New Mexico S&T Plan

Statewide Framework for Foundational Research and Scientific Workforce Development

Prepared by NM EPSCoR
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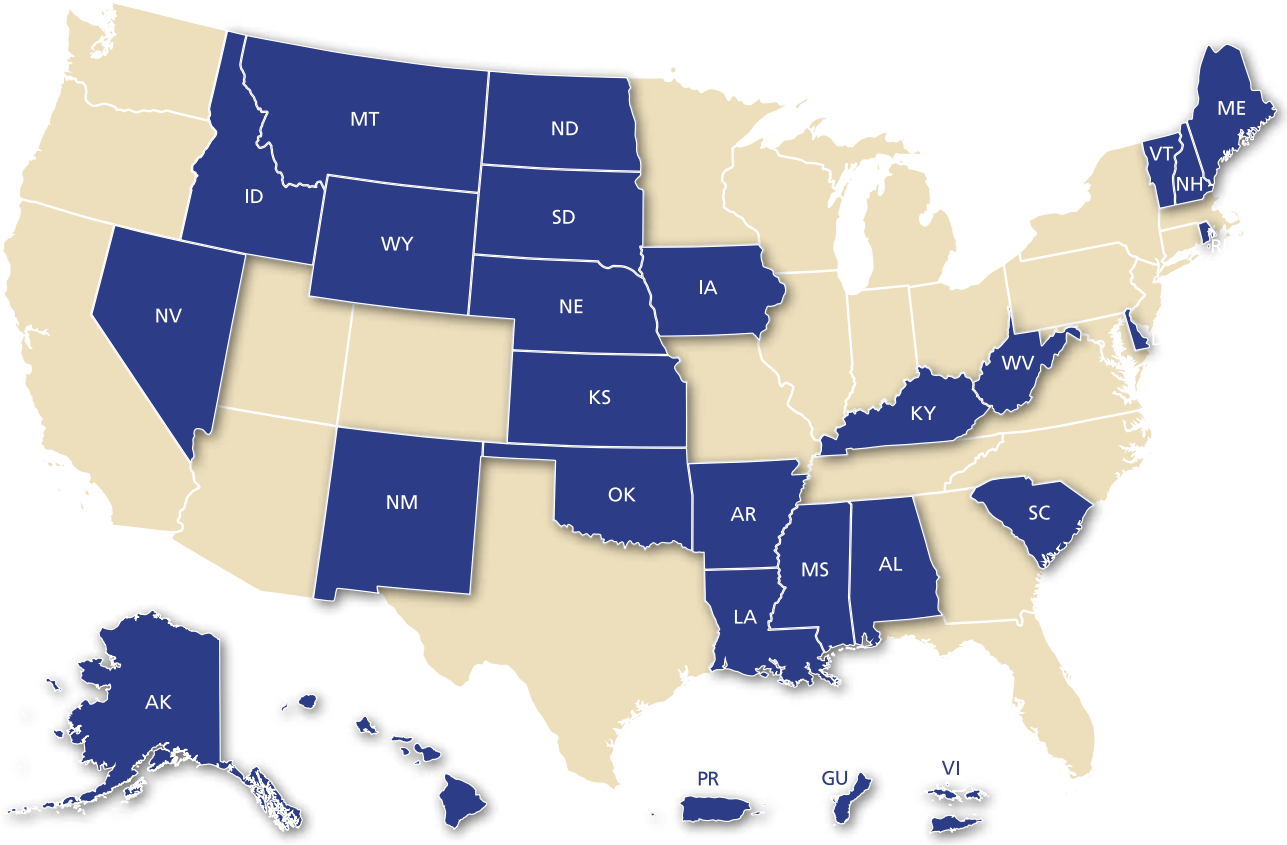
New Mexico EPSCoR
Advancing Collaborative Research Excellence in New Mexico

National Science Foundation EPSCoR Jurisdictions



NSF EPSCoR
ADVANCING GEOGRAPHIC DIVERSITY IN STEM

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I am pleased to present the *New Mexico S&T Plan: Statewide Framework for Foundational Research and Scientific Workforce Development* (*S&T Plan*), the culmination of more than two decades of work by New Mexico's research community participating in the National Science Foundation's (NSF) Established Program to Stimulate Competitive Research (EPSCoR).

