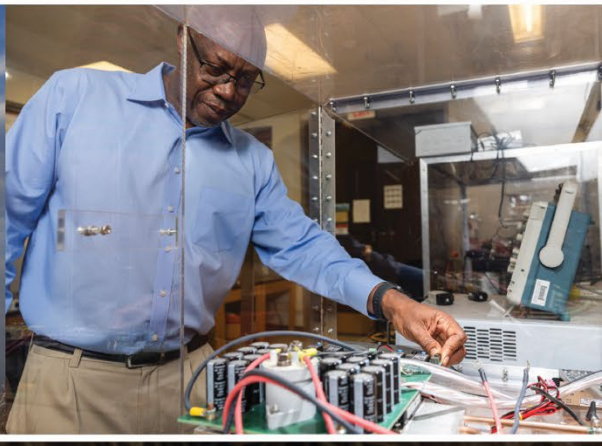
TEXAS TECH™

STRATEGIC RESEARCH & INNOVATION PLAN



FROM HERE,
IT'S POSSIBLE.™

VISION:

By 2035, Texas Tech University will be in the top cohort of U.S. public research universities, achieving membership in the Association of American Universities (AAU).

Texas Tech University is committed to fulfilling the aspirations of the State of Texas to have more public universities in the top tier of national research universities, serving the future needs of the citizens and businesses of the state by creating the nation's premier skilled workforce to support a flourishing high-tech economy, fostering a thriving cultural environment for all citizens, supercharging technological innovation and attracting and retaining industry-leading partners in energy, the information economy, health care, national defense and agriculture.

PRIORITY:

Texas Tech Strategic Plan (2025-2030)

Texas Tech is currently developing a comprehensive institutional strategic plan for 2025-2030 focusing on three intimately entwined strategic priorities that are emblematic of Texas Tech's inherent characteristics:

1. Educate and empower a dynamic student body.
2. Develop, catalyze and promote innovative research and creative activities.
3. Transform lives and communities through strategic outreach and engaged scholarship.

Our plans to enhance the institution's research enterprise will also support our success in achieving all the strategic priorities and goals of the strategic plan.

HISTORY:

Texas Tech, the flagship institution of the Texas Tech University System, is a comprehensive public research university. Since its founding in 1923, Texas Tech faculty, staff, students and alumni have built a strong foundation for world-class research. With an enrollment of more than 41,000 students, the university offers more than 150 undergraduate majors, over 100 master's programs, and 50 doctoral degree programs. The university enrolls students from almost every county in Texas, all 50 states and more than 100 foreign countries. In 2015, Texas Tech achieved the highest level of Carnegie-classified designations, Very High Research Activity, for doctoral granting institutions.

With a $3.5 billion statewide economic impact, Texas Tech has a proven track record of producing significant returns on state investments, leveraging the National Research University Fund and CORE investments to dramatically increase the scope and impact of the university's research enterprise. For example, in 2024 Texas Tech achieved a record total research expenditures of $256.9 million, more than double the university's total research expenditures in 2009. Texas Tech also set records in 2024 for total external research awards ($105.9 million), total federal research awards ($83.5 million), total federal and private research expenditures ($90.4 million), and total federal research expenditures ($62.8 million). In particular, Texas Tech's federal research expenditures have increased by 90 percent over the past 5 years.

Passage of the Texas University Fund (TUF), a $3.9 billion endowment established by the Texas Legislature, provided an additional $23 million of annual resources to Texas Tech to invest in growing its research enterprise in 2024. Current and emerging research emphases include water sustainability, human biology, materials science, microchip manufacturing, food safety and security, cyber-physical national security, biomaterials, severe weather, crop genomics and energy innovation. Thus, Texas Tech has a tremendous opportunity to expand its contributions to regional, state, and national economic vitality, security, and quality of life.

DRIVERS OF TEXAS TECH'S HISTORICAL SUCCESS IN RESEARCH AND INNOVATION:

STATE SUPPORT. Beginning with the investment of funding that the State Legislature established in 2009, Texas Tech strategically invests state resources to leverage excellence in research, scholarship, and creative activity.

PEOPLE. Texas Tech's faculty is composed of outstanding researchers, scholars and creators. The university hosts and supports trailblazers in the humanities, social sciences, arts, sciences, agriculture and engineering. The accomplishments of these individuals contribute to a dynamic research environment throughout the State of Texas and the nation. Texas Tech attracts graduate and undergraduate students of unparalleled quality, thereby developing the next generation of investigators, scholars and leaders.

GEOGRAPHY. West Texas is a microcosm of the challenges and opportunities facing the world this century. Texas Tech's location in West Texas provides a rich laboratory for studying social and community welfare, sustainability, economic development and growth, and national and economic security. The center of one of the world's greatest agricultural and energy producing region, West Texas must serve the needs of rural communities while adequately stewarding scarce natural resources.

I. Plan to Elevate Research Enterprise at Texas Tech University

a. Goals and priorities. Define and describe the institution's priorities for research, development, and innovation. How will the institution advance these priorities? For example, how do centers and institutes at the institution support these priorities?

Texas Tech is prepared to move to the next level of national leadership in research, scholarship and creative activity by achieving the following objectives by 2035:

- Achieve eligibility for membership in the Association of American Universities (AAU), the most impactful organization of top public and private research universities in the world.
- Exceed $500 million in Total Research Expenditures and $200 million in Federal Research Expenditures.
- Double both our researchers' citation rankings for journal articles and the number of monographs/books published by Texas Tech scholars each year.
- Expand our doctoral programs to produce annually over 500 Ph.D. graduates.
- Increase our license revenue and startup company formation five-fold.

Key to this effort will be ensuring that the stewardship and allocation of the Texas University Fund and other institutional resources are targeted to strategically grow the number of tenured and tenure-track faculty researchers, leverage the impact of state and university support for research by a factor of at least five, expand our doctoral education programs and expand and extend the impact of the university's innovation and entrepreneurship programs. Thus, during the next five years Texas Tech's efforts will focus on the following strategies:

1. FOCUSING STRATEGIC INVESTMENTS IN TEXAS TECH'S AREAS OF RESEARCH EXCELLENCE:

After a year of consultation and input from faculty and academic leaders, Texas Tech identified ***five Research Themes that represent areas where Texas Tech's researchers, scholars and creators are already creating world-class impact for critical global challenges of this century***. Simultaneously, these themes represent areas where Texas Tech can continue to make important contributions to the economic well-being, quality of life and sustainability of our region and state. By focusing new research investment in these areas, Texas Tech is building focused scholarly excellence and is receiving national and global recognition of our unique strengths. The following are brief descriptions of each of these five **Research Themes.**

1.1. Powering Our Future. Power, provided by traditional sources and renewable technologies, is a critical part of the economy and culture of West Texas, the world's top producer of petroleum and natural gas and a national leader in the generation of wind energy. Texas Tech researchers are addressing technological challenges to ensure the sustainability of these resources and continue developing innovative technologies for optimizing oil and gas extraction from reserves in our state. Additionally, investigators are exploring uses for new oil byproducts and gas production techniques, including ways to treat, conserve and reuse water produced from hydraulic fracturing. As a leader in renewable energy research, Texas Tech's researchers are developing new models for integrating periodic energy sources like wind and solar electricity into a stable energy grid, so Texas communities and businesses can sustain energy security during regional transmission interruptions.

1.2. Systems Adaptability and Resilience. West Texas is a laboratory for studying and managing the challenges that severe weather can exert on human populations and communities, agricultural systems and the broader environment. Texas Tech researchers have been international leaders in the study of severe weather. Future investments will enhance our ability to study and predict regional and local impacts of severe wind, drought and flooding events. Our researchers from engineering, arts and sciences, and agricultural sciences are forging new paths towards sustainability through interdisciplinary water research. The economic vitality of Central Texas is critically dependent on non-agricultural and recreational uses of land and water resources. Texas Tech research in range management is identifying challenges and developing solutions to ensure the resilience of these regions. Our plant genomics research is focused on producing new crop varietals that will tolerate a broad range of environmental stresses including wind and variations in the quantity and quality of water. Given the characteristics of our geographical location, Texas Tech is dedicated to helping our region assure future adaptability and resilience.

