

A light blue map of the Mid-Continent region of the United States, including states from Montana to Texas and North Dakota to Arkansas. The map is centered on the text.

# Partnerships for Technology Transfer at Federal Labs

August 2017

PRODUCED FOR



Federal Laboratory Consortium  
for Technology Transfer  
Mid-Continent Region

PRODUCED BY



SSTI

## About this report

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SSTI created this report for the Federal Laboratory Consortium for Technology Transfer's (FLC) Mid-Continent region and its research facilities with the primary purpose of identifying opportunities for federal/non-federal partnerships to advance tech transfer.

FLC is a network of more than 300 federal research and development (R&D) entities focused on encouraging the transformation of research into new products and businesses. The FLC Mid-Continent region is comprised of more than 100 federal labs and facilities in 14 states: Arkansas, Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah and Wyoming.

SSTI is a national nonprofit with a more than 20-year history that strengthens initiatives to create a better future through science, technology, innovation and entrepreneurship. In addition to leveraging this experience of working with innovation-focused organizations throughout the country to prepare this report, SSTI interviewed dozens of professionals at federal R&D facilities and state, local and private organizations.

FLC defines tech transfer as "the process by which existing knowledge, facilities or capabilities developed under federal R&D funding are utilized to fulfill public and private needs." Tech transfer, translation, commercialization, and "transformation of research into new products and businesses" are terms to describe this general process. For some audiences, each term conveys specific components or perspectives for the full innovation-to-market process, while others use these terms synonymously. In order to avoid potential confusion for the reader, this report uses "tech transfer" to reference the broad process, but will mostly refer to specific types of transfer-related activities (e.g., licensing, customer identification, access to capital) as often as possible.

While the report's primary audience is the FLC Mid-Continent region and federal R&D facilities staff, the information is structured in a way that will benefit any organization interested in better understanding the region's opportunities to promote tech transfer.

The report begins with an overview of technology transfer and then enters into a discussion of partnership strategies that can help federal R&D facilities find the right type of partner or program to consider as a means for achieving specific tech transfer goals. The final sections of the report define the FLC Mid-Continent region and provide state-by-state profiles of relevant policies and the organizations and initiatives that are strategic targets for federal labs to consider for future partnerships.

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## Understanding Tech Transfer

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FLC defines tech transfer as “the process by which existing knowledge, facilities or capabilities developed under federal R&D funding are utilized to fulfill public and private needs.”<sup>1</sup> This process is critical to the continued success of an innovation economy, which utilizes scientific and technical progress to create growth and prosperity.

### Innovation Economies

SSTI’s experience suggests that an innovation economy for a nation, region or local area requires four core elements:

- **Capacity for Engineering & Scientific Research:** Innovation requires sustained public and private investment in the institutions, resources and talent to encourage discovery and problem solving that advances scientific research and engineering. U.S. public, science and engineering investments are most often placed within colleges and universities, federal labs and nonprofit research centers;
- **Transformation of Research to New Products and Businesses:** Scientific research and technology can drive prosperity and help to solve health, safety and other serious problems when converted into products or businesses with strong market potential;<sup>2</sup>
- **Support for Entrepreneurs:** With access to capital, expertise, connections and other resources, innovators’ ideas can lead to high-growth businesses that create good paying jobs and spur advancements in existing and emerging industries; and,
- **Prepared Talent Pool:** STEM education and technical training of local talent provide companies critical human resources for growth, and enable more people to participate in building economic growth and prosperity.

Federal labs serve significant roles in the national economy, as well as in many state and regional economies. However, the simple presence of a lab is not sufficient on its own to create a highly functioning regional innovation system. The labs must be integral, collaborative elements of the local economy for sustained opportunity, innovation, and prosperity to result.

The overlapping needs of regional innovation systems—producing and transforming innovations—and federal labs’ technology transfer offices—developing and transferring lab innovations—suggests that the labs and regional innovation organizations should be able to

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<sup>1</sup> FLC. (2017). What is T2? *FLC Learning Center*. Retrieved from: <https://www.federallabs.org/What-is-T2>. Unless otherwise indicated, all referenced links are active as of August 2017.

<sup>2</sup> Innovation improves sales, particularly in the tech sector. B.H. Hall. (2011). Innovation and Productivity. *NBER Working Paper*, 17178. Retrieved: <http://www.nber.org/papers/w17178>.

develop effective partnerships. Intentional movement by the tech transfer offices toward closer integration of activities and strategic relationships with the broader regional innovation support system simultaneously advances the labs' technology transfer goals, helps sustain progress toward broader lab objectives and enhances the competitiveness and wellbeing of the regional innovation economy.

