New Mexico's S&T Roadmap:

Prioritizing Investments for Enhanced Competitiveness in Science and Technology

Prepared for: New Mexico Economic Development Department
Prepared by: TEConomy Partners, LLC

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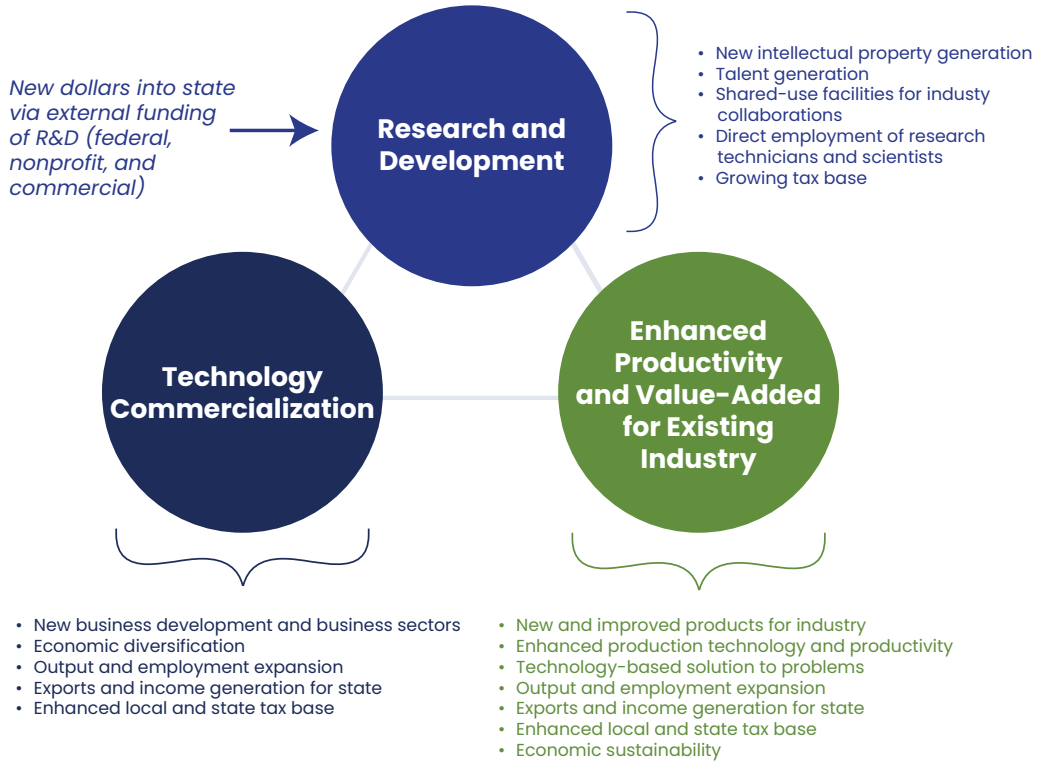
Innovation is a key driver of economic growth—leading to high-quality jobs and rising standards of living (Figure ES-1).

As the World Economic Forum in its highly touted *Global Competitiveness Report* explains:

> *In the long run, standards of living can be expanded only by technological innovation … This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors.*[1]

FIGURE ES-1. INNOVATION-LED DEVELOPMENT IS A KEY DRIVER OF ECONOMIC GROWTH



Source: TEConomy Partners, LLC.

1 World Economic Forum, The Global Competitiveness Report 2010–2011, page 8.

Economic advancement in New Mexico has been driven by scientific innovation for over 80 years, heavily influenced by its role in nuclear weapons development during World War II and subsequent research and development in related fields. Today, New Mexico has the opportunity to leverage its existing research assets to drive future growth in high-value science and technology sectors. The state has demonstrated significant capacity in key industries such as aerospace, cybersecurity, and renewable energy. However, as detailed in the 2021 statewide strategic plan, *Empower & Collaborate: New Mexico's Economic Path Forward*, the state must now prioritize strategic investments that will solidify its competitive advantage in these sectors.

New Mexico's S&T Growth Opportunity Areas

To maintain competitiveness and ensure long-term economic resilience, New Mexico must build on the foundation laid by its rich science and technology (S&T) ecosystem, which is driven by Los Alamos National Laboratory (LANL), Sandia National Laboratories (Sandia), and Air Force Research Laboratory (AFRL) at Kirtland Airforce Base, as well as the state's academic research universities—University of New Mexico (UNM), New Mexico State University (NMSU), and New Mexico Institute of Mining and Technology (NMT). These assets provide a strong base for attracting talent, fostering innovation, and commercializing research in ways that can spur sustainable economic growth.

To better understand the alignment of New Mexico's industrial innovation needs with the core competencies of its research institutions, a rigorous, data-driven approach was undertaken to identify S&T opportunity areas that New Mexico should target for future economic growth. The intersection of where New Mexico excels in the "market pull" of industrial innovation activities and the "technology push" of research capabilities represents the greatest opportunities for future economic growth.

Ultimately, three existing S&T growth opportunity areas and two emerging S&T growth opportunity areas were identified for New Mexico (Figure ES-2). These opportunities can be considered those areas in which New Mexico is best positioned to compete in growing, innovation-led markets that can help sustain the state's leading industry sectors as well as advance emerging markets in new industries of the future. Each of these growth opportunity areas is supported by cross-cutting technical expertise and capabilities that enable innovation and technology development. These capacity areas form the foundational support that cut across specific markets. These enabling capabilities, while not growth areas in isolation, play a pivotal role in translating New Mexico's scientific strength into economic opportunity.

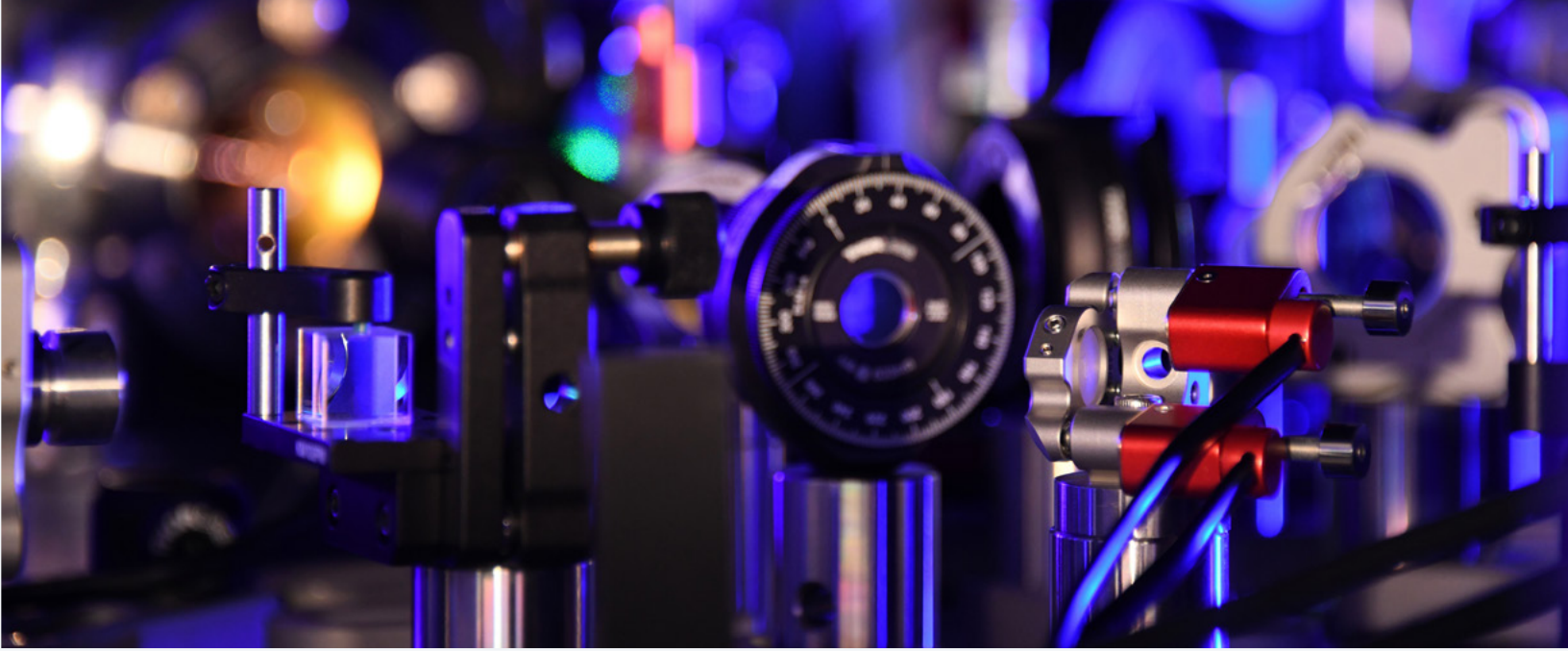
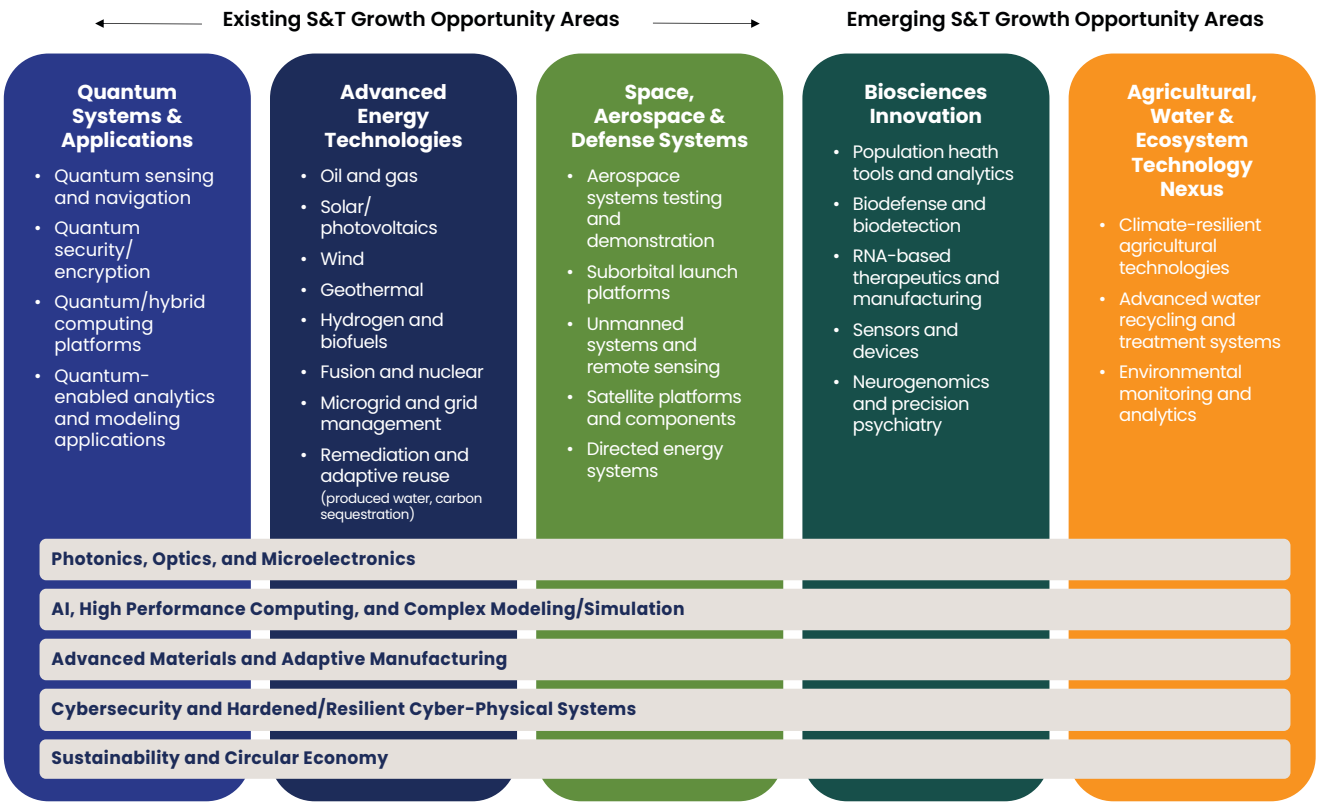


FIGURE ES-2. NEW MEXICO'S S&T GROWTH OPPORTUNITY AREAS



Source: TEConomy Partners, LLC

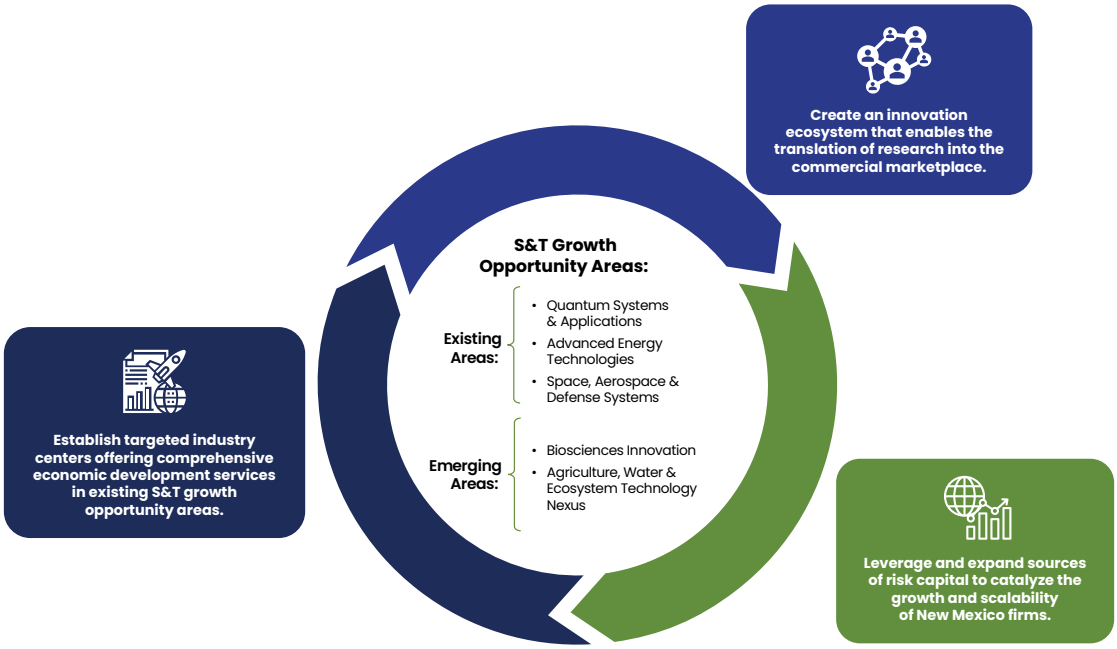
New Mexico's S&T Roadmap: Prioritizing Investments for Enhanced Competitiveness in S&T

While there can be no doubt that New Mexico stands out as an R&D powerhouse, there continues to be untapped potential in the state's ability to commercialize its research base into high-growth startups and industrial partnerships. Across numerous innovation measures, New Mexico consistently ranks behind many of its benchmark states. To reverse these trends, New Mexico must focus on accelerating the number of promising ideas that successfully navigate the innovation continuum, ultimately leading to the location or expansion of existing industry players and the scaling of new businesses that sustain their growth as they generate new, high-paying jobs across the state.

Changing the trajectory of New Mexico's economy will require the state to focus its investments on targeted S&T opportunity areas. Much like the state has done for the past 25 years in its successful efforts to target the film and television industry, now is the time to focus state investments on foundational initiatives that will root S&T growth opportunities, which in turn will drive future economic growth. The ability to create the envisioned innovation ecosystem has high stakes for New Mexico's future. First movers in creating next-generation environments focused on these S&T opportunity areas will enjoy disproportionate competitive advantages and economic growth compared with competitors.

New Mexico's S&T Roadmap lays out a series of recommended bold actions that, if undertaken, will help foster greater levels of economic prosperity. Generating these outcomes does not happen on its own, but rather through a series of intentional, strategic, and proactive investments. This S&T Roadmap capitalizes on New Mexico's strengths and focuses investments on building the ecosystem that will ensure the state's economic vitality for years to come (Figure ES-3).

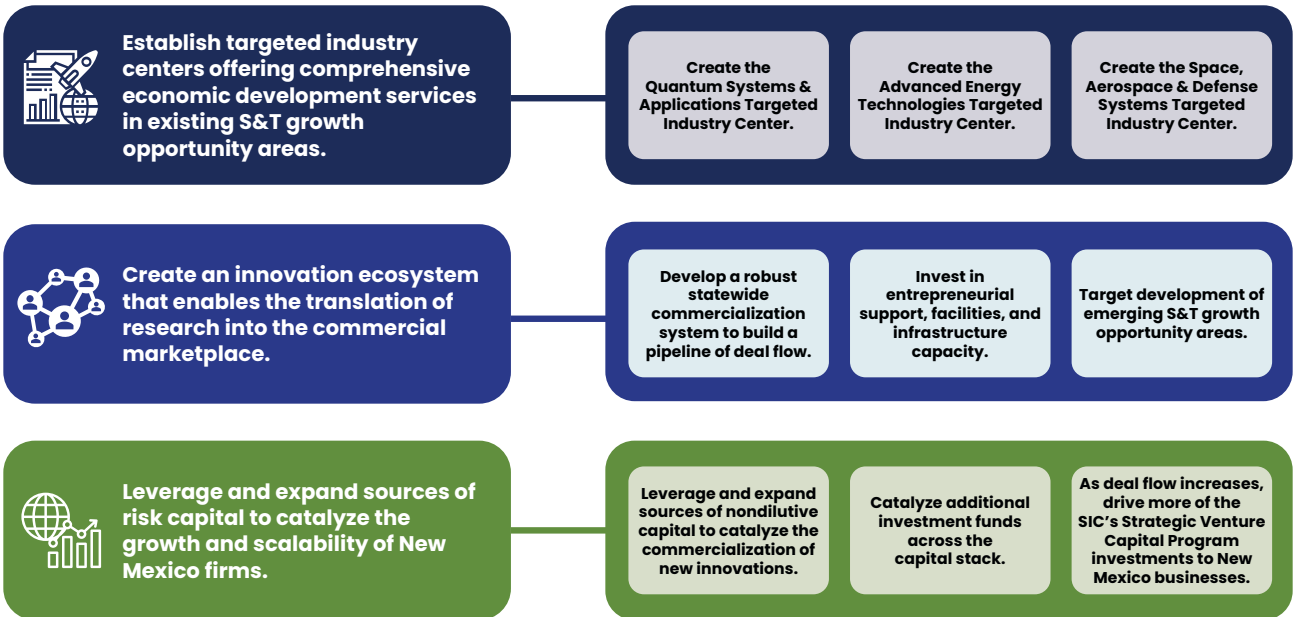
FIGURE ES-3. NEW MEXICO'S S&T ROADMAP



Source: TEConomy Partners, LLC.

The S&T Roadmap is comprised of specific actions that if implemented will drive economic growth. These recommendations are focused on catalyzing the commercialization and deployment of new products/services within New Mexico's S&T growth opportunity areas. These recommended actions comprise the S&T Roadmap and outline the investment priorities for the State of New Mexico (Figure ES-4).

FIGURE ES-4. INVESTMENT PRIORITIES FOR ENHANCING NEW MEXICO'S COMPETITIVENESS IN S&T



Source: TEConomy Partners, LLC

The stakes are high for New Mexico; but, by targeting investments in existing S&T growth opportunity areas, creating a robust innovation ecosystem, and leveraging and expanding sources of financial capital, New Mexico can turn its robust research base into economic growth opportunities.

Introduction

Role of Science and Technology in Driving Economic Growth

Science and technology (S&T) innovation is a key driver of economic growth, high-quality job creation, and rising standards of living—explaining the differences in economic performance not only among nations, but also at the level of state and regional economies.

The World Economic Forum in its highly touted *Global Competitiveness Report* explains:

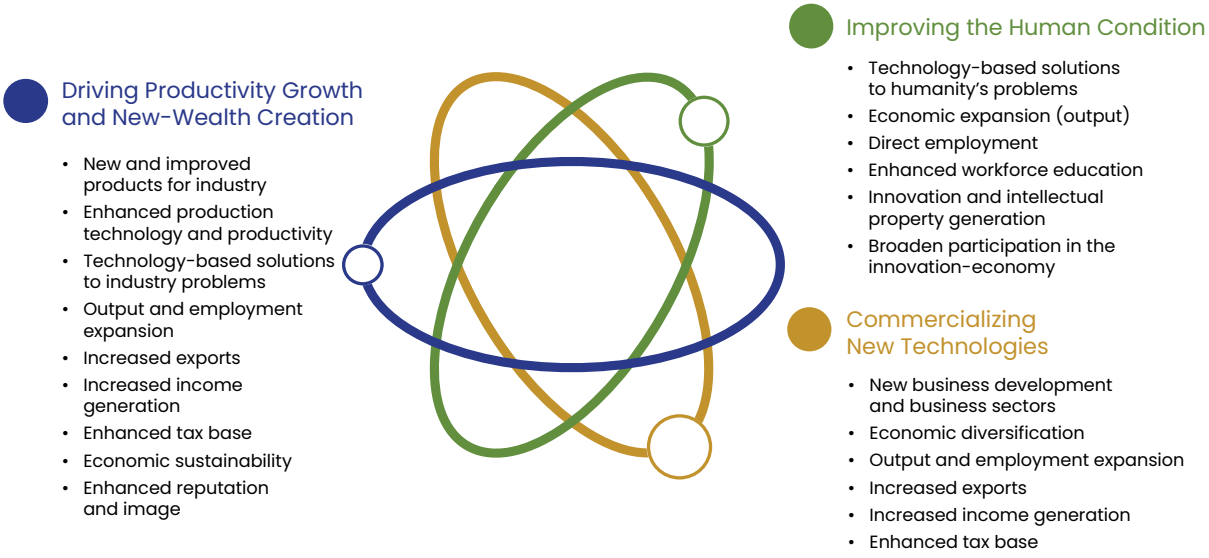
> *In the long run, standards of living can be expanded only by technological innovation… This requires an environment that is conducive to innovative activity, supported by both the public and the private sectors.*[2]

As illustrated in Figure 1, economies anchored by scientific and technological innovation benefit from multiple reinforcing positive economic impacts, including the enhanced ability to:

- **Drive Productivity Growth and New-Wealth Creation:** Science and technology industries are more likely to pay higher wages and offer a higher return on investment (ROI).
- **Commercialize New Products, Processes, and Services:** These novel inventions develop innovative solutions related to society's most pressing challenges.
- **Improve the Human Condition:** Beyond economic benefits, science and technology supports enhanced living standards and quality of life.

2 World Economic Forum, *The Global Competitiveness Report* 2010–2011, p. 8.

FIGURE 1. POSITIVE IMPACTS OF TECHNOLOGY-LED DEVELOPMENT AS A KEY DRIVER OF ECONOMIC GROWTH



Source: TEConomy Partners, LLC.

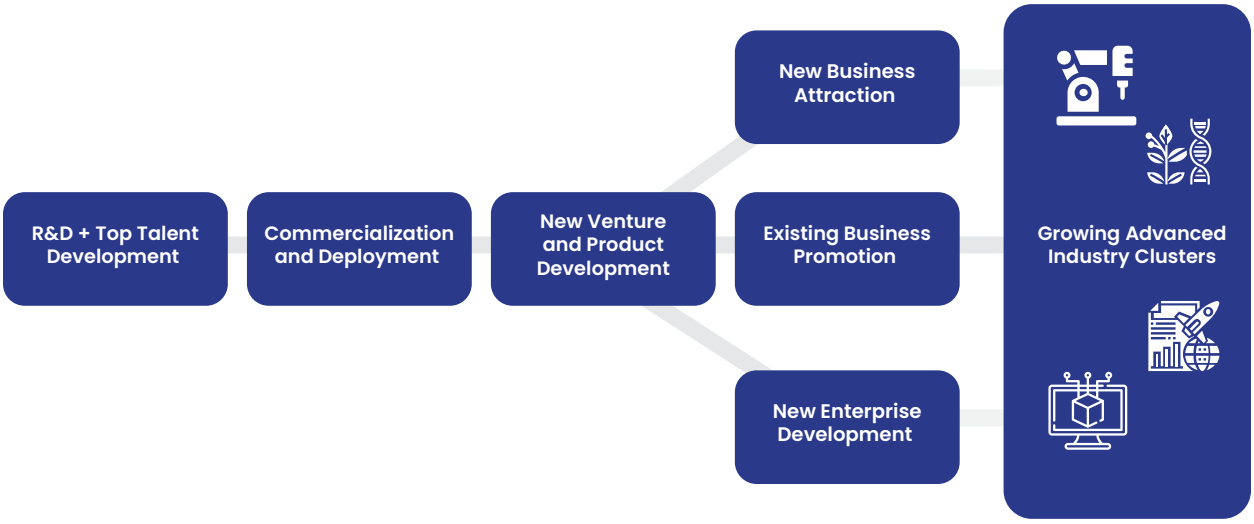
The growth of the U.S. economy has always been fueled by innovation, so the "innovation economy" is not a new phenomenon per se; rather, it is more accurate to say that innovation has increased in importance as the primary impetus of economic growth and competitiveness. Two fundamental forces are driving the preeminent importance of technology and knowledge advancement as the primary determinant of economic success:

- The first of these is the rapidly accelerating pace of scientific discoveries and the technologies that these discoveries give rise to (for example, quantum technology and artificial intelligence are rapidly accelerating scientific discoveries and technology development by enabling faster and more efficient processes, including simulation, optimization, and materials design). The opportunity to speed up the discovery and development processes is leading to an innovation race among competing countries, states, and regions.

- The second fundamental force is the globalization of world markets and the increasing pressure to maintain a high-wage/high-skill employment base by consistently staying ahead in technology and productivity.

The continuum necessary to support transformational innovation that leads to economic growth can best be described as the range of activities, types of assistance, and sources of capital required to move a concept from ideation into a viable product that enters new markets and grows and scales. In the innovation continuum's ideal state, seamless transitions from each stage to the next, with a wide array of support services and resources available at each stage, help meet the needs of businesses (Figure 2).

FIGURE 2. INNOVATION CONTINUUM—THE IDEAL STATE



Source: TEConomy Partners, LLC.

States with economies that are driven by scientific and technological innovation support intentional collaboration between the public and private sectors to facilitate and catalyze the activities outlined in Figure 2 that are requisite for robust economic development.

Research institutions, including both federal laboratories and academic institutions of higher education, are becoming increasingly prominent drivers of economic development, serving as local sources of innovation and leading generators of talent. Regional industry clusters that form around research institutions increase the inventive activities of nearby firms, attract firms from other locales that want to be near the scientific and technological excellence and the associated talent, accelerate the creation of new startups, raise additional private R&D investment, and advance economic opportunities—creating jobs in both the short and long term.

At the heart of the world's most vibrant economies is an R&D base that can generate new knowledge, which in turn can be transitioned into new products, services, or companies. Research institutions that support ideation are committed to fostering entrepreneurial development and facilitating the commercialization of market-relevant findings. It is important to note that R&D will not "magically" pass over the transom from research to the commercial market. To catalyze research translation, initiatives must be put in place to facilitate the commercialization of research discoveries.

Strategic Importance of Science and Technology in New Mexico

New Mexico stands at a crossroads with a unique opportunity to leverage its existing research assets to drive future growth in high-value science and technology sectors. The state has demonstrated strong momentum in key industries such as aerospace, cybersecurity, and renewable energy. However, as detailed in the 2021 statewide strategic plan, "Empower & Collaborate: New Mexico's Economic Path Forward," the state must now prioritize strategic investments that will solidify its competitive advantage in these sectors.

New Mexico's economy has historically been dominated by a small number of industries, including government services and natural resource extraction. While these industries remain vital to the state's economic base, the volatility of these sectors—particularly due to fluctuations in federal policy and energy markets—underscores the need for a more diversified economic strategy. The state has the potential to reduce its dependence on these industries by cultivating new, high-growth sectors with significant competitive advantages. By building on existing assets and strategically developing opportunities in science and technology, New Mexico can not only enhance its economic resilience but also create high-wage jobs that improve the quality of life for its residents.

Economic advancement in New Mexico has been driven by scientific innovation for over 80 years, heavily influenced by its role in nuclear weapons development during World War II and subsequent research and development in related fields. To maintain competitiveness and ensure long-term economic resilience, New Mexico must build on the foundation laid by its rich science and technology ecosystem, supported by institutions like Los Alamos National Laboratory (LANL), Sandia National Laboratories (Sandia), and Air Force Research Laboratory (AFRL) at Kirtland Airforce Base, as well as the state's academic research universities¬—University of New Mexico (UNM), New Mexico State University (NMSU), and New Mexico Institute of Mining and Technology (NMT). These assets provide a strong base for attracting talent, fostering innovation, and commercializing research in ways that can spur sustainable economic growth.

In recent years, New Mexico has made significant strides in advancing its position within emerging fields that build on its history of innovation and have the potential to drive economic growth. Notably, the state has positioned itself as a critical node in the nation's quantum technology ecosystem through the establishment of the Quantum New Mexico Institute and its role in the Elevate Quantum Tech Hub. Parallel momentum can be seen in the aerospace and defense sector, where partnerships with AFRL and initiatives like Space Valley are fostering a vibrant commercialization pipeline linked to national security missions. The state's research universities have also expanded capabilities in frontier areas such as clean energy, cybersecurity, biosciences, and water and environmental resilience—domains where scientific advancement aligns with pressing societal challenges.

Taken together, these developments underscore the state's capacity, but also the necessity, to build on the history of scientific leadership to develop a future defined by diversified, innovation-driven economic growth amidst an environment of national competition for high-tech investment.

Purpose of the New Mexico S&T Roadmap

Today, S&T innovation has the opportunity to continue to be a driving force of New Mexico's growth and prosperity. To this end, the New Mexico Economic Development Department's Office of Strategy, Science and Technology (OSST) commissioned a study to identify unique growth opportunity areas for New Mexico that are strategically positioned at the intersection of university/national laboratory research strengths and industry innovation needs. OSST, which as a result of the enactment of House Bill 20 will be absorbed into the newly created Technology and Innovation Office (TIO), will use this intelligence to guide future investments and inform statewide strategic initiatives. TEConomy Partners LLC, a global leader in research, analysis and strategy for innovation-driven economic development, was engaged to lead the assessment in close collaboration with OSST and its stakeholders.

The narrative that follows outlines an S&T Roadmap for the State of New Mexico based on both quantitative and qualitative information developed for this study. Across in-depth, one-on-one interviews and small group discussions related to key components of the innovation ecosystem, nearly 100 stakeholders from the private, academic, and public sectors contributed to this strategic effort. New Mexicans volunteered a significant amount of time to contribute to this plan's development. The commitment of these participants is reflected in the vigor of this strategic document.

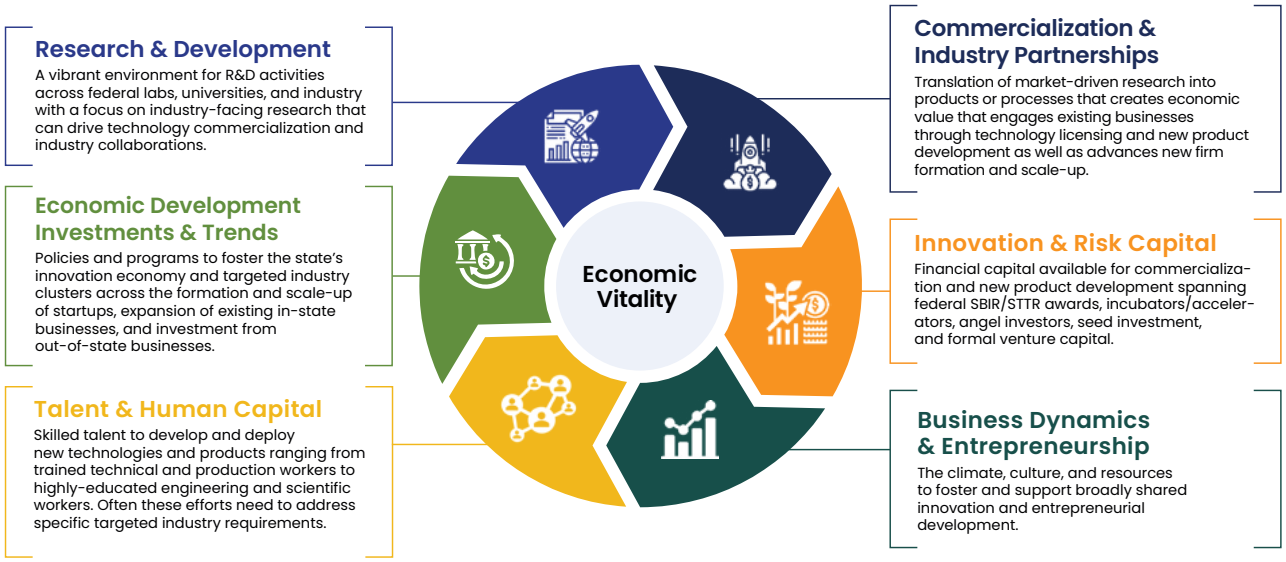
The S&T Roadmap is a culmination of views of key thought leaders and ecosystem builders from across the state seeking to position New Mexico for future economic growth driven by increased innovation. In the pages that follow, the S&T Roadmap lays out a series of recommended bold actions that, if undertaken, will help foster greater levels of economic prosperity for all New Mexicans in the years to come. The first section of this report synthesizes key findings from the innovation ecosystem assessment. The second section provides detailed information for each of New Mexico's identified S&T growth opportunity areas. The final section lays out the roadmap to catalyze S&T innovations that will drive economic prosperity for years to come.

New Mexico's Innovation Capacity—An Ecosystem with Untapped Potential

An innovation ecosystem is a dynamic network of interconnected entities that collaborate to foster creativity, technological advancement, and economic growth (Figure 3).

This intricate system comprises various stakeholders, including entrepreneurs, startups, established corporations, research institutions, investors, and government bodies, among others. Each of these components plays a vital role in nurturing and propelling innovative ideas from conception to market realization.

FIGURE 3. ELEMENTS OF A ROBUST INNOVATION ECOSYSTEM WITH CAPACITY TO IMPACT ECONOMIC VITALITY



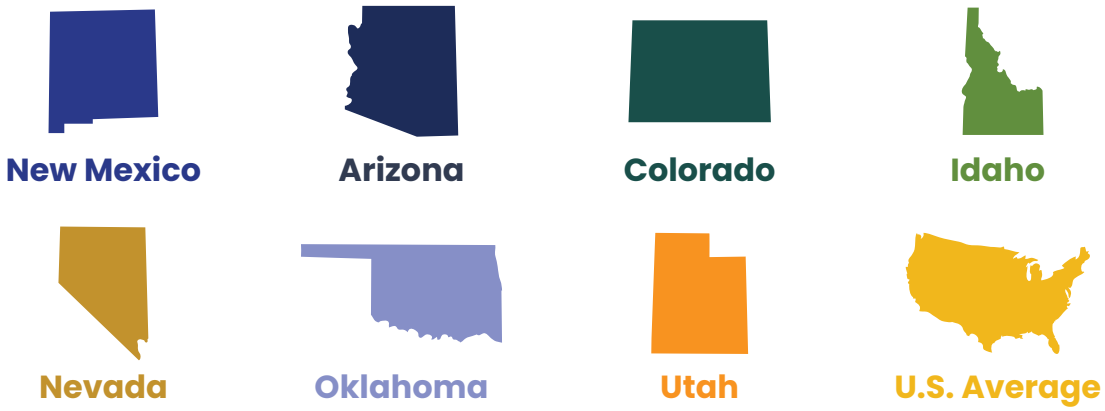
Source: TEConomy Partners, LLC.

Ultimately, the success of a state's innovation ecosystem depends on several factors, including access to funding, a supportive business environment, strong research and educational institutions, and a culture that embraces risk taking. When these elements align, the ecosystem can become a powerful engine for economic development, job creation, and technological advancement, benefiting not just the direct participants but the broader society as well. When any component of the ecosystem is missing, or the elements of the ecosystem are not functioning together properly, economic vitality can be more limited.

To determine whether New Mexico has developed a robust innovation ecosystem—which increases the likelihood of impactful technologies, products, and services making it to the market—it is important to examine how the ecosystem is functioning in aggregate, highlighting areas of strength within the system as well as any potential weaknesses that exist. This requires an objective, data-driven assessment of the capacities, gaps, and opportunities for the state. By examining New Mexico's current innovation ecosystem through this holistic lens, the findings will help inform future policy and investment recommendations based on existing opportunities to advance initiatives that address ecosystem attributes.

TEConomy compared New Mexico's performance against six benchmark states and the national average (Figure 4).

FIGURE 4. QUANTITATIVE ASSESSMENT COMPARES NEW MEXICO'S PERFORMANCE AGAINST SIX STATES AND THE U.S.



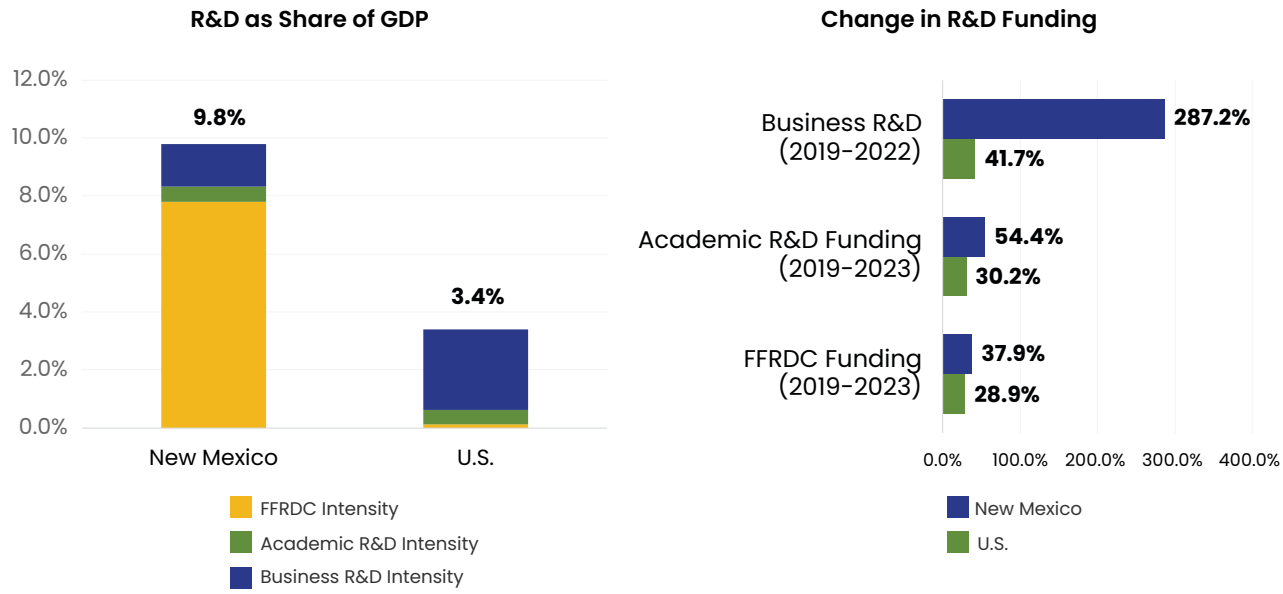
Source: TEConomy Partners, LLC

In addition, stakeholders from academia, federal labs, industry, technology transfer organizations, risk capital providers, venture development organizations, and economic development entities were interviewed. The findings are outlined below.

Research & Development

New Mexico is outperforming the U.S. average in overall R&D intensity and seeing substantial growth across federal, business, and academic R&D (Figure 5). The significant size and breadth of national lab R&D—across AFRL, Sandia, and LANL—provides New Mexico with a unique competitive advantage in several areas of S&T. In addition, efforts have been made over the years to develop productive research collaborations between New Mexico's research universities and the federal labs to drive additional research funding.

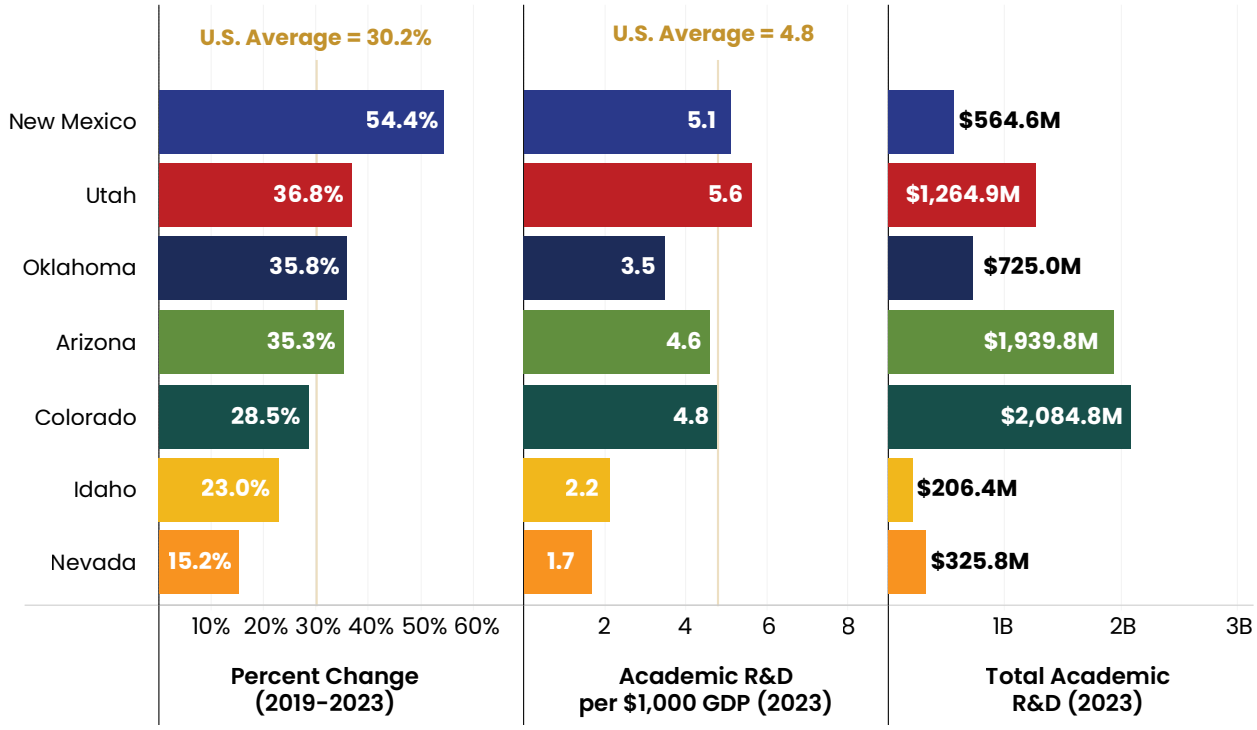
FIGURE 5. R&D INTENSITY AND CHANGE IN R&D FUNDING FOR NEW MEXICO AND THE U.S.



Source: TEConomy's analysis of NSF Data on FFRDC's, Higher-ED R&D, and Industrial R&D

There was some concern expressed that New Mexico's university R&D base is undersized compared to leading innovation states, which in turn holds back the ability of the research universities to contribute and help position New Mexico as an innovation leader. As illustrated in Figure 6, New Mexico ranked 5th of 7 in overall academic R&D in 2023 ($565M). However, it is important to note that the state's level of academic research expenditures has grown by 54 percent since 2019, a rate that far outpaces the U.S. average (30 percent) and all benchmark states. Furthermore, as Figure 6 illustrates, New Mexico ranks 2nd among benchmark states in academic R&D intensity (5.1 per $1,000 GDP), a higher concentration than the U.S. average (4.8 per $1,000 GDP).

FIGURE 6. ACADEMIC R&D PERFORMANCE FOR NEW MEXICO AND BENCHMARK STATES



Source: TEConomy's analysis of NSF Higher-Ed R&D Survey (HERD) Data

Stakeholders also voiced concern that New Mexico's research universities are not collaborating effectively. There is the belief that there needs to be more "bridge-building" initiatives to create more inter-disciplinary efforts across common areas of research strengths at the universities. In addition, New Mexico is missing the tools to forge "pre-IP" collaborations informed by market needs across national labs and research universities.

While the breadth of academic research spans numerous universities, stakeholders noted that nearly all translational research and commercialization centers and initiatives are associated with individual universities. This has created a research environment in New Mexico characterized by "silos" where each university primarily focuses on its own singular efforts to advance translational research and commercialization to move academic research strengths and discoveries to the market.