1.3. Urban and Rural Development. Communities throughout West Texas provide the energy, food, and fiber on which much of Texas' economic vitality depends, yet many rural communities face systemic challenges threatening sustainability and quality of life. Texas Tech is engaged in creating the next generation of crops to ensure enhanced yields and resilience in the face of increasing natural resource limitations. Researchers are generating new varieties of cotton, sorghum, soybeans and other crops including hemp that will be essential for future economic vitality. Our faculty are investing in new technology for water sustainability to ensure the stewardship of our water resources and to identify uses for marginal water resources for agriculture, industry and community utilization. Precision farming and new engineering strategies for optimizing agricultural production are contributing to potential solutions to these challenges. Despite being a source of nutrition for the state and nation, many rural communities struggle to provide adequate nutrition, mental health services and interventions for chronic diseases. New academic leadership in agriculture, health and human sciences and engineering, is fostering creative

research collaborations offering solutions for rural communities. Texas Tech is committed to further investment in research helping rural communities thrive.

1.4. Advancing One Health. The health, economic vitality and culture in West Texas is supported by close interactions involving humans, domestic, wild and invasive animal species, and both naturally occurring and agricultural plant systems. Texas Tech established itself as a world leader in One Health research with the nation's first Ph.D. program in One Health Science in the School of Veterinary Medicine. Texas Tech has enormous potential to grow our portfolio of National Institutes of Health (NIH) funding for basic health-related research. Texas Tech's colleges of engineering, agricultural sciences and natural resources, arts and sciences, health and human sciences and veterinary medicine are all engaging in fundamental research related to: increasing nutritional impact, preventing infectious disease that can threaten animal and human health, monitoring and preventing the spread of prion-based disease in animal populations, studying the molecular basis for aging, examining factors that support human cognition and enhancing environmental health as a strategy for supporting a more vibrant agricultural economy and enhancing the quality of life for citizens. Texas Tech's strengths in areas such as environmental monitoring and assessment, communicable disease, plant health and genomics, and basic life science research position the university to significantly grow in this area of research. In our efforts to grow this support, we have a natural ally in our sister campus, the Texas Tech University Health Sciences Center (TTUHSC). Both our campuses in Lubbock and our School of Veterinary Medicine in Amarillo, Texas have major TTUHSC research units in close proximity. Investment in these activities will help build our plan to advance One Health research.

1.5. ***Strengthening National Security.*** The security of the nation's critical infrastructure has become a central national priority in the face of threats of economic blackmail and strategic interference from nation-state actors. Aside from the monetary impact of cyberattacks on data archives, the disruption of critical infrastructure that supports national defense, power generation and energy distribution, communication, water systems, food security, banking, and other key societal functions is viewed as a major vulnerability in national security. National security threats are becoming more immediate and will continue to evolve at an increasing pace. Texas Tech is a leader in cyber-physical security, which is critical for protecting civilian and military critical infrastructure from intrusion and damage by nation-state adversaries. Texas Tech is producing the next generation of ultra-high bandgap semiconductor devices, energy projection systems and novel energetic and propellant materials. These research areas serve our national nuclear defense, existing Department of Defense (DOD) defense systems and future technologies dependent on hypersonic technology. We continue to invest in research that focuses on strengthening our nation's security.

2. EQUIPPING AND EMPOWERING FACULTY LEADERSHIP IN RESEARCH THROUGH INVESTMENTS USING TUF FUNDING:

Texas Tech is focusing strategic investments supported by TUF and other internal resources to drive our progress toward achieving AAU membership. AAU defines its primary role as the key organization focused on helping to shape national higher education policies regarding science and engineering research, innovation, scholarship, and graduate and undergraduate education by the leading research universities in North America.

For these reasons, the focus of future Texas Tech strategic investments will align with growing our strengths in research to attain the critical metrics (indicators) consistent with the scale and reputation of research, scholarship and creative activity found in AAU public member universities. Consequently, Texas Tech will concentrate on investments that enhance our national standing in the four primary and three secondary indicators employed by AAU in evaluating the ongoing status of their own membership institutions, namely:

AAU Phase 1 Indicators

- Federal/Total Research Expenditures
- Scholarly Citations
- Scholarly Monographs
- Prestigious Faculty Awards

AAU Phase 2 Indicators

- State, Directed Federal, and Industry Research Expenditures
- Ph.D. Degrees Granted
- Postdoctoral Appointees

Prior to the addition of TUF funding, ***Texas Tech had undertaken a program of major strategic investments in focused research thrusts*** to substantially raise Texas Tech's competitiveness for external sponsored project funding in areas of existing research activity, new core of researchers in areas complementing existing research strengths, or those generating a new research focus in a nationally competitive area of research and creative activity. Texas Tech's recent strategic investments have often involved the addition of multiple new faculty lines focused on specific research areas intended to broaden the submission of individual external sponsored project proposals and enhance the competitiveness of larger, programmatic multi-investigator proposal submissions. In addition to allocating salaries to support these new faculty hires, the proposals provide startup funds to successfully transition faculty into the Texas Tech research environment and provide support for individual and shared state-of-the-art instrumentation. As a result of this process, commitments of approximately 30 new faculty lines have been made in six Texas Tech colleges and schools—arts and sciences, engineering, health and human sciences, agricultural sciences and natural resources, media and communication, and veterinary medicine. A rigorous internal evaluation process was established for refining the structure and budget of these strategic proposals to ensure significant returns on investment. These processes have been refined over the past two years and are now applied to strategic investments involving the new TUF resources.

Proposals for TUF investment can originate from the leadership of university academic units, teams of faculty focusing on specific research themes or university offices seeking to enhance scholarly activity through the development of new structures to support research, scholarship and creative activity. Consequently, proposals can request investments to enhance specific areas of research and scholarly activity, provide new tools and resources to enhance research or develop services to support specific needs of scholarly communities.

TUF investments must recognize that building the Texas Tech research enterprise to a level competitive with aspirational AAU peers requires faculty to embrace this mission and the institution to provide sufficient support so that faculty are successful in executing their research. In addition to the colleagues, equipment and world-class research spaces required for this transformation, Texas Tech must offer support services necessary to elevate faculty research activity. We anticipate that, over time, the cumulative investment from TUF resources will be organized as follows:

2.1. New faculty lines invested in strategic research areas: approximately 40 percent of TUF support.
Increasing overall Texas Tech research activity and the competitiveness of specific research teams depends on broadening the faculty expertise in these areas and in raising the national and international visibility of our research efforts. Adding tenured and tenure-track faculty in specific strategic areas will increase the number of proposals submitted annually and enhance the competitiveness of proposals submitted by our existing faculty cohort. With the additional support provided by TUF, Texas Tech has the potential to add 65 new faculty lines over the next five years and leverage TUF funding with unique resources provided by state and philanthropic agencies including the Welch Foundation, Cancer Prevention and Research Institute of Texas (CPRIT), Governor's University Research Initiative (GURI), and Texas Semiconductor Innovation Fund (TSIF).

2.2. Supporting equipment, new instrumentation and core facilities that directly sustain research: approximately 25 percent of TUF support.
Adding new research capacity by creating a core research facility, providing new instrumentation, or upgrading existing equipment can magnify research impact by elevating the research of multiple investigators working on related problems. Texas Tech will use TUF funding to support these types of investments, particularly those that amplify our assets in identified strategic foci.

2.3. Additional staff conducting essential research functions including pre-award support, post-award financial management, security and export controls staff, and research construction project management: approximately 25 percent of TUF support.
Growing the number of proposal submissions and amount of external (particularly federal) sponsored project funding, increasing sensitive and classified research and producing nationally competitive multidisciplinary grants require increased staff to support these activities and bring new specialized skills to support our research. Texas Tech has traditionally operated at a deficit of staff support in many of these areas, making investments in research support functions critical for sustaining research activity growth.

2.4. Faculty enhancement and retention resources: approximately 10 percent of TUF support.
Hiring and mentoring the best possible faculty researchers only pays dividends for the institution if we are able to retain these faculty as they grow in national prominence and scholarly achievements. Consequently, we believe it is essential to designate significant TUF support to enhancing faculty advancement and professional growth, assisting faculty in developing portfolios for national and international honorific and prestigious awards in recognition of their scholarly activity, and retaining the best faculty at Texas Tech.