As one of 28 "jurisdictions" (U.S. States and Territories) approved for participation in this national initiative designed to enhance scientific and economic success, New Mexico has benefited from more than $100 million dollars invested in research across the state and has engaged more than 2,000 researchers in five major research investment programs through collaboration across New Mexico's research institutions, national laboratories, higher education institutions, and K-12 STEM initiatives. This investment has brought in more than $120 million dollars in additional research funding to New Mexico in just the past five years.

In a major restructuring of its EPSCoR program two years ago, NSF asked the jurisdictions to refocus their efforts from the previous model where infrastructure was built over three to five years, to new initiatives designed to strengthen the overall research ecosystem, infrastructure, and long-term competitiveness of participating EPSCoR jurisdictions. At the same time, the national EPSCoR landscape has broadened, with increasing coordination and impact across multiple federal agencies, encouraging long-term efforts to build foundational research capabilities. The New Mexico EPSCoR State Office and our research institutions have successfully embraced these new concepts and are quickly expanding a broad framework for building fundamental science and research capacity that reflects New Mexico's unique research infrastructure, institutional strengths, economic need, and societal challenges.

The development of the *S&T Plan* was led by Strategic Planning Committee Chair, Dr. John Engen, CEO and Director of Research at the New Mexico Consortium (NMC), in collaboration with the New Mexico EPSCoR State Office, the New Mexico EPSCoR Jurisdictional Steering Committee, and numerous stakeholders from across the state. In particular, we worked with the New Mexico Economic Development Department (now Economic Development New Mexico) and the newly established Technology and Innovation Office (TIO) to build upon the priorities and opportunities identified in *New Mexico's S&T Roadmap: Prioritizing Investments for Enhanced Competitiveness in Science and Technology*, published in 2025. The *S&T Plan* focuses on the early investments needed to develop a robust, innovation-based economic development system in New Mexico.

Our future success is only limited by our imagination and dreams...

John (Jack) Jekowski
New Mexico EPSCoR Jurisdictional Steering Committee Chair

The Role of the New Mexico S&T Plan in a Changing Research Landscape

The New Mexico Science and Technology Plan (S&T Plan) has historically served as a strategic document to guide research priorities for the National Science Foundation Established Program to Stimulate Competitive Research (NSF EPSCoR) Track-1 program. Earlier versions of the plan identified specific research focus areas to align statewide efforts and build critical mass in selected topics. This approach reflected the Track-1 center model, in which states organized large collaborative research centers around a small number of targeted scientific themes. The previous plan emphasized building research capacity in areas aligned with economic development priorities, workforce development, and commercialization pathways, while strengthening partnerships among universities, national laboratories, industry, and government.

Recently, the NSF EPSCoR program transitioned from the Track-1 center model toward new initiatives such as EPSCoR Collaborations for Optimizing Research Ecosystems (E-CORE) and EPSCoR Research Infrastructure Improvement through Engagement (E-RISE). These programs shift the emphasis away from a single, topic-focused center toward strengthening the overall research ecosystem, infrastructure, and long-term competitiveness of participating EPSCoR states/territories (called "jurisdictions"). At the same time, the national EPSCoR landscape has broadened, with increasing coordination and impact from EPSCoR programs across multiple federal agencies, including the U.S. Department of Energy (DOE), the National Aeronautics and Space Administration (NASA), the National Institutes of Health (NIH) IDeA Networks of Biological Research Excellence (INBRE), the Department of Defense (DoD), and other mission-driven agencies. This multi-agency engagement reflects a growing recognition that building sustainable research capacity requires aligned investments

across diverse scientific and technological focus areas. As a result, the purpose of the S&T Plan has evolved. Rather than serving primarily as a mechanism to select a small number of research topics, the plan is now intended to guide the broader direction of foundational research and scientific investment across the state, positioning New Mexico to effectively leverage opportunities across this expanded federal ecosystem.

This shift represents a significant philosophical change. The new S&T Plan is not intended to limit research in New Mexico to a small set of topics, nor to act as a gatekeeping document that determines which fields are supported and which are not. Instead, the plan establishes a broad framework for science and research capacity building that reflects New Mexico's unique research infrastructure, institutional strengths, economic needs, and societal challenges.

The goal is to create a flexible and inclusive framework that supports discovery-driven research across multiple disciplines while enabling New Mexico to remain competitive in emerging scientific and technological areas.

