships for use-inspired R&D will continue to foster innovation and contribute to economic development in Louisiana.

Science & Technology Framework



Clean and Renewable Energy
Advanced Manufacturing
Healthcare
Bioengineering
Resilient Infrastructure

Clean Energy
Advanced Manufacturing
Structural Integrity Assurance
Biomedical and Healthcare Solutions
Agriculture and Forestry Products
Resilience and Disaster Recovery
Coastal Restoration
Cyber-Physical Systems

Energy
Materials and Manufacturing
Environmental Monitoring and Remediation
Bioscience and Biotechnology
Cross-cutting: Data, Computational Science, and Cybersecurity

Shared Experimental R&D Infrastructure
Shared Computing and Data Infrastructure
Shared Data and Research Libraries

STEM Disciplines
Computer and Information Sciences
Social, Behavioral, and Economic Sciences

Goals & Strategies

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

GOAL 1 Foundations

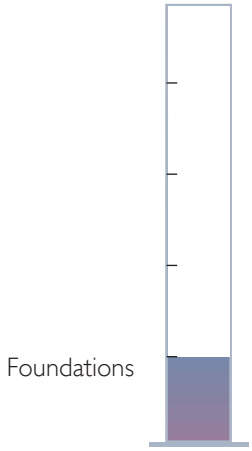
To retain, cultivate and attract world-class talent.

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 in target disciplilnes
- Provide supplemental institutional doctoral fellowships
- Expand undergraduate research experiences



Investment Strategies

- Institutional investments
- Board of Regents Support Fund (BoRSF) competitive opportunities: Endowed Chairs, Departmental Enhancements, and R&D programs
- Competitive federal grants

GOAL 2 Building Blocks

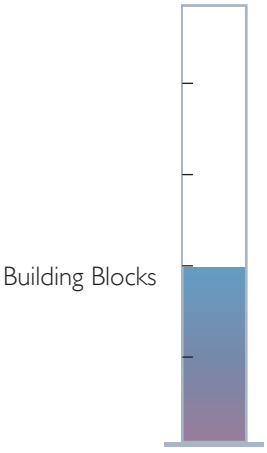
To strengthen the foundation for sustained innovation by developing and maintaining state-of-the-art infrastructure and facilities for fundamental research.

Primary Strategies

- Expand shared-use R&D infrastructure resources across institutions
- Maintain and grow state-of-the-art 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
- Eliminate unnecessary duplication in digital databases and peer-reviewed literature



Investment Strategies

- Statewide infrastructure investments
- Major shared equipment enhancements

Goals & Strategies

GOAL 3 Networks of Excellence

To incentivize the coordination between centers of excellence in core technology areas relevant to existing and emerging industry sectors.

Primary Strategies

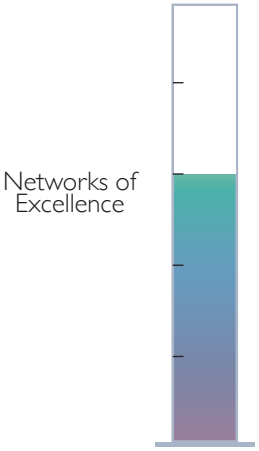
- Incentivize multi-institutional coordination of research activities
- Pursue multi-institutional center grants

Implementing Strategies

- Grow clusters of innovation on and across campuses
- Establish collaborative multi-institutional R&D centers including industry partners

Investment Strategies

- Institutional investments
- BoRSF enhancement grants
- Competitive federal grants
- Cluster hires and retention strategies



GOAL 4 Innovation & Incubation

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

Primary Strategies

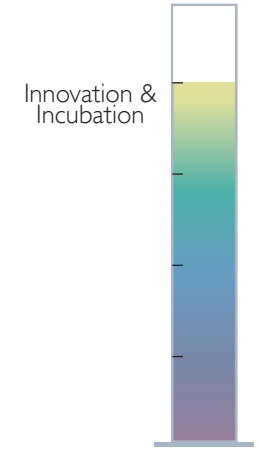
- Target niche areas aligned with resources, strengths, needs and opportunities
- Invest resources to build capacity in areas of competitive advantage

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
- Promote innovative models for technology transfer and commercialization

Investment Strategies

- EPSCoR/IDeA and other competitive federal grants
- BoRSF legislative special initiatives
- Designated federal, State and industry funding



Goals & Strategies

GOAL 5 Target Industry Sectors

To foster the growth of technology-based businesses in targeted areas aligned with R&D strengths at higher education institutions.

Primary Strategies

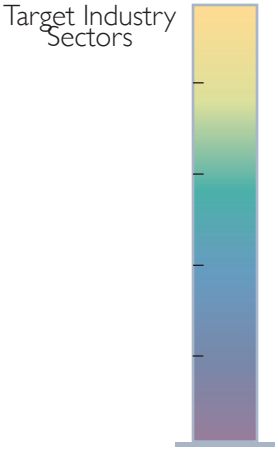
- Coordinate with LED to target industries in emerging areas

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



Targeted Investment Strategies

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

Board of Regents Support Fund programs 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 Endowed Graduate Scholarship programs enable 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 promotes 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 Established 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. 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 drive collaborative industry/university research. Small Business Innovation Research (SBIR) and Small Technology Transfer Research (STTR) grants are supported by most federal agencies. The Industry/University Cooperative Research Center (IUCRC) program of the National Science Foundation is a highly successful model for industry-university collaboration. Other agencies such as the Department of Energy, Department of Defense, the National Institute of Health, Environmental Protection Agency, and NASA offer additional opportunities.

Louisiana Economic Development, a State agency, the highly diverse and inclusive Advisory Committee for Advancement of Research in Louisiana (ACARL) appointed by the Louisiana Board of Regents, and the Louisiana EPSCoR Committee provide guidance for research investment strategies.

Conclusion

FIRST Louisiana is a crucial part of Louisiana's continued evolution into a science and technology powerhouse, providing a comprehensive framework for science and technology development and investment across universities, private industry and government and for the benefit of all residents of the state. Rooted in the State's ongoing 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 continues to build strengths in 21st-century innovation and provide opportunities for a diverse STEM workforce. This will create critical new opportunities for the State's businesses and industries, its higher education institutions, and its citizens. By embracing the comprehensive FIRST Louisiana framework, we are advancing our leadership in the new century of innovation.