3. TEXAS TECH'S CONTINUED FOCUS ON THE ROLE OF UNIVERSITY CENTERS AND INSTITUTES:

Texas Tech plans to ***use the strategic investments made using TUF resources to reinforce the strengths of existing university research institutes or seed the formation of new comprehensive research institutes***. Our goals are to create largely self-sustaining, multi-disciplinary scholarly communities led by Texas Tech investigators and new faculty leaders recruited using TUF funding and support from other state and federal initiatives and stakeholder awards. Independent centers and institutes operating at the highest levels of scholarly activity in areas eligible for substantial sponsored project funding should aspire to involve teams of 20 to 40 faculty members and have annual sponsored project funding exceeding $20 million per year.

Texas Tech expects our university centers and institutes to embody common characteristics that provide value for participating researchers and the university community and provide an efficient vehicle providing necessary services and support for faculty working on common research topics. University institutes are by nature multidisciplinary and focus on unique research thrusts differentiating them from national competitors. They create intellectual communities that transcend academic and departmental units and allow researchers to make unanticipated and new strides in research and scholarly activity. These include the equipment, instruments, world-class research spaces, and highly trained staff to contribute to a vibrant research environment, and skilled administrative support that reduces the time researchers devote to administrative oversight of their programs.

Texas Tech has made critical investments in recognized nationally and internationally prominent research centers and institutes. Examples of these include:

The National Wind Institute. Over the last 50 years, the National Wind Institute (NWI) has evolved from a singular focus on wind hazards to the three main research pillars of Energy Systems, Atmospheric Measurement & Simulation, and Wind Engineering. Their unified mission is to benefit communities with applications having regional and localized impact. NWI is leading research in areas such as Phasor Measurement deployment, renewable energy, grid integration, microgrid design, simulation and development and distribution generation modeling and design. The Atmospheric Measurement and Simulation pillar has built a foundation of multi-scale measurement and simulation capabilities linking atmospheric science to critical economic drivers such as architectural design and engineering, agriculture, water sustainability, rural community resilience, and health. The Wind Engineering Pillar of NWI seeks to advance the understanding of wind, its interaction with the built environment, and the impact of this interaction on society.

The Center for Pulsed Power and Power Electronics (P3E). A unique resource among academic engineering research programs, Texas Tech's pulsed power research involves storing, shaping, transmitting and measuring high voltage, high current pulses with the goal of delivering electrical energy to a load or applicator. The energy is transferred in short pulses enabling a variety of applications such as food treatment and sterilization, high power microwave generators, particle accelerators, lightning simulation, industrial, manufacturing technology, etc. The voltages and currents involved may be in the Mega-Volts and Mega-Ampere range, and on a time scale as short as the sub-nanosecond regime. P3E engineers and scientists investigate the behavior of materials under extreme high electric field stress and electric current densities. Uncovering the underlying physical mechanisms enables the development of advanced high voltage pulse systems and components such as wideband semiconductor switches.

The Fiber and Biopolymer Research Institute (FBRI). Texas Tech is committed to serving the research needs of university researchers, cotton breeders, public agencies, and textile manufacturers. FBRI's mission is to be an international leader in (1) research and technology transfer in fibers and textiles;

(2) academic and professional education; (3) testing, evaluation and consultation related to fiber and textile product properties; (4) development of textile testing methods and instrumentation; and (5) textile manufacturing and bioproducts development. FBRI is recognized as an international leader in research and technology transfer in fibers and textiles.

The Combustion Laboratory. The Combustion Laboratory conducts research in energetic materials. Its most current research involves quantifying and qualifying differences between the properties of nano- and micron- scale thermite powders. The Laboratory's vision is to promote the use of energetic materials through an understanding of basic combustion and energy transfer behaviors. The team leads in the discovery, innovation, and advancement of science and technology for improvement of our way of life. Their research goals are to explore ignition, burning behavior and reaction mechanisms of composite energetic materials.

The Center for Nanophotonics. The Center for Nanophotonics conducts research and development on manipulation of photons-electrons in nano-scale materials for innovative photonic devices and emerging technologies. The Center's research areas cover a broad spectrum, ranging from basic to applied, and dealing with state-of-the-art nano-scale material synthesis, fundamental physics, device fabrication and testing. In particular, the Center's research is dedicated to the advancement of III-nitride wide bandgap semiconductors (BN, GaN, AlN, AlGaN, InGaN, and InAlGaN). These materials have contributed on the grandest scale to many technological advances including UV/blue/green/white LEDs, solid-state lighting, UV/blue/green laser diodes, UV/visible detectors, and high temperature/power transistors.

Investments in research themes representing entirely new scholarly initiatives will be organized as independent "startup" institutes, while investments related to established institutes will be incorporated under the administrative umbrella of those existing units. Initial budgets for new investments will include support for the faculty lines, startup, renovation, and instrumentation requested in the strategic initiative proposal. As these research teams and their portfolio of funded research grow, we expect their needs for administrative support and research development to expand. Budgets for these centers and institutes will grow as their portfolio of funded research expands and shrinks as their research footprint decreases in size. Each center/institute is assigned an oversight committee to review unit progress and provide annual progress reports to Texas Tech's Office of Research & Innovation (OR&I). All major university centers/institutes undergo a review by a committee of both internal and external reviewers every five years.

4. EXPANDING THE SCOPE AND IMPACT OF TEXAS TECH UNIVERSITY'S WORLD CLASS INNOVATION AND ENTREPRENEURSHIP PROGRAMS:

The Innovation Hub at Research Park (the Hub) provides access to education and resources for venture development and creation for students, faculty/staff, alumni and entrepreneurs at Texas Tech. The mission of the innovation and entrepreneurship programs housed at the Innovation HUB is to create a more innovative campus and community by exposing all faculty, staff, students, and alumni to the entrepreneurial mindset. We introduce the basic concepts of innovation (problem definition, idea generation, customer engagement) while participants learn the basics of entrepreneurship (team formation, leadership, finance, intellectual property, manufacturing, commercialization). The programs offered at the Hub focus on three areas: *ideation, commercialization, and acceleration*.

Ideation. Support of early-stage ideas, creative and innovative research is accomplished in ideation programs. These programs focus on the next steps in taking an idea and making a real product. Learning outcomes include idea presentation, team formation, customer discovery and developing a value proposition.

- Red Raider Startup is a weekend program focused on idea generation/pitching, team formation, and customer discovery allowing students to get hands-on experience forming a team around an idea and pitching to a panel of "Sharks."
- Hub Camp is a business planning seminar held twice annually. The Hub Camp is a business plan workshop taught by expert iTTU Mentors and provides attendees with tangible resources for assembling a competitive business plan.
- iLaunch Competition is an annual pitch competition to identify, grow, and launch startup companies
- Faculty C-Startup is a program through which faculty ambassadors recruit students to programs and it provides grants to encourage faculty to teach students about starting businesses. Discoveries to Impact Conference (DTI) occurs annually and highlights the wide range of research, innovation, startups, and engagement occurring at Texas Tech University and in the West Texas community. DTI is a week-long event that includes an undergraduate research conference, engaged scholarship symposium, innovation poster showcase, keynote speakers, panels, and the Texas Tech Accelerator Competition. All these activities are currently funded through Lubbock Economic Development Alliance (LEDA).

Commercialization. Commercialization programs at Texas Tech focus on nascent startups with technologies that need to develop an alpha product with intent for commercial use. Initial validation and assessment of product-market fit is emphasized to facilitate market entry. The Prototype Fund, a precursor to a Proof-of-Concept fund, allows support of initial concept development for teams to create an initial prototype. The Texas Tech Innovation Hub partnered with LEDA to establish the Prototype Fund to further the development of startups participating in Hub programs. This competitive program empowers entrepreneurs to create a minimum viable product (MVP), or prototype based on NSF I-Corps recommendations.