New Mexico's research ecosystem is unlike that of most states. It includes two major national laboratories, Los Alamos National Laboratory (LANL) and Sandia National Laboratories (SNL), the Air Force Research Laboratory (AFRL), multiple research universities, community colleges, tribal colleges, specialized user facilities, and a growing technology and entrepreneurship sector. The state also faces unique challenges and opportunities related to water, energy, national security, rural communities, environmental resilience, and economic diversification. The S&T Plan serves as a strategic guide for how foundational research can support the long-term scientific, economic, and societal needs of the state.

The intent of this document is to guide research investments, infrastructure development, workforce development, and collaboration strategies across institutions throughout New Mexico. It is designed to support institutions of different sizes and missions by enabling meaningful participation in research across a broad range of scientific focus areas. In this way, the S&T Plan supports the development of a statewide research ecosystem rather than a single research center or topic area.

Ultimately, the S&T Plan is a framework for strengthening research and scientific capacity across the state. By focusing on foundational science, research infrastructure, workforce development, and collaboration, the plan aims to position New Mexico as a national leader in emerging scientific fields while supporting economic development and societal resilience over the long term.

Connecting Foundational Research to New Mexico's Innovation and Economic Development Ecosystem

New Mexico's economic development strategy recognizes that innovation-based economic growth depends on a pipeline that begins with basic science and fundamental research (together called "foundational research") and progresses through applied research, technology development, commercialization, and business growth. The state's Economic Development Department (NMEDD) framework, published in July 2025 "*New Mexico's S&T Roadmap: Prioritizing Investments for Enhanced Competitiveness in Science and Technology*" describes this innovation ecosystem as a continuum that includes basic science, applied research and development, prototyping and demonstration, technology transfer, new enterprise development, and expansion of technology-based businesses, as shown in Figure 1.

Within this innovation ecosystem, the S&T Plan primarily addresses the research phase of the pipeline, specifically basic science and portions of applied research and development (left box in Figure 1). The focus of the NM S&T Roadmap from NMEDD is to identify and support five existing S&T areas that are currently showing economic promise (Quantum Systems and Applications; Advance Energy Technologies; Space, Aerospace and Defense Systems; Biosciences Innovation, and Agriculture, Water & Ecosystem Nexus).

Because basic science and applied R&D are the foundation upon which new technologies, companies, and industries are built, without sustained investment in early-stage research (left side of Figure 1), the later stages of the innovation ecosystem (right side of Figure 1) cannot be sustained.

The innovation ecosystem model highlights the critical importance of capital for pre-seed, seed, and venture funding to support new businesses and commercialization activities. However, an equally important component of the innovation pipeline is sustained investment in research and early-stage scientific discovery. Just as capital is required to support startup companies and commercialization, sustained funding mechanisms are needed to support basic science, research infrastructure, faculty, and early-stage applied research across the state's universities and research institutions.

Investment in foundational research provides several long-term benefits to New Mexico:

- Builds research capacity and competitiveness for federal funding.
- Develops a highly skilled scientific and technical workforce.
- Supports innovation and technology development over long-time horizons.
- Enables universities and laboratories to respond to emerging national priorities.
- Provides the knowledge base that leads to new industries and economic diversification.

For New Mexico, the connection between research and economic development is particularly important because the state's innovation ecosystem relies heavily on the interaction between universities, national laboratories, industry, and government. Strengthening the research phase of the innovation ecosystem ensures that New Mexico can continue to generate new knowledge, new technologies, and new companies.

The S&T Plan therefore supports the development of **research pathways across the state.** These pathways enable institutions of different sizes and missions, including research universities, regional universities, community colleges, tribal colleges, and partner institutions, to participate in the research ecosystem in ways that are meaningful and aligned with their strengths. Research pathways include workforce development, access to research infra-