The bottom-line sentiment from interviews was the belief that by concentrating resources on specific technology domain areas where New Mexico has competitive advantage can amplify impact and drive economic growth. Strategic focus (e.g. establishing targeted centers or initiatives) will act as a magnet, aligning universities, national labs, industry, and government toward a common goal.

Intentional collaboration will help achieve the critical mass needed for an industry to flourish locally. When a focused ecosystem is created (including specialized facilities, suppliers, workforce training, etc.), it fosters a "stickiness" that provides companies with a reason to stay in the state or relocate to New Mexico. Conversely, absence of such focus leads to attrition. A strong focus on areas of comparative advantage can create a self-supporting community that anchors firms, scales companies, and provides opportunities for skilled workers.

It is important to note that focus areas must be grounded in realistic potential and New Mexico leadership must avoid "silver bullet" fads. A strategic focus must be accompanied by sustained commitment and periodic reality checks. Done right, a flagship scientific/technology focus can become a powerful engine of economic development and innovation culture in New Mexico.

Commercialization & Industry Partnerships

While there is no doubt that the level of research that takes place across New Mexico's federal laboratories and universities is significant, New Mexico's ability to commercialize its research base to its own economic development advantage is more limited. New Mexico research institutions have performed unevenly in technology transfer and commercialization measures in recent years. In terms of activity level, UNM, Sandia, and LANL have a more prolific track record while AFRL, NMSU, and NMT have generated lower levels of activity.

One reason for this uneven performance is that many institutions lack dedicated resources for technology transfer and entrepreneurial support. Smaller research universities have limited resources for transitioning IP to the marketplace and lack the necessary infrastructure to support industry and national lab partnerships. Interviewees familiar with the various systems noted that across New Mexico, those seeking to translate research into commercial products face numerous hurdles including difficulty negotiating IP rights, lack of non-dilutive funding to de-risk technologies, and lack of entrepreneurial support. This can force researchers to navigate the startup process largely on their own or give up. Without support, many homegrown innovations leave the state.

However, the inability to take advantage of the state's research assets is not limited to startups—it also extends to industry engagements. Overall, while New Mexico's national labs offer an extensive base of specialized testing and evaluation centers to partner with industry, most of this activity is occurring with out-of-state companies. As a result, New Mexico is missing an opportunity to more broadly engage with companies and pursue opportunities for them to locate operations in the state.

Furthermore, industrial partnerships with academic institutions often focus solely on capstone/senior design projects and student internships with limited corporate research sponsorship and commercialization activities. There is a need to develop more effective centralized programs that can support transitioning industry talent development efforts into deeper research collaborations.

While senior leadership at New Mexico's research universities voice support for commercialization efforts and industry partnerships, a more limited number of academic departments and research centers fully embrace a culture that supports research translation and commercialization. Faculty and research scientists often lack awareness and understanding of the limited resources available to support their efforts and possess limited entrepreneurial acumen.

The lack of funding to de-risk technologies and advance translational research and proof-of-concept development, often termed the "valley of death" between research and commercialization, is a significant area of concern. Researchers struggle to move from lab prototype to a marketable product due to lack of funds for proof-of-concept, market research, and pilot facilities, which limits the ability to attract risk capital and/or early customers.

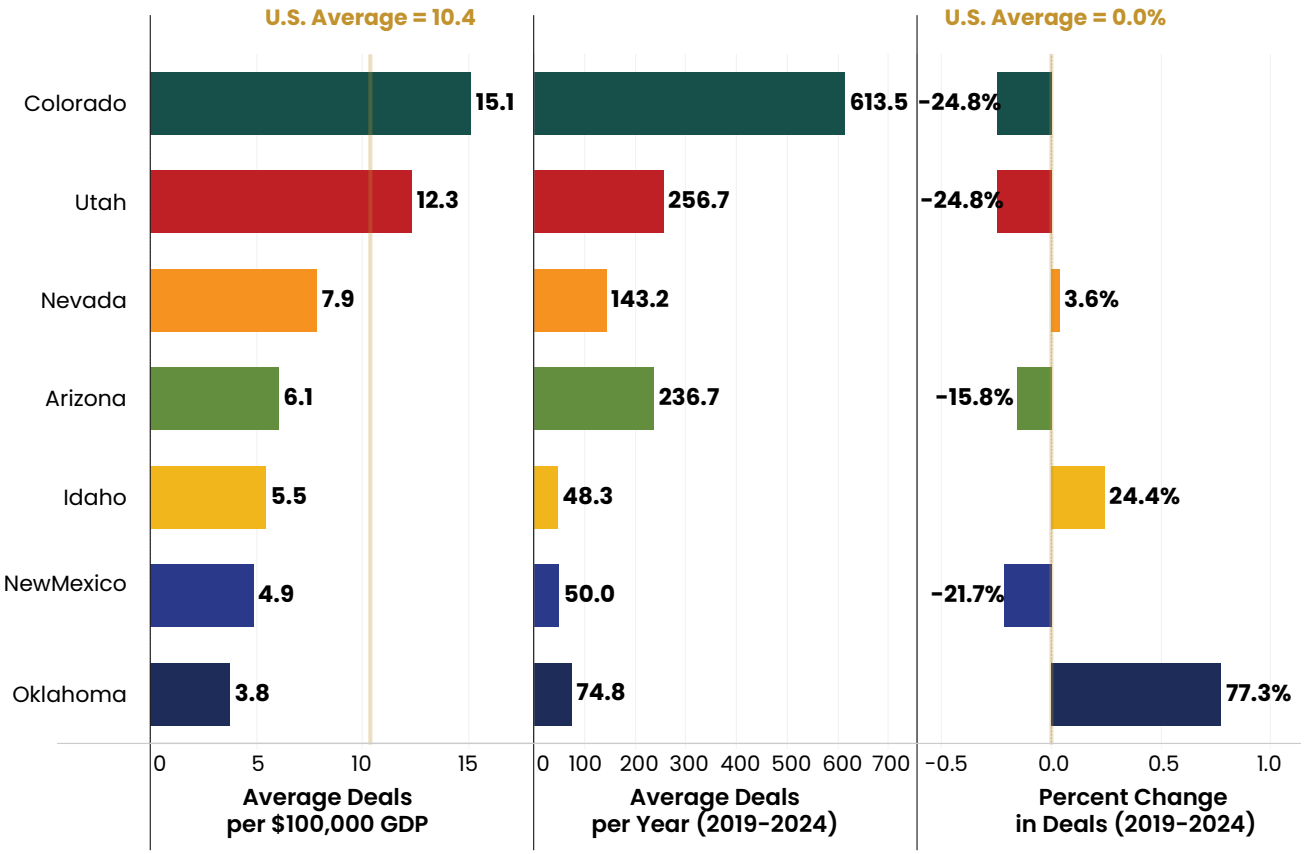
Several interviewees suggested that New Mexico is faced with a policy and cultural hurdle: it is the opinion of some that state leaders have been skeptical about investing in technology commercialization programs and infrastructure because they are not convinced that such investments yield local benefits. There is the perception of a longstanding skepticism regarding the return on investment from research, partly because several of the most successful examples of research translation are companies that left the state in order to secure the resources that eventually led to their success. As a result, this skepticism has become a self-fulfilling prophecy: because the state does not invest in the needed technology commercialization programs and infrastructure, the most promising talent and ideas leave the state, which is then cited as the reason not to invest. Breaking this vicious cycle is necessary to change the current commercialization trajectory.

Innovation & Risk Capital

The lifeblood that enables S&T startups to realize their full potential and scale into high-growth companies is access to ongoing funding at significant levels, available from our nation's $100+ billion private venture capital industry. Of critical importance are follow-on rounds of funding led by private venture capital firms as a startup reaches various milestones in its development. While accelerators, friends and family, and angel investors are valuable at the earliest stages of forming a startup, they are no substitute for investment from a lead private venture capital firm, often at a seed stage, to give credibility and market savvy advice to a new startup and then syndicate follow-on rounds of funding as the startup scales up.

New Mexico has considerably lower levels of venture capital intensity (measured as share of state GDP) compared to benchmark states and the U.S. average (Figure 7). Starting from a low base of activity in 2019, deal flow in New Mexico has declined by 21.7 percent, which ranks 5th among benchmark states and also trails the U.S. average. Since 2019, the volume of deals conducted at the earliest stages has been inconsistent, and due to modest overall levels of venture capital activity, trends in investment totals are largely dictated by a handful of companies receiving later-stage funding (from out-of-state investors).

FIGURE 7. AVERAGE VENTURE CAPITAL DEALS PER YEAR AND PERCENTAGE CHANGE IN VENTURE CAPITAL DEALS (2019-2024)



Source: TEConomy's analysis of Pitchbook Data

Interviewees noted that the creation of the Catalyst Fund in 2017 – leveraging the State Investment Council (SIC) to invest in resident venture funds – was a turning point that helped seed micro-VCs offering pre-seed investments in the $500K–$1M range. This infusion gave startups access to early capital that previously was not available and even attracted some out-of-state startup founders to consider locating to New Mexico. However, these gains proved short-lived. Multiple stakeholders lamented that the effort collapsed under legislative pressure, as policy changes forced the SIC to prioritize only market-rate returns and effectively restricted it from favoring in-state funds. In other words, the very mechanism designed to jumpstart resident venture financing was reined in by rules treating it like a traditional endowment, not an economic development tool. The SIC's recent venture investments have been made into national funds that have no requirement to deploy money within New Mexico – and to date, most have not. This policy approach, while fiscally conservative, means the state's significant capital resources aren't directly fueling in-state startup growth. Several stakeholders contrasted New Mexico's stance with that of peer states or regions where public funds are partially directed into resident venture funds as a risk capital stack catalyst.

It is important to note that the New Mexico State Investment Council (SIC) disagrees with the views of many that were interviewed and believes that it has successfully been working to help fill New Mexico's venture capital gap. The Council's commitments to 12 national venture funds in 2024 set a new record while advancing its recent efforts that dedicated $774 million across more than 20 venture capital funds since November 2022. The SIC's investments have targeted New Mexico's sector strengths, specifically the depth of scientific talent at the state's national laboratories and research universities. The SIC recently announced a formal restructuring of this program, newly named the Strategic Venture Capital Program, solidifying its "market rate" investment approach that diversifies its investments by prioritizing investing in national funds over resident funds. As previously noted, many individuals interviewed expressed concern that the SIC's unwillingness to invest in resident funds will make it nearly impossible for these funds to raise capital rounds. One positive change noted from the restructuring is that economic impact will now be assessed based on in-state job growth versus the previous measure of where the firm was headquartered.

Regardless of the cause, there is a well-recognized seed and early-stage funding gap. While startups can raise money from angels, accelerators, and micro-VCs, they hit a wall when seeking larger seed and Series A rounds. A critical mass of resident capital for $2 to $15 million rounds simply isn't available, and most coastal venture firms are reluctant to invest in companies based in New Mexico until they are at a much later stage. This funding void means companies that prove their concept in New Mexico often must relocate to find growth capital. It also stifles the scale-up of homegrown firms – many never get the chance to reach significant revenue or exit, because they can't finance that growth trajectory in the state.

Beyond institutional capital, as previously noted, some early-stage financing activity does exist due to individual investors and federal programs. New Mexico Angels was mentioned as a critical source of seed funding in the absence of large resident venture capital firms. Angel investors continue to finance many first-time entrepreneurs. Federal Small Business Innovation Research (SBIR) grants have also been a lifeline for technology startups coming out of the labs and universities. But these sources have limitations. Angel capital, while active, can only carry a company so far, and SBIR awards are typically not enough to fully commercialize a product. Moreover, declining federal R&D support (e.g. uncertainty around SBIR/STTR reauthorization) is a critical threat to technology commercialization if the State of New Mexico does not provide a bridge. Without some form of state or university gap funding, many New Mexican innovations stall out in the so-called "valley of death" – too developed for more research grants but not developed enough for private investment. It is important to note that New Mexico has an SBIR matching program, but many feel that not enough funding is available. In addition, some interviewees expressed frustration that the application process and eligibility rules are not well-defined, possibly disqualifying companies for arbitrary reasons. The net effect: there is a need for early-stage financing activity that is not currently being met across the state.

The State of New Mexico does have one very unique non-dilutive funding source for startups. In 2020, the New Mexico Legislature created a Technology Readiness Gross Receipts (TRGR) Tax Credit for the purpose of helping businesses achieve technology maturation for commercialization opportunities that require improvements on a preexisting invention. As a result, LANL and Sandia established the TRGR Technology Readiness Initiative. The TRGR Technology Readiness Initiative provides New Mexico businesses up to $150,000 worth of assistance (cost of labor/materials for national lab staff) per year so that the company can work directly with scientists and engineers to advance the maturation of patents, patent applications, and software related to an active license between the lab and business or developed under an active Cooperative Research and Development Agreement in which the business is a participant. Such collaboration can be invaluable for a technology startup needing specialized R&D help (for example, access to a particular lab instrument or teaming on a DOE grant).

Overall, the lack of New Mexico success stories looms over the funding environment. Several interviewees observed that New Mexico's innovation ecosystem has not yet produced big breakout companies (the proverbial "unicorns" or high-profile IPOs). This has consequences for investor mindset. As one interviewee stated, "The lack of visible success stories has created a scarcity mentality and an aversion to risk" among the state's investors and decision-makers. In other technology hubs, entrepreneurial success (defined as a tech company exit) has created recycled wealth and confidence in funding the next generation of technology startups. New Mexico is still awaiting that virtuous cycle. Instead, it displays a more cautious approach – resident investors tend to be conservative, and public officials worry about the return on any investment of state funds. This cautious culture, while understandable, can be self-defeating: it results in under-investment in the very activities that could produce a success story. Interviewees implied that bold moves are needed to break the stalemate.

Business Dynamics & Entrepreneurship

New Mexico's entrepreneurial ecosystem is characterized by dedicated efforts but a lack of cohesion. Unlike in vibrant startup ecosystems, where an entrepreneur can quickly plug into a well-organized network, founders in New Mexico often find the landscape confusing and siloed. This fragmentation makes the ecosystem hard to navigate. Entrepreneurs have to be very proactive to discover opportunities (grants, mentorship, office space, etc.), and many likely miss out on support simply because they don't know where to look or whom to ask. The idea of a more centralized "front door" for startups came up repeatedly – a place (physical or virtual) where all the threads come together to guide entrepreneurs. It could be a state-level portal or an umbrella organization that ties together universities, incubators, and agencies. As a result, New Mexico is lagging most benchmark states and the U.S. average across various measures of business dynamics, especially as it relates to startup and growth in high-tech firms.

A closely related gap is the lack of mentorship and accelerator programs. While there are efforts underway at UNM, Sandia, and AFRL to ramp up the number of startups, the most frequently mentioned significant gap facing startups in New Mexico is the lack of experienced and proven C-suite talent to join or advise startup managerial teams. This talent is necessary to improve the quality of startups and position them to raise the follow-on, formal venture capital essential to scale-up and realize their full growth potential. Too often, commercialization efforts have had to rely on faculty and graduate students as founders and initial management teams.

Several entrepreneurs interviewed noted that the startup ecosystem also lacks shared service infrastructure – the kinds of resources that many states offer, such as startup bootcamps, mentorship networks, accelerators, and co-working spaces with in-house advisors/mentors/EIRs, are largely missing. While Albuquerque has a few startup-focused physical resources, most other parts of the state have none. As a result, nearly all of New Mexico's SBIR and Venture Capital activity since 2019 have been in the Central and North Central Regions – those that are home to the state's major metropolitan areas (Table 1).

TABLE 1. SBIR AND VENTURE CAPITAL COMPANIES, DEALS, AND FUNDING BY NEW MEXICO REGION (2019-2023)

Region	Venture Capital (2019-2024)			SBIR (2019-2023)		
	Number of Companies	Number of VC Deals	VC Dollar Amount	Number of Companies	Number of Awards	Award Amount
Central (Albuquerque and Surrounding Area)	86	101	$672.3M	66	256	$144.4M
North Central New Mexico	37	70	$474.8M	23	87	$43.5M
Northwest New Mexico	11	11	$82.7M	5	8	$3.5M
Southeast New Mexico	2	2	$8.9M	1	3	$1.1M
Southwest New Mexico	10	3	$37.9M	5	7	$3.2M

Region	Percent of Total Companies	Percent of Total VC Deals	Percent of Total VC Dollars	Percent of Total Companies	Percent of Total Awards	Percent of Total Award Amount
Central (Albuquerque and Surrounding Area)	59%	54%	53%	66%	71%	74%
North Central New Mexico	25%	37%	37%	23%	24%	22%
Northwest New Mexico	7%	6%	6%	5%	2%	2%
Southeast New Mexico	1%	1%	1%	1%	1%	1%
Southwest New Mexico	7%	2%	3%	5%	2%	2%

Source: TEConomy's analysis of SBIR and Pitchbook data
Note: There were zero SBIR and VC Deals in the Northeast Region during the period of analysis.

It is important to note that risk capital is not sufficient to ensure startup success. There is often the additional need to connect startups with EIRs and other proven C-level talent in order to de-risk the opportunity and ensure the company is able to grow and scale. These integrated entrepreneurial and commercialization programs are critical to ensure the viability of startups and position them to realize their growth potential and generate follow-on investments as they reach key milestones. New Mexico has a few newer entities working to provide this level of venture development assistance (i.e., Roadrunner Venture Studios and New Mexico Venture Studios), but they have limited capacity in terms of the number of startups they can work with in any given year. These types of efforts need to scale in New Mexico if critical mass is going to be reached.

Talent & Human Capital

New Mexico produces many skilled graduates: From 2019-2023, New Mexico's colleges and universities averaged more than 2,700 degrees conferred per year in STEM-related fields.[3] However, less than 23 percent of the state's degrees conferred are in STEM fields, which ranks 5th among benchmarks and is lower than the U.S. average. Perhaps more troubling is that unlike the U.S. average and all other benchmark states, New Mexico actually saw a decline in STEM-oriented college degrees from 2019-2023 (8 percent decline). At a time when many states are investing heavily in their higher-ed STEM programs to boost the number of graduates in these important fields, New Mexico is seeing declines, a potentially worrying trend.

Another key challenge facing New Mexico is that the state has a hard time retaining much of this talent in the private sector. For example, an analysis of LinkedIn Talent Insights finds that less than half of the graduates (44 percent) of New Mexico's two largest universities (UNM and NMSU) are staying in-state for their careers (Table 2). When looking at the largest universities in other benchmark states as a comparison, New Mexico ranks last in the share of graduates staying in-state. Based on stakeholder interviews, the conventional wisdom is that the majority of graduate-level STEM talent leaves the state, unless they are hired by the national labs.

TABLE 2. LINKEDIN ANALYSIS OF LARGEST UNIVERSITIES IN NEW MEXICO AND BENCHMARK STATES

State and Number of Schools Included in Analysis	Total Graduates on LinkedIn	Total Graduates Still In-State	Share of Total Graduates Still in State
New Mexico (2)	127,977	56,229	43.9%
Oklahoma (2)	262,198	116,898	44.6%
Arizona (3)	753,776	358,213	47.5%
Idaho (3)	139,163	71,435	51.3%
Utah (3)	409,620	226,611	55.3%
Colorado (7)	522,135	294,697	56.4%
Nevada (2)	155,303	89,524	57.6%

Source: TEConomy's analysis of LinkedIn Talent Insights Data
Note: School listing includes variations found within Linkedin but does not include medical or law schools.

This talent leakage affects the growth and scalability of technology firms in multiple ways. First, if a startup wants to hire an experienced product manager or a lead scientist with industry experience, the local talent pool is thin, necessitating recruiting from out of state, which is difficult. Second, the lack of a robust mid-career professional community can make the

3 TEConomy's analysis of NCES IPEDS data

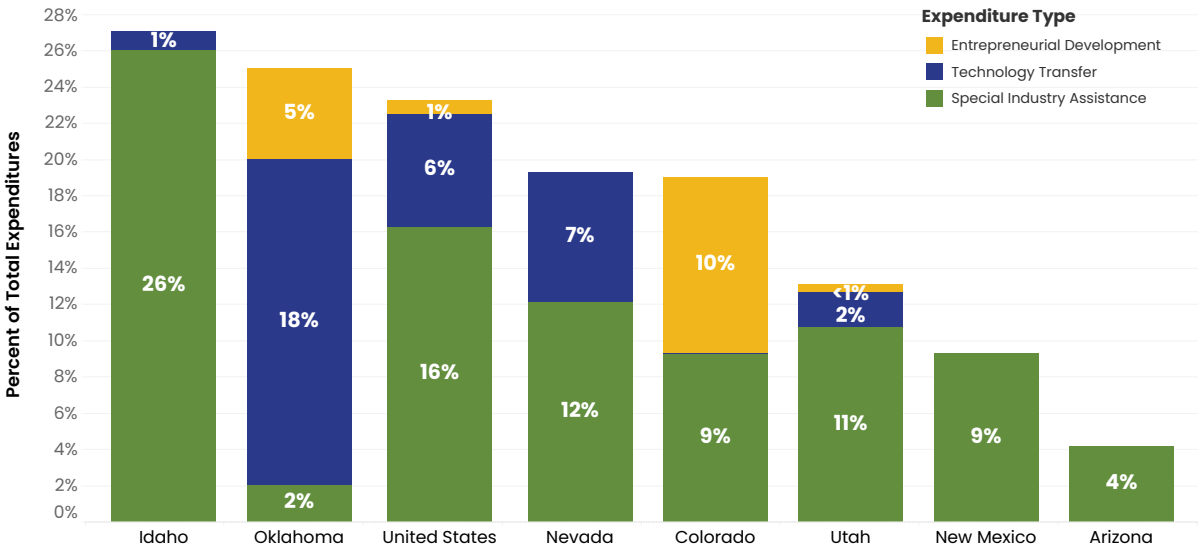
ecosystem feel less vibrant; younger career professionals have fewer local role models and mentors from which to learn.

A beneficial program is JTIP, the Job Training Incentive Program. JTIP reimburses a significant portion of employee wages for new jobs created, effectively subsidizing startups' and scaling companies' talent costs. However, JTIP was structured to exclude companies that earned more than 50 percent of their revenue in-state. The intention was likely to focus JTIP on export-oriented businesses, but the effect was that some successful local startups – especially those selling to local customers or government – suddenly became ineligible for support precisely as they started doing well. The implication is that the program unintentionally penalized companies for finding a New Mexico market. Adjusting such criteria could immediately broaden its impact.

Economic Development Investments & Trends

While the State of New Mexico invests more than most benchmark states in economic development expenditures, investments in S&T-related programs have been relatively small. Since 2019, New Mexico's economic development toolkit has primarily emphasized workforce preparation and development, according to an analysis of the Council for Community and Economic Research (C2ER)'s State Economic Development Expenditure Database. However, less than 10 percent of New Mexico's economic development investments are in areas like entrepreneurial development, technology transfer, or special industry assistance (Figure 8). This share is less than half of that of the U.S. average and lags nearly all benchmark states.

FIGURE 8. SHARE OF ECONOMIC DEVELOPMENT EXPENDITURES BY TYPE (2019-2023)



Source: TEConomy's analysis of C2ER Economic Development Expenditure Data

Note: Does not include Community Assistance funding

Concerns expressed by stakeholders include:

- **Lack of physical infrastructure for technology businesses, including facilities for tech-based companies, is a major gap holding back retention and growth of startups in New Mexico.** This has impacted:
    - Growth of key sites, including Sandia Science and Tech Park and Spaceport
    - Lack of wet lab space for bioscience companies
    - Lack of key quantum signature facilities to partner with industry, including co-packaging shared-use facilities and cryogenics for developing superconducting qubits
    - Some of these issues have been partially resolved by the most recent legislative session, but more can and needs to be done.
- **First customer acquisition is a challenge for New Mexico startups given the small size of the state.** New Mexico has not taken full advantage of the large number of companies collaborating with national labs to help establish connections to in-state startups as first customers.
- **The ability of New Mexico to transition to manufacturing in leading technology areas was raised as a concern.** There has been some success in renewable energy, but the state is lagging in space and defense, and there are concerns that New Mexico is already falling behind in quantum manufacturing.
    - New Mexico is not viewed as a "business-friendly" state for manufacturers due to its unique gross receipts tax approach that is confusing to industry.
- **New Mexico lacks the high-profile, leadership-led, institutionalized "public-private" partnerships needed to foster a sustained initiative for developing the state's S&T growth opportunity areas.** For too long, the state's attitude has been that growth will occur naturally and that proactive initiative were not necessary.
    - Given frequent turnover in state legislature, it is hard to sustain the required long-term effort to address specific needs related to the innovation economy.
    - Various "public-private" partnerships were called for to support the state's S&T economy, including growing translational research, promoting manufacturing for specific sectors, and supporting the growth of space vehicle manufacturing and launches.

Summary

Based on the situational analysis driven by both quantitative and qualitative data, it is clear that there are several strategic needs that need to be prioritized to advance New Mexico's innovation ecosystem and take full advantage of the state's S&T growth opportunity areas. These strategic needs are summarized in Figure 9.

FIGURE 9. PRIORITY STRATEGIC NEEDS FOR ADVANCING NEW MEXICO'S INNOVATION ECOSYSTEM

Source: TEConomy Partners, LLC

New Mexico's S&T Growth Opportunities

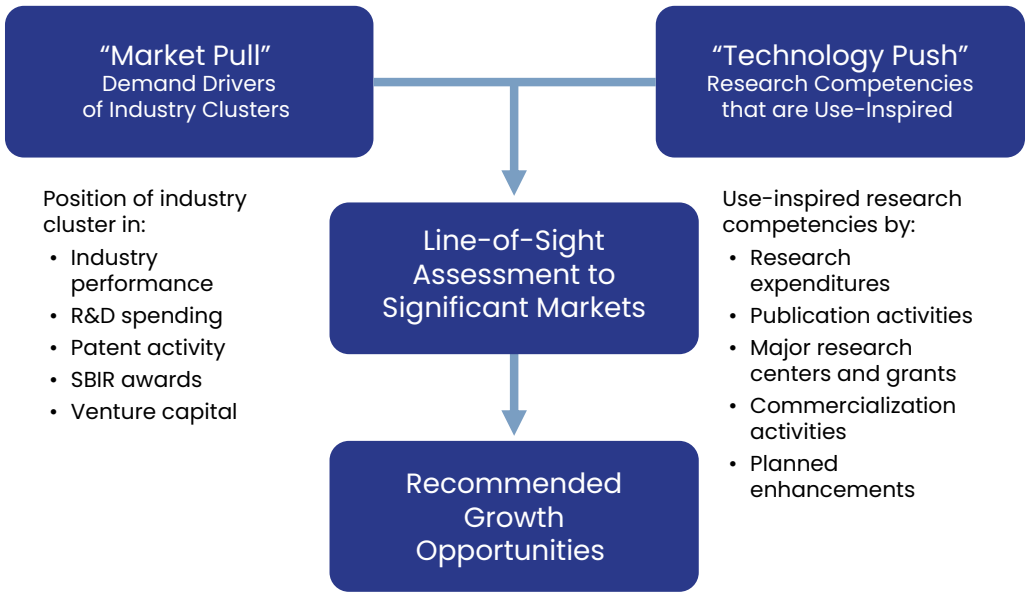
Each state has its own specific industry drivers and research core competencies through which it is best positioned to differentiate itself and build world-class, specialized areas of expertise.

Identifying strategic areas of alignment within New Mexico between its research institutions and its industry drivers can be challenging, as the opportunity set of technologies that research can advance is enormous. However, in order to maximize the potential for economic development impact, it is critical to identify and focus on strategic areas that align New Mexico's research assets and competencies with the needs and opportunities of its industry innovation drivers.

In the face of ongoing technological innovation and disruption of existing industry business models, an assessment of science and technology-led growth opportunities must be forward looking rather than retrospective. Traditional industry targeting analysis relies on examining in-depth trends and competitive position in industry activities that largely shed light on where an economy has been. *While helpful, this is not sufficient to understand the development opportunities that can grow a state's economy into the future amid ever-changing technology and market dynamics.* It is equally important to understand where an economy has the capacity to grow and leverage comparative advantage, which is informed by an analysis of core industry-facing technology competencies.

To better understand the alignment of New Mexico's industrial innovation needs with the core competencies of its research institutions, TEConomy undertook a rigorous, data-driven approach to evaluate New Mexico's competitive positioning within its target science and technology sectors. This **line-of-sight** assessment considered the "market pull" of industry innovation drivers found within established and emerging science and technology (S&T) industry clusters and how they converged with the "technology push" of research capabilities found across the state's research institutions (Figure 10).

FIGURE 10. "LINE OF SIGHT" APPROACH FOR IDENTIFYING STRATEGIC S&T-DRIVEN INDUSTRY OPPORTUNITIES



Source: TEConomy Partners, LLC.

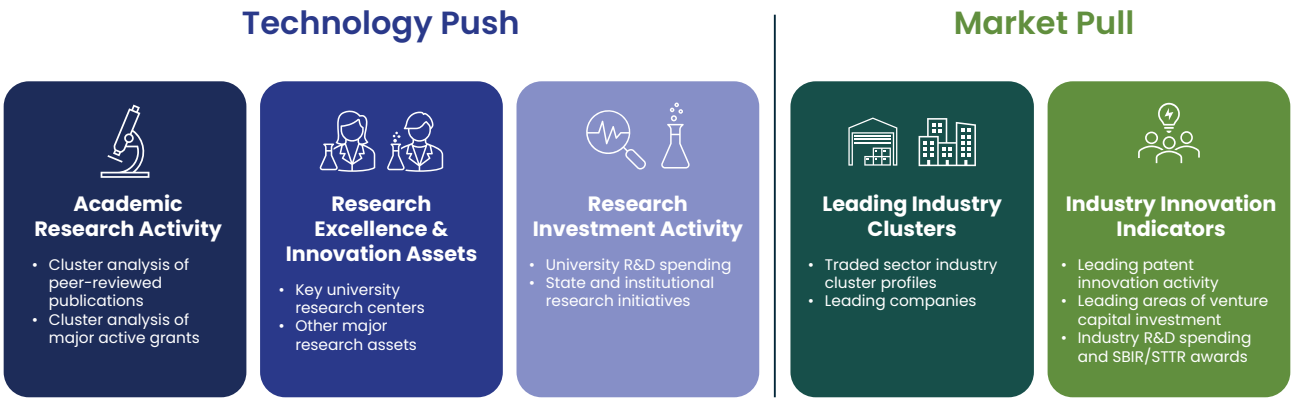
This strategic approach is very much in line with best-in-class efforts. As the Senior Vice Provost at Georgia Tech, Dr. Steven Cross, says in explaining his university's nationally recognized efforts in concurrently advancing research and economic development impact:

> *"Georgia Tech defined an industry facing research strategy focused both on leading-edge, use–inspired [university] research and economic development…Georgia Tech pursues a concurrent strategy centered on the core research areas…selected because they are appropriate aggregations of core university competencies represented in over 300 research centers and laboratories at Georgia Tech, their inter-disciplinary and trans-disciplinary nature, the alignment with strategic markets within the region, and the existence of industry partners interested in working with Georgia Tech."*[4]

The intersection of where the state excels in the "market pull" of industrial innovation activities and the "technology push" of industry-facing core competencies represents the greatest opportunities for future economic growth. As depicted in Figure 11, identifying these growth opportunity areas involves analyzing a number of key indicators. Taken together, these can offer the line-of-sight to growing S&T-led market opportunities that can help sustain the vibrancy of New Mexico's leading existing industry clusters as well as position the state to respond to market opportunities in emerging industries that evolve in the future.

4 Stephen E. Cross, "Strategic Considerations in Leading an Innovation Ecosystem," Global Science and Technology Forum Journal of Business Review, 2013, vol 2, no 3, 104–109.

FIGURE 11. KEY INDICATORS AND ANALYSES LEVERAGED FOR THE LINE-OF-SIGHT ASSESSMENT OF NEW MEXICO'S GROWTH OPPORTUNITIES



Source: TEConomy Partners, LLC.

Using the framework shown above, TEConomy conducted a line-of-sight assessment of forward-looking, innovation-led growth opportunities for New Mexico that involved three steps[5]:

1. **TEConomy assessed New Mexico's core technology competencies across its research institutions' activities to outline areas of technology push.** In this step, a variety of S&T databases were analyzed to provide insights into specific areas of scientific and technological strengths found in the state, based on:
    - In-depth analysis of thematic areas of specialization and critical mass in research activity from examination of peer-reviewed research publications and investigator-initiated grants.
    - Research excellence and the presence of key centers, labs, and other institutes supporting industry-facing innovation and technology development.
    - Research investment activity, highlighting where the research institutions have been growing their enterprise.
2. **TEConomy assessed the market pull of innovation activities in New Mexico's traded sector industry clusters.** The assessment of industry's market pull for innovation considered the current position and recent trends of leading industry clusters, based on a broad set of measures of industry performance and innovation activities that included:
    - Examination of multiple facets of economic performance across the state's traded sector industry clusters, using a variety of industry performance measures.

5 The five growth opportunity area profiles, provided herein, represent condensed overviews of content that has been limited for brevity. Please see the Technical Volume for the more detailed quantitative analysis.

- Identification of areas of active industry-led innovation through examination of indicators related to industry-led spending and investment, intellectual property generation, and other signals of innovative technology or market focus on the part of New Mexico companies.

- Consideration of the context of key industry dynamics, emerging companies, and areas of leading investment funding as indicators of potential market drivers.

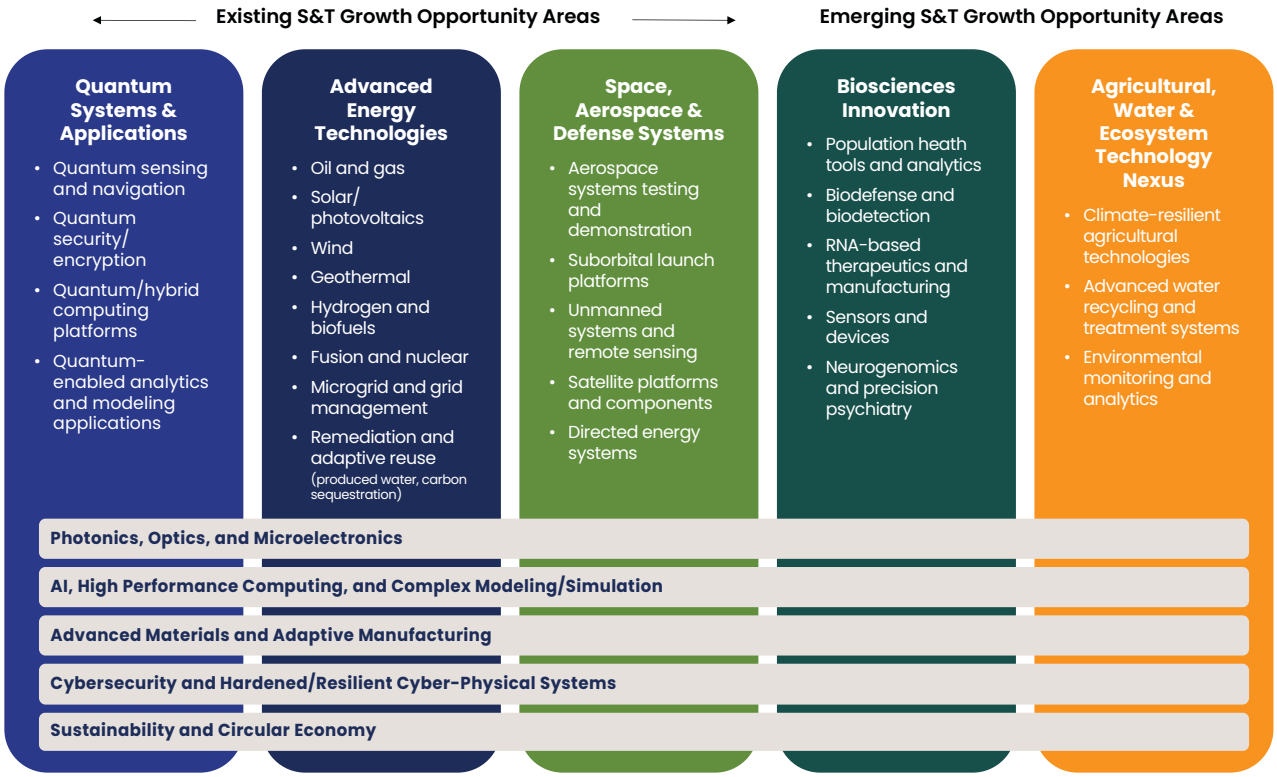
3. **TEConomy considered the alignment of the market pull of industry cluster performance and innovation activities and the technology push of core competencies that provide a line-of-sight to S&T-led growth opportunities with high market potential.** This involved the synthesis of the analyses noted above, in addition to one-on-one and small group discussions with stakeholders across New Mexico regarding key areas of technology focus and opportunities. Note, this effort is still ongoing as additional interviews will be conducted.

Ultimately, three existing S&T growth opportunity areas and two emerging growth opportunity areas were identified for New Mexico through the line-of-sight assessment. These five areas can be considered those in which New Mexico is best positioned to compete in growing, innovation-led market opportunities that can help sustain the state's leading industry clusters as well as advance emerging market opportunities in new industries of the future.

While these opportunity areas all reflect elements of New Mexico's technology, talent, and innovation "push," three of these areas have coalesced around more direct pathways for near-term access to commercial market opportunities and represent the state's existing growth opportunity areas: Quantum Systems & Applications, Advanced Energy Technologies, and Space, Aerospace & Defense Systems. In addition, the state has two emerging opportunity areas that have strong ties to research and innovation in the state but have not yet scaled to the level of critical mass necessary to drive major traded sector industry clusters and broader innovation ecosystems statewide: Biosciences Innovation and the Agriculture, Water & Ecosystem Technology Nexus. In the existing opportunity areas, innovation strengths are already being actively leveraged to support industry partnerships and technology deployment in relevant markets at a level of significant scale, while the emerging areas provide a foundational platform that can be leveraged as market alignment and innovation ecosystems continue to develop into mature industry bases.

As illustrated in Figure 12, each of these growth opportunity areas is supported by cross-cutting technical expertise and capabilities that enable innovation and technology development. These capacity areas form the foundational support that cut across specific markets. For example, fields such as photonics, optics, and microelectronics form the basis for advancements across quantum sensing, aerospace systems, and biosensing applications. AI, high performance computing, and complex modeling/simulation enable breakthrough discoveries and system optimization in areas ranging from fusion energy to climate-smart agriculture. Similarly, advanced materials and adaptive manufacturing underpin innovations in microgrids, directed energy, and biomedical devices. Cybersecurity and resilient cyber-physical systems are critical for safeguarding infrastructure and mission-critical technologies, especially in quantum, aerospace, and energy platforms. Lastly, sustainability and circular economy principles contribute to novel solutions in ecosystem resilience, produced water reuse, and biomanufacturing. These enabling capabilities, while not growth areas in isolation, play a pivotal role in translating New Mexico's scientific strength into economic opportunity.

FIGURE 12. NEW MEXICO'S S&T GROWTH OPPORTUNITY AREAS



Source: TEConomy Partners, LLC

The narrative that follows profiles New Mexico's three existing S&T growth opportunities and two emerging growth opportunity areas. The profiles are organized to detail the following intelligence gathered for each opportunity area:

- An explanation of what the S&T opportunity area is and the key technologies that support it.
- An examination of the market outlook and growth dynamics surrounding the S&T opportunity area.
- An explanation of why this opportunity is a fit for New Mexico in the context of the technology push of core technology competencies and the market pull of emerging or existing industry clusters.
- An explanation of economic development implications for realizing future growth based on insights/discussions with New Mexico stakeholders.

Quantum Systems & Applications: An Existing S&T Growth Opportunity Area for New Mexico

Quantum Systems & Applications represents one of the most potentially transformative and strategically significant technology frontiers of the coming decades. With implications spanning national security, advanced computing, secure communications, and precision sensing, quantum technologies are poised to redefine capabilities across both government and industry. For New Mexico, this domain is not just a speculative investment—rather, it builds directly on a 30-year legacy of research excellence within the state's national laboratories and universities. New Mexico is home to pioneering advances in quantum cryptography, sensing, and algorithms, and it now plays a central role in regional and national initiatives through entities like the Quantum New Mexico Institute and the Elevate Quantum Tech Hub.

While New Mexico possesses significant scientific depth and institutional infrastructure, the global competition for quantum leadership is intensifying. States and nations are investing aggressively in facilities, workforce, and industry partnerships to secure first-mover advantage. New Mexico must proactively invest if it is to convert its research leadership into a durable, high-value industry cluster that creates quality jobs, attracts world-class companies, and strengthens national innovation capacity.

What is Quantum Systems & Applications?

Quantum Systems & Applications refers to the emerging suite of technologies harnessing the principles of quantum mechanics (principles such as superposition and entanglement) to perform functions beyond the reach of classical physics. It encompasses three primary domains: quantum computing, quantum communication, and quantum sensing. Each of these is a technical pillar with distinct capabilities and applications, yet they share overlapping scientific foundations and infrastructure. Together, advances in these areas promise to revolutionize industries ranging from cybersecurity and national defense to pharmaceuticals and materials science.

- **Quantum Computing:** Quantum computers leverage quantum bits (qubits) that can exist in superposition (multiple states simultaneously) and become entangled (linked such that the state of one effect another). This allows certain computations to be executed exponentially faster than on classical computers. For example, problems like factoring large numbers – intractable for today's supercomputers – could potentially be solved by a quantum computer, jeopardizing classical encryption methods. Beyond cryptography, quantum computing holds promise for simulating complex molecular interactions (accelerating drug discovery and new materials design) and solving optimization problems in logistics and finance that are currently impractical to compute. Multiple technological approaches are being pursued to build practical quantum processors. Two leading hardware approaches are 1) superconducting circuits, used by companies like IBM and Google, which require operating at near absolute-zero temperatures, and 2) trapped-ion systems, used by firms like Quantinuum and IonQ, which confine individual

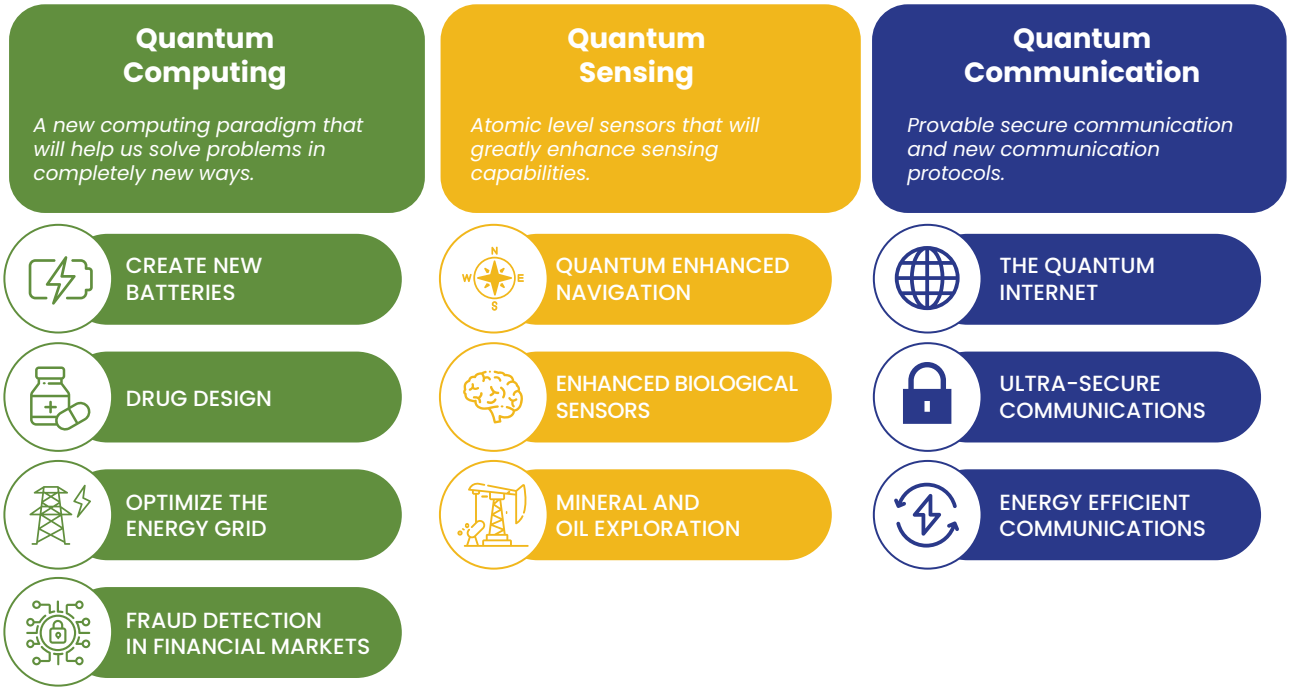
ions and manipulate them with lasers. Each approach faces engineering challenges—superconducting qubits need costly cryogenics to maintain quantum coherence, while ion traps require exquisite precision and still face scalability hurdles. However, steady progress is being made toward more stable, error-corrected quantum processors.