- National Science Foundation (NSF) Innovation (I-) Corps™ is a training program focused on customer discovery to support and accelerate commercialization of scientific and technological innovations through market validation. We are in our seventh year of training cohorts in the NSF I-Corps program. Texas Tech has just been selected as a new partner for the NSF I-Corps West Hub, hosted by USC and UCLA. Texas Tech will join several other leading institutions, including the University of Colorado Boulder, Colorado State University, California Institute of Technology, the Colorado School

of Mines, The University of New Mexico, the University of Utah, University of California-Riverside, and University of California Santa Barbara.

Acceleration. Acceleration programs were developed to quickly move teams who have technology through commercialization and to support them through company formation, industry connections to the market, product testing, and initial customer revenue. The Texas Tech Accelerator, supported by the LEDA for the last five years, is a full year accelerator providing twelve seed stage startup grants of $25,000 annually. Program milestones include MVP, revenue, and company formation. Teams meet weekly with assigned mentors, then pitch at a Demo Day at the end of the year. Currently, the Accelerator is open to all who apply – faculty, students, alumni, and community members.

- Innovate TTU Mentor Program (iTTU) provides support for mentoring and training and is based on the MIT Venture Mentor System.

- The President's Innovative Startup Award is a $50K award (currently awards a total of $100K per year). The Office of the President of both Texas Tech University and TTUHSC provide this award to recognize the top startups annually that exemplify innovation and commercialization. The award allows teams to pay rent on the Innovation Hub space, buy equipment and supplies for prototype creation and travel to perform customer discovery.

SUMMARY OF ANTICIPATED OUTCOMES

We expect the growth of Texas Tech's research enterprise during the next five years will lead to long term results with national and global impact that will manifest themselves in the following outcomes during the first half of this century:

National and international recognition for excellence in research, scholarship, and creative activity

- Be a primary force in research and creative activity throughout the region and State of Texas.
- Become an acknowledged world leader in crop and animal science innovation.
- Establish ourselves as a world leader in energetic materials, next generation semiconductors, and sustainment science for national defense.
- Attain recognition as a visionary in materials and systems that support next-generation energy production and transmission.
- Achieve national leadership recognition in the measurement and prediction of atmospheric phenomena.
- Develop new strategies ensuring sustainability and expansion of surface and ground water resources.
- Grow our national reputation for excellence in entrepreneurship education and startup formation.

An engine for developing the high-technology workforce of the future

- Maintain our role as a primary force in providing talent to serve national security and defense, agricultural innovation, and microprocessor design, and expand our footprint in serving needs in human and animal health, food production, and next-generation energy systems.

A magnet for the highest quality students, faculty and staff for Texas Tech

- Become a primary driver of faculty and staff recruitment.
- Be perceived as a primary value-add for undergraduate matriculation.

A financial resource for Texas Tech University

- Leverage research investments on a 1:4 basis.
- Grow the research and innovation enterprise to encompass one third of Texas Tech's budget.

A catalyst for partnership creation

- Retain our status as a nationally recognized leader in innovation.
- Become the sought-after convener of public/private sector partnerships in the State of Texas.
- Expand our role in the economic development of Texas.

I. Plan to Elevate Research Enterprise at Texas Tech University

b. Collaborations and partnerships. How does the institution foster cooperative efforts amongst faculty across disciplines at the institution? Does the institution collaborate or partner with other Texas institutions? Describe any existing partnerships with Texas institutions or other entities, as appropriate.

Internal and External Partnerships Driven by Texas Tech Strategic Research Planning and Texas University Fund (TUF) Investment Policy

The third strategic priority of Texas Tech University's 2025-2030 University Strategic Plan focuses on transforming lives and communities through strategic outreach and engaged scholarship. Our vision is that all strategic research investments have a pathway for building partnerships that serve their research mission, benefit Texas citizens, and build private sector investment in our region. Over the past five years, we

have developed several best practices in creating and sustaining research partnerships that serve the state and the nation. Some examples of these partnerships include:

- **Texas Tech's STEM Center for Outreach & Engagement (STEM CORE)** has developed a strong partnership with school districts and communities across the South Plains, providing opportunities like STEM Traveling Labs, high school student research, nutrition programs, STEM challenges and summer day camps.

- Researchers are also pursuing external awards that strengthen partnerships with other Texas institutions and industries while providing enhanced training opportunities for students and current professionals. Texas Tech leads the **West Texas Cyber Workforce Development Consortium**, comprised of West Texas A&M University, The University of Texas Permian Basin, industry leaders and regional electric service providers. Faculty across the institutions have collaborated to create a free, comprehensive Critical Infrastructure Training Program funded by the National Institute of Standards and Technology (NIST) Regional Alliances and Multistakeholder Partnerships to Stimulate (RAMPS). More than 200 professionals and college and high school students participated in the program.

- Awards from the DOD and Office of Naval Research have also funded partnerships for advancing training and research in areas of combustion, energetics and cybersecurity. Partner institutions include Angelo State University, The University of Texas San Antonio, Amarillo College, Sandia National Labs and Pantex.

The industry partnership coordinator in the Center for Advancing Sustainable and Distributed Fertilizer Production (CASFER) has secured 10 corporate partnerships, including a Fortune-500 firm, for the CASFER industry research consortium. Industry liaisons for the Institute for Genomics of Abiotic Crop Stress Tolerance (IGCAST) have successfully bid for Texas Tech to host the 2026 Global Sorghum Conference for the first time in the U.S. and have developed a new strategic plan to translate IGCAST genetic discoveries into future products.

National Security Partnerships. Texas Tech University has a long history of collaborations with agencies and laboratories in both the U.S. ~~(~~DOD~~)~~ and the U.S. Department of Energy (DOE). Researchers in Engineering have long-standing collaborations with DOE's Pantex Plant and with Sandia National Laboratories. Similarly, we have historical collaborations with the U.S. Army, having hosted two Army Research Laboratory employees on the Texas Tech campus and currently having six Texas Tech employees as Interagency Assignment Personnel located at Redstone Arsenal in Huntsville, Alabama. Researchers in aerospace engineering, artificial intelligence and machine learning have a multi-year project to assess equipment fatigue in extreme flight conditions, and we have among the nation's best research in energetic materials and power projection systems. Our recent work in Cyber-physical Security is gaining interest from the Army and Air Force, multiple federal intelligence agencies and other federal partners under the Department of Homeland Security. Army Futures Command, located in Austin, Texas, is currently sponsoring Texas Tech's expansion of our sensitive research to encompass classified research in critical infrastructure security, power electronics and energy projection, and energetic materials research.

One Health Partnerships. During the 2020 pandemic, our Centers for Disease Control and Prevention (CDC) funded Laboratory Research Network unit became the first laboratory in the state to provide reliable COVID testing for over 70 surrounding counties. This past year, our researchers were the first to confirm the spread of the H1-N1 Avian Flu virus to a dairy worker in West Texas. We are confident that we have the talented researchers and focus to partner with local, regional, and state health care authorities.

Efforts on the TTUHSC campuses to grow translational research and the basic human biology research on the Texas Tech campus could mutually reinforce investments to grow human health related research. This potential synergy has been recognized by the campus Presidents and the Texas Tech University Board of Regents, so efforts to create closer collaborations have been underway over the past two years.

Agricultural Technology Partnerships. Texas Tech University has a long-standing partnership in agricultural innovation with BASF, Inc. (and its corporate precursor on the partnership Bayer, Inc.). Funded by a $10 million contribution, this partnership has focused on funding joint Texas Tech/corporate research projects related to plant genetics, precision agriculture, value-added agricultural processing, water resilience and other areas of collaboration. This partnership has been enhanced by the presence of a major BASF agricultural research facility on the Texas Tech campus which was recently expanded to create a jointly funded research collaboration with USDA. For the past two years, Texas Tech and USDA scientists have proposed research projects, capped at $100,000 total contribution, to extend university collaboration with projects relevant to USDA researchers.

Given the centrality of cotton production to the West Texas economy, Texas Tech has a thriving relationship with Cotton, Inc. Recent research focuses on the development of new high-strength cotton fiber varieties to support greater automation in textile production, methods for improving fiber yields, and strategies for water conservation in cotton production. Our research in identifying naturally occurring plant traits that can increase crop resilience in the face of severe heat, cold, and variable water availability are attracting interest from a range of partners, including Bayer, BASF, and Innoveins Seed Solutions, three of the world's largest germplasm producers. Our research growth in sorghum and forage sorghum has resulted in substantial new investments and sponsored research projects from the Texas Grain Sorghum Association located in Lubbock.