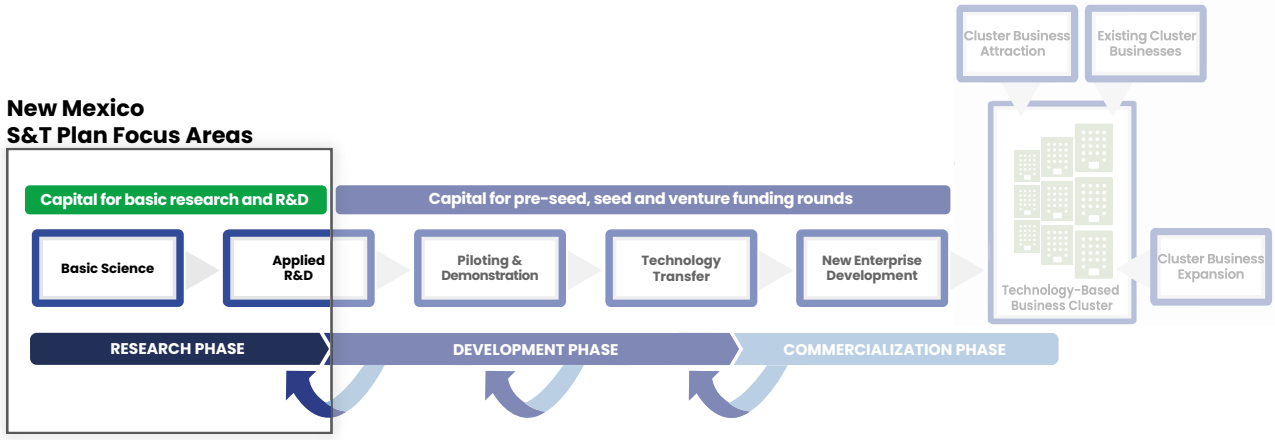


Figure 1. S&T Plan Focus Areas Within an Innovation-Based Economic Development Ecosystem. Modified from Figure 19, p. 108, New Mexico's S&T Roadmap, New Mexico Economic Development Department, July 2025. Source: TEConomy Partners, LLC.

structure, participation in collaborative research projects, and opportunities for students to engage in research experiences.

By strengthening research pathways and investing in foundational research, New Mexico can ensure that the entire state participates in, and benefits from, the research and innovation ecosystem. The S&T Plan serves as the strategic framework to connect foundational research, research infrastructure, workforce development, and innovation to the long-term economic and societal needs of the state.

New Mexico S&T Plan: Statewide Framework for Foundational Research and Scientific Workforce Development

1. Vision and Mission

1.1 Vision

New Mexico will be a nationally recognized leader in foundational research, innovation, and technology development, supported by a collaborative statewide research ecosystem that advances scientific discovery, economic opportunity, environmental resilience, and societal well-being.

1.2 Mission

The mission of the S&T Plan is to provide a strategic framework for strengthening foundational research, research infrastructure, and workforce development across the state, enabling all institutions to participate in the research ecosystem and positioning New Mexico to compete in emerging scientific and technological fields.

2. Strategic Objectives

These objectives are informed by New Mexico's unique research ecosystem, which includes world-class national laboratories, research universities, and specialized user facilities. This ecosystem is further shaped by the state's rich cultural heritage, diverse communities, including strong representation from Native American and Hispanic populations, and a history of scientific leadership in areas such as national security, energy, and space research. New Mexico's distinctive geography and environment also provide natural laboratories for research in climate, water, energy, and environmental resilience. Together, these assets—people, place, and infrastructure—provide a distinctive environment for advancing foundational science across multiple disciplines while enabling collaboration at a national and international scale.

Objective 1: Expand Foundational Research Capacity

Expand New Mexico's capacity for discovery-driven research by strengthening core scientific programs, increasing competitiveness for federal funding, and supporting interdisciplinary collaborations. This objective emphasizes building sustained research excellence across institutions to advance knowledge and position the state in emerging scientific frontiers.

Objective 2: Strengthen Research Infrastructure

Strengthen research infrastructure by expanding access to shared facilities, testbeds, advanced instrumentation, and cyberinfrastructure across the state. This objective emphasizes coordinated investments that enhance research capabilities, promote collaboration, and ensure broad accessibility for institutions and researchers statewide.