- **Quantum Communication:** Quantum communication exploits quantum states (typically of photons) to enable fundamentally secure information transfer. The most well-known application is quantum key distribution (QKD), in which encryption keys are encoded in quantum states of light and can be shared such that any eavesdropping attempt is immediately detectable. Because observing a quantum system disturbs its state, QKD promises theoretically unbreakable encryption for data in transit. Governments and industry see quantum networks as the next frontier for secure communications, and research is advancing on metropolitan quantum fiber links and satellite-based QKD systems. In the long term, a fully realized quantum internet could interconnect quantum computers and sensors, enabling new modes of computing and coordination with high security. New Mexico's research institutions are contributing to quantum networking protocols and testbeds, building on expertise in photonics and optics at the state's universities and national labs. For instance, LANL has pioneered quantum communication experiments and is a key node in federal quantum network testbeds. Such efforts align with national security priorities to secure critical infrastructure in the post-quantum era when conventional encryption might be vulnerable.

- **Quantum Sensing:** Quantum sensing uses the extreme sensitivity of quantum systems to measure physical parameters with unprecedented precision. By exploiting phenomena like quantum superposition, even minuscule changes in an environment can be detected. For example, atomic clocks – which use quantum transitions of atoms – are the world's most precise timekeepers and underpin GPS networks. Similarly, quantum magnetometers can detect faint magnetic fields, and atom-interferometer gyroscopes can provide ultra-precise navigation in environments where GPS signals are unavailable. These sensors are of particular interest to the military and aerospace sectors, where precision guidance, detection of underground structures, and secure navigation are mission-critical. New Mexico's laboratories have a legacy of research in these areas (for instance, Sandia has worked on atomic magnetometry and inertial quantum sensors for defense applications), and local startups are now aiming to commercialize quantum sensor components. The ability of quantum sensors to "detect the undetectable"—from subtle gravitational anomalies to single photons—could also transform civilian applications such as medical imaging, seismic surveying, and industrial process control. Quantum sensing is already moving from theory to practice; for example, quantum-enhanced atomic clocks and GPS receivers are being field-tested to improve timing security for financial networks and grid infrastructure.

Figure 13 illustrates these three technical pillars/key application areas as described by the New Mexico Quantum Institute.

FIGURE 13. ILLUSTRATION OF KEY APPLICATIONS AREAS OF QUANTUM TECHNOLOGIES



Source: Quantum New Mexico Institute

Underpinning all these facets of quantum technology are cross-cutting sub-disciplines related to the materials, hardware, and architecture needed to create these systems, such as quantum materials and photonics, cryogenic engineering, novel algorithm development, and error-correction techniques. Progress in quantum computing relies on developing materials that can behave quantum-mechanically (superconductors, topological materials, etc.) and on error-correcting codes to mitigate decoherence. Quantum communication demands single-photon sources, detectors, and quantum repeaters to extend network range. Quantum sensors often require integration of lasers, optical cavities, and nanofabricated structures to interact with quantum states. New Mexico's R&D ecosystem reflects many of these sub-themes: for instance, Sandia's Microsystems Engineering facility has expertise in photonic integrated circuits and application-specific integrated circuits (ASICs) for quantum devices, while the UNM and LANL have collaboratively advanced quantum algorithms and error correction methods. These underpinning capabilities are critical differentiators because leadership in emerging quantum applications relies not only on owning quantum computers or sensors, but also on access to the production capabilities and experienced talent (e.g., specialized lasers, cryostats, nanofabrication for qubits) that make those systems possible.

Quantum technologies are poised to transform a range of industries, though their applications are unfolding on different timelines. In the near term, quantum sensing and navigation systems are already finding footholds in defense, aerospace, and geoscience sectors. These technologies, including quantum magnetometers, gravimeters, and atomic clocks, offer exceptional precision and reliability in environments where GPS and conventional sensors fail, enabling enhanced navigation, underground detection, and timing security for financial networks and communications. These devices are being prototyped and deployed today, driven by urgent national security and industrial needs. In contrast, quantum computing remains a longer-term pursuit, where an international "arms race" is underway between the competing hardware approaches of trapped ions, superconducting qubits, neutral atoms, and photonics, each offering different trade-offs in scalability, coherence, and error correction. While broad commercial applications in computing are still years away, the potential impacts on cryptography, drug discovery, materials science, and logistics optimization are profound, spurring sustained investment and research by governments and major corporations alike. The real-world applications of quantum technologies thus span a spectrum ranging from immediate tactical value in sensing to strategic long-term disruption in computation.

Economic development stakeholders and policymakers must recognize that quantum technologies are now transitioning from pure research to early commercialization across these various timelines. As this transition to commercial maturity occurs, regions that combine scientific excellence with supportive business environments will attract key players in the emerging quantum industry, in particular scaling startups that are first to market in adapting these technologies for commercial use. New Mexico's challenge – and opportunity – is to build on its strong research and basic science forces anchored by labs and universities by developing a cohesive quantum technology ecosystem that also offers commercialization pathways and a supportive business environment for companies and startups. By doing so, New Mexico can leverage its scientific strengths for economic growth, much as Silicon Valley once translated physics research into the semiconductor industry.

Market Outlook and Growth Dynamics

The overall trajectory of the quantum technology market is one of rapid growth and intensifying global competition across signature research initiatives backed by national investments. Many investors and policymakers worldwide view quantum tech as a strategic frontier akin to the early space race or the birth of the internet, with potentially disruptive economic and national security impacts. A few key dynamics are driving this market's expansion:

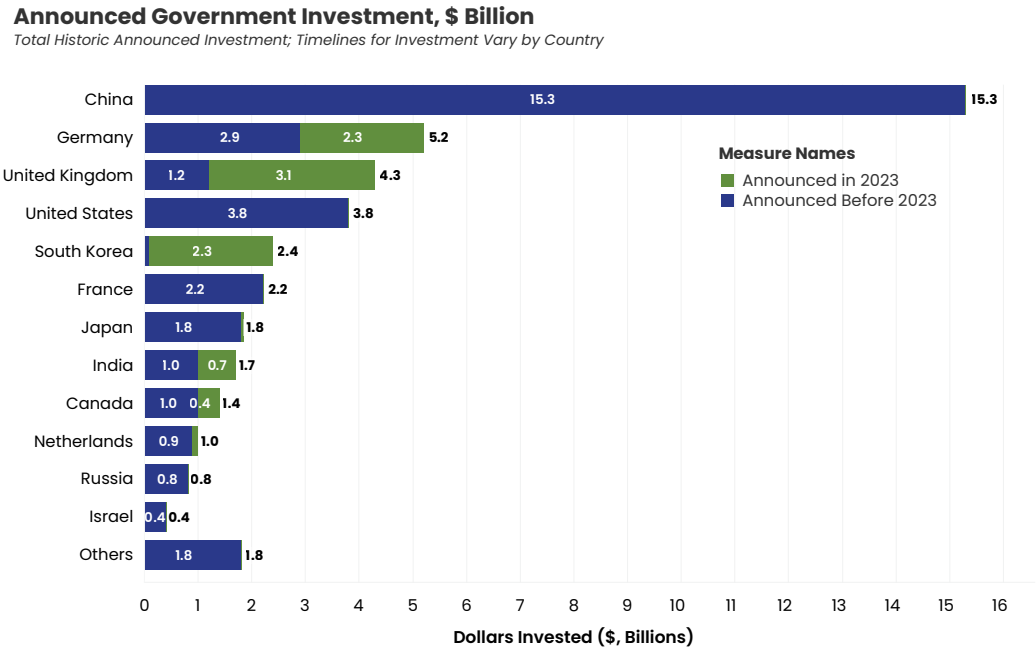
- **Surging Public Investment and Geopolitical Competition:** National governments are pouring unprecedented funding into quantum R&D and infrastructure. The United States catalyzed its efforts through the National Quantum Initiative Act of 2018 (reauthorized and expanded via the CHIPS and Science Act of 2022), which has funded new quantum research centers across DOE, NSF, and NIST. Notably, Department of Energy national labs (including Sandia and LANL) host multi-institution centers focused on quantum computing and networking. U.S. federal quantum R&D funding reaches into the hundreds of millions annually, and the CHIPS Act authorized a further boost, seeing quantum technology as critical to future semiconductor and computing leadership. This national commitment is mirrored (and arguably spurred) by major investments abroad: China famously invested $10 billion in a National Quantum Laboratory in Hefei[6] to seize leadership in quantum computing and sensing, and the European Union launched a €1 billion (~$1.1B) Quantum Technologies Flagship[7] program over 10 years to unify academic and industrial research. Dozens of countries now have national quantum programs. The effect of this public funding is an acceleration of progress and a recognition that quantum technologies are a strategic asset. Nations that lead in quantum innovation could gain advantages in cybersecurity (through unbreakable communications or breaking others' codes) and economic power (through quantum-enabled industries), while laggards risk dependency on others for critical technologies. In short, a global "quantum race" is underway, driving the market forward.

- **Growing Private Sector and Venture Capital Involvement:** Hand-in-hand with government funding, private investment in quantum startups has skyrocketed in the last five years. Large technology companies (IBM, Google, Microsoft, Amazon) have built significant quantum computing teams and cloud-based quantum services, while dozens of startups have attracted venture funding to pursue various quantum hardware and software approaches. In 2021–2023 alone, the quantum sector saw multiple startups (e.g., IonQ, Rigetti, D-Wave) go public or reach valuations in the hundreds of millions to over a billion dollars, reflecting investor optimism in the field. Analysts project robust growth, with some industry estimates expecting that quantum technologies could create economic value in the trillions of dollars within the next decades. While these figures are speculative, the consensus is clear: significant commercial markets will form around quantum solutions, from computing-as-a-service for specialized problems to quantum-safe cybersecurity products and high-precision sensors for industry. The presence of deep-pocketed players (e.g., Amazon Web Services offering cloud quantum access) also points to an emerging quantum supply chain where hardware makers, software developers, and service providers all coalesce to deliver end-to-end solutions.

6 Popular Science (May 2021) – China's $10B Quantum Research Center and goals.
7 McKinsey Quantum Technology Monitor, 2023

While still an emerging market, quantum technologies have already garnered significant investment with global public investments in quantum technology reaching $42 billion in 2023. BCC Market Research reports that the global market for quantum computing services is estimated to reach $1.3 billion in 2025 with a CAGR of 35 percent through 2030, while quantum computing systems is valued at $324 million in 2025 with a CAGR of 33 percent through 2030.

McKinsey & Company identified the following announced government investments, illustrating the rapid increase in global funding.



- **Technology Breakthroughs Edging Toward Practicality:** The market is being propelled by steady advances in the science and engineering of quantum devices. Each year, researchers report new milestones: higher qubit counts, lower error rates, longer coherence times, and demonstrations of algorithms that inch closer to quantum advantage (surpassing classical capabilities for specific tasks). In quantum communication, test networks spanning hundreds of kilometers using fiber and satellite links have been implemented, and the U.S. announced plans for a continental quantum internet prototype by 2030.[8] In sensing applications, quantum magnetometers and clocks have moved from lab demos to deployable prototypes. These breakthroughs feed a virtuous feedback cycle: as technical risk gradually decreases, more investors and end-users become willing to engage, which in turn funds further development. Analysts speculate that if current trends hold, quantum computing could solve valuable problems within 5–10 years, unlocking use-cases worth hundreds of billions in value (e.g., in drug discovery, where a single breakthrough drug enabled by quantum simulation could be immensely profitable).

- **Workforce and Talent Pipeline Development:** A critical factor in market growth is the development of a skilled quantum workforce. The highly specialized nature of quantum engineering means talent is a scarce resource. The market is experiencing a talent crunch, with experts in quantum physics, cryogenics, photonics, and quantum software in high demand. Governments and academia are responding by creating new training programs (for example, NSF-funded Quantum Leap Challenge Institutes and the DOE's workforce initiatives) and even K–12 outreach to seed the next generation of quantum scientists. Private sector consortia like the Quantum Economic Development Consortium (QED-C) have identified workforce development as a top priority, noting that lack of skilled talent could be a bottleneck in the industry's growth. Projections indicate that the quantum industry could require hundreds of thousands of new workers globally by 2030. This includes not only Ph.D.-level researchers but also technicians, engineers, and system developers. Regions that invest in education and training stand to gain an edge in attracting companies.

In summary, the quantum technology market appears to be poised at an inflection point. Global and national investments are ensuring that the field progresses rapidly, possibly yielding transformative commercial applications within decade-scale timeframes. Notably, industry readiness to adopt quantum solutions for competitive advantage is growing just as quickly as scientific breakthroughs bring solutions closer to market. For New Mexico, this broader market context is encouraging, as it indicates that the window of opportunity still exists to become a national anchor in a fast-growing sector.

8 U.S. Department of Energy and National Quantum Initiative Act, 2020.

Why is this S&T Opportunity Area a Fit for New Mexico?

New Mexico's position in quantum technologies is grounded in its historical role as an originator of the field. Foundational advances in quantum sensing, secure communications, and quantum materials were pioneered at Sandia and LANL, where early demonstrations of quantum key distribution, quantum dot fabrication, and integrated photonics systems helped establish core technical paradigms that continue to define the sector. These institutions remain among the most active and technically advanced federal centers in quantum research, anchoring decades of sustained federal investment. Over time, this laboratory-driven leadership catalyzed the growth of quantum programs in the state's academic institutions, most notably at UNM where the Center for Quantum Information and Control—now reorganized as the Quantum New Mexico Institute (QNM-I)—has become a nationally recognized center of excellence in quantum theory, algorithms, and graduate training. The program has produced more than 50 Ph.D. graduates now working in leading roles across the quantum industry, creating a deep network of homegrown expertise that few comparably sized states can match. This legacy, combined with the density of technical infrastructure and domain-specific expertise housed within New Mexico's universities and federal labs, places the state in a distinctive position to shape and benefit from the accelerating evolution of quantum systems and applications.

Highlights of New Mexico's Technology "Push"

New Mexico's technology push in quantum science is defined by the depth and continuity of its scientific research enterprise, led by its national laboratories and universities. The state's institutions have played a foundational role in advancing quantum theory, hardware, and enabling technologies, and continue to generate high-impact research, federal investment, and talent. This sustained activity has created a dense cluster of capabilities that positions New Mexico as a key driver of innovation across multiple quantum subfields against a small subset of other U.S. regions. Key strengths identified in analyses of research and innovation indicators as well as trends noted by stakeholders include:

- **Unique National Laboratory R&D Programs and Facilities:** Sandia and LANL form the core of New Mexico's quantum R&D infrastructure, with broad capabilities spanning quantum computing, communication, sensing, and materials science. Sandia is a principal partner in the DOE-funded Quantum Systems Accelerator (QSA), where it leads the development of ion-trap quantum computing platforms and manages the Quantum Scientific Computing Open User Testbed (QSCOUT), a publicly accessible hardware resource for quantum experimentation. These efforts are supported by Sandia's Microsystems Engineering (MESA) complex, which enables fabrication of low-noise photonic circuits, superconducting qubit packaging, and other essential components for scalable quantum systems. LANL has led quantum communication and sensing research for over two decades, including early demonstrations of quantum key distribution and continued work on free-space QKD and satellite-based secure communications. Its theoretical group is active in quantum algorithm development, quantum annealing, and hybrid quantum-classical methods, often targeting optimization and national security applications. Both labs contribute to quantum materials R&D, including work on quantum dots, spin-based systems, and topological materials, frequently in collaboration with the jointly operated Center for Integrated Nanotechnologies (CINT). Collectively, Sandia and LANL receive tens of millions in annual quantum R&D funding

and support a high-density workforce of PhD scientists and engineers. Their collaborations with New Mexico universities through joint appointments, student internships, and co-led projects reinforce a dense research ecosystem.

- **Long-Standing Academic Leadership in Quantum Information Science:** New Mexico's universities have made sustained and nationally visible contributions to quantum information science, with UNM leading one of the longest-running academic programs in the field. Established in the 1990s, UNM's Center for Quantum Information and Control (CQIC), now formalized as the Quantum New Mexico Institute (QNM-I), has built internationally recognized expertise in quantum algorithms, entanglement theory, quantum measurement, and quantum error correction. UNM faculty have consistently secured competitive federal grants from the NSF and DOE, including a Quantum Leap Challenge Institute award focused on quantum networking, and have authored over several hundred publications in leading quantum journals across these core areas. The program has produced over 50 PhD graduates, many of whom now hold positions at leading quantum firms and federal labs, creating a distributed network of technical expertise rooted in New Mexico. NMT and NMSU offer complementary strengths that support the broader quantum R&D ecosystem. NMT has focused on quantum-relevant research in photonics, semiconductors, and nanofabrication, while NMSU contributes capabilities in computational modeling, AI-enhanced control systems, and applied materials science. Both institutions have received NSF EPSCoR and DOE funding to expand their infrastructure and develop cross-disciplinary programs aligned with quantum technologies. Across all three universities, quantum-related research grants and publications increasingly converge around enabling technologies such as photonic integrated circuits, cryoelectronics, quantum materials, and hybrid computing architectures. These themes directly align with New Mexico's strategic strengths in hardware innovation and position the state's academic institutions as critical contributors to workforce development and translational research.

- **Emerging Quantum Research Initiatives and Programs:** New Mexico's quantum technology opportunity is increasingly defined by coordinated institutional partnerships and the formation of specialized programs that extend beyond individual labs or campuses. In addition to examples such as QNMI, this institutional momentum is amplified through New Mexico's role in the Elevate Quantum Tech Hub, a federally designated multi-state consortium linking New Mexico and Colorado. Elevate Quantum provides a formal mechanism for aligning R&D capacity across universities, national labs, and industry partners, and is supporting the creation of open-access quantum fabrication and testing facilities in Albuquerque. These efforts are designed to fill critical infrastructure gaps in prototyping and component manufacturing, particularly for photonic and cryogenic subsystems. Through Elevate, New Mexico institutions are contributing to collaborative testbeds, shared instrumentation, and workforce pipelines targeting national supply chain vulnerabilities. Academic institutions are also expanding training infrastructure, with initiatives such as Central New Mexico Community College's Quantum Learning Lab (QuLL) supporting technician education, as well as ongoing cross-campus coordination among UNM, NMSU, and New Mexico Institute of Mining and Technology (NMT) to build

interdisciplinary curricula in quantum science and engineering. Stakeholders noted the potential to expand cross-cutting initiatives even further to better leverage other national lab and university innovation assets.

Together, these institutional assets and collaborative programs position New Mexico as a concentrated source of quantum research, talent, and infrastructure. The depth and coherence of this technology push provide a strong foundation for sustained federal investment and future commercial translation, with the opportunity to play a hub role in the national quantum ecosystem.

Highlights of New Mexico's Market "Pull"

New Mexico's quantum research base is increasingly supported by early signals of commercial traction and applied demand. While the national quantum industry remains in a formative stage, the state has begun to build the foundational elements of a market-facing ecosystem—ranging from specialized component startups and supplier firms to emerging defense and aerospace applications and new federal investments in prototyping infrastructure. These developments suggest that New Mexico has the potential to translate its scientific strengths into industry engagement and early-stage commercialization, laying the groundwork for a viable quantum market presence. Several notable indicators of market demand include:

- **Emerging Base of Quantum-Related Firms and Suppliers:** New Mexico is beginning to demonstrate its potential to attract quantum component and systems firms through early-stage engagements and competitive site selection activity. Industry stakeholders point to the state's proximity to national laboratories, specialized academic expertise, and availability of emerging fabrication infrastructure as factors that make it a viable location for startups in quantum sensing, photonics, and device packaging. Several companies have identified New Mexico as a leading candidate for its initial fabrication operations due to its technical alignment and cost advantages, although further work is yet needed to secure commitments to build new facilities. Among firms already operating in New Mexico, there is demonstrated capability at leading companies in fabrication and packaging solutions with direct relevance to quantum photonic and RF devices. These firms, while serving broader defense and electronics markets, are increasingly intersecting with quantum system integrators, providing New Mexico with embedded industrial capacity in key enabling technologies. In parallel, the state's involvement in the Elevate Quantum Tech Hub has raised its profile among major national quantum firms, some of which have identified New Mexico as a critical partner for photonics integration and component development. In a significant milestone for the state's quantum ecosystem, Quantinuum announced plans in 2025 to establish a new quantum R&D center in New Mexico, marking the company's first dedicated facility outside its home base and signaling increased industry confidence in the state's growing quantum infrastructure. While many of other companies are still headquartered elsewhere, their participation in regional initiatives coupled with the buildout of open-access facilities positions New Mexico to host satellite operations, pilot-scale production, and research collaborations.

- **Demand From Anchor End-User Sectors (Defense, Aerospace, Telecoms, Energy):** New Mexico's concentration of defense, aerospace, and national security agencies provides a strong in-state market for early quantum technologies. Organizations such as the AFRL at Kirtland AFB, White Sands Missile Range, and the national laboratories are active consumers of quantum-enabled capabilities, including precision navigation systems, quantum-secure communications, and advanced sensing. AFRL has pursued quantum timing solutions for GPS-denied environments, while Sandia and LANL leverage quantum sensors and computing for stockpile stewardship, cryptographic analysis, and materials modeling. This embedded federal presence creates an environment where quantum startups and suppliers can engage directly with mission-driven end users, facilitating early prototyping and de-risked deployment. State-based integrators and tech contractors supporting the labs or regional semiconductor facilities also present potential customers for quantum components, particularly in photonics and sensing. Additional traction may come from utility, telecommunications, and energy partners, where quantum sensors and secure communication infrastructure have been piloted to drive value-added industry applications.

- **Growing Incentive Programs and Potential Quantum Supply Chain:** New Mexico is taking concrete steps to enhance its competitiveness as a destination for quantum industry investment by building both infrastructure and targeted incentives. Through the Elevate Quantum Tech Hub, the state is establishing a quantum fabrication and prototyping facility at UNM's Science and Technology Park, supported by significant federal and matching state funds. This facility is designed to address a critical gap cited by industry, namely the absence of open-access environments for low-volume quantum hardware development outside federal labs. Paired with Elevate's workforce investments, such as the Quantum Learning Lab at CNM, and supported by existing incentives like the High Wage Jobs Tax Credit and Job Training Incentive Program (JTIP), New Mexico is beginning to assemble the conditions required to attract component suppliers and system integrators alike. In parallel, the state is well positioned to lead in component-level manufacturing across the quantum supply chain. Industry feedback highlights demand for domestic sources of critical subsystems such as VCSELs, single-photon sources, metasurfaces, cryogenic packaging that are currently dominated by foreign suppliers. New Mexico's research base in photonics and quantum materials, especially at Sandia, offers a foundation to meet this demand. If scaled through shared infrastructure and supported with competitive co-investment incentives, the state could become a key supplier to national firms seeking secure, short-lead alternatives. A modest-volume quantum fab capable of producing tens of thousands of components annually is seen by stakeholders as both commercially viable and strategically necessary. Anchoring this capability would establish New Mexico as a hub for quantum hardware, triggering follow-on investment from system firms looking to co-locate near key suppliers. These emerging supply chain dynamics represent one of the clearest opportunities for the state to convert research excellence into sustained industrial growth.

New Mexico's market-facing quantum activity is nascent, with a limited number of dedicated quantum firms currently operating in-state. Nonetheless, the state's alignment with key market drivers across defense and aerospace applications, component manufacturing, and workforce readiness positions it to capitalize on emerging opportunities. Recent investments in fabrication infrastructure, technician training, and multi-institutional coordination through federal programs represent substantive steps toward strengthening its industry-facing ecosystem. As these assets continue to scale, they are expected to support increased engagement from startups, national contractors, and system integrators seeking proximity to quantum-relevant capabilities.

Line-of-Sight Market Applications for New Mexico

Given its strengths in quantum R&D, component technologies, and national security infrastructure, New Mexico has several realistic application areas where commercial and translational activity can take root. These represent opportunities where state capabilities align with emerging market demand, including:

- **Quantum Components and Enabling Hardware:** With the planned open-access fabrication facility at UNM and advanced instrumentation at CINT, New Mexico is positioned to support low-volume production of critical quantum components—such as VCSELs, single-photon sources, photonic integrated circuits, and cryogenic subsystems. These are high-demand technologies across quantum computing, sensing, and communications, and the state's capabilities could fill a key domestic supply chain gap.

- **Quantum-Secure Communication Networks:** National lab expertise in quantum cryptography and the state's defense infrastructure provide a testbed for secure fiber and satellite-based quantum networks. Projects linking LANL, Sandia, and UNM through quantum key distribution could serve as operational demonstrations for future deployment in defense, finance, and critical infrastructure sectors.

- **Precision Navigation and Timing (Quantum Sensing for PNT):** Sandia and AFRL are advancing atomic clocks and quantum inertial sensors for GPS-denied navigation. Coupled with test assets at White Sands Missile Range and end-user proximity, New Mexico can support the development, validation, and potentially localized production of quantum-enhanced PNT systems for defense and aerospace.

- **Quantum Software and Application Layer:** UNM's research leadership in quantum algorithms and Los Alamos's applied computing programs create a foundation for developing quantum optimization, simulation, and AI-enhanced solutions. These could serve sectors such as energy, materials, and national defense, particularly as cloud-based access to early quantum hardware matures. Stakeholders have also highlighted growing industry interest in hybrid quantum-classical systems as a near-term "bridge" to more fully realized quantum computing frameworks, where quantum subroutines are integrated with high-performance computing workflows—a model well suited to New Mexico's combined strengths in quantum theory and classical supercomputing.

- **Quantum-Enabled Advanced Manufacturing and Materials:** Quantum sensing technologies can be applied to semiconductor and precision manufacturing, supporting in-state industries such as microelectronics. R&D in quantum materials also opens adjacent opportunities in energy storage, catalysis, and photonics. These spillovers offer innovation potential beyond core quantum markets that are particularly relevant to other opportunity areas highlighted in this report.

Each of these application areas reflects a convergence of technical capacity, infrastructure, and institutional alignment, offering New Mexico translational paths to market amidst an emerging national landscape as well as longer-term leadership in select quantum market segments that will continue to evolve.

Implications for Economic Development

Positioning Quantum Systems & Applications as a strategic growth sector will require significant investment by the State of New Mexico if this technology platform is to develop into an economic driver of the state's economy. If successfully nurtured, quantum technologies offer a pathway to brand the state as a rising technology hub with unique assets while creating new high-wage jobs in research, engineering, and advanced manufacturing. Building out this sector will create career opportunities across the skill spectrum—quantum physicists, device engineers, photonics technicians—and support ecosystem spillovers in higher education, supplier networks, and adjacent industries.

To realize these benefits, New Mexico will need to address persistent structural challenges in scaling research to market in an industry that is still emerging in terms of its broad commercial viability. Stakeholders emphasized the importance of matching federal or private investment with state support, particularly for translational infrastructure, pilot production lines, and early-stage manufacturing. Bridging the lab-to-market gap will also require more robust mechanisms for technology transfer, entrepreneurial engagement from national lab personnel, and new programs to embed market-facing expertise within research institutions.

Workforce development must accompany these efforts. Expanding training at both the university and community college levels such as UNM's quantum engineering initiatives and CNM's Quantum Learning Lab is essential to meet future demand and provide attractive site location conditions for scaling companies. At the same time, infrastructure investments will be needed to support commercial activity, including shared cleanroom space, cryogenic and photonic testbeds, and secure computing resources.

Sustaining momentum in Quantum Systems & Applications will require New Mexico to move beyond research excellence and into proactive buildout a robust industry cluster supporting this area. While the Elevate Quantum Tech Hub provides a critical foundation for regional coordination, the next phase must focus on securing tangible wins—convincing leading quantum firms to locate operations in the state and ensuring homegrown startups scale locally

rather than elsewhere. This will demand a focused site attraction strategy that leverages New Mexico's unique mix of national lab partnerships, fabrication assets, and workforce programs, while offering compelling co-investment packages to compete with states deploying significant incentive capital.

At the same time, the state must secure ambitious follow-on investment to sustain the infrastructure and workforce initiatives now underway. This includes working to obtain the next phase of federal funding through the Elevate Quantum consortium's pending EDA application, and, if necessary, committing significant state resources to fill funding gaps. Without a bold step forward—such as a sizable state investment in shared-use quantum facilities, translational research, or capital support for scaling firms—New Mexico risks falling behind more aggressive regions.

Summary: Key Findings

New Mexico's ecosystem and institutional infrastructure for Quantum Systems & Applications is unusually rich for its size: Sandia's Microsystems Engineering complex and LANL's CINT user facility provide advanced capabilities in photonic circuit design, nanofabrication, and quantum testbeds, while efforts are underway to establish other open-access fabrication facilities at UNM's Science & Technology Park to address current limitations on private-sector access to federal lab equipment. In addition, the state's designation as a federal Tech Hub, through its role in the Elevate Quantum consortium, brings over $40 million in investment to the region and recognizes New Mexico's central role in building the nation's quantum capacity.

In addition to these resources, the state also has competitive advantages it can leverage to foster economic development opportunities in this space. While other states focus on quantum software or computing stacks, New Mexico is positioned to lead in the critical hardware layer—developing and supplying enabling components such as quantum-grade lasers, sensors, and packaging technologies that underpin all modalities of quantum systems. This focus leverages strengths in photonics, microelectronics, and materials science, and aligns with federal supply chain priorities. Over decades, the presence of the national labs and university centers have built a cluster of expertise, ensuring an entrenched base of human capital and intellectual know-how in quantum theory and experimentation. Additionally, New Mexico's demographics and talent pipeline (with a strong military presence, high per capita levels of advanced engineers, and a large minority-serving institution network) align with the push in quantum to build out workforce, particularly new efforts that include a focus on quantum workforce programs for non-degree holders. As a result, quantum technologies are aligned with New Mexico's economic development goals, offering pathways to diversify the state's economy through high-wage job creation and tech commercialization.

While New Mexico possesses a compelling mix of scientific leadership, specialized infrastructure, and strategic alignment with national priorities, realizing the full potential of its quantum opportunity will require overcoming several structural challenges. Chief among these are the gaps in translational infrastructure and capital investment needed to move innovations from lab-scale to commercial production, particularly in hardware-intensive domains. Existing constraints on private-sector access to federal facilities, limited availability of open-access prototyping environments, and a nascent venture capital ecosystem create friction in scaling quantum ventures locally. Additionally, while the state has made important strides in workforce development, sustained investment will be required to ensure a steady pipeline of quantum-capable technicians, engineers, and researchers across educational levels. Effective coordination across state agencies, universities, national laboratories, and industry will also be essential to avoid fragmentation and ensure that New Mexico's assets are deployed in a cohesive, strategically focused manner.

Advanced Energy Technologies: An Existing S&T Growth Opportunity Area for New Mexico

Advanced Energy Technologies represent one of the most consequential and rapidly evolving areas in the global shift toward sustainable, resilient energy systems. This opportunity area encompasses a diverse and expanding portfolio of technologies and applications, ranging from solar and wind power, hydrogen production and storage, geothermal and nuclear energy, fusion research, carbon capture and reuse, and the critical digital infrastructure needed to manage distributed cyber-secure grids. While these technologies vary in maturity and market readiness, they share a common imperative: the need to be tested, proven, and integrated in real-world settings. As the energy system becomes increasingly complex and decentralized, success will depend not just on individual innovations, but on the ability to validate how these systems work together across varied operating conditions and applications.

New Mexico is exceptionally well-positioned to lead in this space. With world-class national laboratories, strong research universities, expansive renewable and geological resources, and emerging manufacturing capabilities, the state can serve as both a launchpad and proving ground for advanced energy deployment. Its unique geography and infrastructure allow for scalable demonstration, while its legacy energy workforce provides a foundation for cross-sectoral innovation. The opportunity is bookended by early-stage research and piloting on one end and full systems-level integration on the other, and New Mexico's comparative advantage lies in its ability to link these stages through a coordinated ecosystem of institutions, testbeds, and industry partners.

What are Advanced Energy Technologies?

Advanced Energy Technologies encompass a broad portfolio of innovations that are transforming how energy is produced, stored, and utilized. This opportunity area spans **renewable power sources** (such as solar photovoltaics, wind turbines, and geothermal heat), **next-generation fuels** (like hydrogen and biofuels), **nuclear innovations** (advanced nuclear reactors and fusion energy), **modern grid systems** (microgrids and smart grid management), and **environmental management** (carbon capture, water reuse, and clean oil & gas technologies). Collectively, these technologies aim to deliver cleaner and more resilient energy systems. In particular, Advanced Energy Technologies are essential to grid resilience because they diversify energy supply, enhance local autonomy, and enable real-time response to disruptions caused by natural disasters, cyberattacks, or supply constraints. They are also critical in meeting global decarbonization goals: by 2050, nearly 90 percent of electricity could come from carbon-free sources – about 70 percent from solar and wind and much of the rest from nuclear.[9] The advanced energy portfolio thus underpins ongoing energy transitions and represents a rapidly growing market worldwide.

9 International Energy Agency Net Zero by 2050 Analysis, 2021.

New Mexico's potential opportunity spans a number of different modalities of energy generation and management, including technology areas such as:

- **Solar Energy and Photovoltaics:** Solar power is now a cornerstone of new electricity generation. The most widespread technology is photovoltaic (PV) conversion, where semiconductor materials (typically crystalline silicon, or newer thin-film compounds like cadmium telluride or perovskites) absorb photons and release electrons, producing direct current (DC) electricity. These PV cells are assembled into modules and installed in configurations ranging from residential rooftop systems to utility-scale solar farms. Another pathway is concentrated solar power (CSP), which uses mirrors or lenses to focus sunlight onto a central receiver, producing heat that drives a steam turbine—an approach more suited to large-scale installations with thermal storage capability. The cost of PV electricity has declined dramatically—by over 80 percent in the past decade—due to improved manufacturing, higher module efficiencies, and economies of scale. Solar energy is now integrated into a wide range of applications including net-zero buildings, off-grid electrification, agricultural operations (agrivoltaics), and charging infrastructure for electric vehicles. Innovations continue in bifacial panels, solar tracking systems, and building-integrated photovoltaics (BIPV), expanding solar energy's reach and versatility across industrial, residential, and commercial sectors.

- **Wind Energy:** Wind power is another dominant force in clean energy, with modern large-scale turbines generating cost-competitive electricity. Onshore wind systems dominate the market due to lower installation costs and established infrastructure, while offshore wind farms, though more expensive, offer higher and more consistent wind speeds. Technological advancements such as longer rotor blades, variable-speed generators, and advanced control systems have significantly improved capacity factors and reduced costs. Wind power is widely deployed in large-scale farms, often covering hundreds of square miles, but is also used in distributed wind applications such as community-scale projects or hybrid systems combining wind with solar and batteries. Industrial applications increasingly include wind-powered hydrogen production, particularly in high-wind regions, where turbines can drive electrolysis systems.

- **Geothermal Energy:** Geothermal energy utilizes the thermal energy stored beneath the Earth's surface for electricity generation or direct-use heating applications. The primary methods include hydrothermal systems, where naturally occurring steam or hot water from geothermal reservoirs is brought to the surface via wells to drive turbines, and enhanced geothermal systems (EGS), which create artificial reservoirs by fracturing hot, dry rock and circulating water through it. Geothermal plants can operate binary cycle systems, using heat exchangers to vaporize a secondary fluid with a lower boiling point, enabling power production even at moderate temperatures. In addition to electricity, geothermal heat is used in district heating, greenhouse agriculture, aquaculture, and industrial drying processes. Unlike wind and solar, geothermal is a baseload resource, providing continuous, stable power regardless of weather conditions and is particularly suited to regions with volcanic activity, tectonic plate boundaries, or high geothermal gradients.

- **Hydrogen Energy and Biofuels:** Clean hydrogen has risen as a versatile energy carrier that can store energy and decarbonize hard-to-electrify sectors. Production methods include steam methane reforming (SMR) (with or without carbon capture), electrolysis of water using electricity, and biomass gasification. Hydrogen is classified by color codes—green (from renewables), blue (from natural gas with carbon capture), and gray (from fossil fuels without capture). It can be stored as a gas or liquid and used in fuel cells to generate electricity, emitting only water, or combusted directly for high-temperature industrial processes. Hydrogen's versatility makes it critical for decarbonizing sectors such as steelmaking, ammonia production, long-haul transportation, and backup power. Biofuels, meanwhile, are liquid fuels derived from biological feedstocks—including corn, algae, and waste oils. Common types include ethanol, biodiesel, and sustainable aviation fuel (SAF). They are compatible with existing engines and infrastructure and offer carbon reduction benefits when produced sustainably. Advanced biofuels, such as cellulosic ethanol or algae-based fuels, are being developed to increase yield and reduce environmental impact.

- **Fusion Energy:** Fusion energy involves combining light atomic nuclei, typically isotopes of hydrogen such as deuterium and tritium, under extreme temperatures and pressures to release energy, mimicking the processes powering the sun. Unlike fission, fusion does not produce long-lived radioactive waste and carries no risk of runaway reactions. Achieving fusion on Earth requires confinement methods that hold the plasma in place long enough for reactions to occur. The two leading approaches are magnetic confinement (e.g., tokamaks like ITER and stellarators) and inertial confinement (e.g., using lasers to compress fuel pellets). Emerging alternatives include magneto-inertial fusion and pulsed-power systems that use high-voltage capacitors to drive fusion reactions. Recent breakthroughs in laser compression and plasma physics have pushed fusion closer to net energy gain, though challenges remain in scaling and maintaining sustained reactions. Fusion is being pursued not only for electricity generation but also for high-intensity neutron sources, propulsion systems, and isotope production, with multiple private companies and public labs entering the race to commercialize fusion over the coming decades.

- **Nuclear Energy and Small Modular Reactors:** Conventional nuclear fission remains a key part of a low-carbon energy mix, and new advancements are reinvigorating the sector. Small Modular Reactors (SMRs) represent a new class of reactors designed for modularity, scalability, and passive safety. SMRs range in capacity from 10 to 300 megawatts and are built in factories for faster deployment. Designs include light-water reactors, similar to current reactors but scaled down, and advanced reactors using gas, molten salt, or liquid metal coolants, which offer higher efficiency and inherent safety. SMRs are well-suited for remote communities, industrial sites, or areas requiring carbon-free baseload power with limited grid access. They also offer potential for co-generation, such as providing both electricity and heat for hydrogen production or desalination. Innovations in fuel cycles, waste reduction, and proliferation resistance further enhance the promise of nuclear as a clean, firm power source.

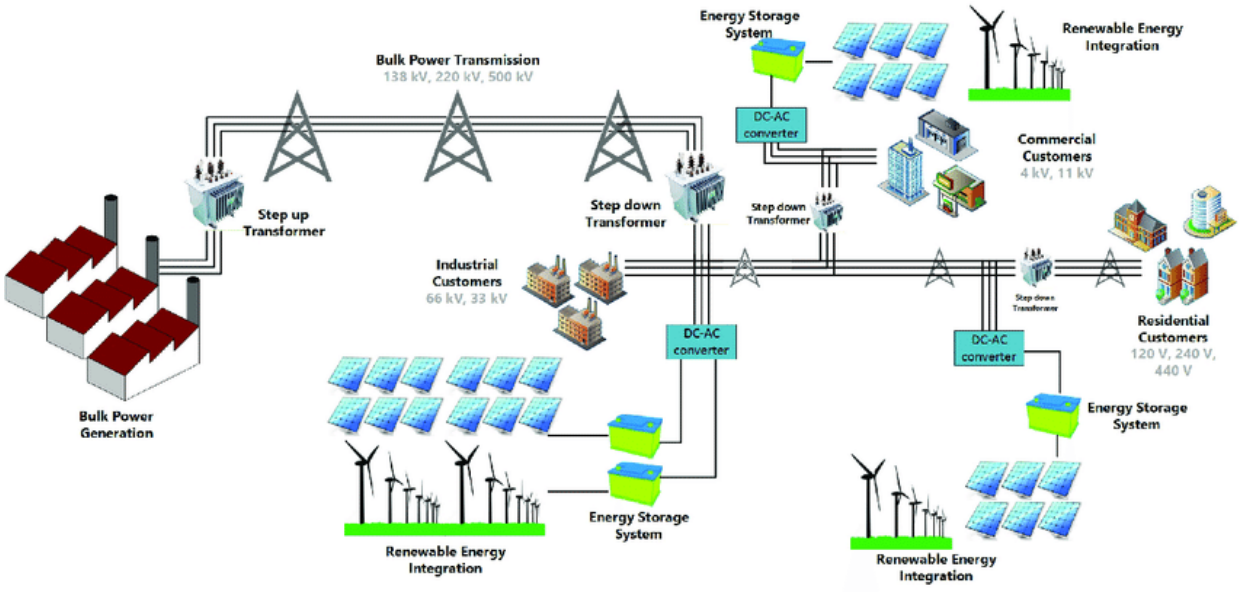
- **Remediation and Adaptive Reuse of Energy Systems Byproducts (Water, Carbon, and Land):** A critical aspect of advanced energy is mitigating environmental impacts of both legacy and new energy industries. In New Mexico, water scarcity and carbon emissions are two intertwined challenges. Energy development (whether drilling, hydrogen electrolysis, or biofuel cultivation) is constrained by water availability in this arid state. A key opportunity lies in produced water reuse – water co-produced with oil and gas extraction. Technologies now exist to treat and reuse this brackish water, for example in agriculture or further drilling, reducing freshwater demand. Similarly, land remediation and reuse has high relevance to New Mexico, as the state has abandoned mine lands and retired industrial sites that could be repurposed for renewable energy farms or other supporting test and deployment sites. On the carbon front, New Mexico has the experience and environment for projects in carbon capture, utilization, and storage (CCUS). New Mexico's oil fields and saline aquifers (notably in the Permian Basin and San Juan Basin) provide abundant storage capacity for captured CO2. In addition, carbon utilization – for instance, converting CO2 into fuels or materials – could become a niche industry given local R&D in chemical engineering.

- **Innovation in Legacy Oil & Gas Industries:** New Mexico is the 2nd-largest oil producer among U.S. states and a major natural gas producer, and revenues from these industries underpin the state budget. As the world pivots to a broader portfolio of energy sources, New Mexico faces the dual challenge of sustaining fossil fuel production and diversifying beyond it. However, rather than a liability, the oil and gas sector can be a platform for innovation. Legacy companies in New Mexico are increasingly adopting advanced technologies ranging from digital oilfield solutions and automation to methane leak detection with drones/AI to reduce the environmental footprint of extraction. There is a strong push to manage methane emissions in the Permian Basin, using sensors and novel materials (this aligns with federal rules and creates a market for tech startups). Moreover, oil and gas expertise is transferable: the same drilling and subsurface skills can drive geothermal energy projects or carbon storage operations. Another avenue is leveraging existing infrastructure – for example, converting idle gas pipelines to carry hydrogen or CO2. Meanwhile, the state's critical minerals potential, often co-located with energy development, is drawing attention. Legacy mining sites and oilfield brines in New Mexico harbor critical elements (lithium, rare earths, etc.) needed for batteries and renewables.

- **Microgrids and Grid Management Technologies:** As more distributed and intermittent resources come online, grid modernization is paramount. Microgrids are localized energy systems capable of operating independently or in coordination with the main grid. A typical microgrid integrates generation (solar, wind, diesel, or gas), energy storage (batteries, thermal), and load management systems within a defined area—such as a campus, military base, or industrial park. When connected to the broader grid, microgrids can provide energy services, demand response, and resilience benefits (Figure 14). When islanded, they ensure continuous power during grid outages, making them essential for critical infrastructure. Advanced microgrids incorporate smart inverters, control algorithms, and real-time sensors that optimize energy use and stabilize voltage and frequency. Complementary technologies include advanced distribution management systems (ADMS), predictive analytics for grid forecasting, and digital twins for grid modeling. These

innovations are central to managing intermittent renewables, integrating distributed energy resources (DERs), and ensuring cybersecurity of energy infrastructure. Industry applications span military installations, data centers, healthcare facilities, and remote communities, particularly as climate-related grid disruptions and electrification of new loads (e.g., EVs) increase.