Texas Tech Economic Development Partnerships. A key component of growing Texas Tech's translational research capacity has been our partnership with the Lubbock Economic Development Alliance (LEDA). In October 1995, Market Lubbock Economic Development Corporation was formed to contract with the city as a not-for-profit economic development corporation. In 2003, the city of Lubbock decided to enhance economic development, job creation and capital investment by funding economic development activities through the collection of 1/8 of one percent of the city's sales tax allocation. LEDA has been an integral partner in the development of the Innovation Hub and has funded key programs (including the Texas Tech Incubator, the Discoveries to Impact Conference and others) to help develop startups that would stay and grow in the community. Recently, LEDA increased its direct support for Texas Tech innovation and entrepreneurship programs by 60 percent, providing over $500,000 per year to expand programs serving the university and Lubbock communities.

Our goal is to create sufficient interest from affiliated venture funds, industry partners and commercial organizations to allow external funding of most, if not all, of the innovation programs that we develop. We already have identified three venture funds (Innosphere, Hub Fuel Fund, Generation Food Rural Partners (GFRP) fund) and several industry partners.

Innovation and Entrepreneurship Stakeholder Engagement. Closely linked to community engagement efforts for Texas Tech University, the Innovation Hub's contribution to our external engagement includes the following:

- Lubbock Angel Network (LAN) provides seed funding and capital for innovative startups in West Texas and beyond. LAN is the only form of privately organized capital for venture investing in Lubbock.

- Entrepreneur Socials is a networking event held every other month at the Texas Tech Innovation HUB at unique and intriguing locations in the community. Connections are made with students, mentors, and industry leaders to create a culture of innovation and entrepreneurship in West Texas.
- The Tech Hub Entrepreneur Texas Tech Alumni Association Chapter was developed in partnership with the Texas Tech Alumni Association to recognize Texas Tech alumni and connect them with the university in a meaningful way to support our entrepreneurship and innovation initiatives.

I. Plan to Elevate Research Enterprise at Texas Tech University

c. Economic impact. How does the institution plan to strengthen its ability to understand, explain and improve the economic impact of research? Are local or regional economic priorities emphasized? How does the institution characterize its economic impact on the region and state?

Intellectual Property Protection and Commercialization

The Office of Research Commercialization (ORC) has overall responsibility for identifying and protecting Intellectual Property developed by researchers on all Texas Tech University System (TTUS) campuses and establishing terms for partnerships with industry that will translate TTUS research into impactful commercial applications. For three consecutive years, the ORC executed over 30 technology license agreements—a nearly 50% increase compared to previous years. Patent filings also reached a historic high, reflecting a surge in invention disclosures by TTUS faculty, spurred by increased research expenditures. The following are some historical comparisons of recent office activity:

Texas Tech's Yearly Metrics	FY21	FY22	FY23	FY24
Invention Disclosures	103	110	122	131
Provisional Patent Apps	34	40	50	58
Non-Prov. & Int'l Filings	100	68	97	68
US Issued Patents	19	25	22	19
Licenses Signed	20	36	30	31
License Revenue	$ 564,450	$ 1,198,875	$ 1,001,440	$ 702,231

A strategic expansion and restructuring occurred within the ORC in FY24 given that our patent portfolio expanded by over 300% in recent years. A new position as Managing Director for Intellectual Property was created, and two new licensing associates were hired to manage the growing level of faculty engagement generated by the higher rate of inventions disclosed and increased industry and startup engagement.

Texas Tech operates the Texas Tech Innovation Hub, a 40,000 sq. ft. accelerator/incubator that serves as home to the Texas Tech technology commercialization infrastructure. This includes the Innovation Hub, the Office of Research Commercialization, and the Institute for Small Business (including the Northwest Texas Small Business Development Center). Texas Tech's existing infrastructure demonstrates our capabilities in research translation. Current programs reach out to all people in all areas of the university and community.

Texas Tech Research Park. The Texas Tech Research Park (TTRP) is a 501c(3) organization formed in 2020 to assist in management of the business components of the innovation district in Lubbock, and is located in a 45-acre site, adjacent to the Innovation Hub and across the street from TTUHSC. The non-profit organization provides an easier pathway to execute contracts and engage in corporate and private partnerships to advance research and innovation.

II. Plan to Increase Research Funding and Productivity at Texas Tech University

a. External funding. How does the institution plan to increase private and federal research expenditures? How does the institution plan to increase industry sponsored research (e.g., number of industry contracts and industry-sponsored research funding)?

Given Texas Tech's stated aspiration of achieving AAU eligibility for membership by 2035, we have established the following targeted outcomes which are consistent with the characteristics of AAU member institutions.

Texas Tech's AAU Metrics	**2025**	**2035**
Federal Proposal Submissions	1,014	2,500
Federal Research Expenditures	$64.9M	$200M
Total Research Expenditures	$268.2M	$500M
Annual Citations	52,010	90,000
Books Published	26	46
Ph.D. Degrees Granted	446	550
Postdoctoral Appointments	100	125

Texas Tech's primary plan for achieving these outcomes and growing research expenditures is to continue investments in expanding strategic faculty teams in our five strategic research themes. We expect TUF-supported initiatives in these areas to become highly competitive for federal research funding and grow strong corporate and community research partnerships. These investments will follow our previously stated focus of our TUF investment strategy for expanding our cohort of talented faculty researchers and retaining Texas Tech's existing productive scholars over the coming five years, investing in new instrumentation, equipment and research services that will increase the competitiveness of Texas Tech research, and streamline research administrative support to allow faculty more time to concentrate on their research, scholarly and creative activity.

EXAMPLES OF RECENT INVESTMENTS IN STRATEGIC RESEARCH PARTNERSHIPS

Advancing One Health

Investments in the Institute for One-Health Innovation:
The Institute for One-Health Innovation (IOHI) is fostering collaborative research among Texas Tech and TTUHSC researchers, with the goal of dramatically expanding health-related funding on both campuses. IOHI has held cross-institutional collaboration workshops in four focus areas related to human and animal health: cancer biomedicine, cognitive health, infectious disease, and metabolic and chronic diseases. The Institute has already seeded three $100,000 multi-institutional research collaborations. The Institute is the focus of a $200 million legislative appropriation request focusing on creating new state-of-the-art research spaces that will accommodate collaborative Texas Tech/TTUHSC research teams. Texas Tech has invested in a IOHI project focusing on investigating the role of the microbiome in the focus areas of the Institute and examining how nutrition and biological stress interact with the microbiome in preventing or promoting disease.

Human Molecular Aging Institute:
The Human Molecular Aging Institute (HMAI) will investigate the sources of errors in the replication of molecular machinery brought on by age. Using archived cell lines and modern techniques, investigating genetic changes and post expression modifications associated with aging. HMAI will identify key molecular and cellular characteristics that result in disease. In addition to genomic and glycomic analytics HMAI will create new detection, diagnostic, and circulatory assay techniques to probe molecular conditions to aging. This investment will add four additional tenure track faculty in omics analytics, single cell assay, and biochemical research.

One-Health Related Instrumentation Investments
High Resolution 700 MHz NMR Spectrometer
Understanding the mechanisms of enzyme function and the consequences of errors in enzyme replication are key to developing a full understanding of life processes and developing new treatments for human disease. This new state of the art technology will place Texas Tech researchers from chemistry, biology, environmental toxicology, health and human sciences, the school of veterinary medicine and engineering at the forefront of this research area.

Nanoscribe Quantum X
The nanoscribe system is a state-of-the-art microchip fabrication tool that will primarily be used by researchers in engineering, biology, chemistry, and agriculture to create novel biosensors. Such biosensors can be used for the rapid diagnosis of metastatic cancer, characterizing the function of single cells, examining the effect of prospective therapeutic agents on diseases, and monitoring growing conditions in crop production. This instrument will serve over 20 researchers and projects at Texas Tech.

Additional TUF investments have been made in a Comprehensive Human Biomechanics System, an MSK Whole Body Imaging, Genetic Biodiversity Instrumentation, a Kingfisher Robot AVITI automated testing system, and a Nanosight Pro Particle Analyzer.