Objective 3: Build a Diverse Scientific Workforce

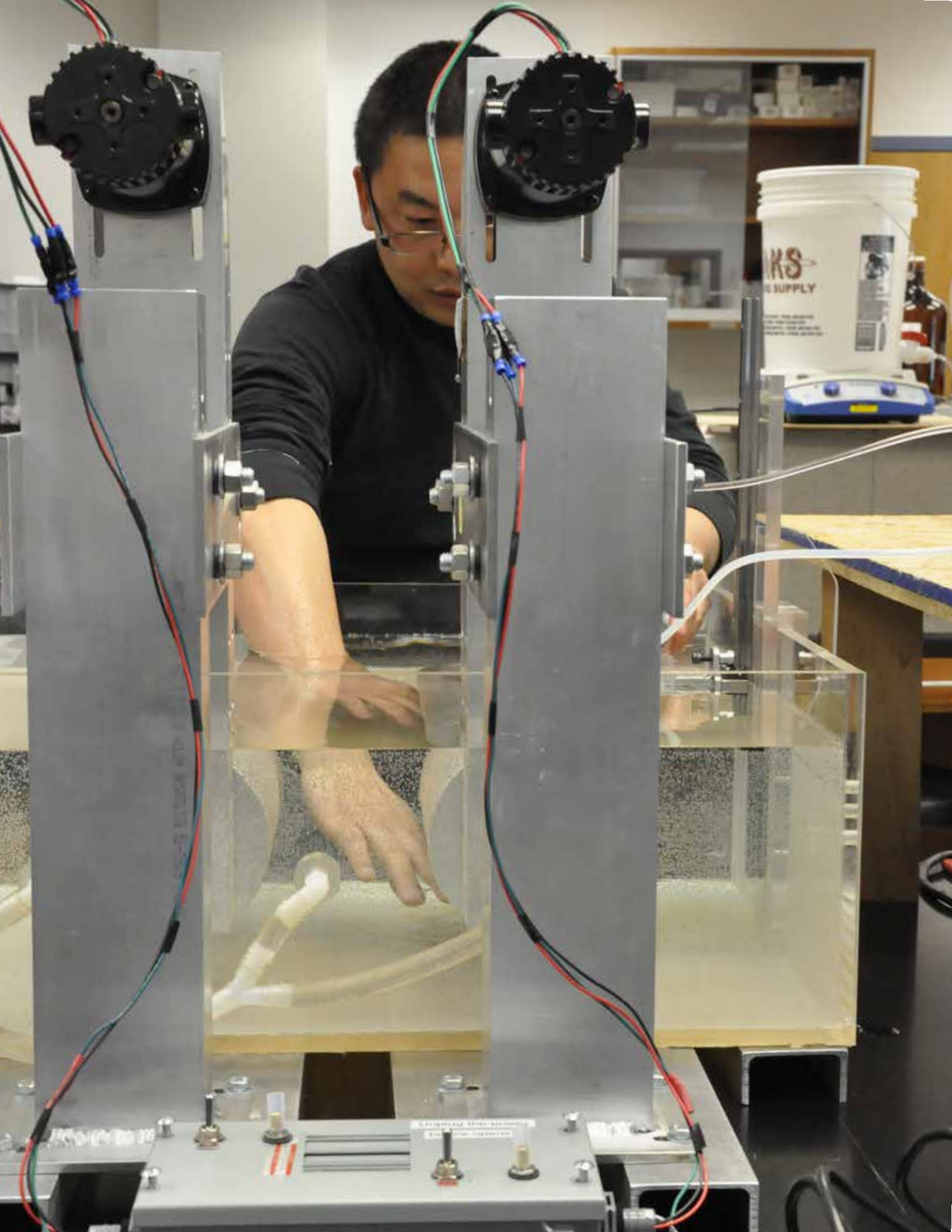
Build a diverse and inclusive scientific workforce by strengthening education and training pathways, expanding participation from underrepresented communities, and integrating research with experiential learning. This objective emphasizes developing the talent needed to sustain and grow New Mexico's research enterprise.

Objective 4: Foster Convergence and Collaboration

Foster convergence and collaboration by enabling interdisciplinary research and strengthening partnerships across universities, national laboratories, and other institutions. This objective emphasizes pre-competitive, collaborative environments that accelerate discovery and address complex scientific challenges.

Objective 5: Position New Mexico as a National Research Leader

Position New Mexico as a national leader in research by aligning with federal priorities, strengthening strategic partnerships, and increasing visibility in emerging scientific frontiers. This objective emphasizes building reputation, competitiveness, and leadership in areas of scientific excellence.