FIGURE 14. ILLUSTRATION OF DECENTRALIZED MICROGRID ARCHITECTURE LEVERAGING A PORTFOLIO OF ENERGY SYSTEMS TO SUPPORT DEMAND



Source: Mumtaz, Faisal & Bayram, I. Safak. (2017). Planning, Operation, and Protection of Microgrids: An Overview. Energy Procedia. 107. 94-100. 10.1016/j.egypro.2016.12.137.

The state's combination of natural resources (sun, wind, subsurface geology), scientific institutions (two DOE laboratories, research universities), and energy industry experience gives it an edge in multiple of these sub-fields of advanced energy. This convergence of assets enables not only the deployment of technologies but also their development, refinement, and integration into broader energy systems.

Market Outlook and Growth Dynamics

The transition to new portfolios of Advanced Energy Technologies is accelerating worldwide, driven by a convergence of economic, environmental, and geopolitical forces. Several key dynamics are shaping the market trajectory for clean energy and advanced energy tech:

- **Surging Global Investment and Policy Support:** Governments across the globe are pouring unprecedented funding into clean energy. The U.S. alone has committed hundreds of billions via the Infrastructure Investment and Jobs Act and the Inflation Reduction Act to boost renewables, hydrogen, nuclear and more. Europe, China, and others have similarly ambitious green investment plans. By 2023, corporate and government commitments pushed global clean energy investment to an estimated $1.7 trillion per year[10], now surpassing investments in fossil fuels. Massive manufacturing incentives (e.g. solar, battery, and wind factory subsidies) are triggering a wave of new production capacity, accelerating the localization of technology supply chains around anticipated new energy market verticals. Public investment has already spurred announcements of dozens of new facilities across the United States, including gigawatt-scale solar panel factories, battery cell plants, and advanced materials manufacturing sites. This surge in investment extends beyond mature technologies into emerging sectors such as fusion energy which are also beginning to benefit from public and private capital flows, as companies seek to establish domestic production capacity for specialized components such as high-voltage capacitors, plasma chamber materials, and cryogenic systems in advance of commercial scale demonstration of new systems.

Significant global markets exist for the portfolio of different energy technologies noted in this opportunity area:

- Estimated solar power market size of $419 billion in 2024, CAGR of 18 percent through 2029.
- Estimated wind power market size of $283 billion in 2024, CAGR of 6 percent through 2029.
- Estimated bioenergy market size of $148 billion in 2024, CAGR of 3 percent through 2029.
- Estimated geothermal power market size of $419 million in 2024, CAGR of 18 percent through 2029.
- Estimated microgrid technologies market size of $40 billion as of 2026.
- Estimated fusion power market size of $1.7 billion in assuming commercial scale available in 2035, CAGR of 32 percent through 2040.

Source: BCC Market Research

10 International Energy Agency, World Energy Investment 2023.

- **Rapid Technology Improvements and Cost Declines:** Innovation is driving down costs and improving performance across nearly all advanced energy domains. Solar and wind costs have dropped ~80 percent over the last decade, making them the cheapest power sources in many regions. Battery energy storage costs are also falling, enabling more reliable renewable integration. In hydrogen, DOE's Hydrogen Shot aims for an 80 percent cost reduction which could make green hydrogen economically competitive with natural gas. Similarly, advanced nuclear designs target simpler, modular construction to lower costs relative to traditional reactors. Progress in fusion, while still early, is accelerating with higher confinement times and break-even energy milestones expected in the next decade. These tech advances also expand new cost effectiveness models in dual use and adjacent markets – for example, cheaper hydrogen will unlock use in steelmaking, shipping fuel, and grid storage. Improving cost-effectiveness also attracts private capital; venture investment in clean energy and climate-tech has surged, financing startups in everything from carbon capture to EV batteries. As technology keeps improving, more applications become viable, creating a virtuous cycle of adoption and scale.

- **Market Demand Driven by Decarbonization and Energy Security:** There is a robust market pull for clean, renewable, and resilient energy sources from multiple directions. Climate impact goals reinforced by international agreements and corporate ESG commitments are pushing industries to seek low-carbon solutions. Sectors like transportation (automakers investing in EVs and hydrogen fuel cell trucks) and heavy industry (chemicals, cement, mining looking at CCUS and electrification) are significantly increasing demand for clean energy technologies to minimize their impacts. At the same time, energy security and resilience concerns are motivating investment, as recent geopolitical events and supply chain disruptions have underscored the risks of over-reliance on imported fuels or centralized grids. Similarly, international competition for new energy technologies is leading to a reorganization of supply chains that reflects a desire to onshore key components of energy systems which China currently dominates, such as manufacturing of solar panels, batteries, and critical minerals processing. Countries and states want domestic energy sources that are secure, favoring renewables based on domestic manufacturing of equipment and nuclear sources that are fuel supply stable along with microgrids for resiliency. Microgrid deployment is growing as critical facilities like hospitals, data centers, military bases invest in self-sufficient power systems to withstand outages and cyber threats. Additionally, consumers and businesses are increasingly choosing clean energy options, adding to demand beyond policy mandates.

- **Convergence of Technologies and Systems Approach:** A notable dynamic is the increasing integration across energy technologies through combination technologies and convergence approaches such as pairing renewables with storage, using nuclear or renewables to produce clean hydrogen, and deploying carbon capture in natural gas plants to provide carbon-free firm power. This systems approach is driving new business models and market niches. For instance, excess solar and wind power can be converted via electrolysis to hydrogen (power-to-gas) for use later, effectively linking the electricity and fuels markets. Electric vehicles are coupling the transportation and power sectors, creating demand for both clean power and smart grid services. Microgrids and digital controls knit these pieces together, enabling local marketplaces for energy transactions. The market

outlook therefore favors companies and regions that can address whole value chains and integrated solutions – for example, offering end-to-end hydrogen supply (production, distribution, fueling) or combined solar-storage-microgrid packages for communities.

The market outlook for Advanced Energy Technologies is defined by strong structural momentum, with global demand drivers, supportive policy environments, and declining technology costs converging to accelerate deployment. Renewables are expected to account for the majority of new power generation capacity worldwide, while hydrogen, nuclear, and long-duration storage are rapidly gaining relevance as critical complements in decarbonized systems. Industrial segments such as grid modernization, carbon capture, and energy storage are moving from demonstration to commercialization, with capital investment rising accordingly. This transformation creates a favorable environment for regions positioned to contribute specialized capabilities and scale production. New Mexico, with its resource advantages, institutional capacity, and legacy industry base, is poised to engage meaningfully in these growth markets.

Why is this S&T Opportunity Area a Fit for New Mexico?

New Mexico's position within the Advanced Energy Technologies landscape reflects a distinctive alignment of scientific capability, industrial infrastructure, and resource endowment. The state offers a rare convergence of high-caliber federal and academic research assets, access to some of the nation's most productive renewable and subsurface energy resources, and longstanding technical expertise rooted in its legacy energy sectors. Its national laboratories are not only leaders in nuclear science and energy systems engineering but are also playing central roles in the advancement of next-generation technologies such as fusion energy, small modular reactors, and grid resilience modeling. These institutions anchor deep federal investment and house infrastructure that supports high-consequence testing, systems integration, and applied research across the advanced energy spectrum.

Geographically, New Mexico benefits from an unusually diverse and advantageous natural environment. Its solar irradiance levels are among the highest in the country, making it a prime location for photovoltaic deployment and solar thermal research. Wind corridors in the eastern plains offer consistent and high-capacity factors, while the state's geothermal resources hold untapped potential for both direct use and power generation. In addition, its complex geologic formations are conducive to subsurface energy storage, mining and fuel production, and carbon sequestration, creating cross-sector opportunities that link conventional and emerging energy systems.

The state also offers a compelling context for energy systems demonstrations. Remote and infrastructure-limited areas provide realistic conditions for testing microgrids, hybrid energy systems, and resilient infrastructure models. These environments are increasingly valuable as the energy sector transitions toward distributed, adaptive, and cyber-secure architectures. Collectively, these attributes position New Mexico not only as a site of energy production but also as a national testbed for the integration, control, and scaling of Advanced Energy Technologies in operationally relevant conditions.

Highlights of New Mexico's Technology "Push"

New Mexico's technology push is defined by a robust constellation of scientific institutions, research infrastructure, and specialized talent focused on energy innovation. These assets form the foundation for advancing next-generation technologies across the full spectrum of the energy system—from generation and storage to control, conversion, and environmental management. Key themes include:

- **Research Institutions and Labs Focused on National Energy Research Priorities:** New Mexico's two DOE national laboratories and its research universities form the backbone of an exceptionally strong energy R&D ecosystem. These institutions have pioneered energy technologies for decades, from Sandia's work on solar photovoltaic materials and grid storage to Los Alamos's advances in nuclear fuel and hydrogen fuel cells. LANL was the birthplace of key hydrogen fuel cell innovations, while Sandia operates specialized facilities that support energy tech development such as the National Solar Thermal Test Facility (for concentrating solar power research) and various elements of the Energy Storage Systems programs (including a leading battery testing lab). In fusion and nuclear, Sandia's Z Machine (the world's most powerful pulsed-power device) and LANL's fusion research give New Mexico unparalleled capabilities. This depth and continuity of research excellence means that the state generates a steady pipeline of new ideas, patents, and technical know-how that can be translated into commercial ventures, in addition to leading research talent working at the labs.

- **Specialized Academic Facilities and Infrastructure:** New Mexico's technology push in advanced energy is underpinned by a set of highly specialized facilities and infrastructure that span fundamental research, applied engineering, systems testing, and workforce development. In addition to the unique facilities at LANL and Sandia, the state is home to a network of academic energy research centers with distinct technical strengths. For example, UNM's Center for Emerging Energy Technologies (CEET) focuses on smart grid control, integration of distributed energy resources, and cyber-physical system resilience and NMT's Petroleum Recovery Research Center (PRRC) combines decades of experience in subsurface science and reservoir modeling with applied R&D in carbon sequestration, produced water management, and hydrogen storage. At NMSU, the Integrated Digital Enterprise Accelerator Lab (IDEAL) is being developed into a reconfigurable microgrid and grid-forming testbed, supporting research in energy storage, power electronics, cybersecurity, and electric vehicle integration, and its ongoing upgrades—funded by congressional appropriations and state matching—position it as a user facility for early- to mid-TRL technology validation in partnership with industry and national labs. Together, these examples as well as other related university centers form a distributed but complementary ecosystem capable of advancing energy innovation across technology readiness levels. Their combined capacities support not just theoretical and laboratory research but also full-system prototyping and real-world testing which provide a natural complement to assets at the national labs.

- **Scaling Talent and Technology Translation Pipelines to Support Ecosystem Development:** New Mexico's technology push in advanced energy is reinforced by a combination of deep human capital and a scaling innovation ecosystem. The state's research universities—UNM, NMT, and NMSU—produce a steady pipeline of engineers and scientists across nuclear, power systems, petroleum, geosciences, and renewable energy disciplines. These institutions are adapting legacy strengths toward new academic programming in emerging areas such as carbon sequestration, geothermal energy, and electrified transportation. Workforce development programs such as the Job Training Incentive Program (JTIP), alongside technical certificate offerings from institutions like CNM, are increasingly targeted toward clean energy occupations, supporting retention and upskilling. While brain drain in the private sector has been a concern historically, the momentum of new projects such as Maxeon's factory, Kairos's campus, and hydrogen startups is beginning to retain and draw back talent. All these factors contribute to a talent base that can sustain an advanced energy cluster, further reinforced by specialized training programs like UNM's branch campus offering certificates in electrified transportation and CNM (Central New Mexico Community College) launching energy technology courses. At the same time, New Mexico is cultivating a stronger culture of public-private collaboration that accelerates technology commercialization. Initiatives such as the Technology Enhancement Fund and tech transfer reforms at the national labs have improved the flow of innovations from lab to market in the energy applications space in particular. Programs like the Center for Rapid Energy Innovation—co-managed by UNM and Sandia—demonstrate a growing capacity for interdisciplinary problem solving in areas like grid storage. This cross-sector connectivity is yielding tangible outcomes: local firms are advancing pilot scale technologies in fusion, geothermal drilling, and clean water systems, often through collaborative efforts spanning public and private institutions.

While New Mexico's research and innovation efforts across the portfolio of emerging energy systems and technologies is a leader nationally and increasingly backed by public-private linkages, it has yet to be matched by coordinated efforts to attract and grow cohesive supplier clusters or to strategically connect its testing and demonstration infrastructure into a unified, statewide innovation network. These are critical steps for translating technical advantages into sustained industrial development.

Highlights of New Mexico's Market "Pull"

New Mexico's market pull reflects the coexistence of a revenue-generating legacy oil and gas industry—with associated infrastructure, technical expertise, and supply chains—and a rapidly expanding footprint in clean energy sectors such as solar, hydrogen, geothermal, fusion, nuclear, and grid modernization. This dual structure creates both immediate application opportunities for Advanced Energy Technologies and a dynamic proving ground for transitional solutions that bridge conventional and emerging energy systems. Highlights of this state's base of industry activity include:

- **Exceptional Renewable Resources and Energy Infrastructure:** New Mexico's expansive solar and wind resources act as a powerful market pull with the potential to attract both project developers and manufacturers to the state. The consistent high solar irradiance and strong wind corridors mean that large-scale projects here can generate electricity at very low cost per kWh, which has already led to a pipeline of utility-scale solar and wind installations in the past few years. Transmission investments also effectively broaden New Mexico's market reach to Arizona, California, and beyond, with the demand for clean electricity in those populous markets driving New Mexico's emerging role in becoming a key supplier. This in turn has drawn companies like Maxeon (solar manufacturing) and Arcosa (wind tower manufacturing) to set up operations in-state to be near project sites and take advantage of logistical efficiencies. Furthermore, the state's legacy energy infrastructure provides market pull: New Mexico has gas pipelines, power plants, and an electric grid that can be partly repurposed or upgraded for advanced tech. For instance, the presence of high-capacity gas pipelines and storage in the northwest and southeast makes it a viable location for blue hydrogen. The existence of the interstate transmission grid and interconnections means any surplus renewable power or new generation type in New Mexico can find customers regionally. At the same time, oil and gas extraction remains a dominant industry in the state, driving demand for innovations in power reliability, water treatment, emissions monitoring, and carbon management.

- **Emerging Industry Clusters in Clean Energy Driven by Pilot Programs and First Adopters:** New Mexico is beginning to exhibit concentrated activity in several advanced energy subsectors, where early-stage industry clusters are forming around anchor institutions, private investment, and demonstration platforms. These ecosystems, though still developing, are establishing the foundation for future supply chains and reinforcing the state's position as a testbed and early market for deployment-oriented innovation. Notable clusters include:

    - **Hydrogen Technologies and Value Chain Integration**
      A diversified hydrogen ecosystem is emerging across the Albuquerque–Rio Grande corridor, spanning production, components, and end-use applications. Projects include production of modular gas reformers, planned renewable-powered electrolysis systems by utilities, and component innovation by New Mexico-based firms. These activities are reinforced by LANL's historical and ongoing work on hydrogen storage, fuel cells, and electrochemical systems. While New Mexico's multistate Western Hydrogen Hub proposal was not federally selected, commercial interest has persisted, and companies are

continuing to advance logistics-linked hydrogen corridors for heavy-duty trucking. This cluster benefits from geographic proximity to transportation corridors and co-located partners, creating an environment where producers, component suppliers, and early adopters can collaborate with reduced transaction costs.

- **Fusion Energy and Enabling Technologies**
  New Mexico is becoming a national node in the fusion energy landscape, rooted in decades of national lab leadership in plasma physics and pulsed power. LANL's Plasma Liner Experiment is spinning out into Liberty Fusion, the state's first dedicated commercial fusion venture. Simultaneously, other New Mexico-based fusion companies advancing pulsed power fusion platforms with applications that range from radiation testing to isotope production. These developments signal the early formation of a fusion innovation corridor that could anchor new supply chains—e.g., for high-voltage capacitors, vacuum systems, cryogenics, and specialized materials. As firms move toward integrated test platforms, New Mexico's existing infrastructure and talent base offer a cost-effective environment for system validation and dual-use applications.

- **Grid Modernization and Microgrid Demonstration**
  Grid innovation in New Mexico is being driven by collaborative utility-lab-academic partnerships that are advancing technologies in distributed control, cybersecurity, and microgrid operations. The NM SMART Grid Center, funded through NSF EPSCoR, coordinates multi-institutional research in real-time power system control and integration of variable renewables. At NMSU, the IDEAL testbed is emerging as a reconfigurable platform for validation of DERs, energy storage, and inverter-based resources. Sandia continues to lead in grid cybersecurity and resilience testing, with deployments at Kirtland AFB and collaborations across the state. These efforts collectively position New Mexico as a systems-integration hub for resilient grid technologies—particularly relevant to markets such as defense installations, tribal communities, and remote industrial operations.

- **Solar, Wind, and Advanced Manufacturing and Supply Chains**
  The state's competitive solar and wind resources are now catalyzing associated manufacturing activity. Recent investments in panel fabrication in Albuquerque are expected to create jobs as well as some momentum towards anchoring downstream assembly and component supply. Wind power development has also expanded rapidly, aided by transmission buildouts and new component manufacturing supported by federal incentives.

- **Advanced Nuclear and Reactor Component Manufacturing**
  New Mexico's legacy in nuclear science is being reoriented toward next-generation reactor development and specialized materials production. Kairos Power's Manufacturing Development Campus in Albuquerque will produce key components for its advanced fluoride-salt-cooled reactor, and the facility is also intended to serve as a future manufacturing and assembly hub for the company's commercial assets. The presence of this site combined with UNM's nuclear engineering program and proximity to URENCO's uranium enrichment plant creates the conditions for a vertically integrated advanced nuclear supply chain. While deployment of SMRs in New Mexico remains a long-term possibility, component manufacturing and coolant production already link the state to other national demonstration projects.

- **Oil and Gas as a Transitional Innovation Platform**
  The state's oil and gas sector remains active and continues to drive energy exports. This mature industry increasingly serves as a customer and testing ground for emerging technologies related to methane mitigation, produced water reuse, and operational efficiency. Regulatory pressure and investor expectations are prompting producers to adopt monitoring tools, sensor systems, and digital controls that overlap with cleantech applications. Startups in these domains are finding first customers among New Mexico's independent and mid-sized producers, creating immediate market opportunities for transitional solutions with broader applicability.

- **Supportive Policy Landscape and Alignment with Defense Sector Needs:** New Mexico's policy environment and federal mission presence together create a powerful, multi-dimensional market pull for Advanced Energy Technologies. The Energy Transition Act mandates 100 percent carbon-free electricity by 2045 for investor-owned utilities, creating guaranteed long-term demand for renewables, storage, and grid upgrades. State incentives including production tax credits, LEDA grants, industrial revenue bonds, and workforce training have successfully attracted manufacturers in the space, while the state's congressional delegation continues to secure federal appropriations for energy R&D and infrastructure, such as hydrogen planning and microgrid testbeds. Importantly, New Mexico's significant national security footprint anchored by Kirtland Air Force Base, White Sands Missile Range, and the DOE labs generates additional demand for resilient, secure energy solutions. Defense and lab installations serve as early adopters for microgrids, backup systems, and advanced nuclear concepts as well as support emerging sectors like fusion through procurement-linked testbeds and mission-aligned technology development. These institutions not only offer demonstration platforms and first customers, but also create pathways to federal markets, positioning New Mexico as a proving ground for energy technologies aligned with both climate and security imperatives.

Overall, New Mexico exhibits a distinctive convergence of demand-side drivers—resource abundance, emerging clean energy industries, policy support, and mission-driven customers—that reinforce its supply-side innovation capacity. This alignment enables technologies originating in the state's national labs, universities, and startups to access local demonstration platforms and early adopters, accelerating validation and iteration. Even in pre-commercial sectors such as fusion, New Mexico offers conditions conducive to scale-up, including affordable infrastructure, regulatory flexibility, and alignment with federal mission needs. This integrated environment of innovation and deployment positions the state as a credible and competitive contender for long-term leadership in advanced energy.

Line-of-Sight Market Applications for New Mexico

Translating New Mexico's strengths into tangible economic gains will depend on targeting specific applications of advanced energy that match the state's capabilities and needs. The state's identity is defined by a dual trajectory: it remains a major producer of oil and gas while increasingly distinguishing itself as a center for renewable energy development and emerging technologies such as hydrogen, microgrids, and fusion. This dual positioning creates a broad spectrum of market opportunities—both in upgrading and decarbonizing legacy systems and in deploying next-generation energy solutions. Translating the state's capabilities into economic gains will depend on targeting near- to mid-term applications where external demand intersects with New Mexico's research strengths, industrial assets, and natural endowments while also recognizing that longer-term opportunities may offer transformational economic benefits. Several such opportunities stand out, offering pathways for high-impact deployment, technology maturation, and sustained economic returns:

- **Utility-Scale Renewable Power Export:** New Mexico's solar and wind resource base, combined with large tracts of developable land and new transmission infrastructure, positions the state to supply gigawatts of low-cost, clean electricity to Western demand centers. Hybrid projects combining solar, wind, and storage offer firm power products, improving dispatchability and grid integration. With a 2045 zero-carbon mandate and growing out-of-state demand, the state is on track to add multiple GW of capacity by 2030. This market is further catalyzed by federal incentives and cost advantages in construction, making utility-scale renewables a durable export industry.

- **Resilient Microgrids and Cybersecure Grid Infrastructure:** Microgrid demonstrations at Kirtland AFB, NMSU, and tribal sites, along with the NM SMART Grid Center and Sandia's SCADA cybersecurity R&D, create a foundation for exporting turnkey resilience solutions. Applications span defense bases, rural communities, and data centers, with increasing relevance due to hazards such as wildfire, cyber threats, and aging grid infrastructure. State and federal programs are funding pilots, while firms commercialize lab-derived controls and system architectures. New Mexico has the potential to host dozens of interlinked operational microgrids and multiple vendors offering secure, scalable grid resilience platforms.

- **Advanced Energy Manufacturing and Supply Chain Anchoring:** Several planned investments and expansions signal momentum in solar manufacturing. New Mexico's aerospace-grade machining and microelectronics capabilities make it well-suited for battery systems, grid inverters, and fusion/nuclear components. Emerging startups have noted potential demand for custom capacitors, vacuum chambers, and plasma subsystems—components that New Mexico firms can supply with modest retooling. Opportunities also exist in lithium and rare earth processing, modular reactor fabrication, and hydrogen storage systems. Strategic co-location of manufacturers at sites like Mesa del Sol could form the basis of a multi-technology energy manufacturing park.

- **Hydrogen Production and Freight Corridor Applications:** Abundant solar and wind enable competitive hydrogen production through electrolysis, with applications in heavy-duty transport, backup power, and industrial decarbonization. New Mexico is a central node in emerging regional corridors such as the Southwest Clean Freight Corridor, with planned production and fueling sites near I-40 and I-25. Firms are developing supply and distribution infrastructure, while LANL and other experts can provide technical depth in materials and catalysis. Near-term milestones include fueling stations, pilot industrial users, and scale-up of local electrolyzer assembly.

- **Carbon Capture, Utilization, and Storage (CCUS):** New Mexico's subsurface geology supports large-scale CO2 storage, and the state's legacy in oil and gas offers both infrastructure and expertise for CCUS deployment. Near-term projects could retrofit existing emitters (e.g., gas plants, uranium enrichment facilities), with captured CO2 injected into depleted Permian fields or coal seams. PRRC's reservoir modeling capabilities, UNM spinouts in CO2 conversion, and active interest in enhanced oil recovery create favorable conditions for a vertically integrated CCUS hub where New Mexico can become a national leader.

- **Fusion Testbed and Component Manufacturing Hub:** Fusion ventures like Liberty Fusion and Fuse Federal emerging from LANL's PLX platform and pulsed-power research have anchored a nascent fusion cluster, with further interest in out of state fusion companies in siting key production and demonstration facilities in proximity to the national labs. Near-term opportunities include testbed deployment, defense-aligned radiation services, and component manufacturing. New Mexico's machining shops, paired with targeted workforce and policy support, could become preferred suppliers of fusion hardware. Hosting prototype systems and grid/power infrastructure for testing positions the state to capture early economic activity in the fusion sector before commercial scale power plants emerge.

These illustrative applications show how New Mexico can leverage its strengths into targeted outcomes. Importantly, many of these opportunities intersect: for instance, success in renewable power export underpins green hydrogen production; fusion testbeds will rely on grid integration and advanced manufacturing know-how; CCUS enables hydrogen from gas and provides CO2 for EOR, linking to legacy industry. This interconnection plays to New Mexico's benefit, allowing an integrated approach. By concentrating efforts on these line-of-sight applications, New Mexico can achieve early wins in advanced energy that demonstrate the state's capabilities, build confidence amongst potential investors, and create momentum for further growth.

Implications for Economic Development

Advanced Energy Technologies represent a strategic opportunity to diversify and modernize New Mexico's economy. The state's combined legacy in oil and gas, strengths in scientific research, and renewable energy resources position it to anchor a nationally relevant advanced energy cluster. Realizing this potential, however, requires overcoming persistent commercialization gaps, scaling a skilled workforce, and aligning infrastructure and policy to support emerging industry needs.

New Mexico's continued strength in oil and gas must be recognized not as a contradiction, but as a strategic asset in advancing its energy transition. The industry remains a major contributor to the state's fiscal base—funding education, infrastructure, and public services—and provides a skilled workforce, industrial capabilities, and infrastructure directly relevant to emerging sectors such as carbon management, hydrogen production, and geothermal development. Rather than displacing this legacy sector prematurely, New Mexico should embrace a dual-track strategy that sustains responsible oil and gas activity while channeling associated revenues and expertise into high-impact investments that accelerate the transition. This includes using revenues to fund clean energy infrastructure, workforce training, and technology commercialization, as well as leveraging existing drilling, pipeline, and processing assets to support low-carbon innovations. By doing so, the state can convert its fossil fuel advantage into a durable platform for economic diversification, turning a historically extractive industry into a foundation for a more sustainable, innovation-driven energy economy.

If effectively developed, new energy technologies can drive high-wage job creation across a broad base of manufacturing, engineering, and construction, and build a more resilient economic base less tied to commodity volatility. Advanced energy also presents a branding opportunity: establishing New Mexico as a hub for clean energy innovation could attract external capital, federal investment, and talent. But to compete with peer regions, the state must address long-standing structural barriers. Chief among these is the "lab-to-market" gap—technologies developed at LANL and Sandia often commercialize out of state. Strengthening tech transfer pipelines, expanding prototype funding, and fostering shared innovation infrastructure near research assets designed to anchor early stage spinouts are critical next steps.

A critical enabler of this transition will be the cultivation of thought leadership, and the strategic attraction of investors aligned with New Mexico's energy ambitions. In the near term, the state must engage capital partners capable of accelerating commercialization of deployable technologies—such as grid controls, hydrogen infrastructure, and renewable energy hardware—through investment in manufacturing scale-up, deployment platforms, and market access strategies. These investors will be essential to translating early-stage innovation into operating systems that contribute to job creation and economic output.

Simultaneously, New Mexico must position itself as a destination for long-term, risk-tolerant capital willing to support frontier technologies like fusion energy, carbon conversion, and next-generation nuclear systems. These sectors require patient investment horizons but offer disproportionate upside in shaping future global energy markets. Establishing dedicated investment vehicles, co-investment partnerships, or mission-aligned funds—alongside proactive convening of national philanthropies, climate tech investors, and strategic corporate partners—will be essential to sustaining momentum and ensuring that New Mexico remains competitive in both near-term growth markets and the long arc of energy innovation.

The state must also move beyond a collection of discrete assets and build an integrated, end-to-end energy innovation ecosystem. This requires deliberate coordination across research institutions, private firms, workforce pipelines, and infrastructure investments to align around shared platforms and applications. Opportunities such as hybrid renewable systems, transportation corridors, and resilient microgrids are inherently interdisciplinary and depend on the seamless integration of technologies across generation, storage, control, and end-use, incentivized and supported by economic development initiatives. By linking national lab capabilities, university research, testbeds like IDEAL, and industry clusters around fusion, solar, and advanced manufacturing, New Mexico can offer a coherent innovation value chain—from discovery to demonstration to deployment and ultimately commercial scaling. Establishing this integration as a core feature of the state's economic development strategy will enhance competitiveness, reduce duplication, and make New Mexico a compelling destination for companies and federal partners seeking scalable, systems-level energy solutions.

Summary of Key Findings

New Mexico stands at a pivotal moment in its energy and economic trajectory. The state's identity as a resource-rich energy producer—anchored in oil, gas, solar, wind, and geothermal assets—remains central to its economic base and must be embraced as a foundation for transition. New Mexico should leverage its existing infrastructure, workforce, and revenue streams to support the deployment of clean technologies such as hydrogen, carbon capture, and geothermal systems. This dual approach enables the state to sustain near-term economic value while investing in a diversified and forward-looking energy economy.

To unlock full value from its technological and natural resource base, New Mexico must also focus on scaling advanced manufacturing and attracting a robust supplier ecosystem that can serve multiple segments of the energy sector. Targeted efforts to recruit component makers for solar, hydrogen, grid systems, and fusion hardware, especially around anchor investments and leading manufacturing companies, will be critical. Developing shared industrial parks, securing specialized workforce training, and offering co-investment in tooling and facilities can help turn pilot activity into durable industry clusters.

Real leadership will also require bold, long-horizon investments in transformative technologies. New Mexico has credible early positions in fusion, small modular reactors, and advanced grid resilience systems. To lead in these fields, the state will need to cultivate investors with long-term risk tolerance, build public-private partnerships to support infrastructure, and signal its willingness to co-develop first-of-their-kind deployments. Maintaining this ambition will be essential to staying competitive as national interest in advanced energy accelerates.

Finally, New Mexico must better coordinate its considerable assets—national labs, universities, testbeds, and industry—into an integrated, statewide platform for energy innovation. A connected network of demonstration sites, field labs, and commercialization pathways would allow emerging technologies to be tested under real-world conditions and scaled into viable markets. Formalizing this network, aligning state agencies, and resourcing collaborative infrastructure will be essential to making New Mexico not just a place where energy innovation occurs, but where energy systems are built, launched, and scaled.

Space, Aerospace & Defense Systems: An Existing S&T Growth Opportunity Area for New Mexico

Space, Aerospace & Defense Systems are increasingly converging into new, more integrated mission areas, reflecting a broader reorientation of national and global priorities toward securing technological advantage in contested domains. The space economy alone is projected to grow by billions of dollars over the next decade, driven by expanding demand for satellite-enabled communications, remote sensing, and orbital services. At the same time, global defense spending has reached unprecedented levels as geopolitical competition intensifies, and national investments shift toward next-generation military and dual-use platforms. These trends are redefining the structure and emphasis of aerospace and defense value chains, accelerating development in areas such as hypersonics, autonomous systems, directed energy, and resilient space-based architectures.

New Mexico enters this landscape with a distinct set of advantages and an innovation focus on space-based systems and their supporting and complementary technology stacks such as areas like remote sensing. The state's long-standing concentration of federal research institutions, specialized testing infrastructure, and industry capabilities aligns closely with emerging national imperatives in space and defense modernization. These assets are further supported by a growing cluster of firms engaged in satellite systems, advanced components, autonomous platforms, and directed energy technologies. The aerospace and defense sector remains among the most specialized areas of traded industry employment in the state and employment growth has outpaced national trends over the last decade. The state has the opportunity to position itself as a premier hub for novel "space tech" applications in coming years as well as build out a supporting ecosystem of advanced technology services firms and suppliers.

What is Space, Aerospace & Defense Systems?

Space, Aerospace & Defense Systems comprise an interconnected suite of technological capabilities spanning atmospheric and orbital flight, advanced sensing, platform testing, and defense system integration. The sector includes both legacy and emerging technology areas essential for enabling operations across air, space, and contested environments. While its foundational elements are rooted in aeronautics and astronautics—the design, development, and deployment of aircraft and spacecraft—the scope extends further to encompass integrated defense platforms, test and evaluation infrastructure, and specialized subsystems such as directed energy, hypersonics, and space-based remote sensing.

At the core of this sector are critical technology domains that align with longstanding institutional and industrial strengths in New Mexico. These include key subsystems such as:

- **Propulsion systems,** where the landscape is being reshaped by the development of systems optimized for high-speed, high-efficiency, and flexible mission profiles. Advanced propulsion development is increasingly focused on hypersonic scramjets, reusable staged-combustion rocket engines, and high-thrust electric systems, each demanding novel thermal, material, and control solutions for performance at extreme velocities

or durations. Hybrid and modular propulsion architectures are also gaining traction to support responsive launch and maneuverable in-space operations.

- **Guidance and control subsystems** like avionics and autonomous navigation, where emerging systems integrate AI-driven autonomy, multi-sensor fusion, and edge computing to enable resilient flight control in GPS-denied and dynamically contested environments. Real-time reconfigurability and onboard decision-making are becoming standard across both unmanned and crewed aerospace platforms.

- **Telemetry and communications** like RF systems, satellite links, encrypted command-and-control are increasingly critical in extreme or contested environments. Software-defined RF systems, optical crosslinks, and quantum-secure protocols are redefining space and defense communications, offering greater bandwidth, reconfigurability, and resilience against jamming and cyber threats. Agile networks also increasingly support multi-domain operations and autonomous platform coordination.

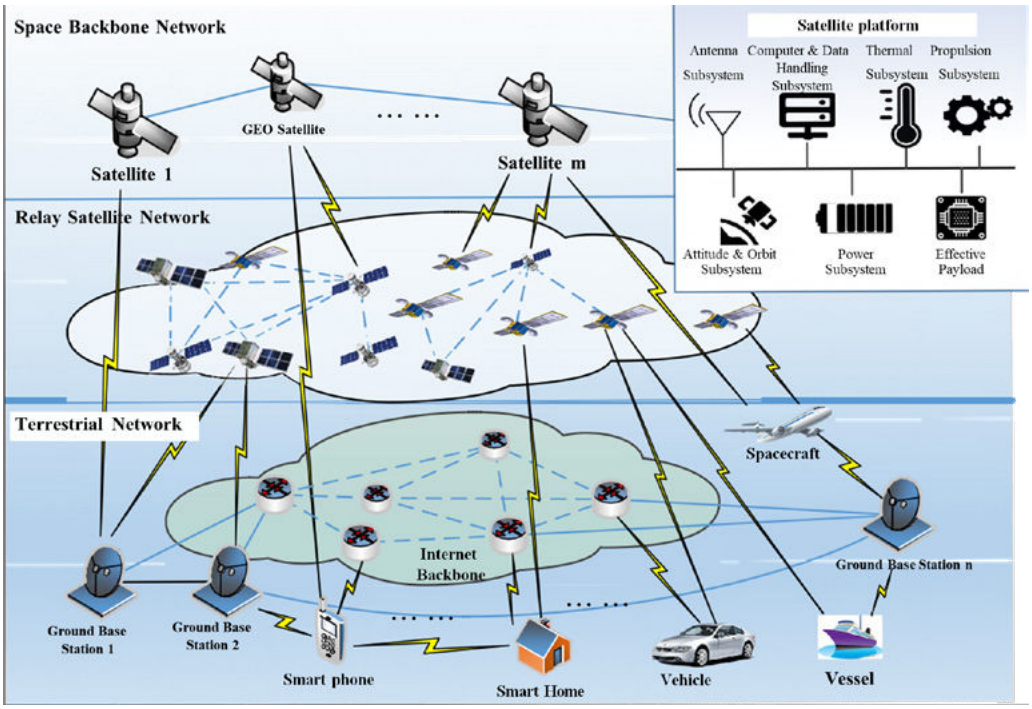
- **Sensor payloads for environmental and threat detection** (electro-optical imaging, synthetic aperture radar, infrared, and LIDAR) have evolved to miniaturized, multimodal sensors combining SAR, infrared, hyperspectral, and optical imaging, and are now paired with onboard AI and edge analytics to deliver real-time threat detection, mapping, and environmental monitoring. Emphasis in space and defense systems is now on autonomous decision making and exploitation, reduced latency, and adaptive sensing in complex operational conditions.

These capabilities are embedded in mission applications ranging from orbital satellite constellations and launch vehicles to missile systems, unmanned platforms, and next-generation aircraft.

Several specialty domains further define the frontier of innovation in this field. Directed energy technologies such as high-energy lasers and microwave systems are being advanced for missile defense, satellite disruption, and counter-UAS missions. Hypersonic platforms introduce complex requirements for heat-resistant materials, precision navigation, and extended-range propulsion, creating spillover demand across the materials science and systems integration landscape. Advanced manufacturing, particularly additive techniques, has become integral for producing lightweight, high-strength aerospace components with rapid iteration cycles. Space situational awareness and traffic management systems are also gaining prominence, reflecting the operational imperative to monitor, deconflict, and safeguard orbital assets.

Importantly, these technologies do not function in isolation. They rely on a broader technical ecosystem—ranging from ground-based command infrastructure and data analytics to multi-domain test environments and resilient component supply chains. New Mexico's assets reflect this interdependence: test ranges for missiles and drones, long-range telemetry systems, advanced RF and materials capabilities, and federal laboratories conducting fundamental research in photonics, autonomy, and secure communications. Together, these elements form the foundation for a strategically relevant and technically differentiated innovation platform in aerospace, space, and defense systems.

FIGURE 15. EXAMPLE ARCHITECTURE OF SATELLITE COMMUNICATIONS NETWORK DEMONSTRATING INTERLINKED NATURE OF PLATFORM AND SYSTEMS LEVEL TECHNOLOGIES TYPICAL IN DEFENSE AND AEROSPACE SYSTEMS APPLICATIONS



Source: He, Daojing & Li, Xuru & Chan, Sammy & Gao, Jiahao & Guizani, Mohsen. (2018). Security Analysis of a Space-Based Wireless Network. IEEE Network. 33. 36-43. 10.1109/MNET.2018.1800194.

These systems support a wide range of commercial and national security applications, with increasing convergence across use cases. In commercial markets, satellite communications and navigation technologies underpin GPS-enabled services, broadband connectivity via low-Earth orbit constellations, and global data transmission. Earth observation and remote sensing platforms supply critical inputs for agriculture, environmental monitoring, disaster response, and commercial geospatial intelligence. The aerospace transportation sector spans both conventional aviation and emerging services such as suborbital point-to-point travel and commercial space tourism.

Defense applications mirror and extend these capabilities. Satellite constellations support secure communications, persistent surveillance, and precision-guided systems, while high-altitude UAS and autonomous aircraft provide long-range reconnaissance and tactical strike functions. These platforms are increasingly integrated through advanced software-defined architectures, enabling multi-domain coordination and adaptive command-and-control.

Many enabling technologies are inherently dual-use, serving both commercial and defense markets. A high-resolution imaging satellite, for example, may support precision agriculture and military terrain analysis simultaneously; reusable propulsion systems lower launch costs while enhancing strategic national launch readiness. This overlap drives technological spillovers, accelerating innovation across sectors and reinforcing the interdependence of scientific, commercial, and defense-driven advancement.

New Mexico's combination of advanced research institutions, specialized testing environments, and mission-driven federal assets supports a full innovation continuum—from early-stage discovery to system validation under operationally relevant conditions. Institutions such as Kirtland Air Force Base (and the Space Rapid Capabilities Office as well as AFRL facilities located there), White Sands Missile Range, LANL, and Sandia collectively provide a rare integration of satellite payload development, directed energy research, telemetry engineering, and range-based testing capabilities. These resources are complemented by academic programs that generate skilled technical talent and contribute to sensor innovation, remote sensing analytics, and autonomous systems development. This end-to-end capability positions New Mexico to play a central role in advancing national priorities in space and defense technologies, while also enabling the state to compete for emerging commercial opportunities built on the same technical foundation.

Market Outlook and Growth Dynamics

Space and defense technology-driven sectors are both independently as well as jointly undergoing a period of accelerated transformation, driven by shifting geopolitical priorities, evolving commercial models, and sustained public and private investment. Across both national security and commercial domains, demand is expanding for systems that offer greater autonomy, resilience, and operational reach. This momentum is reinforced by advances in satellite technologies, increased launch cadence, integration of AI and software-defined architectures, and a renewed emphasis on space as a strategic domain. At the same time, defense modernization efforts and dual-use technology development are creating new pathways for innovation and market convergence.

Several markets associated with New Mexico's growth opportunity have a significant market size and growth outlook:

- Global market for satellite remote sensing platforms valued at $6.5 billion in 2023 with a CAGR of 13 percent through 2028.
- Global market for satellite-based internet valued at $5.6 billion in 2023 with a CAGR of 28 percent through 2029.
- Global market for drone technologies valued at $30.4 billion in 2023 with a CAGR of 13 percent through 2029.
- Global market for large-scale, government-funded aerospace and space exploration research projects valued at $17.2 billion in 2025.

Source: BCC Market Research

Several key dynamics are shaping this outlook:

- **Space Economy Expansion:** Commercial space activities are expanding rapidly, driven by downstream applications that leverage satellite data for services on Earth. According to several industry analyses, the global space economy reached record size in the past year and is projected to continue climbing sharply, propelled by demand for satellite-based navigation, communications, and Earth observation services. Private sector innovation in areas like small satellite constellations, reusable launch vehicles, and space-as-a-service business models – are lowering costs and opening new markets. This "NewSpace" boom is expected to triple the number of active satellites within a decade, creating ecosystem opportunities in manufacturing, launch, and data analytics.

- **Record Defense Spending, Modernization, and Contested Space Environments:** Global defense priorities are undergoing a significant recalibration, with heightened geopolitical competition prompting sustained increases in military spending and a renewed focus on modernization. Across the U.S. and allied nations, investment is concentrated on next-generation capabilities in air and space domains—ranging from hypersonic weapons and advanced missile defense to space-based communications and surveillance platforms. These shifts reflect not only a response to emerging threats but also a recognition that technological superiority in aerospace and defense systems is foundational to strategic deterrence. The resulting demand spans the full spectrum of enabling technologies, including advanced propulsion, sensor integration, resilient electronics, and hardened communications infrastructure. As space becomes a more contested domain, resilience, redundancy, and responsiveness are emerging as baseline design criteria, driving further convergence between traditional defense systems and emerging commercial space architectures. This broad upswing in defense procurement is also driving demand for upstream technologies, from new materials and propulsion systems to electronics that can withstand nuclear or cyber threats.

- **Emergence of New Market Segments and Convergence with Advanced Manufacturing:** The convergence of aerospace, defense, and digital technologies is giving rise to new market segments while simultaneously transforming the means of production. Emerging domains such as space situational awareness (SSA) are becoming increasingly critical as orbital congestion intensifies, driving demand for tracking services, debris mitigation, and space traffic coordination. Urban air mobility, including autonomous air taxis and drone logistics, represents another new market, built on aerospace engineering foundations but accelerated by advances in autonomous systems, electric propulsion, and safety architectures originally developed for defense applications. Similarly, the rise of space tourism and the very early stages of concepts such as the "lunar economy," including commercial landers and habitat technologies, reflect the extension of the aerospace sector into previously undeveloped commercial domains. These markets are in their formative stages, requiring both continued technological advancement and supportive regulatory frameworks.

At the same time, aerospace R&D and manufacturing processes are being reshaped by the adoption of Industry 4.0 capabilities. Digital engineering tools such as virtual design environments and digital twins are reducing development time and cost. Additive manufacturing is enabling the rapid fabrication of complex, lightweight components, particularly in metals and high-performance composites, while machine learning and AI are being embedded into platforms for autonomous navigation, predictive maintenance, and mission planning. These shifts are lowering the barrier to entry for new firms and accelerating innovation cycles, allowing smaller organizations to iterate on propulsion systems, avionics, and structural designs at unprecedented speed.