Strengthening National Security, and Powering Our Future

The National Institute of Standards and Technology has identified 16 critical infrastructure sectors. Texas Tech has a strong research presence, including industry and government partnerships, in many of these critical sectors. Texas Tech's Critical Infrastructure Security Institute (CISI) is a key national research resource in addressing these ongoing national security concerns.

Critical Infrastructure Security Institute (CISI)
The administrative team of CISI coordinates extensive research collaborations with the Department of Defense, Department of Energy, and numerous industry partners in the national security, telecommunications, and energy generation and transition field. The team is managing existing unique facilities for the study of cyberthreats to energy production and distribution and remote management systems in Global Laboratory for Energy Asset Management and Manufacturing at the Reese Technology Center. CISI is also developing a range of new laboratories for evaluating potential cyber-physical vulnerabilities introduced by foreign manufacturers in existing electronic components of U.S. critical infrastructure. The allocated funding will create a team of eight permanent staff who can work on classified and sensitive research projects.

Attacks on critical infrastructure including national water systems and assets, energy generation and distribution systems, transportation, communication networks, food supply chains, and banking and finance systems can be used by adversary nations to disrupt normal public life and national defense. Intrusions of this type are already happening due to inadequate cyber-physical security, and vulnerabilities built into existing components of U.S. critical infrastructure. This investment adds four tenure track faculty who will team with existing Texas Tech investigators to create the top national resource in detecting, defeating, and averting cyber threats from nation-state actors.

Additional aspects of Texas Tech's national security research activities include:

Center for Pulsed Power. The Texas Tech Pulsed Power laboratory is a team consisting of experts in energy electronics, high energy pulses and their interactions with physical systems. The military is highly concerned with power pulses that can permanently damage electronic systems including communication, transportation, and weapons systems. Defense contractors and private sector companies contributing to all aspects of U.S. physical infrastructure are concerned that adversaries may use pulsed power to disrupt processes that support communities and manufacturing capacity. This investment will add two new tenure track faculty researchers who can employ the Reese Technology Center flightline to examine the effects of pulsed power projection on drones and other critical infrastructure components, and test systems that can protect U.S. infrastructure from pulsed power events.

Center for Telecommunications Security. Because telecommunications technologies have become the go-to method for monitoring and controlling much of the nation's critical infrastructure, existing vulnerabilities in telecommunications hardware and software represent one of the nation's greatest cybersecurity vulnerabilities. Texas Tech leads in investigating and mapping cybersecurity vulnerabilities built into telecommunications hardware and software. Using resources at the Reese Technology Center, researchers will construct model telecommunications systems and learn how to thwart attacks by nation-state actors on the nation's telecommunication system. This initiative will add three new tenure-track faculty specialists in telecommunications design and security to the Institute team.

Hypersonic Propulsion, Materials and Aerospace Applications. Hypersonic technology promises to create tactical and strategic weapons capabilities that cannot be intercepted by current defensive technology. Texas Tech is one of the nation's premier leaders in the research on energetic materials, a key component for designing hypersonic propulsion systems. Our plans to transform one of our existing programs into a new "Mechanical and Aerospace Engineering" unit will add to Texas Tech's capability to collaborate with DoD agencies and defense contractors on hypersonic systems research. This investment will add two new tenure-track faculty in energetic materials, propulsion, and combustion physics, and two positions in the design of extreme materials required to support hypersonic transport systems.

Vertical Lift Innovations. Our collaborators in vertical lift technology are benefiting from Texas Tech's innovations in novel controls and sensor systems informed by artificial intelligence and machine learning. Texas Tech students remain a major source for future research needs of our national defense and nuclear defense laboratories. We intend to expand our capacity to conduct sensitive and classified national security research. This research area provides a natural opportunity for building collaborations with Angelo State University.

Systems Resilience & Adaptability, and Urban and Rural Development

Bioplastics. If current production and waste management trends continue, roughly 12,000 million tons of plastic waste will be in landfills or the natural environment by 2050. FBRI researchers have developed a process to break down low-quality cotton fibers into cellulose in as little as ten minutes. The cellulose can then be molded in a gel form and shaped into a bioplastic that is completely biodegradable in 6-8 months. With facilities designed to test, evaluate, and manufacture textiles and fabrics, FBRI is exploring better ways to produce high quality fiber that is produced and used in more sustainable ways.

Plant Stress Tolerance. From genome to phenome, scientists are using cutting-edge genomics tools to improve crop productivity under adverse conditions while simultaneously improving nutritional value and fiber quality. IGCAST researchers are also developing technologies, materials and processes to use bioengineering approaches for food production from carbon dioxide. With an estimated 820 million people worldwide undernourished, there is a pressing need for a cheap and renewable source of proteins, fatty acids, and essential micronutrients.

Urban/Rural Sustainability. The Center for Coupled Urban & Rural Environmental Sustainability (CURES) is addressing the problems of underserved communities in rural and small urban areas through a multidisciplinary approach that unites sciences, engineering, social sciences, and humanities. Lubbock has long served as the economic, educational, and healthcare hub for rural communities in the South Plains region of the Texas Panhandle. Our location gives Texas Tech researchers a unique perspective on the ways secondary or mid-sized cities are connected culturally, economically, and environmentally to our rural neighbors.

TUF Equipment Investments

Next Generation Radar Equipment. Detailed study of atmospheric interactions is critical to understanding how to predict the local and regional damage potential of wind events on agricultural production and community assets, and from the atmospheric detonation of strategic weapons. The National Wind Institute is currently a world leader in studying the atmospheric physics of wind effects on a local and regional level, through their ability to extend this research is currently hampered by the limitations of existing weather radar systems. The new solid state radar system supported through this grant will extend the sensitivity of NWI measurements to predict the impacts of severe wind events more precisely on crops and structures, and the impact of strategic weapons on humans and infrastructure.

II. Plan to Increase Research Funding and Productivity at Texas Tech University

b. Research facilities. If applicable, how does the institution plan to improve or expand its research facilities (e.g., research parks or other research infrastructure with incubator capabilities)?

Providing state-of-the-art research facilities to attract new faculty and address the growing needs of existing researchers is one of Texas Tech's key initiatives. As we move researchers from their current laboratories into

newly renovated spaces, we plan to systematically upgrade the vacated spaces to support new research scholarship and creative activity. We are currently engaged in this process with the 90,000 square foot "Old Science" building, one of the first 5 buildings constructed on the Texas Tech campus, and the existing Biology Building, constructed in 1960.

In addition to upgrading existing spaces, Texas Tech is committed to enhancing our ability to monitor the productivity of scholarship underway in existing research spaces. Our university data team is collaborating with the Offices of the Provost, and Research and Innovation, to create a new database linking research projects to specific laboratory, clinical, and office spaces.

These activities will not completely satisfy the need for research space for specific strategic initiatives. Texas Tech is currently engaged in four major planning efforts that will expand our strategic research and partnership needs.

Institute for One Health Innovation Collaborative Research Space
Texas Tech and TTUHSC are requesting a new research and clinical facility that will house our growing Institute for One Health Innovation. This facility will co-house researchers from our two campuses working on collaborations in our four thrust areas: Neurological health, cancer, nutrition, and infectious disease. Texas Tech land, directly adjacent to TTUHSC in Lubbock will be the home for this facility, which will address a critical need for expanded health related research space on both campuses.

National Security Campus at Reese Innovation Center
As Texas Tech has expanded its national security research, the need for unique research assets that can support the research needs of the Department of Energy, U.S. Army, and other federal security and intelligence agencies. These research topics will require large, distributed testbeds for telecommunications security and energy projection studies, and advanced facilities that can support classified research. The requirement to controlled access to these facilities argues for the creation of a new technical campus remote from the main university. Texas Tech already owns several buildings on the Reese Innovation Center site, including a controlled access facility that supports research involving select agents. Our current wind energy, experimental microgrids, and cybersecurity testbeds located on the adjacent Reese airport flightline could easily be expanded to support these needs. Texas Tech is currently planning to build out a Secure Compartmentalized Information Facility (SCIF) on our Reese property to support the need for classified research spaces for our National Security initiative.