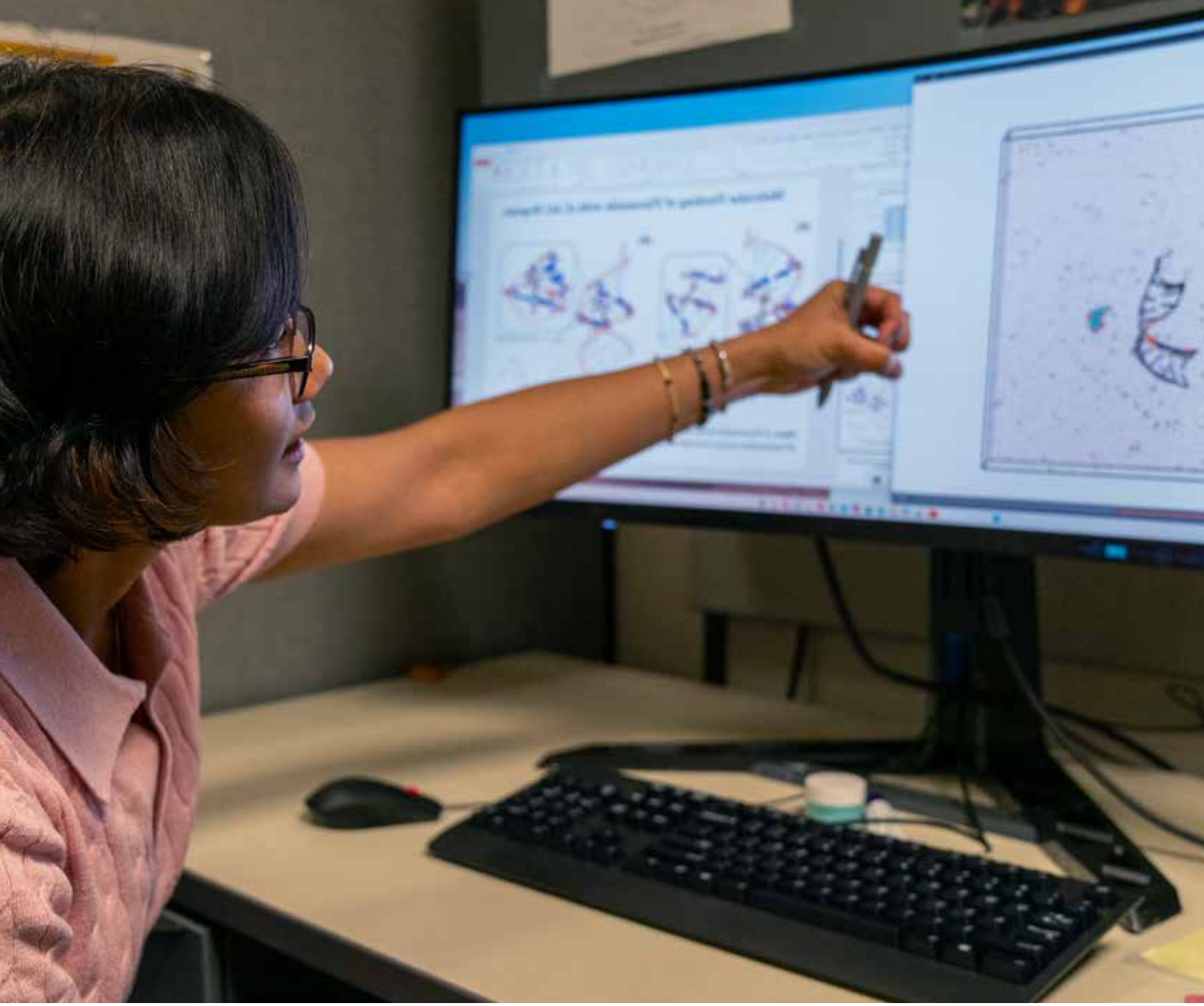
3. Science and Technology Focus Areas

The research focus areas identified in this plan are intentionally broad and foundational, recognizing that transformative innovation often emerges from advances in fundamental science. These priorities directly support the growth opportunity areas identified in the *New Mexico S&T Roadmap*—including Quantum Systems and Applications, Advanced Energy Technologies, and Space, Aerospace, and Defense Systems—and provide critical scientific underpinnings for emerging opportunities in Bioscience Innovation and the Agricultural, Water, and Ecosystem Technology Nexus. Together, these investments strengthen New Mexico's research enterprise while creating the knowledge base, talent pipeline, and infrastructure needed to support future economic growth.

These focus areas represent a broad and flexible research portfolio that enables New Mexico to address scientific challenges while leveraging its unique institutional strengths. This approach ensures resilience, adaptability, and long-term impact in a rapidly evolving national and global research landscape. The focus areas are divided into three broad categories, Foundational Sciences, Enabling Sciences, and Societal & Environmental Systems, see Figure 2.