- **Strategic Shifts in Supply Chains:** Recent global events have highlighted the importance of secure and resilient supply chains in aerospace and defense. There is a marked trend toward on-shoring or "friend-shoring" critical component production – for example, U.S. initiatives under the CHIPS Act for semiconductor fabs producing trusted electronic components for defense use, or NASA and DoD efforts to ensure domestic sources for rocket motors and satellite electronics. This creates openings for regions to attract or grow companies in specialty manufacturing (e.g., radiation-hardened microelectronics, satellite solar panels, precision optics) where scarcity domestic supply exists. In fact, industry leaders note that space component shortages are driving acquisitions and investments, and addressing these bottlenecks can be a lucrative niche. Cost pressures are another factor – commercial air travel and space launch markets both place a premium on cost reduction, favoring locations with lower operating costs for manufacturing and testing.

Taken together, these market dynamics suggest that this growth opportunity will remain a vibrant area for industry-relevant in the coming decades. Notably, given new trends in technology development the opportunity exists not only for established aerospace and defense hubs but also for states like New Mexico that can offer a combination of technical talent, unique facilities, and business-friendly conditions. As the sector becomes increasingly distributed—relying on smaller, more agile firms, specialized test environments, and modular supply chains—regions that can integrate federal research assets, skilled labor, and low operational costs are becoming more competitive. New Mexico's ability to support early-stage R&D alongside flight testing, materials qualification, and systems integration positions it as a platform for full-cycle innovation across newly emerging market verticals in space and defense tech commercialization. Moreover, the state's potential to facilitate government-industry-academia collaboration aligns well with national priorities around accelerating dual-use technology development and improving defense-industrial base resilience.

Why is this S&T Opportunity Area a Fit for New Mexico?

New Mexico exhibits a high degree of structural alignment with the scientific, technical, and operational demands of the Space, Aerospace & Defense Systems sector. The state's co-location of mission-driven federal R&D institutions, expansive test and evaluation infrastructure, and supporting industry stakeholders provides the pieces for an integrated innovation environment if various institutions and resources can be effectively networked together. Its capacity to support both upstream technology development and downstream commercialization and deployment is reinforced by a specialized workforce, active public-private partnerships, and access to airspace, instrumentation, and facilities tailored to advanced aerospace applications. This confluence of assets positions New Mexico not merely as a participant in sector growth, but as a platform capable of accelerating national priorities through a full-spectrum research-to-application pipeline.

Highlights of New Mexico's Technology "Push"

- **Concentration of Federal R&D Investment and Aligned Defense Missions:** New Mexico maintains one of the highest concentrations of federal science and technology investment in the United States, anchored by national laboratories, Department of Defense (DoD) research installations, and a longstanding alignment with national security missions. Sandia and LANL together support thousands of engineers and scientists engaged in directed energy systems, advanced sensing, secure communications, nuclear propulsion, and satellite instrumentation—capabilities tightly coupled with emerging space and defense priorities. At Kirtland Air Force Base, AFRL houses both the Directed Energy and Space Vehicles Directorates, collectively advancing research in satellite platforms, high-energy lasers, space domain awareness, and space-based defense systems. These institutions routinely collaborate with the Department of Energy, Space Force, and other DoD entities to develop dual-use technologies that underpin both classified and commercial missions. This concentration of federal assets creates a persistent pipeline of intellectual property, domain-specific expertise, and transition-ready technologies relevant to the sector.

- **Unique Testing and Research Infrastructure:** New Mexico offers a rare breadth of test and demonstration assets that directly support the iterative development of advanced aerospace and defense systems. White Sands Missile Range (WSMR) serves as one of the country's most expansive and instrumented testing environments, supporting missile defense, hypersonic trials, and aerospace telemetry calibration. Co-located with WSMR is Spaceport America, the world's first purpose-built commercial spaceport, encompassing 18,000 acres adjacent to restricted airspace. Spaceport America provides launch complexes, a 12,000-foot runway, and 6,000 square miles of restricted airspace overhead, providing vertically integrated access to suborbital flight testing and enabling launch providers and satellite developers to conduct flight validation in a secure, uncongested airspace corridor. AFRL's Starfire Optical Range and directed energy test facilities at Kirtland support laser propagation, beam control, and space-targeting experimentation under atmospheric and exo-atmospheric conditions. LANL maintains test ranges for propulsion and explosives characterization, while NMT operates the Energetic Materials

Research and Testing Center, supporting DOD-grade munitions and propulsion analysis. These assets are complemented by additional university-affiliated platforms such as NMSU's Physical Science Laboratory, an FAA-designated UAS Test Site with 18,000 square miles of controlled airspace, supporting telemetry validation and high-altitude systems. Collectively, these environments allow developers to design, qualify, test, and launch systems within a single state. Perhaps even more critically, access to the collection of these facilities in proximity to one another allows iterative prototyping and trials at lower cost and with fewer regulatory hurdles than in more densely populated states.

- **Thought Leadership and Talent Development in Specialized Applications:** New Mexico's universities have aligned with this sector to provide research capacity and workforce development pipelines tailored to the evolving needs of the space and defense sectors. UNM, NMSU, and NMT offer domain-specific programs in aerospace engineering, electrical systems, and materials science, often in direct collaboration with federal laboratories and defense agencies. UNM's COSMIAC center specializes in space electronics and radiation effects, operating a dedicated testing laboratory in partnership with AFRL to support space-qualification of advanced components. NMSU's Physical Science Laboratory supports research and training in unmanned systems, remote sensing, and high-altitude platforms, while also hosting commercial and defense-related test campaigns. NMT's academic programs and facilities include the Magdalena Ridge Observatory and research in antenna systems and energetic materials support applications in space domain awareness, propulsion, and signal intelligence. Across these institutions, student engagement in senior design projects, laboratory internships, and commercialization initiatives reinforces the integration of academic R&D with industry and defense applications. Quantitative analysis of research outputs indicates strong institutional specialization in applied optics, materials for extreme environments, space instrumentation, and high-power RF systems—all core domains for future defense and space missions. Federal grant activity across NSF, DOD, and NASA programs further reflects emphasis on radiation-hardened electronics, autonomous flight systems, and precision sensing. There has been some evidence of successful engagement around university tech translation related to these research activities, particularly in small satellite systems, RF engineering, and advanced manufacturing that can serve as the basis for further interlinking these programs with companies and defense customers.

Highlights of New Mexico's Market "Pull"

- **Growing Industry Ecosystem:** New Mexico's industrial base in aerospace and defense, while smaller than giants like California or Florida, is remarkably robust for the state's size and has been growing in recent years. By one recent inventory, the state hosts 30–40 dedicated space companies and over 200 aerospace-related businesses, including major primes and a multitude of contractors. Major defense contractors like Boeing, Northrop Grumman, Lockheed Martin, L3Harris, and Raytheon all have a presence or contracts in New Mexico (often near Kirtland AFB or LANL). The state has also attracted or grown "alternative primes" and startups that are now mid-sized players, such as BlueHalo which scaled by acquiring local companies and now employing hundreds in the area to work on satellites and directed energy systems. Similarly, Rocket Lab, a leading small launch and spacecraft company, acquired SolAero Technologies in Albuquerque, making the site one of only three in the world that produce radiation-hardened solar cells for satellites. Additional homegrown companies, often spun out of national labs and built around defense contract needs, have built niches in the state serving defense and space customers. This critical mass of companies has created a local market pull, attracting additional contracts and talent to the state.

- **Concentrated Federal and Military Customer Base:** New Mexico's concentration of mission-aligned federal installations and laboratories creates a stable and sustained source of demand for advanced aerospace and defense technologies. The state consistently ranks among the top recipients of federal investment per capita, with major flows of funding directed toward national laboratories, military bases, and defense-related test infrastructure. This spending supports not only internal R&D activity but also a broad range of contracting and procurement opportunities that form the economic foundation for many local firms. Kirtland Air Force Base plays a particularly strategic role, hosting both AFRL's Space Vehicles and Directed Energy Directorates and key operational elements of the U.S. Space Force, including Space Systems Command units responsible for acquisition and program execution. These entities drive direct procurement activity in areas such as satellite command and control, space situational awareness, laser communication, and high-power energy systems. Similarly, the Army's test and evaluation presence at White Sands Missile Range and the proximity of Fort Bliss support ongoing requirements in missile defense, range operations, and systems integration—fostering a geographically accessible customer base for vendors supporting land- and air-domain technologies. The national laboratories also contribute to demand-side strength, issuing subcontracts for specialized hardware, software, and technical services in areas such as precision optics, radiation-hardened electronics, and secure communications. This close coupling between federal R&D missions and regional industry enables firms to engage early in program development, respond rapidly to emerging requirements, and build long-term relationships with institutional customers. In effect, New Mexico's federal footprint not only catalyzes innovation but creates a durable pipeline of funded projects, accelerating the commercialization of new technologies and reinforcing the competitiveness of the state's industrial base.

- **Expanding Cluster Support and Ecosystem Coordination:** New Mexico's aerospace and defense ecosystem is increasingly supported by a network of formalized cluster organizations, innovation hubs, and government-led technology transition programs designed to reduce fragmentation and accelerate commercialization. These emerging structures are actively knitting together the state's federal R&D base, academic institutions, and private-sector participants.

  For example, NewSpace Nexus, an industry-focused nonprofit, serves as a statewide convening and commercialization platform, offering shared facilities, technical assistance, and a curated expert network to help space companies navigate federal procurement and transition technologies into national security and commercial markets. With over 270 members and dozens of early-stage companies supported to date, NewSpace Nexus plays a central role in linking startups, primes, and institutional stakeholders through structured programming and procurement matchmaking. Additionally, the Space Valley initiative represents a multi-stakeholder effort backed by AFRL, the Space Force, national labs, and universities to position the region as a nationally recognized hub for space innovation. Its geographic footprint includes key facilities across Albuquerque, Las Cruces, and White Sands, and its mandate focuses on technology transition, workforce pipeline development, and cross-agency alignment. Finally, Q Station, a mission-focused innovation center in Albuquerque, plays a complementary role by serving as a neutral ground for collaboration among startups, federal entities, and research institutions. Operated in partnership with AFRL and the New Mexico Trade Alliance, Q Station hosts events, briefings, and accelerator programming that bring together end users and solution providers early in the technology development cycle. It is also a core venue for classified and unclassified exchanges, helping firms understand mission requirements and adapt R&D trajectories accordingly. The facility supports direct interface with program managers, facilitates joint proposal development, and lowers the transaction costs of establishing trust-based collaborations in the national security space.

  These initiatives are further reinforced by AFRL-New Mexico's Tech Engagement Office, which has institutionalized collaborative pathways through CRADAs, Educational Partnership Agreements, and Cooperative Test Agreements. AFRL also leads several downstream commercialization accelerators—including the SpaceWERX-funded Space Force Accelerator Program and the Hyperspace Challenge—that catalyze alignment between government-defined mission needs and emerging commercial solutions. These programs have supported hundreds of companies through structured cohorts, securing significant non-dilutive federal investment and follow-on venture capital for selected firms.

  Together, these platforms signal a shift toward a more coordinated and capability-driven cluster model. By aligning mission sponsors, research institutions, and commercial actors around shared infrastructure and procurement pipelines, New Mexico is building the institutional scaffolding necessary to support sustained industry growth.

- **Precision Manufacturing and Supply Chain Capabilities:** New Mexico possesses a growing set of specialized manufacturing capabilities that anchor high-value segments of the aerospace and defense supply chain. The state is home to production facilities that support space-grade components—such as advanced photovoltaics, high-reliability electronics, and structural assemblies—critical to satellite systems and other mission-specific platforms. These capabilities are concentrated in precision manufacturing environments that meet rigorous aerospace quality standards, enabling in-state fabrication of satellite structures, optical mounts, avionics enclosures, and other flight-qualified hardware. This technical capacity is further reinforced by a legacy in microelectronics and advanced materials, including semiconductor R&D and prototyping infrastructure tied to national laboratory assets and long-standing commercial fabrication expertise.

  The result is a regional supply base capable of delivering complex, mission-assured components for both defense and commercial customers. Importantly, this ecosystem is not optimized for mass production but is well-suited to small-batch, high-performance applications—characteristics that align with the needs of space systems developers and emerging defense integrators. New Mexico's relative cost advantages, including lower labor and real estate expenses, allow firms to scale production efficiently while maintaining access to technical talent and proximity to federal testing and qualification facilities. These conditions position the state as a potential Tier-1 or Tier-2 supply hub within national aerospace and defense industrial networks. The presence of niche manufacturing capabilities not only enhances local economic activity but also deepens the region's embeddedness in critical national supply chains.

Taken together, these demand-side dynamics illustrate a maturing and strategically aligned market environment for space, aerospace, and defense technologies in New Mexico. The co-location of federal mission sponsors, operational users, research institutions, and specialized manufacturers creates a dense and functionally integrated ecosystem capable of absorbing, adapting, and scaling innovation. As national priorities shift toward distributed industrial resilience, dual-use technology transition, and faster acquisition cycles, regions like New Mexico stand to gain competitive advantage due to an environment where proximity to customers, supply chains, and test infrastructure is tightly coupled.

Line-of-Sight Market Applications Aligned with New Mexico's Position

Given New Mexico's institutional capabilities, infrastructure assets, and applied R&D strengths, several focused application areas present realistic and differentiated opportunities for strategic positioning within the broader Space, Aerospace & Defense Systems landscape. Given the highly competitive nature of the industry and the existence of large incumbent defense firms, it will be critical for the state to focus on niches that play to the ecosystem strengths and reflect the mission priorities of the cluster of federal customers that exist in the state. Several of these potential opportunities include:

- **Small Satellite Systems and Constellations:** New Mexico is positioned to support the full lifecycle of small satellite development, from subsystem design and integration to in-state testing and ground station operations. Co-location of sensor innovation, flight hardware prototyping, and responsive launch infrastructure enables rapid deployment cycles. National initiatives in resilient SATCOM and tactical ISR platforms create sustained demand for radiation-hardened smallsats and customizable bus architectures, all of which align with existing state competencies.

- **Remote Sensing and Earth Observation Analytics:** With recognized strengths in optics, sensor development, and high-performance computing, New Mexico can deliver vertically integrated solutions in remote sensing—from sensor payloads to AI-enabled data analytics. Applications in land management, wildfire monitoring, and energy infrastructure monitoring create clear public- and private-sector use cases. Cross-sector linkages to agriculture, water, and environmental science further reinforce this opportunity.

- **Unmanned Aerial Systems (UAS) and Autonomous Platforms:** Leveraging FAA-designated test ranges and extensive restricted airspace, the state offers a unique environment for UAS development, testing, and integration into national airspace. Key focus areas include autonomous flight systems, counter-UAS applications, and drone-based sensing platforms for defense and civil missions. New Mexico's experience in telemetry, electronic warfare, and high-altitude platforms reinforces its competitive edge in this domain.

- **Directed Energy Systems (Lasers and High-Power Microwaves):** As a national leader in directed energy, New Mexico can serve as a primary location for the prototyping, field-testing, and integration of laser and HPM subsystems. The convergence of adaptive optics, beam control, and high-power electronics within the state supports end-to-end system development. Dual-use spillovers in optical satellite communication and photonic components present additional commercialization pathways.

- **Space Component Manufacturing and Supply Chain Services:** The state's capabilities in producing space-qualified components—including radiation-hardened photovoltaics, RF systems, and structural composites—can be further scaled into a reliable supplier hub for national programs. Proximity to testing infrastructure and access to federal lab expertise position New Mexico as a site for turnkey component validation and subsystem qualification, particularly under supply chain resiliency mandates.

- **Defense Telemetry, Tracking, and Space Communications:** Specialized capabilities in RF engineering, phased-array antennas, and satellite ground systems position New Mexico to lead in next-generation telemetry and command architectures. Increasing demand for over-the-horizon tracking, missile test instrumentation, and modular ground stations supports in-state design and deployment of secure, mobile communication infrastructure for both defense and commercial space operations.

- **Space-Qualified Advanced Materials:** Applied research in ceramics, composites, radiation-resistant polymers, and thermal protection systems provides a foundation for developing aerospace-grade materials tailored to extreme operational environments. Pilot production and material qualification—backed by laboratory-scale fabrication and environmental testing—represent a high-value niche within national materials innovation efforts.

- **Cislunar Space Operations and Space Domain Awareness:** Building on AFRL and Space Force research activity, New Mexico is well-positioned to contribute to space domain awareness and cislunar tracking initiatives. Opportunities exist in orbital debris monitoring, autonomous maneuvering algorithms, and development of navigation and control systems for beyond-GEO operations. These capabilities respond directly to emerging national security priorities and align with long-range DOD and NASA mission roadmaps.

These application areas are not exhaustive, but they represent several growth drivers at the intersection of market opportunity and New Mexico capability. Each area also has spillover benefits: success in one applications space can create jobs and supplier activity that benefit others (e.g., component suppliers, testing services). In practice, many of these applications overlap and reinforce one another (directed energy requires advanced materials; small satellites rely on ground station networks; UAS generate data for remote sensing, etc.), which has the potential to be a reinforcing driver of further complementary supply chain and testing and demonstration infrastructure buildout.

Implications for Economic Development Activity

New Mexico's technological strengths in Space, Aerospace & Defense Systems are well recognized, but realizing their full economic potential will require a more deliberate and coordinated approach to sector development. Conversations with industry stakeholders emphasized the need for stronger strategic alignment, particularly the establishment of a clear organizing entity or "front door" for both industry and defense customers. Despite numerous programs and assets, the state's ecosystem remains fragmented with duplication of support functions, ambiguous mandates, and lack of a singular coordinating strategy diminishing collective impact and the ability to aggregate against longer term strategic markets. A unifying structure, whether an existing or reorganized state-level strategy office, public-private consortium, or empowered intermediary, is needed to integrate priorities, reduce redundancy, and represent the sector in national forums. Additionally, aggregating this functionality could increase the ability of the sector to interface across multiple military and federal funding streams and missions that are relevant to this opportunity.

Workforce remains a second critical constraint. Talent shortages in the private sector persist across the board from highly skilled R&D engineers to technicians and advanced manufacturing workers. Stakeholders consistently called for expanded pipelines through university-industry programs, accelerated training models, and retention incentives specifically designed to funnel talent into space and defense tech commercialization companies. Informal collaborations exist, but more structured, state-supported talent pathways—particularly in applied engineering and fabrication—are required to meet growing demand. Without this, New Mexico risks stagnation, as firms hesitate to scale in the absence of a reliable labor force.

Capital access and infrastructure gaps also limit the state's competitiveness. SME firms in the defense and aerospace industry cited the absence of early-stage risk capital, secure facilities for classified work, and consistent access for scaling companies to the numerous testing assets that exist in the state as persistent barriers to growth. In particular, industry stakeholders noted a need for simplified access to economic development incentives and clearer communication from state agencies around state vision in this area, both with respect to alignment with specific defense missions and emerging segments of the commercial space market. Investments in secure electronics manufacturing, ground station infrastructure, and modular prototyping facilities would further enhance the region's ability to retain both firms and federal missions.

Ultimately, New Mexico must shift from a collection of high-value assets and anchor companies to an integrated, mission-aligned innovation cluster. The opportunity lies not just in technology push from the labs and defense contracts which has continued to create commercialization opportunities, but in coordinating market pull across the scaling industry and defense customer base by building connective infrastructure, aligning incentives, and presenting a coherent value proposition to attract new companies and contract vehicles. The next phase of growth depends less on developing new programs and more on coordination of the state's rich asset base through clarifying leadership, aligning efforts, and reinforcing the architecture that enables long-term, scalable success.

Summary of Key Findings

New Mexico's position in Space, Aerospace & Defense Systems is underpinned by world-class research assets, expansive test infrastructure, and a growing industrial base focused on mission-critical technologies. The state benefits from a rare confluence of capabilities—federal R&D intensity, domain-specific talent, and dual-use technology innovation—that collectively form a strong platform for future growth. Across the sector's most dynamic application areas, ranging from small satellite systems and directed energy to advanced telemetry and space-qualified materials, New Mexico demonstrates the potential for meaningful competitive edge in coming years. These strengths are amplified by their ability to support end-to-end innovation cycles, from concept development to field validation, within a single geography. Recent ecosystem coordination efforts have recognized this potential, and both industry and research organizations are beginning to build momentum towards a more integrated innovation environment.

However, the scale of opportunity now confronting the state cannot be fully captured without a step-change in how its ecosystem is organized and engaged. Fragmentation across institutions, lack of unified leadership, and overlapping programmatic efforts have created friction in what could otherwise be a highly coordinated innovation system that rivals other U.S. aerospace and defense hubs built around major military installations. Companies and researchers alike pointed to the need for a more deliberate structure to align federal mission sponsors, commercial actors, and state agencies around shared goals. This includes not just interfacing within sectors, but building connective pathways across agencies, labs, and operational commands that historically function in parallel. The current model lacks the integrative mechanisms required to fully unlock the network effects latent in New Mexico's asset base.

Moreover, as competition intensifies for federal investment, procurement, and program siting amidst increasing defense spending, New Mexico will need to present a sharper, more coherent external identity—one that articulates a specific rather than general value proposition against emerging space and defense markets and also signals its capacity to deliver. This will require sustained investment in coordination infrastructure across governance models, convening platforms, and boundary-spanning intermediaries that can translate across technical domains, institutional mandates, and operational needs.

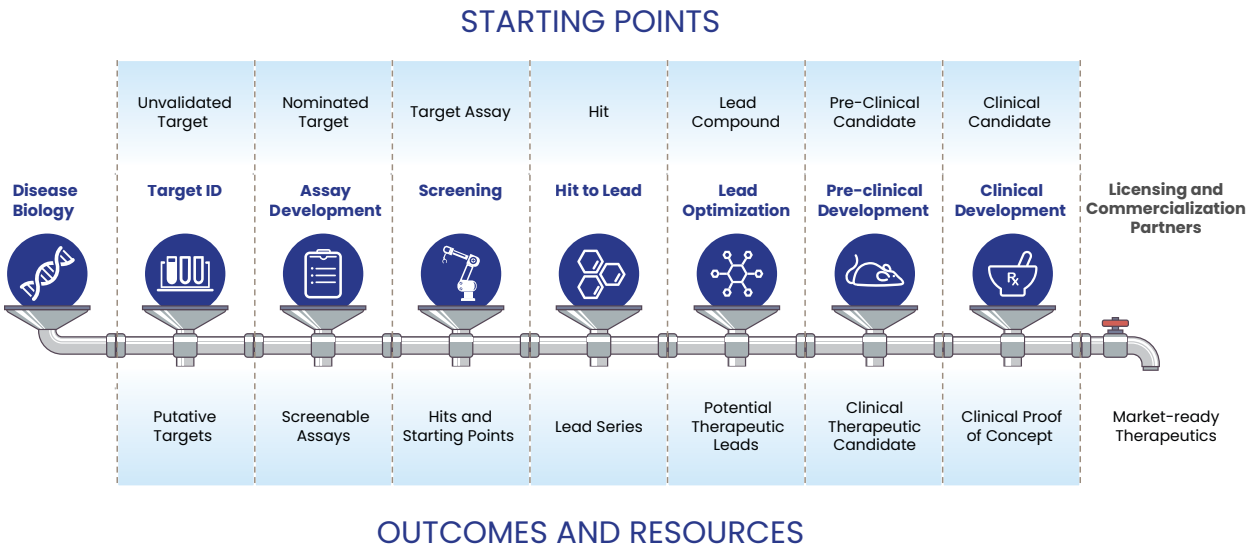
Biosciences Innovation: An Emerging S&T Growth Opportunity Area for New Mexico

New Mexico's emerging biosciences sector represents a science- and technology-intensive opportunity focused on early-stage therapeutics development, population health, and translational research. While the state does not yet possess the industry density of established life science hubs, it is home to a distinct constellation of assets that position it well for longer-term strategic growth. These include a nationally recognized academic medical center at UNM with strengths in cancer, infectious disease, and behavioral health; two national laboratories conducting advanced bioscience and biosecurity R&D; and a small but growing set of companies advancing therapeutics manufacturing, diagnostic platforms, and biodefense technologies. Pre-clinical research activity has yet to coalesce around a distinct identity, and instead spans areas such as molecular drug discovery, vaccine development, circular RNA biomarkers, and cell-free biomanufacturing. Broader institutional efforts are increasingly geared toward inclusive clinical research, health equity, and longer-term population health outcomes. Though not yet a cohesive or mature industry cluster, biosciences in New Mexico constitute emerging opportunity area where targeted investment, infrastructure development, and sustained ecosystem coordination could generate outsized returns for both the state's economy and public health outcomes.

What is Biosciences Innovation?

Biosciences Innovation encompasses the wide-ranging application of life sciences knowledge to generate new products, platforms, and systems that address critical challenges in health, agriculture, environmental sustainability, and national security. This opportunity area integrates discovery and applied research in biology, chemistry, engineering, and computational science, with the unifying objective of translating molecular and cellular insights into practical solutions that improve human well-being and economic resilience (Figure 16). Broad in scope, Biosciences Innovation spans the full arc from foundational research to advanced manufacturing and commercialization.

FIGURE 16. ILLUSTRATION OF TRANSLATIONAL RESEARCH PROCESS FOR THERAPEUTIC DISCOVERY AND DEVELOPMENT THAT UNDERLIES SUCCESSFUL COMMERCIALLY-DRIVEN HUMAN BIOSCIENCES INNOVATION ECOSYSTEMS



Source: NIH National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), https://www.niddk.nih.gov/research-funding/research-programs/translational-research-therapeutic-discovery-development#:~:text=Clinical%20Development-,Translational%20Research%20for%20Therapeutic%20Discovery%20&%20Development,of%20therapeutic%20discovery%20and%20development.

The sector includes well-established domains such as biomedical research, pharmaceuticals, diagnostics, and therapeutics, as well as upstream components of agricultural and environmental biotechnology. Emerging applications increasingly involve the convergence of biosciences with digital technologies and materials engineering. Key subfields include:

- **Therapeutics and Precision Medicine:** Biologics (e.g., monoclonal antibodies, RNA-based therapies), gene editing (CRISPR), regenerative medicine, and pharmacogenomics that enable personalized treatment strategies.
- **Diagnostics and Biomarker Platforms:** High-throughput sequencing, RNA- and protein-based assays, AI-enhanced diagnostics, and wearable or point-of-care systems for early detection and monitoring of disease.
- **Biomanufacturing and Bioprocessing:** Innovations in cell-free systems, continuous-flow production, modular manufacturing platforms, and single-use bioreactors for scalable, cost-effective production of vaccines and biologics.
- **Ag-biotech and Environmental Biosciences:** Molecular breeding, microbial bio-inputs, and stress-resilient crops, as well as biosensors and bioremediation strategies for environmental health and sustainability.

- **Bioinformatics and Computational Biosciences:** The integration of machine learning, predictive modeling, and large-scale biological data analysis to accelerate drug discovery, optimize clinical trials, and simulate complex biological systems.

- **Biosecurity and Biodefense:** Technologies to detect, prevent, and respond to biological threats, including sensor platforms, rapid diagnostics, and surveillance tools informed by national security needs.

Advances in these areas are rapidly transforming the biosciences sector globally. The deployment of CRISPR-based tools for therapeutic development, the commercial success of mRNA vaccine platforms, and the growing use of AI in clinical trial design and molecule screening are reshaping R&D workflows. These innovations are driving a shift toward more personalized, efficient, and scalable biomedical solutions. Simultaneously, industrial biotechnology is moving toward more sustainable and decentralized manufacturing paradigms, enabled by developments in synthetic biology and materials science.

Public investment and policy have reinforced this momentum. The 2022 launch of the National Biotechnology and Biomanufacturing Initiative by the U.S. federal government signaled a strategic pivot toward building domestic capacity in bio-innovation. This includes support for regional innovation hubs, workforce development in biomanufacturing, and incentives to re-shore critical supply chains for pharmaceuticals and biologics. Federal agencies such as NIH, ARPA-H, NSF, and BARDA have expanded funding to catalyze translational research and high-risk, high-reward innovation across biosciences subfields. These policy shifts reflect growing recognition of biosciences not only as a source of healthcare solutions, but also as a pillar of national resilience and industrial competitiveness.

Another particularly important and increasingly visible dimension of Biosciences Innovation is the emergence of population health as a focus area that bridges scientific discovery with measurable public health outcomes. Population health innovations apply biosciences-derived tools such as genomic screening, epidemiological modeling, environmental exposure analytics, and digital diagnostics to understand and address health disparities at scale. These approaches often originate from translational research programs housed within academic medical centers and public health institutes, where insights from bench science are rapidly applied to real-world interventions across diverse populations. In New Mexico, this translational pipeline is supported by assets such as UNM's Clinical and Translational Science Center (CTSC), which integrates electronic health record data with clinical trial infrastructure and community engagement strategies to support equitable research. These capabilities enable innovations in behavioral health, chronic disease prevention, and infectious disease response, tailored to underserved and rural populations. As the biosciences field evolves, the intersection with population health represents a growing frontier, one that links molecular and clinical insights to upstream determinants of health, and positions Biosciences Innovation as a platform not only for new therapies but also for systems-level impact in healthcare delivery and public health resilience.

New Mexico is positioned to engage more meaningfully in this emerging bioeconomy, particularly at the intersection of biomedical innovation, public health, and national security. The state's national laboratories have longstanding programs in biosecurity, biodefense, and computational biosciences, while the University of New Mexico Health Sciences Center (UNM HSC) brings together advanced research infrastructure in cancer, infectious disease, behavioral health, and health equity. At the same time, the state faces rural health disparities and chronic health outcomes challenges that can serve as the driver for broader biosciences ecosystem development via a focus on translational medicine and health outcomes.

Market Outlook and Growth Dynamics

Biosciences Innovation is advancing rapidly due to several converging macro trends that are redefining how societies manage health challenges and supplying medicines. This sector has become a primary target of public investment and private capital, as both national governments and global firms seek to capitalize on its high-value, high-impact potential. Regions that have proactively organized research capacity, commercial infrastructure, and workforce pipelines around these trends have successfully developed globally competitive bioscience clusters. For New Mexico, which has some foundational assets but a modest industry footprint today, the opportunity lies in aligning strategically with these broader market forces to carve out a distinctive niche within the biosciences economy. Key forces shaping the sector include:

- **Demographic Pressures and Healthcare Demand:** Aging populations and the rising prevalence of chronic diseases are generating sustained demand for more effective, personalized, and preventative medical solutions. This is accelerating investment in biologics, gene therapies, and targeted diagnostics that can treat or manage complex conditions earlier and more precisely than traditional approaches.

- **Technological Convergence and Integration of AI:** The integration of artificial intelligence, machine learning, and computational modeling into biosciences is fundamentally changing how discoveries are made and therapies are developed. AI is being used to predict molecular interactions, optimize clinical trial design, and simulate treatment outcomes, enabling faster development cycles and more efficient resource allocation across the R&D pipeline.

- **Shifting Biomanufacturing Models:** Advances in production technologies, including continuous-flow processes, cell-free synthesis platforms, and modular manufacturing systems, are reshaping how biologics and vaccines are manufactured. These innovations support more decentralized, scalable, and cost-effective manufacturing models that can operate with greater speed and geographic flexibility.

- **Sustainability and Supply Chain Resilience for Biosciences Products:** The vulnerabilities exposed during the COVID-19 pandemic have prompted a strategic shift toward regionalized production and more resilient supply chains. Governments and industry leaders are investing in domestic biomanufacturing capabilities to reduce reliance on overseas production and ensure preparedness for future health and biosecurity challenges.

- **Federal Investment and Strategic Policy Alignment:** National science and technology policy has increasingly prioritized biosciences as a critical domain for economic competitiveness and public well-being. Federal agencies are directing unprecedented levels of funding to translational research, advanced manufacturing infrastructure, and regional innovation ecosystems, enabling a wider set of geographies to participate in the emerging bioeconomy.

- **Regulatory Innovation:** U.S. regulatory agencies are adapting approval pathways and product classification systems to keep pace with the complexity of advanced bioscience products. This includes mechanisms to accelerate the review of gene therapies, RNA-based treatments, and personalized medicine approaches, providing greater predictability for early-stage firms navigating commercialization.

Together, these trends reinforce the view of biosciences as a long-term, high-growth market that is increasingly accessible to regions beyond traditional industry hubs. The sector's evolution toward decentralized production, digitally enabled discovery, and population-level interventions is opening the door to new geographies with the right mix of research capacity, clinical diversity, and applied infrastructure.

For New Mexico, these dynamics present both a challenge and an opportunity. If the state can align its bioscience research institutions, translational health assets, and early-stage commercialization pathways with national market priorities and federal investment trends, it can begin to build its own specialized role within the broader biosciences economy.

Why is this S&T Opportunity Area a Fit for New Mexico?

New Mexico's bioscience sector today is still emerging, characterized by pockets of excellence in research and a handful of anchor companies. At first glance, New Mexico might not seem well-aligned with broader trends, as the state lacks a large pharmaceutical headquarters or a long list of homegrown, venture capital-backed biotech startups with major investment success. However, several factors suggest that Biosciences Innovation is an emerging strategic fit for New Mexico if the ecosystem can be properly coordinated, including:

- **Research and Clinical Base:** UNM HSC anchors the state's translational research capacity, combining a medical school, pharmacy school, NCI-designated cancer center, and an NIH-funded Clinical & Translational Science Center to support biomedical discovery and clinical trial infrastructure. With specialized strengths in areas such as infectious disease, brain and behavioral health, and oncology, UNM's ecosystem has produced commercially relevant research and spinouts.

- **National Laboratories and Biosecurity:** LANL and Sandia contribute deep expertise in bioinformatics, immunology, and sensor technologies, supporting bioscience research with national security applications and cultivating a highly technical workforce. Several lab-associated startup successes demonstrate the potential of translating defense-developed detection platforms into commercial systems for homeland security and public health use.

- **Selective Homegrown Successes:** New Mexico's biosciences landscape, while fragmented, includes several companies demonstrating scalable models for growth, including Curia, Nature's Toolbox (NTx), Circular Genomics, and BioFlyte, each of which reflects a different strength in manufacturing, platform development, diagnostics, or dual-use innovation. These firms have raised significant capital, formed federal partnerships, and established operational infrastructure in-state, proving that commercial bioscience ventures can be launched and scaled from New Mexico with the right alignment of talent, capital, and institutional support.

- **Strategic Geography and Demographics:** New Mexico's relatively low cost of doing business, along with LEDA-backed incentives and infrastructure support, makes it attractive for startups looking to extend their runway while building operations while still in proximity to more mature West Coast biosciences investment ecosystems. The state's diverse and medically underserved population enables inclusive clinical trials and health interventions, positioning it as a natural testbed for innovations that address disparities in chronic disease, behavioral health, and rural care delivery.

- **Convergence with Other Sectors:** The state's strengths in supercomputing, artificial intelligence, and advanced engineering—rooted in national labs and growing software and aerospace sectors—create fertile ground for cross-disciplinary bioscience applications. These include bioinformatics, health data analytics, and infectious disease profiling and tracking technologies, offering pathways to integrate biosciences into broader innovation areas such as space health, security platforms, and computational drug discovery

New Mexico possesses some of the key foundational elements for Biosciences Innovation and a recognition that the sector has the potential to drive traded sector growth and public health benefits for the state. However, the sector remains fragmented and underdeveloped, with persistent gaps in infrastructure, specialized workforce, access to growth capital, and statewide coordination. Addressing these deficits will be essential to transform New Mexico's current momentum into a cohesive, competitive ecosystem.

Highlights of New Mexico's Technology "Push"

Despite more limited scale, New Mexico's Biosciences Innovation ecosystem is reinforced by innovation efforts emerging from its research universities, translational institutes, incubators, and state-backed coordination initiatives. These efforts, while still spread across a broad array of innovation themes that have not yet coalesced around a critical mass of activity, form the architecture for an integrated bioscience ecosystem organized around the state's most relevant domains of excellence:

- **Clinical and Translational Research Infrastructure:** UNM HSC anchors the state's bioscience research with translational platforms such as the NIH-funded Clinical & Translational Science Center (CTSC), which supports early-stage investigators, clinical trials, and biostatistical services. Specialized centers in cancer, brain and behavioral health, infectious disease, and metabolic disorders link laboratory discovery with clinical application and routinely engage with Sandia and LANL in areas such as digital pathology, tumor genomics, and environmental health, producing both intellectual property and startup formation.

- **Neurotherapeutics, Psychiatry, and Brain Health:** New Mexico is advancing a unique niche in mental health innovation through integrated research in neuroscience, neuroimaging, and RNA diagnostics. The UNM Brain & Behavioral Health program and its 7T MRI core support translational studies on mood disorders, addiction, and cognitive development, while spinouts like Circular Genomics exemplify the commercialization of biomarker-based diagnostics for precision psychiatry. This domain benefits from the state's diverse population and growing infrastructure for longitudinal behavioral health research.

- **Infectious Disease and Vaccine Research:** UNM's Infectious Diseases & Immunity program, supported by BSL-3 infrastructure and NIH training grants, anchors the state's research on host-pathogen dynamics, antimicrobial resistance, and novel vaccine platforms. Projects span CRISPR-based delivery systems and nanotechnology for immunization, positioning New Mexico as a regional leader in preclinical vaccine development with applications in both global health and national biosecurity.

- **Cancer Therapeutics and Precision Oncology:** The UNM Comprehensive Cancer Center (an NCI-designated Comprehensive Cancer Center) integrates genomic sequencing, digital pathology, and flow cytometry into targeted therapy development and population-specific cancer research. This includes drug discovery and repurposing pipelines tailored to Hispanic and Native American patient groups, leveraging unique genomic datasets and underrepresented trial populations for translational impact and potential commercialization.

- **Environmental Health and Exposure Science:** UNM's Environmental Health Sciences program investigates the health effects of uranium, arsenic, PFAS, wildfire smoke, and other pollutants, often in partnership with tribal communities. Supported by mobile sampling, microneedle diagnostics, and bioanalytical cores, this work is a foundation for new environmental biosensing tools and community health interventions, particularly relevant to arid, resource-constrained regions across the Southwest.

- **Diagnostics and Bio-AI Integration:** New Mexico bioscience ventures are increasingly focused on diagnostics, particularly platforms that integrate AI for real-time data interpretation. Examples include retinal scanning technologies and lab-developed molecular assays supported by TriCore Reference Labs.

- **Child Health and Developmental Research:** The UNM Pediatric Clinical Trials Center and Child Health Research program support multisite studies on asthma, obesity, opioid exposure, and early development, particularly in underserved and rural populations. These centers integrate clinical infrastructure with school-based research and tribal partnerships, creating pathways for pediatric therapeutics, imaging, and policy-informed innovation.

- **Rare Disease and Population-Specific Genomics:** New Mexico's clinical diversity—especially its Hispanic and Native American populations—offers a distinctive platform for rare disease research and pharmacogenomics. There is growing interest in using these genetic datasets to inform targeted therapy trials, attract pharmaceutical partnerships, and build biorepositories that reflect population health variation underrepresented in national cohorts.

- **Plant Biology and Environmental Genomics:** Researchers at UNM and NMSU are leveraging plant physiology, natural product chemistry, and environmental stress biology to develop solutions in sustainable agriculture, bioproducts, and climate resilience. This includes work on bioenergy crops, stress-tolerant species, and synthetic biology for plant-derived therapeutics and ag-biotech applications, integrated with remote sensing and environmental modeling.

- **Biosensing and Environmental Systems:** Faculty from UNM's School of Engineering and Biology departments are advancing biosensor systems that combine low-cost instrumentation, biological measurements, and real-time analytics for applications in agriculture, healthcare, and environmental monitoring. These platforms are being piloted in community health, climate impact tracking, and built environments, offering a convergence zone for bioengineering, public health, and sustainability innovation.

- **Health Equity and Community-Informed Engineering:** An emerging cross-disciplinary focus at UNM is the integration of health equity, engineering design, and community partnership. Projects range from culturally adapted medical devices and health communication tools to engineered systems for rural water safety and air quality monitoring. These initiatives embody a place-based approach to bioscience, linking technological innovation to local wellbeing and social impact.

The national labs provide a complementary focus on additional areas of biosciences (sometimes in collaboration with the state's universities) via their funded areas of research capacity, including:

- **Biosecurity and Pathogen Detection:** Both LANL and Sandia have extensive programs in biodefense, including rapid pathogen detection, bioaerosol sensing, and biosurveillance technologies. These efforts support dual-use applications in public health and national security and have already led to commercialization examples.

- **Computational Biology and Bio-AI:** LANL's high-performance computing capabilities are applied to epidemiological modeling, genomics, and protein design, aligning closely with emerging bio-AI ventures and statewide interest in precision medicine and digital diagnostics.

- **Microfluidics, Sensors, and Diagnostics Platforms:** Sandia's engineering expertise in sensor integration, microfluidics, and materials for biosensing underpins point-of-care diagnostic technologies and lab-on-a-chip systems, supporting innovation in decentralized healthcare and field-ready platforms.

- **Synthetic Biology and Biomanufacturing Tools:** LANL conducts research in microbial engineering and synthetic biology with applications in biofuel production, environmental sensing, and potentially therapeutic protein expression, supporting foundational tools for regional biomanufacturing and sustainability-oriented biotech.

Despite these clear pockets of research strength and translational activity, New Mexico's biosciences technology push remains fragmented today, with limited consolidation and coordination towards areas of critical mass and supporting value chains of translational programming and support services. Even areas with more substantial capacity such as UNM's cancer center often operate within institutional silos, preventing broader aggregation of investment towards significant investments in infrastructure and facilities. High-value initiatives exist in isolation rather than as part of an integrated innovation system, reducing visibility, slowing commercialization, and weakening the state's ability to attract sustained investment. Bridging these silos between universities, national labs, clinical partners, and entrepreneurs will be essential to convert scientific excellence into a cohesive, high-performing bioscience ecosystem.

Highlights of New Mexico's Market "Pull"

While New Mexico does not yet possess a mature biosciences industry cluster, select developments in biomanufacturing, clinical integration, and regional coordination are beginning to create tangible market pull—early indicators that the state could support a more robust innovation-to-commercialization pipeline with strategic investment. Currently, only a few anchor companies drive significant demand, and structural challenges such as the limited availability of specialized lab space and constrained later-stage capital impede the scaling of bioscience ventures. Nonetheless, several areas illustrate how nascent market demand is forming around the state's unique assets:

- **Emerging Biomanufacturing and National Health Security Capacity:** The expansion of Curia's Albuquerque site, supported by BARDA and the Department of Defense, has introduced fill-finish pharmaceutical manufacturing infrastructure to the state for the first time. This, alongside NTx's development of modular RNA biomanufacturing platforms, positions New Mexico as an emerging contributor to decentralized, resilient health production systems linked to national biodefense priorities.

- **Statewide Coordination and Rural Engagement:** The New Mexico Bioscience Authority (NMBSA) is laying the groundwork for a more connected market by convening stakeholders, mapping bioscience assets, and launching initiatives like the Rural NM Biotech program. These efforts—while still formative—are beginning to unify a geographically dispersed ecosystem and open new channels for startup visibility and investor engagement.

- **Clinical Trial and Diagnostic Validation Pathways:** Institutions such as TriCore Reference Laboratories and UNM Health Sciences Center offer embedded pathways for startups to pilot diagnostics and lab-developed tests, which is a key enabler of early market traction in fields like precision health and infectious disease.

- **Diverse Populations for Inclusive Health Innovation:** New Mexico's highly diverse population, including large Hispanic and Native American communities, presents an important differentiator for clinical research and product testing aimed at underserved and historically underrepresented groups, a growing priority for federal funders and pharma partners alike.

In sum, while market pull in New Mexico's biosciences sector remains unfocused and concentrated among a handful of successful firms and initiatives, it reflects potential momentum towards more meaningful growth. Unlocking broader and more sustained demand will depend on expanding infrastructure, growing the talent base, and continuing to build statewide cohesion around shared commercial goals.

Line-of-Sight to Market Applications Aligned with New Mexico's Position

At present, New Mexico lacks a clearly defined pathway to large-scale market capture in biosciences. Despite a small set of promising firms, strategic assets, and early initiatives, the state's commercial base remains modest and highly fragmented. No single market segment has yet reached sufficient scale to drive a self-sustaining innovation and commercialization cycle. As such, a pragmatic approach must be adopted: rather than bet on one application area prematurely, New Mexico should cultivate a portfolio of opportunity spaces and monitor where traction builds based on growing its innovation infrastructure for biosciences. This includes focusing on areas of differentiated research, aligning R&D capacity with translational pathways, and ensuring early-stage startups have the conditions to remain and grow in-state.