Ultra-wide Bandgap CHIPS Cleanroom
Texas Tech University is a national leader in the development of ultrawide bandgap materials for microchip research. Microchips using ultrawide bandgap materials are particularly important in power electronics research for military applications and for energy projection technology. Our plan for a 6,000 square foot cleanroom specifically designed to support this power electronic innovation would be a unique resource within Texas.

Texas Tech Research Park
Texas Tech has been working with the University Research Park team from JLL, Inc. for the past three years to outline the characteristics and scope of a live-work-play research park on 45 acres of Texas Tech land adjacent to the Texas Tech and TTUHSC campuses. This modern take on university business parks would create a space supporting new university research spaces (focusing in health sciences, agriculture, and energy research), provide additional space for incubating new companies, provide laboratory and office space for co-working by existing corporate partners, and offer amenities including housing, food and recreation in a modern innovation district development. Current planning involves working with national investors to build and manage the district, based on the expanding need to foster partnerships with the adjacent universities.

II. Plan to Increase Research Funding and Productivity at Texas Tech University

c. Commercialization. What is the role of technology transfer? How does the institution plan to increase its commercialization impact (e.g., patents, licenses)?

Over the next five years we aim to create a continuous pipeline of new technology-based startups, complementing the existing resources in the Texas Tech Innovation Hub, the Office of Research Commercialization, and the Institute for Small Business. This will support the increased research capacity developing at Texas Tech and TTUHSC to create a wider range of commercialization opportunities. Existing partners in this process include the Lubbock Economic Development Alliance, Innosphere Ventures, New Idea Ventures, and Research Capital Funds. New partners will be added to grow the translational capacity of the university as new areas of research capacity are added. This will create an innovation ecosystem in West Texas that will enhance the existing areas of our economic development as well as adding new opportunities discovered by our research.

We intend to develop a GAP-funding or Proof-of-Concept (POC) program that will serve a crucial role in advancing innovation and technology commercialization. POC funds bridge the often-daunting funding gap between early-stage research or innovation and market-ready products. This funding enables inventors to develop prototypes, conduct proof-of-concept studies, explore the technology's readiness for investment or market entry and gain an understanding of potential products and markets. We have the beginnings of POC programs developed as part of two NSF Engineering Research Centers (ERC) on campus.

Strengthening the technology transfer and innovation ecosystem to better translate academic research into commercially viable products, contributing to Texas' economic growth has led to the development of the following objectives:

1. To provide robust commercialization support to faculty and researchers, along with a Proof-of-Concept Fund to support early-stage innovators needing market validation, we will develop commercialization training programs for IP protection and commercialization, inventor awareness programs guiding faculty through the commercialization process, faculty incentive initiatives linked to milestones in patent and commercialization process, and additional administrative support for faculty startups.

2. We plan to streamline the technology transfer process to reduce barriers and increase speed to market through the development of standardized licensing agreements, “fast-track” licensing agreements for industry partners in high-growth sectors, and the establishment of a state-wide online technology portal providing external stakeholders access to available Texas Tech intellectual property.

3. We aim to build a robust statewide infrastructure to track and support technology transfer efforts by identifying bottlenecks and optimizing resources that lead to the development of a statewide data collection system for tracking technology transfer outcomes, including invention disclosures, patents, licensing deals, and startup creation.

4. We will foster corporate partnerships and industry engagement to increase innovation by developing corporate partnership programs, industry participation boards, and co-developing innovation hubs in strategic regions of Texas. These initiatives will result in increased networking opportunities for

researchers and entrepreneurs, and in the promotion of cross-sector collaboration and leveraging corporate expertise for commercialization.

5. A strengthening of the talent pipeline will occur through the development of a commercialization fellowship program for graduate students and postdocs, providing hands-on experience with technology transfer and startup formation. Additionally, a student commercialization competition to encourage innovation and entrepreneurial thinking among students from diverse disciplines will be established.

III. Doctoral Programs at Texas Tech University

a. Doctorate Awards. How does the institution plan to maintain or increase the number of research doctorates awarded?

Texas Tech places emphasis on doctoral education to support its research and innovation enterprise. Through strategic investment in high-demand doctoral programs, Texas Tech currently ranks 41st in the U.S. in the number of doctoral degrees it confers. As the university moves forward to expand its research and innovation enterprise, support of its doctoral programs will continue to be paramount. To this end, the university will implement the following multi-phase approach to attract, retain, support, and graduate doctoral students in order to sustain its doctoral production.

1. **Recruitment.** The recruitment landscape in both the domestic and international markets is becoming increasingly competitive. Texas Tech will respond by transforming its graduate student recruitment efforts by the following:
   - requiring each program to develop an active recruitment plan
   - expanding coordinated marketing and recruitment efforts
   - increasing presence at in-person and virtual recruitment fairs
   - expanding relationships with primarily undergraduate degree-granting institutions
   - increasing interactions with EducationUSA centers in promising international markets
   - highlighting Texas Tech programs through in-person and virtual campus visits

2. **Competitive Fellowships**. Texas Tech recognizes that competitive assistantship packages are critical to attracting top applicants. The university will continue to benchmark stipend levels (see b below) and has several programs that leverage resources to fuel the doctoral pipeline and maintain throughput.
   a. Distinguished Graduate Student Assistantships (DGSA). These assistantships attract top doctoral students by offering competitive stipends for up to four years. The awards are made by the Graduate School and require a 1:1 match from programs/departments in order to leverage funding, including from individual faculty extramural grants. Prospective recipients are nominated by highly productive programs and are awarded competitively to candidates who meet merit criteria.
   b. Doctoral Dissertation Completion Fellowships (DDCF). DDCFs increase the throughput of doctoral students by awarding fellowships from the Graduate School to students in their final year so they can work exclusively on their dissertation so as to hasten their completion; department/program funds (including from PI external grants) that were supporting DDCF recipients must be used to recruit a new doctoral student. Awards are made on a competitive basis with merit that includes credentials of the student, research training environment, and credentials of the advisor.
   c. Recruitment fellowships. Recruitment fellowships are supported by the endowment of the Graduate School and its continuing philanthropic efforts. Recruitment fellowships are supplements awarded to high-performing departments/programs that are combined with funds of the unit to make stipend offers more competitive. The fellowships are used to support new doctoral students for up to four

years. The current supplement is $5000; the level of the supplement is reviewed annually and benchmarked against the Oklahoma State University Graduate Stipend Survey to ensure competitiveness.

3. **Graduate and Postdoctoral Support.** Texas Tech is committed to reducing attrition, increasing degree completion and reducing time to degree through building a graduate student community and deploying a comprehensive graduate student support program that is based on research, student surveys, and best practices. The following efforts are in place or under development:
   - Bridge programs and transition coaching (e.g., first generation)
   - Intervention advising for at-risk students (e.g., students on probation)
   - Student networking events (informal events that foster interaction between and among students from different disciplines)
   - Professional and career development (workshops dedicated to career planning, professionalism, developing and honing communication skills, teaching skills, etc.)
   - Academic resources (workshops on library searching, publications/authorship issues, statistical consulting, etc.)
   - Graduate Writing Center (provide writing support for class assignments, theses/dissertation)
   - Office of Graduate and Postdoctoral Fellowships (helps students identify extramural fellowship opportunities as well as with development of competitive applications)

III. Doctoral Programs at Texas Tech University

b. Supports for Doctoral Candidates. How does the institution plan to provide competitive financial support to doctoral students including teaching assistantships, research assistantships, and fellowships for research priorities?

Texas Tech is committed to providing competitive packages to support the recruitment, retention, and degree completion of doctoral students in areas that align with its research priorities.
Teaching assistants play a critical role in the teaching mission of the university. These positions also augment the number of funded doctoral students who engage in research, thereby increasing research capacity priority areas. Recruitment packages for teaching assistants include a stipend, remission of tuition, and a partial allowance for the health insurance premium. Over the course of the next five years as the number of doctoral students funded on external grants and fellowships increases, the university will be in a position to keep TA stipends competitive and to provide an allowance to cover the full health insurance premium.