Foundational Sciences	Enabling Sciences	Societal & Environmental Systems
Fundamental Physical Sciences	Engineering & Emerging Technologies	Geosciences & Environmental Resilience
Biological Systems & Human Health	Computing, Data & Intelligent Systems	Human & Societal Systems
		STEM Education & Research Pathways

Figure 2. New Mexico's S&T Plan Focus Areas.



3.1 Fundamental Physical Sciences

The Fundamental Physical Sciences focus area involves fundamental research to understand the principles governing matter, energy, and their interactions. It spans disciplines such as physics, chemistry, and mathematics, including emerging areas like quantum science, photonics, and advanced materials. This work develops theoretical, computational, and experimental foundations that enable deeper insight into physical systems and underpin future scientific and technological advances.

3.2 Engineering and Emerging Technologies

The Engineering and Emerging Technologies focus area involves design, control, and integration of complex engineered systems. It broadly encompasses engineering topics such as semiconductor science, nanoscale devices, rapid prototyping, advanced manufacturing, systems engineering, and mineral, petroleum & natural gas engineering with an emphasis on the underlying physical principles that enable new functionalities. This work advances the scientific foundations of engineering while supporting the development of next-generation technologies.

3.3 Computing, Data, and Intelligent Systems

The Computing, Data, and Intelligent Systems focus area involves computation, data science, and information systems. It includes areas such as artificial intelligence, high-performance computing, quantum computing, algorithms, data storage, and cyber-physical systems, with an emphasis on developing new methods for processing, modeling, and understanding complex data and systems. This work advances the theoretical and computational foundations that enable scientific discovery and next-generation technologies.

3.4 Biological Systems and Human Health

The Biological Systems and Human Health focus area involves fundamental research to understand living systems across molecular, cellular, organismal, and ecological scales. It includes areas such as molecular biology, bioengineering, neuroscience, and systems biology, advancing knowledge of biological function, resilience, and dysfunction. This work provides the foundational understanding needed to inform human health, strengthen agricultural systems, enable biomedical innovation, and deepen insight into complex life processes.

3.5 Geosciences and Environmental Resilience

The Geosciences and Environmental Resilience focus area involves understanding the processes that shape the Earth and its environment. It includes areas such as climate science, water science, geology, and environmental systems, with an emphasis on observing, modeling, and predicting complex Earth system dynamics. This work advances foundational knowledge of natural systems while also providing insight into environmental variability, risk, and resilience, supporting informed responses to changing conditions and long-term sustainability.

3.6 Human and Societal Systems

The Human and Societal Systems focus area involves human behavior, social systems, and economic dynamics. It includes areas such as decision-making, social networks, innovation systems, and the societal impacts of technology, with an emphasis on developing theories and data-driven insights into complex human systems. This work provides a foundation for understanding how individuals and societies adapt to, and shape, technological and environmental change.

3.7 STEM Education and Research Pathways

The STEM Education and Research Pathways focus area addresses how individuals learn, engage with, and persist in science, technology, engineering, and mathematics. It encompasses areas such as learning sciences, education systems, technical training, and workforce development, with an emphasis on designing and evaluating research pathways that support progression from education to participation in research and innovation. This work advances evidence-based approaches to broaden participation, improve outcomes, and develop a diverse, skilled, and adaptable scientific workforce.

4. Cross-Cutting Research Themes

The cross-cutting research themes represent foundational capabilities that span multiple scientific and engineering disciplines and enable broad collaboration across New Mexico's research ecosystem.

4.1 Convergence Science

Convergence Science focuses on integrating knowledge, methods, and perspectives from multiple disciplines to address complex scientific challenges. It emphasizes collaborative, cross-cutting research that brings together fields such as physical sciences, engineering, computing, and life sciences to enable new discoveries and approaches. This work fosters innovation at disciplinary boundaries and accelerates advances that cannot be achieved within a single field alone. In New Mexico, convergence science is uniquely enabled by the close proximity and complementary capabilities of national laboratories and research universities.

4.2 Advanced Research Infrastructure

Advanced Research Infrastructure focuses on the development and access to shared scientific facilities, testbeds, instrumentation, and cyberinfrastructure that enable cutting-edge research. It includes areas such as nanofabrication, high-performance computing, quantum computing, advanced characterization tools, and data platforms, with an emphasis on statewide accessibility and collaboration. This infrastructure provides the foundational capabilities required to support discovery and innovation across disciplines.

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New Mexico EPSCoR
University of New Mexico
MSC04 2815
1312 Basehart Rd SE
Albuquerque, NM 87106


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