Promising application areas that merit proactive cultivation include:

- **Population Health Tools and Analytics:** The state's unique demographic and clinical research capabilities position it well to develop scalable, real-world population health solutions for underserved and rural populations. Applications could include social determinants of health platforms, longitudinal health analytics, and digital tools for chronic care management, especially for conditions like diabetes and behavioral health.

- **Biodefense and Biodetection Technologies:** Emerging companies and initiatives at Sandia and LANL underscore potential for innovation in threat detection, portable diagnostics, and environmental biosurveillance, which are increasingly aligned with federal preparedness and response strategies.

- **RNA-based Therapeutics and Manufacturing Platforms:** With NTx's modular mRNA production systems and connections to UNM translational research, the state could support targeted applications in vaccine development and localized delivery systems, especially for defense and low-resource health markets.

- **Neurogenomics and Precision Psychiatry:** Traction with miRNA-based diagnostics for depression and suicide risk offers a window into building a specialty cluster around neurogenomics, combining strengths at UNM HSC with private capital and lab capabilities.

- **Next-Gen Diagnostic Sensors and Devices:** Advanced sensor development at the national labs, combined with clinical needs identified by health system partners, could drive development of portable, high-sensitivity diagnostics for both clinical and environmental uses.

- **Biosecurity-Grade Disinfection and Materials Science Platforms:** Sandia's Disinfectant 2.0 and related nanomaterial-enabled pathogen control technologies provide opportunities in durable antimicrobial coatings and PPE innovations for healthcare, travel, and military settings.

- **Ag-bio Interface and Pathogen Resilience:** New Mexico's agricultural research strengths, including at NMSU and the NMC, offer pathways to integrate biotech innovations into crop health monitoring, antimicrobial resistance tracking, and soil/pathogen biosensing.

- **Theranostics and Molecular Imaging Agents:** Opportunities exist to bridge national lab imaging science with UNM Cancer Center research into radiopharmaceuticals, creating targeted therapies and diagnostic agents for oncology and neurological disorders.

Specific areas within this portfolio remain emergent and unproven at commercial scale, but conversations with industry stakeholders have highlighted the technology commercialization potential of population health applications as well as biodefense and biodetection platforms as being untapped resources that have not fully been explored due to limitations of the state's innovation ecosystem.

Implications for Economic Development

The biosciences sector has not yet reached critical mass and remains constrained by foundational barriers in infrastructure, talent development, and capital access. The state's most immediate economic development need is to make targeted, upstream investments that enable early-stage biotechnology ventures to incubate, mature, and scale in place. Without such enabling conditions, the ecosystem will remain dependent on sporadic attraction of major biosciences site locations and external markets for capital, infrastructure, and talent, forfeiting economic value creation to other regions. A successful strategy will require building the infrastructure and support mechanisms that allow commercial pathways to emerge organically across the diverse portfolio of opportunities noted above.

Key economic development challenges include:

- **Lack of Lab and Scale-Up Infrastructure:** Stakeholders emphasized that current incubator and lab space is inadequate for clinical-grade, regulated biotech development. Investments in wet lab cores, GMP/CLIA-ready facilities, and a university-based translational biosciences hub could address this foundational gap.

- **Fragmented Institutional Coordination:** Silos persist between and within university campuses, national labs, economic development programs, and industry, impeding collective strategy and shared resource development. A state-supported convening and coordination mechanism could help unify the ecosystem.

- **Capital Shortfalls and Talent Drain:** Most companies cannot raise follow-on rounds larger than $1 million in-state, forcing relocation to bioscience hubs with deeper venture pools. A targeted public-private growth fund and incentives to retain executives would help anchor companies post-formation.

- **Workforce Gaps in Mid-Skill and Biomanufacturing Roles:** Existing firms report persistent shortages of cleanroom technicians and mid-level engineering talent, which hinder expansion. Expanded state investments in biotech technician training through community colleges, alongside scalable credentialing programs, are needed to build a durable talent pipeline.

Ultimately, New Mexico's economic development strategy in biosciences must prioritize infrastructure and ecosystem readiness as a short-term strategy. By building the conditions necessary for startup formation and scale, the state can create the foundation from which commercially relevant clusters may emerge and serve as more distinct drivers of line of sight to markets.

Summary of Key Findings

Biosciences Innovation represents a high-potential, yet still early-stage, opportunity for New Mexico. While the state benefits from strong research institutions, national lab expertise, and selective company successes, its biosciences sector has not yet reached the scale or cohesion needed to support sustained commercial growth. The ecosystem today is characterized by distributed scientific strength without corresponding market depth, with most activity concentrated in isolated centers of excellence rather than integrated, cluster-wide momentum.

The state's unique demographic diversity and translational research capabilities provide real differentiators, particularly in areas such as population health, neurogenomics, and biodefense diagnostics. The expansion and growth of several homegrown biosciences companies shows that bioscience ventures can succeed in the state, but they remain the exception rather than the norm. Stakeholder feedback consistently points to major structural gaps, most notably the lack of specialized lab space, insufficient programmatic infrastructure, and limited access to follow-on capital as persistent barriers to scaling in place.

While there is no singular commercial direction yet with critical mass, a number of application areas show promise and alignment with New Mexico's existing capabilities and should be monitored over time to identify potential for further locally anchored successes. These include decentralized health manufacturing, diagnostics and digital health solutions for underserved populations, environmental biosensing, and advanced biosurveillance systems. However, realizing this potential will require the state to make foundational investments that enable startups to progress beyond the proof-of-concept stage without relocating. Specifically, the creation of modern, accessible lab and pilot-scale facilities, along with stronger coordination between institutions, is essential if New Mexico is to translate its bioscience research base into a competitive, innovation-led industry.

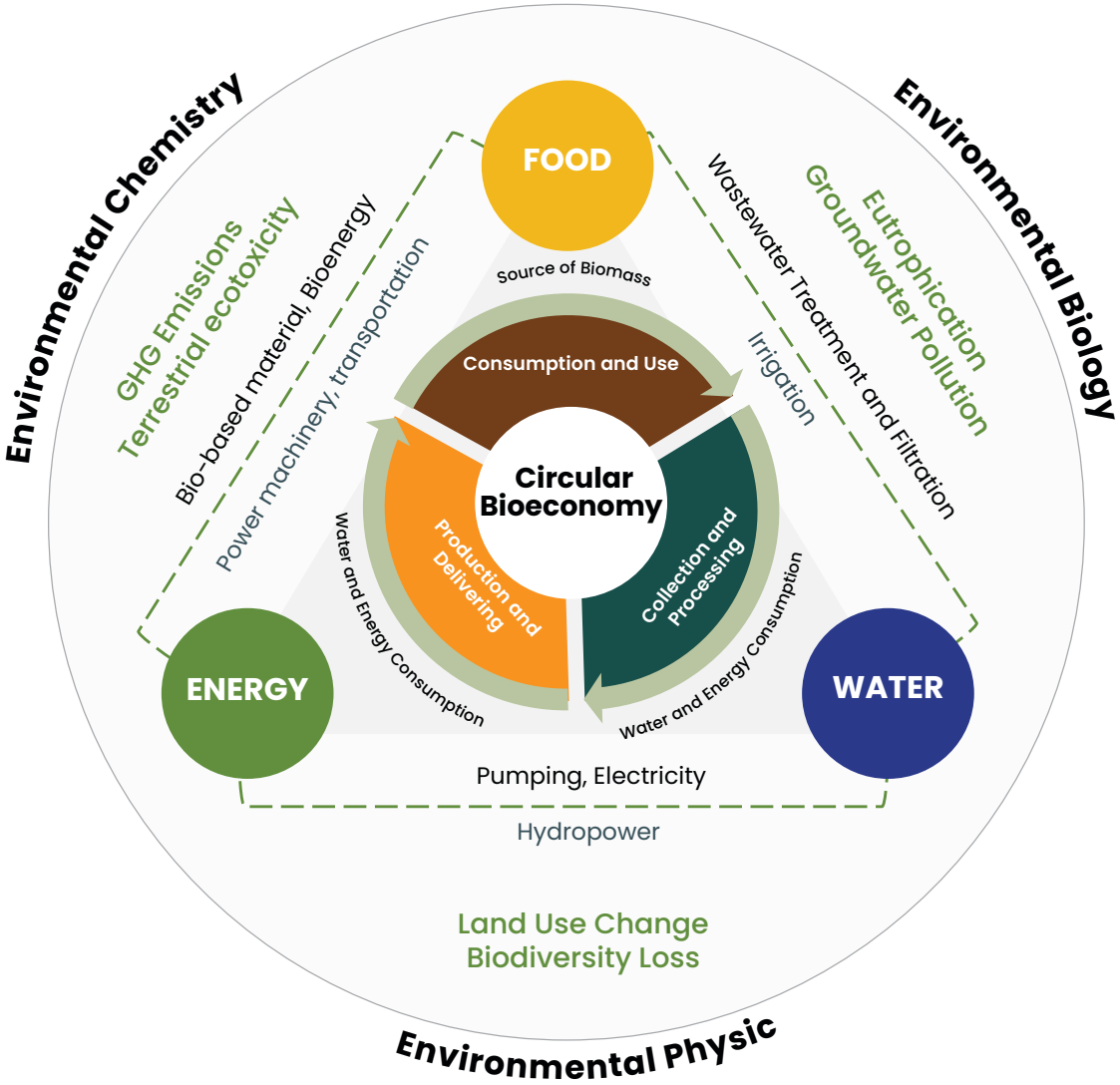
Agricultural, Water & Ecosystem Technology Nexus: An Emerging S&T Growth Opportunity Area for New Mexico

New Mexico's natural environment places it at the forefront of a converging technology nexus that links agriculture, water resources, and ecosystem management. This nexus refers to the integration of innovative agricultural systems, advanced water management technologies, and environmental sensing for ecosystem monitoring, areas that are critically intertwined and important in arid and climate-challenged regions. As climate change intensifies droughts and wildfire risks, and as sustainability and resilience become economic imperatives, technologies in these domains increasingly work in tandem. New Mexico's unique combination of arid landscapes, academic research efforts in these areas of convergence, and relevant federal lab research directorates provide an ideal proving ground for the integrated solutions necessary to address major challenges. The state's high desert climate forces creative approaches to farming and water use, while its scientific assets in turn supply the pipeline of novel approaches to environmental management and technology platforms to turn these challenges into innovation opportunities. Although the relevant commercial industry base in the state is still emerging, there is a broad opportunity to leverage New Mexico's strengths to develop climate-resilient agriculture, smart water systems, and ecosystem monitoring tools in a coordinated way, positioning the state as a leader in climate adaptation technology.

What Is the Agricultural, Water & Ecosystem Technology Nexus?

The concept of a "nexus" around the usage of water and energy and their interaction with both agricultural production and environmental impacts reflects a broader trend of the convergence of technologies and applications that ensure sustainable agriculture, efficient water use, and resilient ecosystems. Recognizing that these domains are deeply interdependent, the nexus framework emphasizes the need for integrated strategies that simultaneously address resource constraints, optimize land and water productivity, and reduce environmental degradation. Advances in digital agriculture, remote sensing, hydrologic modeling, and ecosystem monitoring are increasingly deployed not in isolation, but as part of linked systems where data and decision-support tools cross traditional sectoral boundaries (Figure 17). This convergence is not only a scientific evolution but a practical necessity in the face of climate volatility, growing water scarcity, and rising demands for food and ecosystem services. The Agricultural, Water & Ecosystem Technology Nexus thus represents both a conceptual shift and a concrete area of innovation where technologies are co-developed and co-applied to achieve multi-benefit outcomes at the landscape scale.

FIGURE 17. ONE EXAMPLE OF COMMONLY CITED CONCEPTUAL FOOD-WATER-ENERGY NEXUS FRAMEWORK (INCORPORATING SUSTAINABILITY CYCLE) DESCRIBING IMPACT LINKAGES ACROSS AGRICULTURE, WATER USAGE, AND ENVIRONMENTAL OUTCOMES



Source: Adapted from Optimizing water-energy-food nexus: achieving economic prosperity and environmental sustainability in agriculture. Adrianto et al, Frontiers in Sustainable Food Systems, Volume 7, 2023.

Applications in this area span several interconnected technology and application areas:

- **Precision Agricultural Systems and AgriTech,** including precision agriculture technology platforms using sensors, drones, and AI to optimize crop production, arid-land farming techniques, controlled environment agriculture (greenhouses/vertical farms), and bioengineering for climate-resilient crops. For example, agritech solutions encompass everything from genomic breeding of crops to improve drought or pest tolerance to AI-driven farm management and robotics. New Mexico's focus is often on agriculture in water-scarce conditions, and food production in arid lands is a noted specialty at NMSU. This includes developing crops suited for desert climates, improving water efficiency in irrigation, and ensuring food safety and value-added processing in supply chains. The nexus approach recognizes that improving agricultural output in these environments requires innovations that also account for water constraints and ecosystem health (such as soil quality and pollinator support).

- **Water Resource Management Technologies** (WaterTech) covers innovations in water conservation, treatment, recycling, and infrastructure management. In New Mexico's context, key technologies include advanced wastewater treatment and reuse, desalination of brackish or produced water, smart irrigation systems, and data-driven water allocation tools. Relevant areas of innovation highlight water conservation and desalination, as well as efficient water use in food processing and even oil & gas "produced water" treatment. Managing water in an arid environment means integrating sensors (for monitoring soil moisture, aquifer levels, pipeline leaks), deploying new materials (for filtration, purification), and using modeling software to optimize reservoir releases or predict shortages. Water use and hydrology innovation in this context is not isolated, as it directly supports agricultural production and sustainability across ecosystems in addition to water needs for residential populations.

- **Environmental Sensing and Ecosystem Monitoring** refers to technologies that observe and model environmental conditions, particularly related to climate impacts like drought, wildfire, and pollution. It includes remote sensing satellites and UAVs to monitor vegetation health, soil moisture, or wildfire spread, as well as in-situ sensor networks tracking weather, water quality, or biodiversity. These advanced remote sensing systems and modeling tools are often originally developed as a result of funded federal research or for national security missions, and are in turn applied to environmental monitoring across wide variety of use cases. For example, relevant technologies for New Mexico encompass coupled fire-atmosphere simulation models that integrate wildfire behavior with ecological variables such as vegetation structure, topography, and fuel moisture, providing decision-makers with advanced tools for anticipating fire spread and evaluating mitigation strategies. Another example are ground-based environmental monitoring arrays that track key ecosystem indicators including soil moisture, water quality, atmospheric pollutants, and vegetation health. These tools can support the detection of contaminants such as heavy metals or wildfire-related particulates, offering insight into the environmental and public health impacts of land use and climate stressors. Beyond monitoring, ecosystem technologies increasingly support valuation and decision frameworks that quantify

ecosystem services such as carbon sequestration, watershed regulation, and biodiversity conservation and integrate these into land and resource management planning. Modeling platforms that couple hydrology, climate, and ecological processes are particularly valuable in arid and semi-arid regions, where resource constraints necessitate coordinated strategies for sustaining both agricultural productivity and ecosystem resilience.

Notably, the interconnections among these sub-areas are the defining feature of the nexus structure of applications in this space. Drought is a prime example: managing drought risk involves crop science (drought-tolerant crops and farming methods), water tech (optimizing scarce water supplies), and ecosystem monitoring (drought indices, soil health, forest dryness to prevent fires) together. A holistic technology strategy might use satellite data to detect drought stress in both farms and forests, deploy IoT soil sensors to fine-tune irrigation scheduling, and apply recycled wastewater to support crop growth – all coordinated via predictive models of water availability.

New Mexico's unique position in this nexus comes from combining its natural testbed with its institutional know-how. The state's pronounced climate variability, water scarcity, and ecological diversity create a highly relevant context for developing and testing integrated solutions—conditions that increasingly mirror those in other water-stressed and climate-vulnerable regions globally. This natural testbed is complemented by a dense institutional landscape that spans agricultural sciences, hydrology, climate modeling, and advanced sensing technologies. The research infrastructure within the state supports end-to-end innovation pipelines, from fundamental scientific inquiry to field-scale application, with particular strength in areas such as resource-efficient food systems, coupled climate-hydrology modeling, and sensor-based environmental monitoring. High-performance computing, geospatial analytics, and systems integration capabilities further augment this capacity, enabling multi-scale modeling and data assimilation critical to managing complex socio-ecological systems. This combination of context-specific challenges and high-caliber technical expertise positions New Mexico as a strategic leader in developing and demonstrating technologies at the intersection of agricultural productivity, water resource sustainability, and sustainable growth.

Market Outlook and Demand Drivers

Global market dynamics increasingly reinforce the relevance of technologies at the intersection of these various technologies. Several long-term drivers are shaping demand in this space, each contributing to the emergence of new innovation trajectories, capital flows, and policy priorities that align closely with the capabilities embedded in the nexus:

- **Expanding Need for Sustainable Agritech and Food Systems:** Agricultural producers face rising pressure to increase output while simultaneously reducing environmental impacts and conserving water resources. Market demand is shifting toward technologies that enable efficiency, traceability, and resilience—particularly under conditions of climate variability and land degradation. Precision agriculture, remote sensing, AI-enabled crop analytics, and climate-resilient crop genetics are increasingly seen not only as productivity tools but as mechanisms for managing risk. This shift is reinforced by consumer demand for sustainably sourced food, as well as investor and regulatory expectations related to emissions, water use, and soil health. As such, the emphasis in agritech is moving from yield maximization to systems optimization, balancing food production with long-term ecological integrity.

- **Rising Demand for Climate Adaptation and Water Resilience Technologies:** Water scarcity, increasing climate volatility, and aging infrastructure are driving demand for advanced water management solutions across both urban and rural geographies. Technologies that enable efficient allocation, reuse, monitoring, and purification of water are becoming central to climate adaptation strategies. Governments, utilities, and industries are seeking integrated approaches that combine engineered systems with digital infrastructure ranging from real-time monitoring networks to smart irrigation and groundwater recharge modeling. Climate resilience is no longer treated as a secondary benefit but as a primary investment criterion across agriculture, urban planning, and resource-intensive industries, creating strong cross-sectoral demand for innovations that mitigate hydrologic risk.

- **Greater Emphasis on Quantifying and Managing Ecosystem Services:** As environmental externalities become more visible and costly, public and private actors are placing increased value on technologies that can measure, monitor, and verify ecosystem services. The proliferation of carbon markets, biodiversity credits, and regulatory frameworks tied to ecosystem outcomes is fueling demand for reliable data and modeling tools. Remote sensing, environmental sensor networks, and ecological forecasting platforms now serve as the backbone for decision-making in areas such as land restoration, rangeland health, and wildfire mitigation. The ability to quantify environmental baselines and detect change in near real-time is becoming essential for risk management, regulatory compliance, and sustainable investment.

- **Acceleration of ESG-Driven Investment and Regulatory Requirements:** Environmental, social, and governance (ESG) priorities are increasingly shaping capital flows, procurement decisions, and operational strategies across sectors. Investors are actively seeking technologies that contribute to emissions reduction, water efficiency, and land conservation, while regulators are embedding environmental performance standards into policy frameworks at multiple scales. This is translating into expanded markets for technologies that offer transparency, accountability, and verifiable impact—particularly in climate-sensitive sectors such as agriculture, forestry, and utilities. As ESG commitments mature into enforceable targets, demand is growing for integrated technology platforms that can link environmental outcomes with financial performance.

- **Integration of Data-Driven Decision Tools Across Resource Sectors:** The convergence of agriculture, water, and ecosystem management is increasingly mediated by digital technologies that enable system-level insights and predictive capabilities. Modeling tools that couple hydrologic processes with land use, weather, and ecological parameters are gaining traction as core infrastructure for public planning, farm management, and environmental monitoring. This integration is driven by the need to manage uncertainty at multiple temporal and spatial scales, from daily irrigation scheduling to decadal drought planning. As digital infrastructure becomes embedded in land and water systems, opportunities are expanding for technologies that can synthesize large, diverse datasets into operational decision support tools.

- **Climate Resilience as a Market Imperative:** Demand for solutions that can sustain agricultural productivity, water reliability, and ecological health under conditions of stress is growing well beyond traditional geographies. Technologies developed in arid, high-variability regions are increasingly viewed as globally exportable, particularly in light of shared challenges related to water scarcity, desertification, and climate extremes. Policymakers, development agencies, and multinational firms are seeking solutions that have been field-tested under these conditions, creating pathways for innovation hubs focused on dryland resilience to participate in international markets. This dynamic reinforces the relevance of locally developed technologies with demonstrable performance under resource constraints.

Together, these drivers form a durable and expanding basis for investment and innovation across the Agricultural, Water & Ecosystem Technology Nexus. The convergence of long-term environmental pressures, shifting societal expectations, and maturing technological capabilities creates a favorable environment for integrated solutions that link food security, water management, and ecosystem resilience. New Mexico's alignment with these dynamics positions it to serve as both a testing ground and a supplier of next-generation resilience technologies.

Why is this S&T Opportunity Area a Fit for New Mexico?

New Mexico's strategic positioning as a "nexus" is underpinned by both structural necessity and deliberate institutional alignment. The environmental imperative is acute: current hydrologic models project as much as a 25 percent reduction in available water supplies by mid-century[11], a constraint that will increasingly govern agricultural viability, municipal planning, and ecosystem resilience. This long-term aridification trend necessitates systemic innovation in water-use efficiency, drought-resilient food systems, and integrated environmental management. Concurrently, the state has cultivated a research and infrastructure base capable of addressing these interlinked challenges. Its geographic diversity provides ecologically distinct testbeds for applied research in climate-adaptive agriculture, watershed modeling, and landscape-scale ecosystem restoration. The state's institutional ecosystem is also uniquely configured to support this convergence. NMSU serves as a land-grant anchor in arid agriculture and water technologies, NMT offers national-caliber expertise in hydrology, atmospheric sciences, and geospatial modeling, UNM contributes depth in environmental health, ecology, and climate adaptation, and LANL and Sandia extend advanced capabilities in remote sensing, wildfire dynamics, and systems modeling. These assets function not only as centers of theoretical research but as operational contributors to field-ready technologies ranging from UAV-based environmental monitoring and precision irrigation systems to predictive wildfire modeling platforms, underscoring New Mexico's comparative advantage in producing integrated, application-oriented solutions.

Highlights of New Mexico's Technology "Push"

The state's core R&D competencies in this area span its universities, federal labs, and field stations, creating a rich pipeline of innovation that can be translated for public impact as well as potential commercialization. These capabilities are distributed across the thematic strengths that make up the nexus concept:

- **Agricultural Sciences and Arid-Land Food Systems:** NMSU, as the state's land-grant institution, anchors statewide agricultural R&D and serves as the focal point for arid-zone food systems innovation. Agricultural sciences constitute NMSU's largest area of R&D expenditure and specialization, with core strengths in dryland agronomy, food safety and storage, climate-resilient crop genetics, and value-added processing. Researchers at NMSU are advancing solutions specifically tailored to water-scarce environments, such as developing drought-tolerant chili cultivars, optimizing post-harvest handling to reduce spoilage in remote areas, and enhancing food security logistics. NMSU also plays a critical role in water-related agricultural research, with active work in environmental microbiology, wastewater treatment, irrigation conservation, and produced water reuse. For instance, the university leads efforts to desalinate brackish groundwater and explore reuse options for treated produced water, expanding the portfolio of usable water sources for agriculture in arid regions. These research activities are supported by unique facilities such as the Physical Science Laboratory (PSL), a nationally designated FAA UAS Test Site, which contributes drone-based sensing and data telemetry solutions for precision agriculture and environmental surveillance. PSL's inventory of fixed-wing, multirotor, and high-altitude unmanned systems, paired with expertise in sensor integration, creates a testbed for remote environmental diagnostics and farm-level decision support.

11 USGS and USDA projections.

- **Water Management and Hydrologic Modeling:** NMT delivers leading-edge R&D in geoscience, hydrology, and infrastructure systems modeling. The Hantush-Deju National Center for Hydrologic Innovation, recently established at NMT, focuses on modeling groundwater-surface water interactions and developing tools for sustainable aquifer management. These models inform irrigation planning, aquifer recharge strategies, and urban-rural water allocation decisions. NMT also hosts the Climate & Water Consortium, which integrates atmospheric science, drought forecasting, and ecological monitoring. Its distributed weather monitoring infrastructure and regional climate models generate granular insights for Southwestern water planning. NMT's engineering faculty further contribute to the nexus through the Institute for Complex Additive Systems Analysis (ICASA), which develops models of interdependent infrastructure systems such as water, energy, and communications that are critical to climate adaptation and resilient service delivery. NMSU complements these capabilities with applied work in agricultural water reuse and conservation, while UNM researchers model water-climate interactions and contribute to environmental policy research. Sandia and LANL bring additional capacity in high-performance computing, water treatment materials, and hydrologic simulation, enabling cross-scale modeling from aquifers to watersheds. Together, these institutions provide a systemic, interdisciplinary foundation for water innovation.

- **Environmental Modeling, Monitoring, and Resilience:** UNM contributes significant capabilities in environmental modeling, ecosystem dynamics, and public health-linked monitoring. UNM's Health Sciences Center houses one of the region's leading Environmental Health Sciences programs, focused on exposure to contaminants such as arsenic, uranium, wildfire smoke, and PFAS. The program combines field-based assessments with the development of novel exposure monitoring tools, and the innovation pipeline enhances community-scale environmental diagnostics and feeds into ecosystem health assessments. On its main campus, UNM participates in long-term ecological research through the Sevilleta LTER, examining desert ecosystem responses to climate variability, biodiversity shifts, and land-use change. Faculty across Earth and Planetary Sciences, Geography, and Biology are actively engaged in modeling climate impacts on hydrology, species distributions, and ecosystem services. UNM's collaboration with the U.S. Army Corps of Engineers further advances applied research on climate resilience strategies for vulnerable communities. Complementing these efforts, NMSU contributes to ecosystem monitoring through its Jornada Experimental Range, which has produced over a century of data on dryland degradation and restoration. NMT strengthens the state's resilience R&D with expertise in wildfire behavior, prescribed burns, and coupled climate-hazard modeling. LANL's FIRETEC wildfire model and Sandia's satellite and sensor development platforms provide advanced tools for regional hazard prediction and ecosystem surveillance. Collectively, these institutions create a full-stack capability for understanding, modeling, and managing environmental change, forming a critical component of the state's nexus technology ecosystem.

LANL and Sandia serve as critical innovation engines supporting the nexus via additional enabling federal R&D infrastructure and testbeds. The labs contribute foundational capabilities in high-performance computing, remote sensing, geospatial analytics, and environmental simulation. Sandia's legacy in satellite systems and sensor payload development is increasingly applied to environmental and agricultural monitoring missions, while LANL's FIRETEC model and other fire-atmosphere simulators represent state-of-the-art tools for understanding wildfire behavior at landscape scales. Both labs conduct advanced work in hydrology, water treatment materials, and atmospheric modeling, supporting applications ranging from watershed management to contamination response. New Mexico's expansive land holdings and military-affiliated test ranges also enable large-scale technology validation, whether in wildfire mitigation, watershed restoration, or drought-adapted agriculture.

Taken together, these research assets form a compelling innovation ecosystem with the capacity to generate, validate, and scale technologies that align with the Agricultural, Water & Ecosystem Technology Nexus. Across multiple institutions and scientific domains, New Mexico is actively producing IP, field-ready tools, and specialized talent aligned with the environmental challenges. The presence of high-impact research centers, coupled with operational testbeds and federal collaboration, provides a durable foundation for translating research excellence into economic and environmental outcomes.

Highlights of New Mexico's Market "Pull"

On the demand side, while New Mexico is beginning to exhibit stronger and more diversified forms of market pull that can absorb and accelerate innovation within this space, commercial markets are still more oriented towards internal state industries and public stakeholders and have yet to build to a robust private traded sector cluster. While the state's historical economic base most aligned with this area has been weighted toward traditional agriculture and federally anchored defense and energy sectors, structural shifts—such as climate stress, regulatory pressures, and technological convergence—have the potential to reshape market behavior. Agricultural producers are increasingly seeking data-driven tools to manage water risk and improve resilience, while legacy energy and infrastructure sectors are engaging with environmental monitoring technologies to meet ESG and operational compliance goals. Simultaneously, a new generation of startups, applied research ventures, and mission-aligned private actors is emerging, creating demand signals for advanced sensing, precision irrigation, drought modeling, and land management analytics that have the potential to scale over time. These evolving dynamics suggest that New Mexico's market environment can mature in ways that align with the nexus opportunity beyond public sector customers, creating space for both homegrown solutions and external investment. Key elements of this emerging market pull include:

- **Agriculture and Agribusiness Demand:** Agriculture remains a significant part of New Mexico's economy (nearly $4 billion total value of agricultural production in 2023[12]) and is dominated by a few big commodities—dairy, beef, hay, pecans, chile peppers. The larger operators in these sectors are increasingly seeking technology to improve efficiency and sustainability. For example, New Mexico is a top-ten milk producing state and home to some of the nation's largest dairy farms; these dairies have huge water and waste footprints and thus are interested in solutions like precision feed management, manure-to-energy digesters, and sensor systems for herd and waste monitoring. Similarly, the state's pecan orchards (where New Mexico often ranks as a leader in pecan production) are heavy water users through flood irrigation and there is now market pressure to adopt micro-irrigation, soil moisture sensors, and drought-hardy rootstocks. Chile pepper growers face labor shortages and have started to look at mechanization and even robotics for harvesting; this opens the door for agtech companies or collaborations with universities around solutions prototyping and demonstration. The New Mexico Economic Development Department has explicitly targeted "Sustainable & Value-Added Agriculture" as a growth industry, with incentives and programs in place to expand agri-food processing and to encourage sustainable practices. This emerging opportunity area aligns with the needs of processing facilities, which include efficient water recycling systems and energy use monitoring. All these factors create a receptive local market for innovations.

- **Water Utilities and Infrastructure Needs:** New Mexico's municipal, tribal, and regional water and civil infrastructure authorities represent a consistent source of market demand for innovations emerging from research in this space. While these entities operate primarily within the public sector and thus do not drive the state's traded sector economy, their operational mandates, infrastructure needs, and regulatory constraints generate real-world use cases that parallel broader commercial opportunities, particularly in other water-scarce and infrastructure-limited geographies. Urban utilities such as the Albuquerque Bernalillo County Water Utility Authority and the City of Santa Fe have demonstrated long-term engagement with water conservation, demand forecasting, and infrastructure modernization. These utilities have piloted IoT-enabled leak detection, advanced metering infrastructure, and climate-informed supply planning, offering a localized proving ground for water-tech startups and applied research collaborations. Innovations in predictive analytics, reservoir optimization, or distributed reuse systems can be piloted in these settings, de-risked through operational feedback, and scaled to markets with similar climatic and infrastructure profiles. In parallel, acute water access and quality challenges persist in rural and tribal communities across the state, where issues such as groundwater contamination, failing infrastructure, and lack of centralized service create a distinct demand profile. Organizations such as the Navajo Tribal Utility Authority and the New Mexico Environment Department are actively pursuing decentralized, affordable water treatment technologies such as solar-powered purification units and mobile desalination systems that can function in remote, off-grid conditions. These public sector needs offer a dual opportunity: they create immediate, mission-aligned markets within the state, while also serving as reference cases for broader commercialization in arid regions worldwide.

12 USDA NASS and New Mexico Department of Agriculture, 2023 *New Mexico Agricultural Statistics Bulleti*n.

- **Environmental and Land Management Market:** A significant portion of New Mexico's land is federally or state managed (national forests, BLM rangelands, state forests). These agencies and the service providers that work with them constitute a market for environmental monitoring and management tools. Following large-scale events like the 2022 Hermits Peak/Calf Canyon wildfire, federal investments in remediation have driven procurement of tools for post-fire assessment, erosion modeling, and aerial reseeding. Local firms have already been engaged in LiDAR-based watershed mapping and satellite-derived erosion risk analysis. Beyond remediation, land agencies increasingly seek technologies for early wildfire detection, fire behavior modeling, and prescribed burn planning. Similarly, rangeland monitoring, critical for both land managers and ranchers, has become a priority, with growing interest in satellite imagery to assess forage conditions and remote systems to monitor livestock water supplies. Programs like the USDA Jornada Experimental Range's Desertification Data Catalog and Database for Inventory, Monitoring and Assessment (DIMA) demonstrate how public sector research can serve as the basis for potential commercial offerings in vegetation monitoring and rangeland health.

- **Cross-Sector and External Market Linkages:** The pipeline of research-driven innovation aligned with the nexus concept is further reinforced by strategic intersections with adjacent industries and regional market linkages that extend beyond the state. New Mexico's established aerospace and defense sectors contribute significant capabilities in remote sensing, UAV systems, and platform integration, all technologies increasingly adaptable to agricultural and environmental monitoring applications. Firms and test ranges initially focused on defense applications are now developing use cases in precision agriculture, wildfire surveillance, and resource mapping. Similarly, the energy sector, encompassing both oil and gas and emerging renewables, drives demand for water treatment and reuse technologies such as membrane filtration and evaporation control that have parallel applications in agriculture and land management. These cross-sectoral connections create a diffusion pathway for technologies developed in one domain to be validated and scaled in another. Moreover, New Mexico's proximity to major agricultural markets in Texas and California offers a natural export channel for solutions proven under arid and high-variability conditions. The state's role as a functional testbed allows innovators to de-risk technologies locally and deploy them into broader commercial environments as a regional supplier of early stage resilience-focused technologies.

- **Emerging Commercial Activity and Entrepreneurial Momentum:** New Mexico's commercialization ecosystem is beginning to generate a pipeline of early-stage companies and applied technology ventures aligned this space. Many of these firms are spinouts from national laboratories and research universities, translating core competencies in geospatial analytics, environmental sensing, and agricultural biotech into commercially viable applications. Key areas of entrepreneurial activity include machine learning for crop forecasting, laser-based environmental sensors for greenhouse gas detection, IoT-enabled irrigation systems, climate-smart agriculture platforms, and advanced materials for decentralized water treatment. These ventures are supported by a combination of federal SBIR/STTR awards, state matching programs, and regional commercialization infrastructure such as accelerator initiatives and proof-

of-concept support at university-affiliated centers. Additionally, established engineering and consulting firms in the state are increasingly acting as technology integrators by embedding remote sensing, climate data, and water analytics into environmental and infrastructure projects.

While New Mexico's current industry footprint is not yet aligned with pureplay traded-sector opportunities in agricultural technology, water innovation, or environmental monitoring, the broader market landscape presents significant potential—particularly in related sectors such as agriculture, energy, and infrastructure. These sectors are increasingly shaped by climate adaptation and environmental performance imperatives, creating latent demand for integrated, tech-enabled solutions. However, realizing this potential will depend on the state's ability to anchor innovation within domains that are predominantly driven by public investment and regulatory mandates. Many of the most immediate customers—municipal utilities, land management agencies, tribal authorities, and federal research partners—operate within public or quasi-public frameworks, where procurement timelines, validation requirements, and risk tolerances differ from conventional private markets. For New Mexico to translate its research advantages into economic impact, it must create the institutional scaffolding to support these market pathways over longer, publicly-driven commercialization cycles, including facilitating deployment pilots, sustaining commercialization programs, and integrating research with long-range public procurement strategies. If successful, the state can build a self-reinforcing system—one in which public-sector problem sets drive innovation, local firms provide solutions, and adjacent commercial markets absorb and scale them.

Line-of-Sight to Market Applications Aligned with New Mexico's Position

To convert research strength into economic impact, New Mexico must focus on specific, high-potential market applications where state institutions have an R&D lead and where demonstrable need exists. These applications represent areas to monitor closely for innovation traction and early commercialization potential, particularly external investors from outside the state who could be attracted to scale the opportunity. Identifying and supporting these focal points can help channel technology development, attract investment, and inform strategy around deployment and market entry.

- **Climate-Resilient Agricultural Technologies:** New Mexico's research base supports the development of drought-resilient crops, precision irrigation, and rangeland monitoring tools. These solutions can be tailored to small-scale farms and cooperatives, leveraging sensor networks, localized climate forecasts, and adaptive management models. Applications include decision-support tools for yield forecasting and water allocation, with broader relevance across arid agricultural regions.

- **Advanced Water Recycling and Treatment Systems:** There is a clear path to develop modular, decentralized water treatment systems, particularly for produced water reuse, brackish groundwater desalination, and community-scale greywater systems. These technologies are being validated in field conditions and could be exported to regions with similar water stress, aligning with ESG priorities and global demand for resilient water infrastructure.

- **Wildfire Prevention and Recovery Technologies:** The state's ecosystem and research base support innovations in fire modeling, remote sensing, and post-fire remediation. Opportunities include fire spread forecasting platforms, UAV-based monitoring, and drone-enabled reseeding and soil stabilization. These tools respond to urgent local needs and are transferable to fire-prone areas across the western U.S. and globally.

- **Environmental Monitoring and Analytics Platforms:** Institutions across the state are generating environmental datasets with commercial potential in rangeland management, water quality monitoring, and emissions tracking. Applications include remote sensing for forage conditions, continuous water contamination detection, and greenhouse gas measurement services for agricultural operations. These tools offer recurring revenue models through subscription-based analytics and SaaS platforms.

- **Sensor-Enabled Ecosystem and Public Health Surveillance:** Technologies developed in New Mexico are enabling real-time tracking of contaminants such as arsenic, uranium, or PFAS in water systems, as well as air quality impacts from wildfire smoke. Wearable or in-situ sensors can support applications ranging from rural drinking water assurance to occupational exposure monitoring.

- **Integrated Land and Resource Management Decision Tools:** Coupling hydrology, climate models, and land use data, New Mexico is positioned to develop scenario planning tools for watershed-scale decisions. These platforms serve federal and state land agencies, utilities, and conservation organizations managing competing priorities under climate stress.

These focal points align with New Mexico's comparative advantages and reflect broader national and global market trends. Monitoring innovation activity in each domain via a concerted "prospecting" strategy within state institutions and facilities, particularly around pilot deployments, customer adoption, and product-market fit, will be essential to guide targeted investments and ecosystem development as well as ensure that external investment drives growth within the state rather than being "exported" to other markets.

Implications for Economic Development in New Mexico

The convergent technologies and applications domains of the Agricultural, Water & Ecosystem Technology Nexus present a strategic economic development opportunity for New Mexico, but only if the state proactively cultivates the infrastructure, institutional partnerships, and policy tools needed to translate research into market-aligned innovation. While pureplay traded sector activity in this domain remains limited, New Mexico's public-sector customers, legacy industries, and environmental imperatives create strong demand-side signals that can anchor emerging technologies.

To capitalize on this opportunity, New Mexico can position itself as a national testbed for nexus-relevant innovation, building pathways that support pilot deployment, applied validation, and public procurement of climate-resilient technologies. This includes expanding the use of state and federal resources to enhance testbed environments, embedding commercialization support within applied research programs, and aligning procurement incentives to support early adoption by utilities, land agencies, and agricultural producers.

Aggressive support should be directed toward high-potential innovations already in development such as predictive wildfire modeling, decentralized water reuse systems, and sensor-based irrigation and rangeland tools to gauge the ability to attract external funders and grow new industry sectors. State agencies and higher education institutions should jointly identify, track, and prioritize opportunities that are identified as having high near-term commercial relevance, focusing investment and workforce alignment around clear product-market pathways.

To support this ecosystem, the state must also continue scaling commercialization capacity, leveraging matching grant funding, technology transfer incentives, and early-stage capital to move technologies out of labs and into startups or public-sector deployment. Coordinated efforts across economic development, environmental, agricultural, and tribal partners are essential to ensure that innovation outcomes are economically scalable.

Summary of Key Findings

New Mexico holds significant research-driven strengths across the Agricultural, Water & Ecosystem Technology Nexus, anchored by its land-grant and research universities, national laboratories, and unique environmental testbeds. Institutions such as NMSU, NMT, and UNM contribute deep expertise in arid agriculture, hydrology, climate modeling, environmental monitoring, and public health. These assets are complemented by advanced capabilities at Sandia and LANL in remote sensing, high-performance computing, and fire-atmosphere simulation. This dense and interdisciplinary research base as well as its natural climate and ecosystems positions New Mexico as a leading center of applied innovation for climate-resilient technologies across a number of applications domains.

While traded sector commercial activity remains emergent outside of specialized agricultural production industries, early signs of market alignment are evident in areas such as climate-resilient agriculture, water treatment and reuse, wildfire management, and environmental data services. Public sector needs—particularly from utilities, land agencies, and tribal governments—are driving local demand, and several startups and applied ventures are beginning to respond. However, this opportunity area is still maturing, with many technologies in the pilot or early commercialization stage. As a result, the state will need to closely monitor the innovation ecosystem to identify the most viable applications as they progress toward later stages of market readiness, particularly those that begin to attract external investment and partnerships. Proactive investment in testbeds, pilot deployments, and commercialization support will be critical to translating research strengths into durable economic outcomes.

Conclusion

Across the five opportunity areas—Quantum Systems and Applications, Advanced Energy Technologies, Space and Aerospace Systems, Biosciences Innovation, and the Agriculture-Water-Environment Technology Nexus—New Mexico demonstrates a strong foundation of scientific and technical capabilities that are linked to its history of leading federal assets, research programs, and specialized infrastructure. Each area benefits from institutional anchors, including the state's national laboratories and research universities, which together drive technology development and enable access to specialized testbeds and collaborative consortia. Quantum, energy systems, and space and aerospace systems stand out as areas where the integration of public and private investment, competitive federal funding, and more targeted state-level engagement has begun to yield a clearer line of sight to commercial scale-up. By contrast, the biosciences and ag-water-environment nexus are grounded in strong research activity and pressing regional challenges but require additional investment to translate emerging innovations into industry-relevant outcomes at scale.

Key commonalities also emerge across all five areas. Cross-cutting support structures such as technology transfer offices at the labs and universities play a central role in bridging research and commercialization, but ecosystem gaps remain, especially in early-stage venture support, coordination of statewide capabilities, and connective tissue between siloed R&D hubs. Fully realizing economic opportunities will require a sustained, state-led approach that links the science and technology push with proactive economic development mechanisms, positioning New Mexico not just as a source of innovation, but as a site for future traded industry cluster development.

New Mexico's S&T Roadmap

Prioritizing Investments for Enhanced Competitiveness in S&T

"Business-as-usual" will not be sufficient if New Mexico is to realize its untapped potential in catalyzing the commercialization of its significant R&D assets. Further strategic action is needed to accelerate the number of promising ideas that successfully traverse the innovation continuum from R&D to industry activity, ultimately leading to the location or expansion of existing industry players and the scaling of new businesses that sustain their growth as they generate new, high-paying jobs across the state.

Five key tactics will be necessary to accomplish this goal:

- **Build connections among and between research institutions and industry.** New Mexico's research assets are considerable; however, because they are spread across multiple institutions, they are not always optimized, nor are potential partners aware of their collective strength. Building a world-class reputation and stature in key fields and ensuring that the research agendas of these institutions address industry interests requires increased connectivity among and between higher education, national labs, and industry.

- **Focus investments in identified S&T growth opportunity areas.** New Mexico cannot and must not simply invest indiscriminately in all fields and areas. New Mexico must focus its resources on those areas in which the state can be world class and attract investments from around the globe.

- **Establish means to better ensure commercialization capabilities**. New Mexico must establish mechanisms, approaches, tools, and programs that link industry to research problems and create seamless efficient systems to pull research assets and their associated technologies quickly into the marketplace to address real needs. This requires that financial support be provided for market assessments, that adequate nondilutive risk capital be available around which to form firms with breakthrough prospects, and that licensing and technology transfer is predictable and realistic.

- **Provide discretionary funding support to encourage institutional partners to seek and secure new opportunities.** The state's investments in building research capacity must also support the pursuit of federal and private funding to create centers, institutes, and major programs in New Mexico. Planning grants that support the organization of joint ventures and encourage private-public partnerships can help New Mexico secure federal centers, institutes, and additional discretionary funding.

- **Build supply chains to help ensure long-term viability of the S&T growth opportunity areas.** A strong link exists between design and development and manufacturing. If New Mexico is to evolve from a primarily basic research state and become the applied innovation state, it is important that no artificial silos be created between product design and development and product manufacturing.