Emphasis will be placed on increasing the number of doctoral graduate students supported as research assistants on external grants-by revising research expectations of and rewards for tenured/tenure-track faculty and increasing support to programs and faculty that facilitate the preparation and submission of competitive applications. Currently, recruitment packages for research assistantships include a stipend, remission of tuition, and allowance for the full cost health insurance premiums. By shifting more support of doctoral students to RAs funded by external grants, we expect to keep RA recruitment packages competitive. The overall strategy to increase externally-supported RAs include increasing the number of individual faculty grants as well as the number of larger, multi-investigator grants in TTU's strategic research themes and graduate student training grants (e.g. Graduate Assistance in Areas of National Need, NSF— Innovations in Graduate Education Program, National Science Foundation—Research Traineeship Program, USDA—National Needs Graduate Fellowship (NNF) Grants Program).

Texas Tech graduate student fellowships as well as externally funded fellowships and internships represent an important part of the overall doctoral student funding plan as the university expands its research enterprise over the next five years. Texas Tech fellowships are critical to fueling the doctoral student pipeline, increasing doctoral student throughput, and leveraging external grant funds to increase the number of doctoral students. Every student who receives a TTU graduate fellowship must develop and submit an application for an external fellowship or internship, either from a private foundation or a federal agency. The Office of Graduate Student and Postdoctoral Fellowships assists graduate students to identify fellowship opportunities and helps them develop competitive applications. Targets for external applications include prestigious fellowships from the DOD, DOE, NIH, and the NSF. Internship opportunities also are increasing as a result of Texas Tech's collaboration with various DOD (e.g., Redstone Arsenal) and DOE (e.g., Argonne National Laboratory, Pantex Plant, and Sandia National Laboratories) supported initiatives.

III. Doctoral Programs at Texas Tech University

c. Areas of emphasis. How do the institution's doctoral programs emphasize disciplines with high current or projected workforce demand?

Doctoral programs are evaluated annually on productivity (e.g., extramural funding, scholarly works/citation, Ph.D. applications/acceptance rate, Ph.D. enrollment, PhD. production/faculty, stipend level, etc.), alignment with workforce demand (cf. US Bureau of Labor Statistics projections), and alignment with Texas Tech's research priorities. Based on the most recent analyses and in consideration of identified research priorities, the university has identified several new areas of excellence, including a recently approved doctoral program in One Health (that examines issues at the intersection of human, animal, and environmental health) as well as developing and planned inter-/transdisciplinary programs in aerospace engineering, agricultural engineering, artificial intelligence, bioengineering, data analytics, and robotics. Support for these new and emerging areas will come from strategic allocation of funds from various sources, including The Graduate School endowment and fellowship programs, TUF, and extramural sources, especially federal grants.

IV. Plan for Faculty Development at Texas Tech University

a. New faculty.

Texas Tech projects a significant growth in its number of full-time tenured and tenure-track faculty as a result of the university's TUF allocation with the expected addition of up to 65 new TUF-funded faculty lines in strategic research areas. Recruitment efforts for these positions can be categorized as follows:

- Visibility and reputation:
  - TTU places job advertisements for strategic research hires in prominent and highly visible publications (e.g., *Nature)* in addition to:
    - United States Department of Labor
    - Veterans in Higher Education
    - Work in Texas
    - HigherEdJobs.com

    All hiring units are further required to post job advertisements in at least one discipline-specific outlet other than those listed above.

- Texas Tech has initiated a centralized marketing campaign featuring existing faculty with significant accomplishments in the university's strategic research areas. This campaign includes a digital marketing and social media campaigns, website redesign, and the creation of video content. Content (print, digital, video) has been jointly produced by the communications staff in the office of research and Texas Tech's Office of Marketing & Communications and features faculty members who are highly successful in their research roles.

- Support and resources:
  - Texas Tech is finalizing the development and implementation of a tailored resource program for finalists for faculty positions. Designed to enhance the experience of faculty finalists while they are on the Texas Tech campus, this new resource program aims to provide faculty finalists with a more personalized and customizable campus visit.
  - The university has also implemented major revisions to faculty search processes in general. Updates to faculty search processes include the creation of a new, centralized support system for faculty search committees featuring the addition of a full-time staff member fully dedicated to facilitating faculty searches.

IV. Plan for Faculty Development at Texas Tech University

b. Faculty research.

Texas Tech provides new faculty members with start-up packages designed to maximize their success in research and creative activities. These packages are jointly supported by the hiring unit, the hiring college, the Provost's Office, and the Office of the Vice President for Research and Innovation. Typical requests for faculty hired into strategic research areas include support for facilities, equipment, salary (staff and student), travel, and publication fees. Texas Tech's policy on start-up funding allows a new faculty member three years to fully expend the allocated amounts, with the opportunity to apply for a one-year extension of the funds as necessary. This policy reinforces the purpose of the start-up program as a means of maximizing a new faculty member's productivity, innovation, and effectiveness in their area(s) of research/creative activity.

Additional sources of support include:

- STEM Research Assistance Program: Funded by the Office of Research & Innovation, the purpose of this program is to help faculty increase research productivity and external proposal submissions. These grants will focus on initiating new lines of research (Research Seed Funding) or resubmissions of previously declined proposals (Proposal Resubmission) for individual Texas Tech faculty in the STEM fields. Applications will be evaluated in terms of merit, clarity, persuasiveness, need, and potential outcomes. Reviewers will also consider the level of impact of the research, how this proposal will promote the faculty member's research agenda and Texas Tech strategic initiatives, and the likelihood of continued funding in the future.

- Open Access Publication Initiative: Funded by the Office of Research & Innovation, this initiative helps defray the cost of open access publication fees and expedite the dissemination of research findings. Awards are typically first-come, first-served and limited to $1,000 per publication, per faculty member, per academic year. Funds may be used for publication fees for journal articles and book chapters.

- Faculty Travel Grants: Funded by the Office of Research & Innovation, these grants assist with costs associated with travel up to ($1,000) for faculty to conduct research or present at major prestigious conferences in their field of study. Applications are accepted each semester for travel during the following term.

- Scholarship Catalyst Program: The Offices of the President, Provost, and Research & Innovation fund the Scholarship Catalyst Program (SCP), providing up to $75,000 per year to promote research, scholarship, and creative output (construed broadly, including written publications, non-print presentations, curatorships, exhibits, and artistic performances). The primary goal of the program is to promote the research and creative endeavors of individual Texas Tech faculty in the Arts, Humanities, and Social Sciences (including law). SCP funds are intended for faculty who do not currently have start-up funding, or who cannot use their start-up funding purposes of the project.
- Faculty & Staff Wellbeing & Success Mini-grant Program: Funded by the Office of Faculty Success and available to all full-time faculty members, this centralized program provides successful proposers with up to $2,000 in funding to support activities related to professional success. Now in its third year, the mini-grant program has provided support to faculty members for conference presentations, publication fees, acquisition of specific licensures/certifications, and engagement in specialized training. While the award amount is very small, this additional source of funds allows faculty members the ability to expand their research and creative activities as opportunities arise, especially opportunities related to conference presentation and publication.
- Cross-Disciplinary Faculty Research Excellence Competition: The Institute for Studies in Pragmaticism supports the Faculty Cross-Disciplinary Research Excellence Awards. This program is specific for project proposals that generate synergy across diverse disciplines and promote innovation in cross-disciplinary research, all in alignment with Texas Tech's strategic themes. Awards total $30,000 annually and support the preparation of select projects for submission for federal funding.
- Office of International Affairs Seed Grants: Funded by the Office of International Affairs, these grants range from $3,000 to $7,000 and support full-time faculty interested in developing international research collaborations.
- Humanities Center Book Publishing Lab: While Texas Tech's Humanities Center has a long history of supporting faculty members in the humanities (and related disciplines), a newly funded program provides up to $25,000 per year in support of expediting book publication. For high-potential and highly productive faculty members in the humanities and related disciplines, this new initiative provides support for the final phases of manuscript completion and publication with a goal of increasing the number of faculty publications with reputable presses annually.
- Targeted external awards: the Offices of the Provost and Research & Innovation provide generous support to faculty members who receive highly prestigious, targeted external awards. With relocation (and associated costs) of up to $25,000 per award, plus a post-award honorarium opportunity of up to $5,000, faculty members are strongly incentivized to apply for highly prestigious external awards in their disciplinary (and other relevant) areas.