Much like the state has done for the past 25 years in its successful efforts to target the film and television industry, New Mexico must now make foundational investments to root its S&T opportunities and catalyze robust economic growth in a diversity of industries. It is now time to focus state investments to mobilize commercialization and deployment of new products/services within New Mexico's S&T growth opportunity areas.

To help guide New Mexico's future investments, the following S&T Roadmap is proposed, which is comprised of specific actions that if implemented will drive economic growth. These recommendations are focused on catalyzing the commercialization and deployment of new products/services within New Mexico's S&T growth opportunity areas. Specifically, it is recommended that the State of New Mexico make the following strategic investments:

1. **Establish targeted industry centers offering comprehensive economic development services in the following existing S&T growth opportunity areas:**

    - Quantum Systems & Applications,
    - Advanced Energy Technologies, and
    - Space, Aerospace & Defense Systems.

2. **Create an innovation ecosystem that enables the translation of research into the commercial marketplace by:**

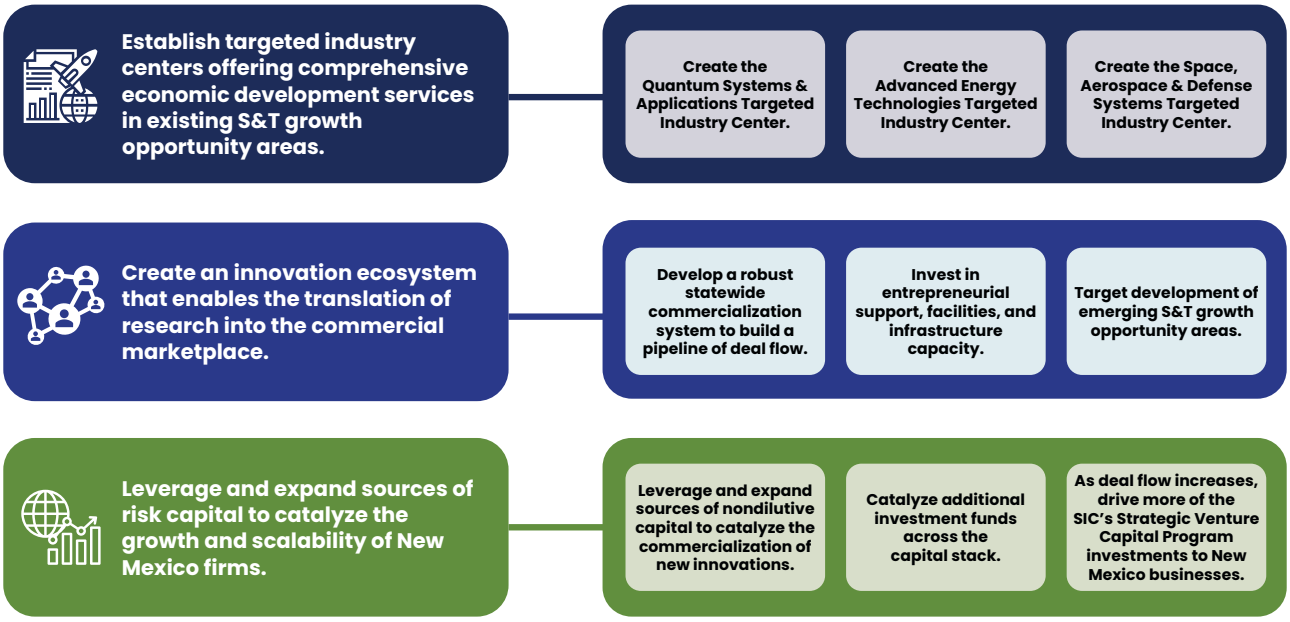
    - Developing a robust commercialization pipeline,
    - Investing in entrepreneurial support, facilities, and infrastructure capacity, and
    - Targeting development of the following emerging S&T growth opportunity areas:
        - Agricultural, Water & Ecosystem Technology Nexus, and
        - Biosciences Innovation.

3. **Leverage and expand sources of financial capital to catalyze the growth and scalability of New Mexico firms by:**

   - Leveraging and expanding sources of nondilutive capital to catalyze the commercialization of new innovations,
   - Catalyzing additional investment funds across the capital stack, and
   - As deal flow increases across the state, focusing efforts to drive more of the SIC's Strategic Venture Capital Program investments to New Mexico businesses.

These recommended actions outline the investment priorities for the State of New Mexico (Figure 18).

FIGURE 18. INVESTMENT PRIORITIES FOR ENHANCING NEW MEXICO'S COMPETITIVENESS IN S&T



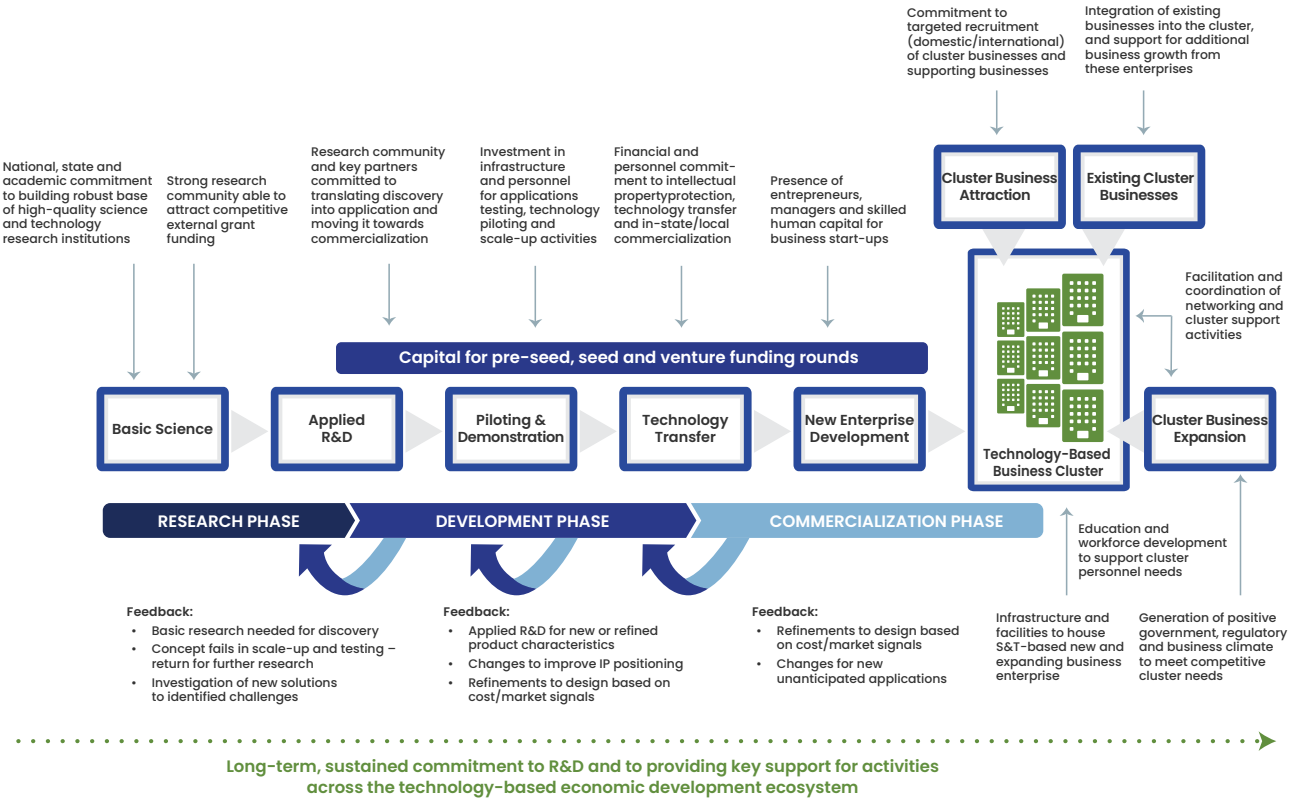
Source: TEConomy Partners, LLC

Action 1: Establish Targeted Industry Centers Offering Comprehensive Economic Development Services for Existing S&T Growth Opportunity Areas

Economic development in general is not easy to achieve; technology-based economic development is an even greater challenge. For technology-based economic development to occur, an entire interconnected sequence of positive economic factors must be in place to strengthen the drivers of advanced industries, namely, innovation, capital, and talent. If any stage of this innovation continuum either inadequately addresses the region's economic needs or is missing altogether, a sustainable technology-based economy with capacity to generate quality jobs is unlikely to develop. Success requires a high-functioning innovation ecosystem (Figure 19) that is able to do the following:

- Translate R&D activities into new products,
- Move technology commercialization into high-growth businesses, and
- Provide a competitive advantage in which emerging firms develop, existing businesses grow, and out-of-state businesses are attracted.

FIGURE 19. A ROBUST INNOVATION-BASED ECONOMIC DEVELOPMENT ECOSYSTEM



Source: TEConomy Partners, LLC

New Mexico stands to benefit by focusing significant investments in the identified existing S&T opportunity areas (Quantum Systems & Applications, Advanced Energy Technologies, and Space, Aerospace & Defense Systems) where it has the capacity to build a critical mass of activity to drive economic growth. Rather than spreading investment thinly across many fields, a strategic focus means picking a few high-potential opportunities and concentrating funding, infrastructure, talent development, and marketing around them.

In order to develop an impactful innovation continuum, the State of New Mexico must be willing to support collaborations within these strategic focus areas between the private, academic, and public sectors. The state's economic development efforts must be targeted at advancing these opportunity areas in new and different ways by ensuring an ecosystem in which firms can:

- Constantly innovate based on knowledge,
- Maintain their competitiveness by focusing on innovation, time to market, quality, and cost,
- Integrate current technological revolutions into the workplace, both in terms of how they do business and in terms of the markets in which they choose to participate,
- Network with other firms and institutions, establishing collaborative alliances, and
- Reward and invest in its primary resources: talented individuals and teams.

New Mexico should create three Targeted Industry Centers, one for each of the identified existing S&T opportunity areas. This statewide organizational approach to pursuing strategic innovation opportunities offers the advantage of supporting strategic areas of innovation while bringing together numerous industrial partners, academic and federal research institutions, and the public sector in a unique partnership to advance New Mexico's economy.

While New Mexico has already made significant investments in a number of these existing growth opportunity areas, the activities are often not connected nor of a scale to have statewide impact. The proposed Targeted Industry Centers will work to leverage these disparate efforts to develop critical mass and statewide relevance. By proactively investing in the three existing S&T opportunity areas, these targeted development initiatives will:

- Advance technological convergence and innovation capacity, particularly across New Mexico's economic industrial drivers.
- Foster the creation and growth of new firms by creating an ecosystem that provides access to specialized shared-use facilities for advancing new product development, process improvements, and commercialization of new technologies through active connections to serial entrepreneurs and investment funds.
- Brand and conduct proactive outreach that creates and sustains a market leadership position for New Mexico and helps generate business attraction leads.
- Attract and generate top talent and a broader-skilled technical workforce that meets industrial demands.

Learning from the Massachusetts Life Sciences Center and the North Carolina Biotechnology Center (see text boxes), in order to ensure accountability and strong economic development connections, it is important that each Targeted Industry Center be advanced as an industry-led, nonprofit organization, with broad representation of New Mexico's industry leaders (representing both large-, mid-, and small-sized firms), as well as participation by academic research institutions, federal labs, and relevant governmental agencies.

The creation of Targeted Industry Centers in New Mexico's identified existing S&T growth opportunity areas allows for a sustained effort that addresses major strategic needs in a comprehensive manner. Each Center also helps build a "brand" for the state thereby helping to attract out-of-state industry investments. It is envisioned that each Center would work closely with the New Mexico Partnership, the state-designated, public-private organization that serves as a single point of contact for businesses looking to locate or expand in New Mexico. The New Mexico Partnership provides a coordinated approach to streamline site selection opportunities by offering expertise on various factors such as talent, infrastructure, real estate, and incentives. However, the budget for the New Mexico Partnership is quite small in comparison to other state's attraction efforts, and as a result, its capacity is limited. With the New Mexico Partnership working with the three Targeted Industry Centers, the Centers will be able to effectively convene subject matter experts and anchor partners to more proactively position New Mexico to compete for out-of-state industry investments in New Mexico's S&T opportunity areas.

The Massachusetts Life Sciences Center (MLSC) is an example of a targeted industry center established to help solidify Massachusetts' dominance in the life sciences. MLSC is an independent quasi-governmental organization created by state statute. It began in 2008 as an unprecedented $1 billion, 10-year program to stimulate job growth and solidify Massachusetts' standing as one of the leading states for life sciences. It has been renewed twice: in 2018 for five years and an additional $623 million in funding and in 2024 for another 10 years with another $1 billion. It has also spanned three different Governor's terms to date.

The MLSC takes a comprehensive approach to working with the life science industry cluster in the state. Activities include:

- Targeted tax incentives for life sciences companies, spanning startups, expansions, and newly locating companies.
- Capital infrastructure for collaborative shared-use research facilities, shared-use biomanufacturing centers, and a network of incubators/accelerators.
- Venture investments in seed stage and emerging companies.
- Talent development with K-12 bioscience equipment and supply grants and support for an extensive internship program for college and high school students with industry.

Since its inception, MLSC reports:

- $6.5+ billion in leveraged investments.
- 17,500 jobs created with $208 million in tax incentives and $40 million in company grants and loans.
- 7,000+ college and high school internships funded at more than 1,100 companies.

The North Carolina Biotechnology Center (NCBiotech) is a dedicated, private, nonprofit, industry-led development organization for advancing biotechnology, created by the North Carolina legislature in 1984. The Center focuses on public-private partnerships and filling key gaps to ensure the growth of the industry in the state. Over the years, NCBiotech became the state's key mechanism for catalyzing life science industry development, working across the innovation ecosystem continuum. The Center is focused on developing the biotechnology sector statewide by supporting research, business, and education. NCBiotech provides funding for collaborative research projects, financial assistance in the form of grants and loans to early-stage bioscience companies, and support for an array of bioscience education initiatives. NCBiotech also supports efforts that serve as the connective tissue for growing biotechnology in the state, including portals and other assistance aimed at connecting early-stage companies with larger corporations, venture capitalists, and university licensing offices; an industrial fellowship; monthly networking forums and an annual in-state biotech conference; listings of available commercial wet-lab space; and entrepreneurial education produced in cooperation with the Council for Entrepreneurial Development. NCBiotech has also been instrumental in business attraction of bioscience companies for North Carolina. It serves as the marketing arm that helps identify and qualify leads.

Most of its funding comes from state appropriations, typically in the range of $15 to $20 million annually. In terms of economic impact, since 1989 NCBiotech's Emerging Company Development team has invested $61 million in loan funding to 277 startup life sciences companies. For every $1 in loans from NCBiotech, an additional $132 was raised by these startups from other funding sources. In addition, since 2008 NCBiotech has assisted in the state's efforts to attract or retain 160 major life science employers. Finally, NCBiotech has been instrumental in positioning North Carolina as a national leader in biomanufacturing through its comprehensive development services.

The three Targeted Industry Centers are envisioned as being public/private partnerships, and as such, should sit outside any research institution as a non-profit 501(c)(3) or 501(c)(6). It is envisioned that each Targeted Industry Center would receive one-time capital funding from the state to invest in equipment, pilot plants, and design labs in their specialty focus areas. In addition, operating funding will be needed for a minimum of the first ten years as the Centers come online and develop fee-for-service products and services. It is important to note that, even once fully operational, some level of public support will be needed to augment activities, in particular for small and medium-sized enterprises (SMEs) as well as for attraction/branding efforts.

Additional specificity for each of the three Targeted Industry Centers is provided in the following narrative.

Quantum Systems & Applications Targeted Industry Center

To solidify New Mexico's position in the national quantum ecosystem, the State of New Mexico should pursue the establishment of a dedicated organization that can act as a center of gravity for quantum activities in the state. As part of House Bill (HB) 20, the state recently committed $20 million for quantum technologies and business incubation. This funding should be utilized to create the Quantum Systems & Applications Targeted Industry Center.

The center would serve as the physical and programmatic hub for commercialization, prototyping, startup engagement, and regional collaboration. The center should be led by and serve as the physical headquarters for the Quantum New Mexico Institute (QNMI) and be designed to reflect the unique needs of scaling quantum ventures, while also providing proximity to unique facilities at the national labs and planned investments through funded programs. Key features of the center should include:

- **Statewide Integration of Quantum Activities:** QNMI can serve as the lead convener and coordinating entity for the center, formalizing partnerships with New Mexico's research universities (UNM, NMSU, and NMT), Central New Mexico Community College (CNM), Sandia, LANL, and AFRL. This structure would provide unified governance for shared facilities, joint faculty appointments, and research collaborations, ensuring alignment between academic, lab, and commercial efforts. The center would also serve as a mechanism to align curricula, workforce development, and translational research across the state's institutions under a common quantum innovation strategy.

  As a part of its governance structure, and reflecting differing levels of commercial market maturity of technology applications in this space, the center should integrate a working group model that incorporates the key technology and economic development "verticals" of this opportunity area: Quantum Sensing, Quantum Communications, and Quantum Computing. Two additional working groups focused on Quantum-Enabling Supply Chain and Production Facilities as well as Quantum Workforce Development should also be incorporated. Ideally, these working groups would tie directly into the leadership structure

of the center and also leverage different institutional "champions" based on alignment with institutional research and partnership strengths. All institutions across the state should be represented as a part of this structure in order to ensure a focused state vision as well as to avoid duplication of programmatic efforts.

- **Signature Physical Facility:** Located at or adjacent to UNM's Science & Technology Park and its planned open access commercial quantum lab investments[13] as a part of Elevate Quantum, the center should include a purpose-built signature, multi-use facility to house shared cleanroom infrastructure, quantum testbeds, startup workspace, and secure collaboration areas. The facility should support nanofabrication of quantum photonic and superconducting components, cryogenic packaging, and trapped ion or atom-based systems testing. Modular lab bays could be made available to startups and research teams, with high-spec optical benches, RF shielding, vacuum systems, and laser-safe environments. Quantum experts from national labs, military stakeholders, and other relevant groups should be integrated into the design and planning stages of the facility to ensure that shared-use facilities and equipment are not duplicative. When complete, the facilities should position the state competitively against the collection of assets available through other regions (such as key facilities that are part of the Chicago Quantum Exchange network that represent current gaps for New Mexico). The center should also include a visitor-ready demonstration space to host industry partners, federal agencies, and potential investors.

- **Strategic Role in Capturing Federal and Private Investment:** The center should be explicitly designed to compete for major federal investments beyond the initial Elevate Quantum Tech Hub award. It should house a dedicated staffing function responsible for identifying and securing DOE, NSF, and DOD applied R&D grants, SBIR/STTR support, and procurement opportunities relevant to this space. This office would also assist startups and university teams in proposal development, compliance, and business development, while working in tandem with state economic development officials to attract private capital. Positioning the center as a regional translational research platform will be essential for securing federal follow-on funding, particularly under competitive programs like NSF Engines.

- **Startup Attraction and Support:** A key function of the center will be to attract and scale quantum startups by providing infrastructure, incentives, and technical support tailored to early-stage firms. The facility should include co-working and lab space for 10-20 companies, as well as short-term leases for relocating startups. A co-investment fund could be established to match federal or private awards, with eligibility tied to relocation, IP development, or hiring milestones. The center should also host a venture studio for quantum startups, coordinated in partnership with venture firms, national labs, and philanthropic organizations focused on deep tech commercialization.

13 As per QNMI's 2024 presentation, Elevate Quantum has planned to invest $1 million of EDA funds for space rental at UNM S&T Park and ~$2 million of EDA and $1 million of New Mexico Technology Enhancement Fund (TEF) investment to purchase equipment for the user facility. Additional funding ($3 million EDA and additional TEF funds) is planned for personnel to operate the facility, and additional state funding is being pursued for a proposed photonics user facility and collaborative space. Elements of this funding and mission could be repurposed to support a signature center that provides similar capabilities as a part of its facilities.

- **Talent Development and Workforce Integration:** To address the talent needs of the emerging quantum economy, the center would coordinate workforce training across institutions, beginning with technician training through CNM's Quantum Learning Lab (QuLL), and extending to quantum engineering degree and certificate programs at UNM, NMSU, and NMT. A shared curriculum model could be adopted to maximize course offerings and enrollment, and the center could lead the process of bringing online unique academic degree concentrations in each of the three quantum applications domains (sensing, communications, and computing), with opportunities for practical lab and demonstration work. The center would also offer short courses and fellowships for mid-career upskilling, enabling professionals from adjacent sectors (e.g., semiconductors, optics) to enter the quantum workforce pipeline, with a focus on making the center a national hub for formal credentialing in the industry that can draw in talent from well outside the region. Industry-aligned student capstone projects, internships, and mentoring should be embedded into center operations, with close relationships and rotational program arrangements across the major research universities.

- **Regional Quantum Network Interface and Economic Development Infrastructure:** The center should serve as the physical anchor for New Mexico's participation in the Elevate Quantum consortium, hosting coordination meetings, regional pilot projects, and testbed development. Participation from outlying institutions should be enabled through leadership in key applications areas via the governance structure, distributed research fellowships, and traveling workshop models.

  To ensure long-term competitiveness, the center should also serve as a key interface between the State of New Mexico and Colorado's Front Range quantum cluster, particularly in Boulder, through the creation of a regional quantum network. This would involve coordinating data transfer infrastructure and secure testbeds, aligning use cases for quantum communication and sensing technologies, and establishing formal channels for shared workforce and infrastructure planning (including improvements to transportation infrastructure that would allow for accessible commuting between regions).

  At the state level, the economic development apparatus should be enhanced to support the quantum sector specifically: dedicated staff should be sited at the center physically and assigned to each major vertical (quantum computing, quantum sensing, and quantum communications) with expertise allowing for leadership in site selection, incentive development, and industry engagement. Additional support structures such as a quantum business concierge, a revolving infrastructure fund for tool upgrades, and a targeted startup relocation grant program could significantly enhance the state's ability to attract and scale firms in this space.

Together, these elements would position the proposed center not only as a physical hub but as a strategic platform for the growth of a competitive quantum economy in New Mexico, which is expected to be driven in its early stages by a combination of large federal funding investments and emerging commercial startups. Building a signature center that signals continuity of investment in infrastructure, startup readiness, federal funding alignment, and statewide

integration can serve as a differentiating signal to external firms and investors. Additionally, the establishment of the center responds directly to investments from peer regions who are also seeking to scale their own quantum ecosystems.

Advanced Energy Technologies Targeted Industry Center

To position New Mexico at the forefront of 21st-century energy innovation, the State of New Mexico should pursue the establishment of a targeted industry center for advanced energy systems designed to coordinate and accelerate energy technology development, demonstration, and industry integration across the state. As part of HB 20, the state recently committed $40 million to establish the Research, Development and Deployment (RD&D) Fund to provide early-stage capital and financial support to emerging technologies, startups, and research initiatives. A portion of these funds should be utilized to help establish the Advanced Energy Technologies Targeted Industry Center.

This structure of the Center is envisioned as a dual-hub and spoke model in order to better leverage the collective portfolio of New Mexico's deep energy research assets, world-class natural energy resources, and growing clean energy manufacturing base, while also ensuring robust commercialization pathways and workforce alignment across industry sectors.

The key features of the Advanced Energy Technologies Targeted Industry Center's design would be:

- **An early stage innovation, piloting, and demonstration hub** in proximity to the national labs (Albuquerque Metro Region) that would serve as the anchor for ideation, research translation, and high-risk/high-reward demonstrations—especially in emerging sectors such as fusion energy, next-generation nuclear, and carbon-neutral fuel synthesis. Proximity to Sandia, LANL, AFRL, and Q Station ensures seamless integration with federally funded R&D missions and facilitates early-stage technology prototyping and IP development. This hub would act as the primary coordinating center for lab-industry-university collaborations, including centralized grant management for DOE demonstration funding, programmatic alignment with DOE Laboratory Directed Research and Development (LDRD) program investments, and early-stage spinout acceleration. It would host a curated set of shared infrastructure for pulsed power systems (e.g., for fusion and grid testing), materials testing, and radiation-hardened systems for energy infrastructure applications—reflecting shared-use facilities needed by existing companies, potential attraction targets, and federal entities. This site would also be the primary destination for any signature investments in first-of-class fusion demonstration capabilities and facilities or other signature investments likely to attract emerging companies.

- **A second hub focused on systems integration and demonstration testbeds** would be physically anchored at the newly planned and rebranded Integrated Digitally-networked Enterprise Accelerator Laboratories (IDEAL) facility in Las Cruces. This facility, originally established as the Southwest Regional Experiment Station (SWRES) in the 1980s and serving as a DoE photovoltaic testing and demonstration facility, has very recently seen new federal investment towards transforming the facility into a testbed for clean energy, grid modernization, and microgrid development. Building on this initial funding as well as early plans for a new signature hub facility, the site would leverage additional state investment to undergo major capital investment and programmatic revitalization with the strategic aim of positioning it similarly to NREL's Energy Systems Integration Facility (ESIF) collaborative research hub. Its function would be to serve as the back-end systems integration and validation environment where energy technologies from various verticals (solar, wind, hydrogen, geothermal, etc.) can be tested in combination to simulate real-world, multi-input energy environments. Drawing on existing IDEAL redevelopment plans, this hub would receive significant state investment in hardware upgrades (storage, grid controls, switching platforms), expanded outdoor testing bays, and cybersecurity infrastructure for energy system validation. The Las Cruces hub would focus on power reliability, resilience, and interoperability—key for both civilian and defense use cases—and serve as the primary location for real-world testing of distributed systems and microgrids. Use cases include backup power for military bases, resilient rural microgrids (including for tribal communities), and high-reliability systems for data centers or health facilities.

- **Each spoke within the center's network would be anchored in a specific energy vertical and co-located with institutional or industry assets that provide domain expertise, infrastructure, and commercialization potential.** For instance, a solar and power electronics spoke in the Albuquerque area could leverage UNM's Center for Emerging Energy Technologies (CEET) and the Maxeon manufacturing facility to support pilot projects in inverter integration, PV system reliability, and solar-plus-storage optimization. Similarly, a hydrogen and fuel systems spoke could concentrate around the Rio Grande Corridor, linking LANL's electrochemical materials research and commercial hydrogen catalyst innovation to real-world demonstration platforms. In Socorro, a potential geothermal and subsurface energy spoke could build on NMT's Petroleum Recovery Research Center (PRRC) and GO-TECH platform to support enhanced geothermal systems, carbon storage, and hydrogen reservoir co-utilization. A bioenergy and water reuse spoke could be established in the San Juan Basin, where algae biofuels, produced water treatment, and waste-to-energy systems can be tested in conjunction with legacy infrastructure. Each spoke would be responsible for facilitating testbed access, coordinating with hub-level management, and cultivating relationships with local firms and educational providers to create vertically specialized yet cross-linked innovation nodes statewide.

These dual hubs and spokes focused on early-stage breakthrough research and real-world integration capabilities would operate under a unified governance structure with a central coordinating entity responsible for strategic direction, funding disbursement, performance tracking, and cross-hub integration. This entity, potentially a state-designated nonprofit or public-private partnership, would oversee both hubs and their respective spokes, ensuring alignment with state energy priorities, DOE mission areas, and industry needs, while maintaining clear accountability for program outcomes and resource allocation. Other center capabilities could then be supported by cross-cutting program and resourcing functions that include:

- **Integrated Grant Disbursement and Demonstration Pipeline:** The center would serve as the administrative and strategic backbone for distributing state and federal pilot funding. Structured similarly to the national Energy Innovation Hubs, it would coordinate calls for demonstration projects, prioritize technologies with strategic fit (e.g., grid-tied hydrogen systems or modular fusion components), and ensure that funded demonstrations have paths toward commercial-scale replication. Projects could rotate through both hubs and spokes to match testing needs with expertise and infrastructure.

- **Anchor Manufacturer and Supply Chain Recruitment:** Each major spoke—aligned with a vertical (e.g., solar, hydrogen, geothermal, oil and gas)—would seek to recruit at least one anchor manufacturer per technology category. These firms would receive preferred access to demonstration and testing infrastructure, supply chain introductions, and custom workforce solutions. For example, solar equipment firms co-located near a solar cell factory might gain pilot support at the CEET or IDEAL facility to integrate additional components or systems leveraging state funding programs. Similarly, hydrogen systems firms could test integrated devices at spokes that align with transportation or refining capabilities hosted at research universities.

- **Workforce Coordination for Technician and Systems Integration Roles:** The center would coordinate a statewide workforce initiative aligned with technician- and operator-level jobs spanning solar deployment, microgrid installation, hydrogen systems maintenance, geothermal drilling, and other supporting advanced manufacturing. This initiative would work through institutions such as CNM and other community colleges as well as technical programs at NMSU and NMT to develop stackable credentials, hands-on internships at testbed sites, and curriculum updates to reflect real-world systems integration needs. This capacity would help to produce a flexible, interdisciplinary energy workforce capable of managing evolving hybrid systems.

Together, this two-hub and multi-spoke model offers New Mexico a unified platform to coordinate energy innovation across research, demonstration, and commercialization stages across a diverse portfolio of applications. By integrating sector-specific capabilities into a cohesive statewide network, this investment would position New Mexico to lead in the deployment of resilient, scalable energy systems while also seeking to anchor early-stage industry and commercial viability pathways.

Space, Aerospace & Defense Systems Targeted Industry Center

New Mexico's space, aerospace, and defense ecosystem spans a unique constellation of federal laboratories, defense installations, advanced manufacturers, and early-stage ventures. Yet, despite this asset base, the ecosystem remains fragmented with overlapping programs and under-leveraged capabilities. Interviewees and institutional actors alike consistently emphasized the absence of a coordinating architecture—a missing "center of gravity"—to organize, scale, and translate the state's technological potential into durable economic impact.

Rather than creating a wholly new entity or campus, a targeted industry center for this opportunity area would function as a strategic overlay—integrating, resourcing, and coordinating existing assets such as NewSpace Nexus, Space Valley, the New Mexico Space Grant Consortium, AFRL's Technology Engagement Office and Q Station, and the Space Force Rapid Capabilities Office (RCO), as well as physical testing and flight infrastructure available through installations such as White Sands and SpacePort America. Its core purpose would be to unify ecosystem efforts, eliminate duplication, and provide a structured, accessible interface for both private sector suppliers and federal customers. As part of HB 20, the state recently committed $40 million to establish the RD&D Fund to provide early-stage capital and financial support to emerging technologies, startups, and research initiatives. A portion of these funds should be utilized to help establish the Space, Aerospace, and Defense Systems Targeted Industry Center.

The Northeast UAS Airspace Integration Research Alliance (NUAIR) is an example of a targeted industry center established to position Central New York as a national leader in Uncrewed Aircraft Systems (UAS) and Advanced Air Mobility (AAM). NUAIR was founded in 2014 by its strategic partner Center State CEO, the lead economic development organization for Central New York, to take advantage of AFRL's legacy in the region. It is funded by Empire State Development, New York's lead economic development agency. NUAIR manages operations of the New York UAS Test Site at Griffiss Airport, one of just seven FAA-designated UAS test sites in the U.S. NUAIR also leads the commercialization and industry collaborations for New York's $30 million investment to provide a 50-mile flight traffic management test corridor between Syracuse and the Griffiss International Airport for advancing "beyond visual line of sight" testing and safe integration of drones into the national airspace. NUAIR also partners with local educators and national organizations to offer training sessions and certification courses for UAS operators. Finally, NUAIR works together with Center State CEO to attract local and national companies within the uncrewed systems industry to locate operations in Central New York.

The core functions and features of the targeted industry center, ideally staffed at a physical location adjacent to existing AFRL and Space Force offices, would include:

- **Unified Ecosystem Coordination and Front-Door Access:** The center would serve as the primary coordination and navigation interface for the sector, offering clear, structured engagement pathways for companies, academic researchers, and federal stakeholders. It would formalize integration between existing platforms such as NewSpace Nexus's commercialization services, Q Station's mission engagement capabilities, AFRL's tech transition initiatives, and the convening role of Space Valley—into a cohesive framework. A digital ecosystem interface would catalog in-state assets, capabilities, and procurement pathways, allowing defense agencies, primes, and startups to locate relevant partners, facilities, and support services more efficiently. This function would significantly reduce the transaction costs and confusion currently faced by those seeking to engage with New Mexico's distributed innovation landscape.

- **Embedded Coordination Staff and Supplier Services:** At the core of the center's operating model, there would be a state-funded, embedded staffing function. These professionals would support supplier coordination, procurement matchmaking, proposal development, and business-to-government interface across AFRL, Space Systems Command, the national labs, and other anchor institutions. A formal Supplier Integration Program would organize and elevate small and mid-sized firms into a cohesive industrial base, offering hands-on services such as certification support, CRADA/OTA navigation, and shared business development resources, with the goal of enabling more firms to participate in mission-critical contracts without duplicating administrative or technical support structures.

- **Reduction of Redundancy and Strategic Program Alignment:** One of the center's key functions would be to inventory and streamline overlapping initiatives within the ecosystem. By mapping current programmatic efforts across commercialization, workforce, federal engagement, and applied R&D, the Center could identify redundancies and clarify the scope of each partner organization. Through jointly defined roles and performance metrics, platforms like NewSpace Nexus and Q Station could operate in a coordinated manner, with complementary strengths and shared accountability. This function would address a frequently cited challenge: the inefficiency of parallel efforts with similar goals but insufficient coordination, particularly in state-funded or federally aligned programs.

- **Supplier Ecosystem and Industrial Base Activation:** The center would directly address critical supply-side gaps by standing up shared services and advocating for infrastructure investment. Based on input from interviews, priorities include a secure, shared-use SCIF facility to enable classified work by small and mid-size firms, as well as in-state PCB fabrication and electronics assembly capabilities. The center could also facilitate the development of common-use testing infrastructure—such as vibration, thermal vacuum, and EMI chambers—through pooled investment models. By building out this enabling infrastructure and coordinating supplier capacity, the state can accelerate the growth of New Mexico as a Tier 1–Tier 2 supplier region for space, satellite, and defense components.

- **Strategic Alignment Across Defense, Space, and Electronics Missions:** As technology domains converge—particularly across defense innovation, space systems, and microelectronics—New Mexico has a distinct opportunity to link its initiatives across these sectors. The center could serve as a connector between national lab semiconductor R&D, CHIPS Act-funded investments, and the growing demand for radiation-hardened space components. It could coordinate joint workforce programs, shared grant proposals, and unified supply chain development efforts that cut across traditional silos. This cross-sector integration would be particularly valuable in light of federal priorities around defense-industrial base resilience and dual-use technology transition and overlapping technology use cases with other opportunity areas identified in this report.

- **Trusted Interface for Federal Mission Sponsors:** The center would develop mechanisms to formalize a consistent engagement channel for mission sponsors such as AFRL, the Space Rapid Capabilities Office, and DOE laboratories. Building on AFRL's Tech Engagement Office and the SpaceWERX accelerator model, the center could coordinate stakeholder briefings, technology road mapping sessions, and proposal consortia that allow local firms and institutions to respond quickly and collaboratively to federal needs. A rotating advisory board—comprising representatives from AFRL, Sandia, LANL, UNM, NMSU, NMT, and key private-sector firms—would guide priorities, ensure relevance, and provide governance. This role as a cross-agency integrator ensures that the center's activities remain relevant to the needs of federally-funded space and defense missions and allows for a consistent single organization for the state to leverage in supporting capacity funding and incentive programs over time.

- **Commercial Space Industry Development and Market Attraction:** In addition to supporting national security missions, the center would actively promote New Mexico as a destination for commercial space investment and expansion. This function would focus on identifying, engaging, and attracting commercial firms, ranging from satellite operators to propulsion startups, that could benefit from the state's launch infrastructure, supply chain capabilities, and test ranges. The center would maintain a dedicated commercial engagement team responsible for site selector coordination, investment promotion, and facilitation of public-private partnerships tied to commercial launches, payload development, and spaceport utilization. It would also serve as a concierge for firms navigating incentives, workforce programs, and facility siting, lowering entry barriers and strengthening New Mexico's brand as a competitive node in the commercial space economy.

A targeted industry center aligned with this opportunity area must be designed such that it does not replicate existing work, but rather organize it together into a coherent, high-functioning "primes and suppliers" ecosystem that mirrors other leading aerospace and defense-driven clusters across the country. Investment in connective infrastructure across shared staffing, unified messaging, and consistent stakeholder engagement will significantly improve the value proposition of the state as a hub for integrated regional innovation in mission-critical technologies.

Action 2: Create an Innovation Ecosystem that Enables the Translation of Research into the Commercial Marketplace

The translation of research into the commercial market does not occur by happenstance. Instead, states that are benefiting economically from their research base are making investments to strengthen the foundational conditions (i.e., the innovation ecosystem) necessary for commercialization to occur, thereby bridging the gap between basic scientific discoveries and practical applications to meet industrial needs. This involves translating findings from the academic setting into the commercial marketplace. The successful translation of research can lead to new commercial products, which in turn creates jobs and diversifies the state's economy. In essence, university involvement in translational research and the effective commercialization of that research ensures that scientific advancements are not confined to academic journals but are instead translated into tangible benefits for society.

As previously noted, while the level of research that takes place across New Mexico's federal laboratories and universities is significant, New Mexico's ability to commercialize its research base to its own economic development advantage has not yet been realized. New Mexico research institution have produced uneven performance in technology transfer and commercialization measures as many institutions lack the necessary resources and infrastructure to transition IP to the marketplace and support industry and national lab partnerships. For those institutions that have greater levels of commercialization resources, concern was expressed by stakeholders that efforts are more focused on litigation activities as a revenue source rather than initiatives to translate research into the commercial marketplace.

For New Mexico's research institutions in general, technology commercialization has been viewed as the province of traditional technology transfer as it unfolded with the passage of the Bayh-Dole Act of 1980.[14] These traditional technology transfer activities involve the passive management of intellectual property from the disclosure of discoveries from research faculty before they are made public to the filing for patent protection based on the novelty and potential market of the technology to the licensing of the patent to either an existing company or to create a new business, often led by the faculty or their graduate students.

In the past decade, it has become apparent to leading research universities across the nation that moving research discoveries into the marketplace cannot be fostered effectively through a passive "pipeline" approach. Instead, the translation of research discoveries to the marketplace is a highly complex, interactive, and market-driven process that calls for a **proactive commercialization approach** to enhancing research discoveries into technology solutions to meet the need(s) of customers in the marketplace. It involves a number of activities, such as assessing technology and its potential markets against current products in the marketplace (e.g., technology and market assessments). It also involves proof-of-concept of the viability of technology and optimizing its engineering and design to meet price points of

14 Bayh-Dole provided the opportunity for universities to take responsibility for intellectual property developed with federal funds and initiated a broadened university role in patent activities and licensing given that federal funding comprises more than half of university research funding.

the marketplace in order to enhance the potential for sales and growth. The value proposition of university-industry collaborations is significant—universities can offer their cutting-edge solutions based on research discoveries and expertise, while industry partners can bring their understanding of market needs and expertise and capabilities in product development. Finally, for successful start-ups, it involves addressing product-market fit, identifying and recruiting seasoned management teams, and securing risk capital that will carry the product and/or firm through the various stages of growth and development.

As a result, the demands for university engagement are changing. As a 2017 report by the Association of Public and Land Grant Universities on Technology Transfer Evolution explains:

> *University leaders are increasingly responding to the needs of the innovation economy—and in particular their local economies—by including innovation, entrepreneurship, and "economic engagement" programming in their strategic planning processes … In evolving toward broader participation in university economic engagement, technology transfer offices will develop deeper relationships with industry and other community partners; broaden their reach to areas such as education, technology development, and entrepreneurship; and integrate more closely with other supportive administrative functions such as industry contracting.*[15]

To meet the needs of the innovation economy, research institutions require a complementary technology commercialization capacity beyond the legal protection and licensing of traditional technology transfer. This technology commercialization capacity needs to be able to navigate the highly complex, interactive, and market-driven processes for enhancing research discoveries into technology solutions to meet the need(s) of customers in the marketplace, often referred to as "proof of commercial readiness." Best practices in technology commercialization activities today involve a wider range of activities, such as:

- Assessing the technology and its potential markets against current products in the marketplace.
- Addressing the technology's viability through proof-of-concept projects addressing key technology development questions.
- Ensuring high-quality, hands-on coaching and mentoring for the principal investigators by serial entrepreneurs who can provide guidance in assessing markets and accessing and successfully pitching to sources of early-stage risk capital needed to advance the technology from ideation through demonstration to company launch.

In short, a high-functioning commercialization capacity requires not only an ability to manage and license the institution's intellectual property, but also complementary technology commercialization activities focusing on the market for the technology, proof-of-concept/

15 Association of Public and Land Grant Universities, Technology Transfer Evolution, November 2017, pages 3-4.

proof of commercial readiness to validate the technology, and entrepreneurial guidance to successfully launch the startup as well as strong industrial relations.

It is recommended that in order to create the innovation ecosystem capacity in New Mexico that will enable the translation of research into the commercial marketplace, a series of strategic investments will need to be made. Specificity for each of the three recommended targeted investments is provided in the following narrative.

Develop a robust statewide commercialization system to build a pipeline of deal flow.

Translating New Mexico's research strengths into market outcomes requires a robust technology commercialization system—the set of processes and supports that help an invention in the lab become a product in the marketplace. The state has a strong foundation of R&D activity to build upon, including research universities and federal laboratories that generate new ideas and intellectual property. However, New Mexico has seen limited pockets of commercialization success due to the hurdles faced and outlined throughout this report. The consequence of these gaps is a pattern of missed opportunities and "brain drain" of innovations. New Mexico-bred technologies have ultimately been developed elsewhere because many companies have had to leave the state to find a supportive ecosystem.

New Mexico's innovation ecosystem has a unique advantage due to the extensive federal presence, including major federal research laboratories, key military and space installations, and significant federal research funding streams. These assets, if fully leveraged, can be a cornerstone of the state's S&T Roadmap. However, stakeholders have identified that engagement between local innovators and federal entities is not as seamless or coordinated as it could be. Startups and even established companies often struggle to interface with the labs or navigate federal programs despite improved accessibility, meaning New Mexico is likely leaving federal dollars and partnership opportunities on the table. A concerted effort to coordinate services and touchpoints with federal agencies could dramatically improve this situation, integrating New Mexico's economy more tightly with national R&D endeavors.

One important step is to create formal mechanisms that link the state's companies with its academic institutions, the national labs, and military installations. Currently, there are successful but limited programs that are focused on developing synergies between the various assets. The state can take a more active role in managing this disconnect by leveraging the New Mexico Consortium (NMC) to serve as a foundational platform for strengthening research translation and startup formation across the state. Originally established to facilitate partnerships between LANL, research universities, and industry, NMC was designed to bridge institutional divides and provide neutral infrastructure to support applied research and innovation. With an expanded mission to engage all federal entities—not just LANL—and to prioritize commercialization outcomes, the Consortium is well-positioned to play a central role in enabling innovation-based economic growth statewide. Key functions that could be enhanced or expanded via NMC in conjunction with dedicated funding include the following:

- **Modernize and streamline the tech transfer processes.** Consideration should be given to centralizing the technology transfer and commercialization functionality of the state's three research universities in order to expand the staffing and operational capacity, provide commercialization support and resources for promising opportunities, develop startup-friendly licensing terms and support services (e.g., standardized agreements with low upfront costs and royalty deferrals), and work to embed commercialization metrics into faculty evaluation criteria. Tech transfer institutions in the state have already recognized the benefit of a more collective approach through the formation and funding of Innovate New Mexico, which serves as a collaborative platform to showcase university technologies and facilitate joint outreach to industry and investors. However, its funding and infrastructure remains limited. By incorporating the efforts of Innovate New Mexico under the envisioned revitalized NMC, a shared, professionalized tech transfer and commercialization office could be created backed by pooled funding and staffed with specialized personnel in licensing, market validation, and startup development, thereby greatly enhancing deal flow and reducing duplication across institutions. This centralized approach would also allow for the consistent application of best practices, more efficient IP management, and a stronger, unified interface for external partners seeking to engage with New Mexico's innovation ecosystem. Other states have used similar strategies to accelerate spinout activity and reduce friction in IP licensing. As part of HB 20, the state recently committed $5 million for infrastructure for innovations hubs. These funds should be utilized to help establish this joint innovation hub.

- **Formalize coordination between labs, universities, and industry** by expanding the role of the NMC to align all research and federal entity stakeholders, maintain a directory of lab capabilities and points of contact, and troubleshoot policy or process barriers to collaboration. A single online portal with clear pathways for industry–lab partnerships would improve visibility and accessibility for startups. This would institutionalize and expand on existing but limited efforts like TRGR and CRADA mechanisms, which are often underutilized due to lack of awareness and navigability.

- **Streamline federal procurement engagement** for local high-tech firms by expanding technical assistance programs that help startups access contract opportunities with Kirtland AFB, White Sands, and associated primes. Encourage national labs to increase licensing activity with in-state companies through incentive programs or pooled IP funds, while the state plays a proactive role in surfacing and promoting commercializable lab technologies to local entrepreneurs and investors.

- **Increase visibility and collaboration across the innovation ecosystem** by hosting statewide R&D showcase events and establishing a centralized, searchable portal of licensable technologies, lab capabilities, and research expertise. Similar platforms in other states have helped bridge institutional silos and attract external commercialization partners, while events like "Innovation Days" provide curated exposure to investors and corporate scouts.

The Deshpande Center for Technological Innovation at MIT - a pioneering effort to advance commercialization of high potential university research discoveries and technology innovations. The Deshpande Center stands out in its emphasis on ensuring wrap-around entrepreneurial services along with its proof-of-concept funding. An immersive experience exposes grantees to a rich network of experts—including other MIT researchers, venture investors, and executives with experience in early-stage companies—as well as events sponsored by the center and MIT's startup-friendly culture. This includes funding a seasoned entrepreneur "catalyst" mentor for each project by the Deshpande Center to provide the research team with ongoing guidance as they assess market opportunities, commercialize their inventions, and launch startup companies.

Since 2002, the Deshpande Center has averaged roughly $1 million a year in first year and renewal grants. Altogether, 190+ projects involving 500+ faculty, post-docs, and graduate students have been funded, which has generated the following results:

- 51 spinout companies, and
- More than $1.5 billion in investment capital raised by these startups.

Stanford University High Impact Fund (HIT) builds upon best practices to help advance technologies to the point where additional external funding or technology transfer, to an existing organization or to an inventor-led start-up, is achieved. All project teams involved with the HIT Fund are provided with hands-on mentoring and coaching resources, which may include:

- Industry-specific executives and domain experts as advisor(s) through the award term.
- Connections to industry experts who can share actionable insights on key requirements, prototype building, industry standards, and manufacturing at scale.
- Introductions to potential partners, customers, suppliers, collaborators, investors, and advisory board members.
- MBA Interns to help with customer discovery, identifying go-to-market approaches, and analyzing the market opportunity and competitive landscape.
- Patent attorneys and technology licensing experts to help with patent strategy and white space mapping.
- Venture capitalists that offer feedback on go-to-market strategy and investment pitches.
- Business ideation sessions with Industry and domain experts to help identify promising market opportunities and go-to-market approaches.

To build a future pipeline of high-quality commercialization projects, HIT also offers an initial track of Advisory Support Only that can lay the foundation for seeking funding in future years.

In its initial pilot year of 2022, the HIT Fund was already demonstrating results. Thirteen project teams were funded, and by 2023 three had already created companies and were engaged in license negotiations. Collectively, the HIT Fund has facilitated discussions for project leaders with more than 150 industry experts and stakeholders, including potential partners, possible customers, and venture capital investors.

- **Enhance joint planning with federal agencies** by maintaining active dialogue with DOE, DOD, NSF, and others to anticipate funding priorities and co-develop competitive proposals. New Mexico should pre-position multi-institutional teams to respond to major federal initiatives, ensuring alignment of state resources with national R&D trends and amplifying New Mexico's competitiveness as a federal innovation partner.

If New Mexico makes these investments, it can considerably smooth the pathway from lab to market. Ideally, an inventor or research team with a viable discovery would find an array of supports readily at hand: help with patent filing and business plan development, a small grant to build a prototype, an introduction to an entrepreneur-in-residence or potential CEO, access to test facilities, and eventually a chance to pitch for seed investment—all without leaving the state's support framework. In such an environment, startups will form organically around local innovations, and more of them will reach maturity, offering better chances of homegrown success. Over time, one can expect a virtuous cycle: as a few homegrown tech companies succeed and gain national recognition, they will inspire further confidence, recycle expertise and capital locally, and attract outside investors to pay attention to New Mexico.

Invest in entrepreneurial support, facilities, and infrastructure capacity.

A critical foundation for a thriving innovation ecosystem is the quality of value-added entrepreneurial support services and availability of modern facilities/physical infrastructure to help firms grow and scale. New Mexico currently faces severe gaps in these areas, especially for science- and technology-based startups that require specialized services, space, and equipment.

New Mexico's entrepreneurial support system remains fragmented and under resourced, creating a challenging environment for founders trying to launch and grow companies. Unlike leading innovation hubs that offer navigable, well-coordinated support, New Mexico's entrepreneurs encounter a patchwork of programs and organizations that are disjointed and hard to navigate. There is no single "front door" or centralized platform that can guide a new founder to the array of resources available; instead, entrepreneurs must piece together help on their own, often missing critical support due to lack of awareness. This fragmentation was a common theme in stakeholder input—the absence of a one-stop hub means that promising startups may flounder simply because they did not find the right mentor, funding source, or facilities at the right time.

Closely related is the paucity of comprehensive mentorship programs. Founders report difficulty finding seasoned mentors or serial entrepreneurs aside from a handful of small programs. The ecosystem lacks major shared services and robust infrastructure outside of several isolated programs, leaving many entrepreneurs largely unguided. For example, while there are a few incubators (one notable example being a bioscience incubator in Albuquerque), these serve narrow sectors or early stages and often do not offer the extensive coaching, networking, and investor exposure that other state-supported programs provide. The result is that a founder in New Mexico often must rely on personal networks or trial-and-

error to learn how to build a startup—a steep learning curve that in other regions is eased by entrepreneurial support services, mentor networks, and peer entrepreneurs. Likewise, critical "wraparound" services—such as readily accessible legal counsel, accounting expertise, and human resource support tailored to young tech firms—are scarce in New Mexico. In more mature ecosystems, incubators or innovation centers often coordinate such services (e.g. office hours with lawyers, volunteer CFOs, etc.), but in New Mexico many startups struggle to obtain affordable professional support, compounding the challenge of growing a business.

To transform this landscape, New Mexico must expand and better coordinate its entrepreneurial assistance offerings along several fronts:

- **Establish a central coordinating hub or digital portal to unify and streamline access** to New Mexico's entrepreneurial support landscape. This "one-stop" platform would connect startups with relevant incubators, accelerators, venture studios, funding programs, mentors, and professional services, reducing navigation burdens and ensuring that founders across regions and sectors are efficiently routed to the right resources at the right time. For example, Missouri has created an entrepreneurial pathways program, called MOSourceLink, that serves as an "intake system" for entrepreneurs to learn about and access the various resources within Missouri that are dedicated to assisting entrepreneurs. MOSourceLink operates not only a website but also works directly with entrepreneurs to link them to the resources that best fits their needs.

- **Expand incubator, accelerator, venture studio, and mentorship services with sector-specific focus** by scaling and aligning existing programs (such as Arrowhead Center, BioScience Center, FatPipe, Rainforest Accelerator, HyperSpace Challenge, New Mexico Startup Factory, and others) and supporting new models where strategic gaps remain. This could include potentially launching additional state-supported incubators, accelerators, or other entrepreneurial support service models (or investing as a co-lead in venture studios forming in the state), particularly in key targeted S&T opportunity areas. Investments should be aligned with the Targeted Industry Centers outlined in Action 1 as well as to develop more general capacity to scale tech-based startups. These initiatives should be networked together into a cohesive statewide framework that enables resource-sharing, consistent programming standards, and broader reach across geographies and technology areas. These initiatives should deliver structured curricula, investor engagement, mentor matching, and founder coaching, and act as downstream landing zones for technologies emerging from the research base. A coordinated statewide mentor corps, organized through the Centers, would further enhance support by pairing experienced executives and domain experts with startups based on their stage and sector. As part of HB 20, the state recently committed $5 million for operational support for incubators, accelerators, and venture studios. These funds should be utilized for this action and the amount of funding should grow as initiatives come on-line and expand to respond to increased deal flow.

The St. Louis BioGenerator is a privately funded, nonprofit 501(c)(3) organization established in 2003 to facilitate the formation and early growth of successful, sustainable bioscience companies in the St. Louis area. The BioGenerator is an affiliate of BioSTL—a regional biosciences cluster organization—and is part of the CORTEX Innovation District. The BioGenerator offers a range of integrated commercialization-to-venture investment services. At the earliest stage, the BioGenerator deploys over a dozen Entrepreneurs in Residence (EIRs) as part-time contractors who provide commercialization guidance and advice to university faculty and entrepreneurs about the commercialization process and who work with the entrepreneur/inventor to establish a company, formulate a development plan, access sources of funding, and connect to professional services including lawyers and accountants. In some instances, EIRs will provide management support during initial company formation and are encouraged to take one or more companies forward as the CEO or other key management position. The BioGenerator complements the efforts of its team of EIRs, typically before a company is formed or at the very earliest stages after its formation, with proof-of-concept grants to pay for early de-risking of technologies involving patent reviews, regulatory guidance, small market studies, prototyping, or conducting key lab experiments. As a new company is launched, the BioGenerator has a venture investment arm to invest in promising new companies to take them through technical and business milestones that would position them for next-stage investors. Additionally, the BioGenerator offers access to flexible, low-cost collaborative laboratory spaces and helps startups pursue nondilutive grants, such as federal SBIRs. The St. Louis BioGenerator has supported over 150 technology commercialization efforts with proof-of-concept funding and has made $31 million in venture investments in more than 50 startups coming through their commercialization efforts, generating $2.4 billion in follow-on investments.

- **Invest in talent retention and attraction as core ecosystem infrastructure** by addressing the shortage of mid-career professionals available to support startup growth. While New Mexico produces strong technical graduates, limited local career pathways outside the labs contribute to outmigration. Workforce strategies should emphasize expanded experiential pathways into startups (e.g., internships, fellowships), while urban development should focus on building dynamic, amenity-rich environments that appeal to technical and entrepreneurial talent. As part of HB 20, the state recently committed $10.8 million for talent recruitment and retention in high-tech fields. A portion of these funds should be utilized to address the shortage of mid-career professionals available to support startup growth.

- **Create physical spaces to support the growth and scale-up of the state's S&T startup community.** The state has virtually no dedicated scale-up laboratory space beyond a single small physical incubator—a situation that leaves growing companies (particularly in the biosciences) with nowhere in-state to conduct advanced R&D or pilot production. The lack of wet labs, fabrication/prototyping workshops, and pilot manufacturing facilities forces many startups to relocate once they outgrow the basic lab benches available at early incubators. Simply put, without adequate facilities to scale innovations, New Mexico cannot retain the very companies it is trying to nurture.

Addressing this infrastructure deficit will require strategic public investment, as private developers alone are unlikely to build such facilities in New Mexico's current market conditions. Stakeholders indicated that specialized lab spaces are not financially viable for private investors because the rents that local technology firms can pay are far below the levels in major tech hubs, undermining the business case for private development. In other words, the market won't solve this on its own; the state must step in with subsidies, capital outlay, or public-private partnerships to close the gap in critical R&D infrastructure. Comparable regions have shown that government support can kick-start the creation of facilities that enable cluster growth. New Mexico should take a similar approach, treating innovation infrastructure as a long-term economic development asset.

Several high-impact infrastructure investments are possible. One priority is to develop multi-tenant innovation centers with wet-lab and engineering space in the state's major hubs. For instance, stakeholders have proposed financing a flagship bioscience innovation center in Albuquerque—on the order of 20,000 square feet of affordable wet laboratories, shared core equipment, and co-working offices—to provide growing life-science companies the space they need after incubating a prototype. In tandem, regional incubator expansions could target areas with unique research assets: Santa Fe might host a wet-lab incubator leveraging LANL spinoffs; Las Cruces could create incubator facilities to support NMSU's agbioscience innovations; and a "biomedical cluster campus" near UNM's Health Sciences Center could be created to co-locate biotech startups adjacent to research labs and clinical trial sites to encourage collaboration. Innovation facilities, supported by public capital and operated in partnership with universities or local economic development entities, would extend the state's capacity to house startups. Across all these efforts, the emphasis is on building fit-for-purpose spaces (e.g. wet chemistry labs, controlled environments, pilot production lines) that are currently absent in New Mexico's commercial real estate inventory.

Beyond bricks-and-mortar labs, technical support infrastructure must also be strengthened. High-tech startups benefit from access to specialized equipment and validation environments, including test ranges, field laboratories, and pilot plants. New Mexico's pilot-scale testing facilities (e.g. for energy microgrid technology) are valuable in bridging technologies from lab bench to applied demonstration (Technology Readiness Levels ~3–5). Augmenting such testbeds and proving grounds—whether for renewable energy, water treatment, advanced materials, or agricultural technology—would allow startups to validate their products in-state and attract external partners who see New Mexico as a place to develop and prove new solutions. In sum, investing in physical infrastructure and equipment capacity (wet labs, incubators, test sites, and innovation parks) is foundational to an ecosystem that can support emerging S&T opportunities. These investments directly enable startups to build and scale in New Mexico rather than exporting their ideas to better-equipped regions.

Connecticut BioScience Facilities Fund. At a time in the late 1990s when the State of Connecticut was hampered by the lack of wet lab space, it created the BioScience Facilities Fund to help finance the construction of wet-lab space. The BioScience Facilities Fund provided financing to qualified biotechnology companies already in Connecticut, or to firms thinking about moving to the state, for the construction of wet-lab and related space. The Fund was instrumental in assisting the startup and expansion of Connecticut biotech companies. Over an approximate 10 year period, the fund invested $33 million to facilitate the construction of more than 320,000 square feet of new laboratory and related space in the state. Funding was structured as equity, convertible debt, or debt with warrants depending on individual circumstances of the deal.

Target development of emerging S&T growth opportunity areas.

While the above measures build broad ecosystem capacity, it is equally important for New Mexico to target specific innovation domains for early-stage support and to build momentum around early "wins"—effectively seeding the sectors that hold the greatest promise for the state. Among the S&T opportunity areas identified in this roadmap, the three mentioned in Action 1 hold the greatest promise for near term focus; however, two others stand out as potential test cases for focused near-term intervention due to their strong technology "push", alignment with New Mexico's unique assets, and need to overcome current lack of capacity for early-stage incubation and support. They are:

- Agriculture, Water & Ecosystem Technology Nexus, and
- Biosciences Innovation.

These areas are very different in market focus but share a common rationale for state support: each leverages a comparative advantage of New Mexico (natural-resource context or research strength), each addresses significant local and global challenges, and each currently faces ecosystem gaps that, if filled, could allow a vibrant industry cluster to flourish. By providing targeted early-stage resources in these domains, New Mexico can develop broader capacity for innovation ecosystem support outside of the investments noted above as well as accelerate the potential development of future homegrown industry clusters.

Leveraging the broader capabilities and investments described previously, each area could serve as a demonstration case for scaling up the capabilities in an emerging S&T opportunity area:

- **To seed early stage innovation in the Agriculture, Water & Ecosystem Technology Nexus, New Mexico should:**
    - Establish an Innovation Hub anchored at NMSU that provides shared wet labs, controlled environment agriculture infrastructure, and adjacent field sites to support existing university assets for in situ testing of irrigation systems, filtration membranes, and climate-resilient crops.
    - Create pilot demonstration grant programs that fund real-world technology deployments with irrigation districts, utilities, or oilfield operators. Regulatory sandboxes should allow controlled experimentation with new water solutions.
    - Launch a sector-specific accelerator and venture fund focused on water efficiency, precision agriculture, and environmental remediation technologies. Pair financial support with access to end users for feedback and adoption.
    - Develop challenge grants and innovation prizes targeted at key problem statements (e.g., brackish water reuse, drought-resilient farming) to incentivize academic and entrepreneurial teams to develop and test practical solutions.
    - Leverage national labs and state research institutions as applied R&D partners and first validators for new technologies. Use these partnerships to generate data that can attract federal or private follow-on funding.
    - Position New Mexico as a "living laboratory" for arid-climate innovation by marketing available testbeds and industry use cases via dedicated attraction campaigns aimed at early stage companies developing water and land management solutions.
- **To seed early stage Biosciences Innovation, New Mexico should:**
    - Reposition the New Mexico Bioscience Authority as a more dynamic public-private partnership with the mandate to incubate firms, administer grants, support sector accelerators and/or venture studios in collaboration with partners, and collaborate with the New Mexico Partnership in business attraction and recruitment efforts. It is recognized that the state has made significant investments in biosciences innovation, including creating and providing continued funding for the New Mexico Bioscience Authority. However, the state's biosciences industry landscape remains fragmented, and the bioscience industry cluster has not yet reached the necessary critical mass to support a fully realized translational ecosystem focused on key growth opportunities. As a result, additional investments and alignment of initiatives is needed:

- Develop a network of bioscience-ready facilities, including a potential flagship wet-lab innovation center in Albuquerque and satellite facilities in other regions. Provide flexible lab suites, shared equipment, and incentives for private development.
- Establish an Executive-in-Residence (EIR) program to embed seasoned bioscience executives within local startups. Offer relocation or engagement incentives to bring experienced leadership into the state's biotech ecosystem.
- Expand applied bioscience workforce programs in partnership with community colleges and higher education institutions to train lab technicians, trial coordinators, and regulatory staff in response to startup needs or as part of shared-use lab and early-stage production facility resources.
- Build industry connectivity through regular programming, including startup showcases, mentoring networks, and investor forums. Ensure bioscience innovators have access to clinical trial infrastructure and lab-to-market guidance from day one.

Action 3. Leverage and Expand Sources of Financial Capital to Catalyze the Growth and Scalability of New Mexico Firms.

States and regions with thriving entrepreneurial sectors share one characteristic—they are home to a risk capital community that is both oriented toward early-stage financing and committed to local/regional investment. Entrepreneurs require access to capital at each stage of their development, from early-stage (including proof-of-concept, prototype development, pre-seed, angel, and seed) to Series A and B venture financing. States that have limited risk capital in which to invest end up leaving their entrepreneurial companies on the "runway," unable to take off and reach their growth potential. States wishing to grow entrepreneurial companies have used a variety of mechanisms to encourage risk capital investments and to address market gaps, particularly at the commercialization and pre-seed stages. While risk capital needs vary by industry, Figure 20 illustrates at each company stage of development the likely sources and amounts of funding that are often required.

FIGURE 20. THE RISK CAPITAL CONTINUUM

	Ideation	Commercial Viability	Market Entry	Growth & Scalability
Activities at Each Stage	Idea development/ invention, possibly involving lean startup approaches, market assessments, and (if applicable) IP creation	Customer discovery, new product development, proof-of-concept testing, prototype development, and validation/market testing	Finalize commercial products, add key team members, execute business plans, marketing plans, manufacturing plans, develop supply-chains, and generate early revenues	Generate operating capital to expand markets, scale manufacturing, re-examine team member mix, generate new employment, and begin new product development
Likely Sources of Risk Capital	**Sweat equity; friends and family; non-dilutive grants**	**Non-dilutive grants; SBIR; accelerator, pre-seed, angel**	**Angel; seed; early-stage; Series A**	**Series A, B and C (later-stage VC); private equity; debt**
$ Amounts will Vary by Industry	On average, up to $50k	On average, $50k-$250k	On average, $250k-$2million	$2 million +

Source: TEConomy Partners, LLC

Emerging trends in risk capital are making it even more imperative for states to have access to resident funds for the growth of innovative firms. These resident funds help in identifying promising discoveries and technology advances, providing the initial funding to validate these opportunities, supporting the formation of new ventures, and providing the on-the-ground capacity to support these new ventures and facilitate their connection to outside venture capital.

The earlier analysis clearly indicates that New Mexico has insufficient levels of risk capital and deal flow has been declining. Since 2019, the volume of deals conducted at the earliest stages has been inconsistent and trends in investment totals are largely dictated by a handful of companies receiving later-stage funding from out-of-state investors. This suggests a shift toward larger, later-stage investments and fewer early-stage deals, making it difficult for many entrepreneurs across New Mexico to access risk capital. This was reinforced by the qualitative assessment that highlighted access to risk capital as an area of great concern across the state. The bottom line is that New Mexico's ability to support the translation of research into the commercial market and then grow and scale commercial enterprises requires sufficient pools of investment capital.

It is proposed that the State of New Mexico pursue three targeted efforts to help deploy greater levels of risk capital to help New Mexico startups grow and scale.

Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.

Research institutions find that potential market applications often go unrealized unless funding is available to develop an idea or approach, conduct further applied research, undertake due diligence, or expose the research to people with differing perspectives. As a result, it has become increasingly common for states and/or universities to provide funding for activities needed to determine the commercial potential of a discovery and to advance the technology to the point at which a commercial partner can be found. Proof-of-concept funds support prototype development, testing and validation, and market research, and are usually provided in the form of a grant that does not require any repayment (nondilutive).

The State of New Mexico currently has four programs in existence, managed by OSST (now TIO), that provide nondilutive capital to promising opportunities. It is recommended that funding be increased to:

- **Support the New Mexico SBIR Matching Grant,** which awards non-dilutive funds for business development expenses to selected New Mexico recipients of federal SBIR and STTR awards. It is recommended that priority be given to startups in S&T growth opportunity areas. In addition, stakeholders recommended that consideration should be given to revising eligibility criteria thereby eliminating some of the restrictions that currently limit the number of companies that receive grants.

- **Support the Science & Technology Business Startup Grants,** which awards non-dilutive funds for business development expenses to early-stage New Mexico companies commercializing new technology. It is recommended that priority be given to startups in S&T growth opportunity areas. As part of HB 20, the state recently committed $4 million for this grant program.

- **Support the New Mexico Advanced Energy Award Program** that awards non-dilutive funds to New Mexico companies developing and commercializing technologies in advanced energy. Since Advanced Energy Technologies have been identified as an S&T growth opportunity area, this program directly supports this platform. It is recommended that TIO works closely with the Advanced Energy Targeted Industry Center (Action 1) to identify firms. Or conversely, the funding allocation could be granted to the Center to award firms directly. As part of HB 20, the state recently committed $8 million for advanced energy grants.

- **Support the New Mexico Quantum Technologies Award Program** that awards non-dilutive funds to early-stage companies working in quantum technologies that are located in New Mexico or establishing a presence in New Mexico. Since Quantum Systems & Applications have been identified as an S&T growth opportunity area, this award program directly supports this platform. It is recommended that TIO works closely with the Quantum Targeted Industry Center to identify firms. Or conversely, the funding allocation could be granted to the Center to award firms directly.

It is also recommended that New Mexico create two new nondilutive sources of funding:

- **Space, Aerospace & Defense Systems Award Program** that would award non-dilutive funds to New Mexico companies developing and commercializing technologies in space, aerospace, and defense technologies. Since Space, Aerospace & Defense Systems has been identified as an S&T growth opportunity area, this non-dilutive funding source would directly support this platform just as the quantum and advanced energy funds support innovation in the other two existing opportunity areas. It is recommended that TIO works closely with the Space, Aerospace & Defense Systems Targeted Industry Center to identify firms. Or conversely, the funding allocation could be granted to the Center to award firms directly.

- **Traded-sector Matching Grant Program** that would match investments by New Mexico's private-sector companies in New Mexico startups. Building connections among and between industry and entrepreneurial endeavors is an important component of advancing sector-specific innovation efforts. The program would develop grants that would provide a 1:1 match for a private company investment in a startup as a way to commercialize technologies. This would help to create "stickiness" of New Mexico's startup firms, encouraging them to stay in New Mexico due to the linkages/partnerships that are developed with major industry players. It would also serve as another source of capital to help launch innovative ideas.

What Others Do: Proof-of-Concept Models

Georgia Research Alliance (GRA) Ventures was created to move university technologies out of the lab and into the marketplace and to grow university-based startup companies in Georgia. To accomplish these goals, GRA awards the following:

- Phase I grants (up to $50,000) to university researchers to answer the question, "Is it commercially feasible to build a company around this technology?"
- Phase II grants (up to $100,000) to university researchers to continue prototype development and formulate a company.
- Phase III loans (up to $250,000) to companies that have a fully executed license from the university. These companies must also have Georgia-based management. The noncollateralized loan has favorable repayment terms and conditions.

Since 2002, GRA has evaluated the commercial potential of more than 400 inventions or discoveries at universities. The most promising of these were awarded grants to help fund the technology research necessary to further develop the invention or discovery. This process has led to the formation of more than 150 early-stage companies that employ more than 1,300 people and have generated more than $140 million in revenue.

The North Carolina Biotechnology Center (NCBiotech) is at the forefront of leadership in life sciences cluster development of North Carolina. Among the many programs and initiatives offered by NCBiotech that span the tech-based economic development chain is the Biotechnology Innovation Grant or "BIG" program.

The BIG program is designed to support preliminary translational life science research studies that explore the potential commercial applications of early-stage inventions at North Carolina's universities. These studies are often the basis for strategic "go/no-go" decision-making regarding the pursuit of intellectual property protection and/or further commercial product development. Additionally, BIG awards are intended to strengthen the entrepreneurial culture within universities and nonprofit research institutes.

The grant provides up to $100,000 for researchers to explore commercial applications of their inventions through:

- Technical research projects that extends the scientific research; and
- A concurrent commercial development projects, in partnership with a Commercial Development Advisor, that examines commercial aspects of the technology such as the IP landscape, potential markets and competition, mapping out product development milestones, and other key aspects for commercial potential.

NCBiotech views a "successful" BIG project as one that uncovers technical and commercial opportunities or weaknesses; provides go/no-go decision points regarding continued development of IP claims and protection; and positions the technology for further commercial development. A BIG project that leads to a clear decision whether to support continued investment or not is considered a successful outcome.

Another way that the State of New Mexico can expand sources of nondilutive capital is by ensuring that the state's tax code and incentives encourage S&T innovation. All state tax codes represent a state's industrial history. Ensuring that a state's tax structure is built for future industries requires a concerted effort of reviewing such issues as sales and use tax treatment of R&D, supplies, and laboratory equipment; exemptions regarding personal and real estate; corporate and other tax code provisions regarding treatment of equity; and the salability and transferability of tax credits by young firms with limited tax liabilities.

The State of New Mexico has proven that it is open to creative tax code policy as a means of providing sources of capital for innovative firms. For example, in 2020 the New Mexico Legislature created the Technology Readiness Gross Receipts (TRGR) Tax Credit for the purpose of helping businesses achieve technology maturation for commercialization opportunities that require improvements on a preexisting invention by providing access to technical assistance from LANL and Sandia. This tax credit effectively funds the technical support businesses receive from the labs, allowing them to advance technologies beyond the initial research and development phase towards commercialization. The TRGR Technology Readiness Initiative was designed to advance technology and expedite product commercialization by providing technical assistance to New Mexico businesses that currently have licensed IP or is engaged in a cooperative research and development agreement with a New Mexico national lab. The initiative builds relationships with a network of leading scientists and engineers and should continue to be supported.

In addition, a number of stakeholders indicated that another beneficial program is JTIP, the Job Training Incentive Program. JTIP reimburses a significant portion of employee wages for new jobs created, effectively subsidizing startups' and scaling companies' talent costs. However, JTIP was structured to exclude companies that earned more than 50 percent of their revenue in-state. The intention was likely to focus JTIP on export-oriented businesses, but the effect is that some successful local startups—especially those selling to local customers or the government—became ineligible for support. The implication is that the program unintentionally penalizes companies for finding a New Mexico market. Adjusting such criteria could immediately broaden its impact.

Below are a few additional ideas based on best practices from across the nation that could be implemented as New Mexico works to build a more innovation-driven economy:

- Increase R&D tax credit level for companies investing in S&T opportunity areas, and expand the definition of the size of firm that qualifies for the credit.
- Increase funding for the New Mexico Local Economic Development Act (LEDA) tax program to ensure shovel-ready sites are available, particularly for companies investing in S&T opportunity areas.
- Create a Wet-Lab Facilities Fund to help finance the construction of wet-lab space. The Fund would provide financing to qualified companies already in New Mexico, or to firms thinking about moving to the state, for the construction of wet-lab and related space.
- Make greater use of New Markets Tax Credit to invest in companies within S&T opportunity areas that locate in rural or distressed areas.
- Consider overhauling New Mexico's Gross Receipts Tax (GRT), which was viewed by many individuals interviewed as a complex and confusing tax system that places New Mexico at a disadvantage, particularly compared to the tax climate in neighboring states for which the state is competing against.
- Expand the Angel Tax Credit so that is it transferrable to other tax liabilities.
- Tie international trade mission efforts to attracting new investments to the state related to the S&T opportunity areas.

Catalyze additional investment funds across the capital stack.

While providing the very earliest stages of nondilutive sources of innovation capital is critical to catalyze ideation, the ability to begin to de-risk the technology to prove commercial viability and enter the market is the only way to achieve economic outcomes. As a result, sources of resident angel, pre-seed, and seed funds, as well as working capital loans, are also needed by innovation-based entrepreneurs. While further downstream from the funds recommended previously, these additional early-stage investments constitute a critical private-sector market gap as the investment size is usually too small for larger venture funds or traditional sources of capital to consider.

Having dedicated, locally-managed, resident early-stage sources of funding is absolutely essential for building the "farm team" of firms, which, as they gain experience and need additional funds to expand, become candidates for "major league" funding from larger, more diversified venture funds. The presence of strong resident investment funds is needed to attract outside regional and national funds to invest in New Mexico's growing pipeline of deal flow in the coming decade.

Recognizing that building a critical mass of innovative firms is unlikely without early-stage financing, many states have developed programs to increase the availability of early-stage risk capital. States have taken various approaches such as capitalizing funds that make direct investments in companies, investing in privately managed venture funds, investing pension funds in venture capital, and using tax incentives to encourage investment in venture capital. In some cases, universities and foundations are investing a portion of their endowments in seed and pre-seed funding. A number of states have used state dollars to create such investment funds (see textbox).

What Others Do:

The State of Ohio, through the Ohio Third Frontier, has made significant investments to build its resident risk-capital base through the Ohio Third Frontier Pre-Seed/Seed Plus Fund Capitalization Program (PFCP). As a result of this program, the Ohio Third Frontier has helped establish Ohio as a leading location for early-stage risk-capital investment through the capitalization of multiple Ohio-based pre-seed funds. The goals of the Ohio Third Frontier PFCP are as follows:

- Increase the number of professionally managed pre-seed funds investing throughout Ohio.
- Increase the amount of early-stage capital being invested in Ohio technology-based companies.
- Create a risk capital climate that supports the development, retention, and attraction of investable technology companies in Ohio.
- Build a pipeline of technology company deal flow that increasingly attracts the resources of venture capital firms both within and outside of Ohio.

The Ohio Third Frontier had invested approximately $65 million in over 44 pre-seed and seed funds across the State of Ohio. These funds, in return, have leveraged over $3 billion in follow-on funding and have created nearly 5,000 jobs.

The Colorado Venture Capital Authority (VCA) supports access to venture capital for Colorado's entrepreneurs and startup businesses funded from the sale of Colorado insurance premium tax credits. VCA is currently a partner in four active resident funds, all of which invest in early-stage startups throughout Colorado. This state-backed venture capital fund is actively investing in early-stage startups headquartered outside of the Front Range—areas commonly overlooked by traditional venture funds. Unlike many funds, VCA uses gross revenue as its return variable, which incentivizes simple revenue growth for both parties and is less manipulatable compared to EBITDA, net income, or any metric that is calculated further down on the income statement.

Revenue-based investments help the fund focus on building healthy, sustainable companies in industry verticals often overlooked by traditional venture capital funds. The fund leverages networks around peer-to-peer founders, mentorship, funders, sales and marketing, and recruiting to support portfolio companies. The funds also provides continuing education and strategic guidance through meetups and portfolio retreats. Portfolio companies range from manufacturing to agriculture to data analytics firms, among other sectors.

The New Mexico SIC has historically worked to make investments to improve the risk-capital climate of the state. Now is the time to double down on these efforts, particularly by supporting resident funds. However, as previously noted, SIC is currently moving away from investing in resident funds and instead is targeting investments in national funds. While investing in national funds can help to increase deal flow and later stage investments over time, as the next section discusses, it is also critical to continue to support resident funds with on-the-ground management teams. Many states have utilized the federal State Small Business Credit Initiative (SSBCI) to help make these investments by strategically deploying the funds to close capital gaps, especially for companies bridging from non-dilutive sources of risk capital to Series A.

New Mexico should commit either SIC resources, SSBCI resources, or other state appropriations to **create pre-seed and seed funds** managed by resident private fund managers and associated with the sector-specific Targeted Industry Centers as well as venture studios being created within the state's identified growth opportunity areas. As Targeted Industry Centers come online and develop a pipeline of deal flow, providing sector-specific funds that align with targeted areas of innovation will become necessary, particularly if the targeted areas are not traditional investment platforms. The investment funds should require a 1:1 match, which could increase over time to reflect how the success of the initial rounds has helped to mitigate future risk.

What Others Do: The Missouri Technology Corporation

The Missouri Technology Corporation (MTC), a public-private partnership created by the Missouri General Assembly to promote entrepreneurship and foster the growth of new and emerging high-tech companies, has used the State Small Business Credit Initiative (SSBCI) to support early-stage, high-growth, technology-focused companies through its IDEA Fund Co-Investment Program. The IDEA Fund program is a state-sponsored risk capital initiative that utilizes public funding (both state and federal) to drive economic development within the state. The fund provides venture capital-based financing to eligible businesses through three programs that correspond to the stages of growth for promising early-stage high-growth potential businesses: (1) pre-seed capital stage financing; (2) seed capital stage financing; and (3) venture capital growth stage financing. Funding decisions are made on a quarterly basis through a multi-tiered, competitive application process. MTC invests in scalable, high growth technology startups that are either located in Missouri or willing to relocate to Missouri and is focused on product development in one of MTC's seven focus areas.

Over the past 15 years, MTC's IDEA Fund has invested $53 million in 160 companies, leveraging $2.1 billion in private capital and creating over 8,000 jobs across Missouri. In 2022, Missouri was allocated $95 million through the federally funded SSBCI 2.0 program, and designated $65 million for deployment through the IDEA Fund. The SSBCI funds are also used to provide technical assistance to small businesses applying for SSBCI and other government programs.

Finally, New Mexico's Economic Development Department should **create a working capital loan program** for startups that do not choose or are not a fit for private equity investments but still have capital needs that are going unmet. It is intended that the loan program would provide working capital to New Mexico businesses with limited access to funding from conventional financing sources due to technical and commercial risk factors associated with the development of new products or services within targeted traded sectors. It is envisioned that the loan fund would finance up to 75 percent of allowable project costs with loans typically ranging in size from $250,000 to $2 million.

As deal flow increases across the state, focus efforts to drive more of the SIC's Strategic Venture Capital Program investments to New Mexico businesses.

Complementing the focus on early-stage innovation capital, it is recommended that New Mexico help ensure access to follow-on venture funding by leveraging the SIC's Strategic Venture Capital Program. As the pipeline of investable deals increases through the successful implementation of the proceeding recommendations, consideration should be given to ensuring that SIC's Strategic Venture Capital Program has policies and guidelines in place to help make certain that out-of-state capital partners have a meaningful New Mexico connection/presence. It will also be important that these funds seek to build relationships with resident early-stage funds, the angel investment community, and Targeted Industry Centers in order to source deal flow and encourage syndication.

A Call to Action

While there can be no doubt that New Mexico stands out as an R&D powerhouse, there continues to be untapped potential in the state's ability to commercialize its research base into high-growth startups and industrial partnerships.

Across numerous innovation measures, New Mexico consistently ranks behind many of its benchmark states. To reverse these trends, New Mexico must focus on accelerating the number of promising ideas that successfully navigate the innovation continuum, ultimately leading to the location or expansion of existing industry leaders and the scaling of new businesses that sustain their growth as they generate new, high-paying jobs across the state.

Changing the trajectory of New Mexico's economy will require the state to focus its investments on targeted S&T opportunity areas. Much like the state has done for the past 25 years in its successful efforts to target the film and television industry, now is the time to focus state investments on foundational initiatives that will root S&T growth opportunities, which in turn will drive future economic growth. The ability to create the envisioned innovation ecosystem has high stakes for New Mexico's future. First movers in creating next-generation environments focused on these S&T opportunity areas will enjoy disproportionate competitive advantages and economic growth compared with competitors.

Implementation Plan

Based on TEConomy's assessment of the New Mexico ecosystem, and its experience implementing S&T Roadmaps around the nation, Table 3 identifies for each strategy and subsequent actions:

- The classification of **Priority**: critical for those actions that are essential for the success of the strategy, significant for those actions that can make a major impact in advancing the strategy, and important for those actions that can contribute to the success of the strategy.
- The classification of **Timing**: Immediate actions are those that should be undertaken in the first year; short-term actions are those to be undertaken in the one- to three-year period; and mid-term actions are those to be implemented beginning in years three to five. However, a number of actions implemented during the first five years will take a full 10 years or more to begin to see measurable impacts.
- **Resources required** are based on TEConomy's experience implementing economic development strategies around the nation, and is our best estimate based on similar requirements elsewhere. These are simply projections, and absolute requirements will need to be developed by the New Mexico Economic Development Department and other key stakeholders as the S&T Roadmap's initiatives are rolled-out.

TABLE 3. RECOMMENDED IMPLEMENTATION PLAN

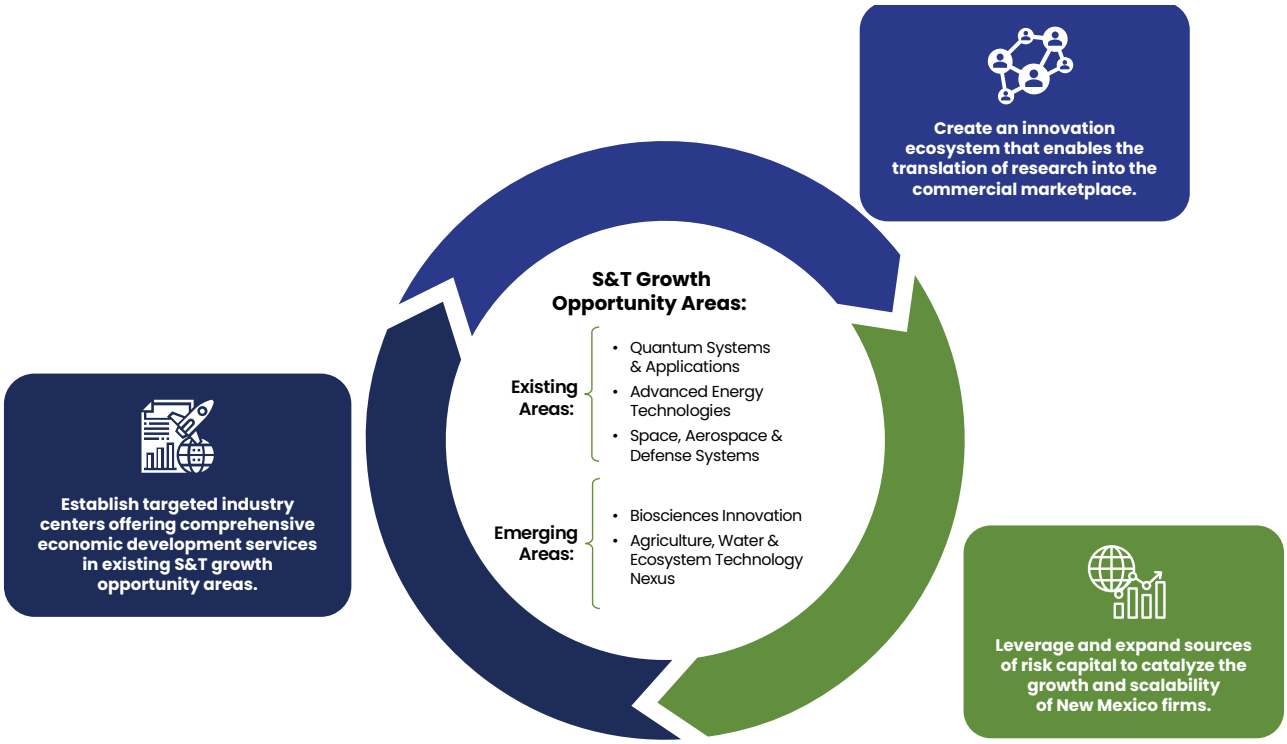
Action	Priority	Timing	Resources Required	
			New Mexico RD&D Fund	Additional Resources Needed
Action 1: Establish Targeted Industry Centers offering comprehensive economic development services for existing S&T growth opportunity areas.				
Create the Quantum Systems & Applications Targeted Industry Center.	Critical	Immediate	$20 m.	Ongoing operating support for first 10 years: $3-$5 per year.
Create the Advanced Energy Technologies Targeted Industry Center.	Critical	Short-term	$20 m.	Ongoing operating support for first 10 years: $3-$5 per year.
Create the Space, Aerospace & Defense Systems Targeted Industry Center.	Critical	Short-term	$20 m.	Ongoing operating support for first 10 years: $3-$5 per year.
Action 2: Create an innovation ecosystem that enables the translation of research into the commercial marketplace.				
Develop a robust statewide commercialization system to build a pipeline of deal flow.	Significant	Immediate	$5 m.	Ongoing operating support: $2-$3 m. per year.
Invest in entrepreneurial support, facilities, and infrastructure capacity.	Significant	Immediate to Short-term	$5 m. for incubators, accelerators, and venture studios. A portion of the $10.8 m. for talent recruitment and retention in high-tech fields should be used for mid-career professionals to support startup growth.	Ongoing operating support: $1 to $1.5 m. per year for each organization supported. $30 million infrastructure fund structured as equity, convertible debt, or debt with warrants depending on individual circumstances of the deal.
Target development of emerging S&T growth opportunity areas.	Important	Short- to mid-term		Depending on the targeted investments made through other means, an additional $10 m. each could be set aside to support the emerging opportunity areas of the biosciences and the agriculture, water, and ecosystem technology nexus.

Action	Priority	Timing	Resources Required	
			New Mexico RD&D Fund	Additional Resources Needed
Action 3: Leverage and expand sources of financial capital to catalyze the growth and scalability of New Mexico firms.				
Leverage and expand sources of nondilutive capital to catalyze the commercialization of new innovations.	Critical	Immediate	$4 m. for science and technology business startup grants. $8 m. for advanced energy grants.	In the future, a total of $10 m. per year in non-dilutive capital is needed to support startups in the three existing opportunity areas through the Targeted Industry Centers. An additional $5 - $7 m. per year in non-dilutive capital should also be made available to support other startups that are not within the existing opportunity areas.
Catalyze additional investment funds across the capital stack.	Significant	Short-term		$50 m in SIC resources, SSBCI resources, or other state appropriations to create pre-seed and seed funds managed by resident private fund managers and associated with the sector-specific Targeted Industry Centers as well as venture studios being created withing the state's identified growth opportunity areas. The investment funds should require a 1:1 match for a total of $100 m in equity available for investment. $25 m. working capital loan fund administered by EDD. Loan fund will finance up to 75 percent of allowable project costs with loans typically ranging in size from $250 k. to $2 m.
As deal flow increases across the state, focus efforts to drive more of the SIC's Strategic Venture Capital Program investments to New Mexico businesses.	Important	Mid-term		SIC resources tailored to help ensure Venture Capital Program investments are targeting New Mexico businesses as deal flow increases.

Conclusion

New Mexico's S&T Roadmap lays out a series of recommended bold actions that, if undertaken, will help foster greater levels of economic prosperity. Generating these outcomes does not happen on its own, but rather through a series of intentional, strategic, and proactive investments. The S&T Roadmap capitalizes on New Mexico's strengths and focuses investments on building the ecosystem that will ensure the state's economic vitality for years to come (Figure 21).

FIGURE 21. NEW MEXICO'S S&T ROADMAP



Source: TEConomy Partners, LLC.

The stakes are high for New Mexico; but, by targeting investments in existing S&T growth opportunity areas, creating a robust innovation ecosystem, and leveraging and expanding sources of financial capital, New Mexico can turn its robust base of research into economic growth.

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