## The Federal Laboratory Approach to Tech Transfer

Since the early 1980s, technology transfer activities at the federal labs have grown in scope, scale and sophistication.<sup>3</sup> Today, the activities addressed by the federal laboratory community typically fall within one of four buckets (Appendix 1 includes examples of activities and partnerships):<sup>4</sup>

- **Collaboration:** Through cooperative research and development agreements (CRADA's), a federal lab commits resources such as personnel, facilities, equipment, intellectual property, and other non-financial resources to any interested non-federal party;
- **Facility Usage:** The government allows interested parties (e.g., universities, industries, federal labs) to conduct proprietary and non-proprietary research using federal facilities;
- **Technology Licensing:** The private sector can negotiate a license to use and further develop federal lab technologies (or agencies license private technologies); and,
- **Other Work:** Relevant activities may also include conducting research, consulting services or technical assistance for private entities to pursue common interests.

## Impacts of Tech Transfer

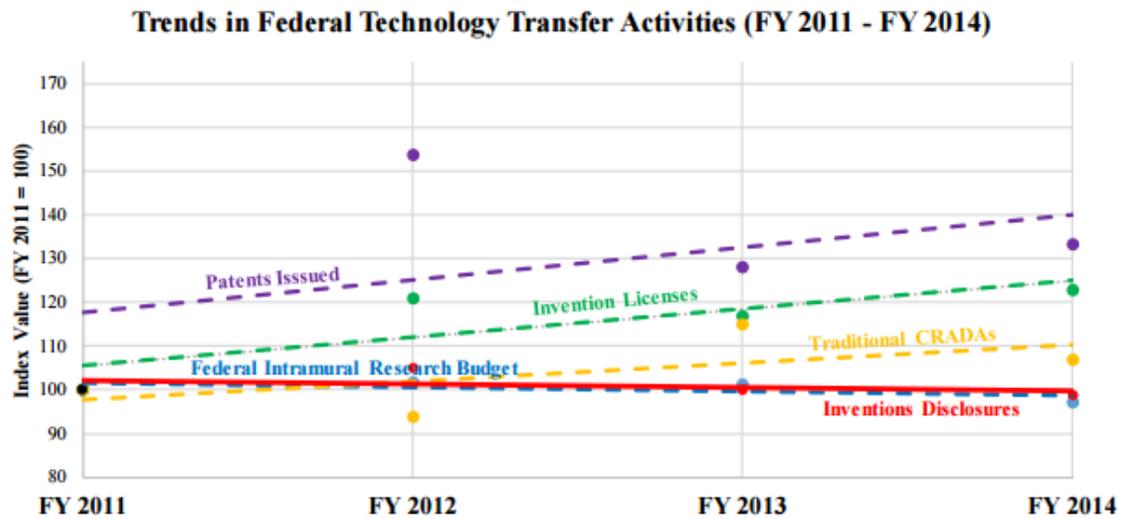
Tech transfer can result in multiple impacts. R&D at federal labs is related to each agency's mission. Therefore, successful transfer of lab innovations to the market frequently help fulfill the agency's mission, whether to improve the safety of American warfighters (Department of Defense), reduce energy consumption (Department of Energy), develop sensors for water-borne contaminants (Environmental Protection Agency), or numerous other possibilities. These types of tech transfer outcomes are often difficult to express quantitatively, although the effects of these developments for America are substantial.

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<sup>3</sup> The changes in the early 1980s were driven by legislative changes. The *Stevenson-Wydler Technology Innovation Act of 1980* required federal laboratories to actively participate in and budget for technology transfer activities. That same year, Congress passed the *Bayh-Dole Act*, which permitted institutions that conducted federally-funded R&D to elect to pursue ownership of an invention instead of ownership being automatically granted to the federal government.

<sup>4</sup> FLC. (2017). T2 Mechanisms. *FLC T2 Toolkit*. Retrieved: <https://www.federallabs.org/T2-Mechanisms>.

Figure 1. Outcomes of federal lab tech transfer, FY 2011-2014



The outcomes of tech transfer are often measured by the raw outputs of transfer activities. An analysis by the National Institute of Standards and Technologies (NIST) found that federal labs have increased patents issued, inventions licensed and CRADA activity from 2011-2014 (Figure 1).<sup>5</sup> Increases in technology transfer activity have resulted in increased revenue for the federal government. In FY 2014, for example, the total income received by the federal government for all active licenses increased by 35 percent from FY 2010 and by 27 percent for royalties, while CRADAs increased by 17 percent to 9,780 active CRADAs in 2014.

Many of our nation’s most successful innovative enterprises stem from research performed by or with federal labs. Research from the federal labs have led to commercial applications in health and life sciences, consumer products and advanced manufacturing. For the last 15 years, Department of Energy researchers alone accounted for roughly one in three R&D 100 Awards, sometimes called “the Oscars of Innovation”.<sup>6</sup> Federal lab-developed advances have included medical treatments for burn victims, advancements in race car engines, improved non-slip surfaces and much more.

## The Language of Technology Transfer

The elements of technology transfer are popular with Americans but perhaps not by the same names or language used within the field. Independent polling conducted in 2015 found that 89

<sup>5</sup> National Institute of Standards and Technology. (2016). *Federal Laboratory Technology Transfer FY 2014*. Retrieved: [https://www.nist.gov/sites/default/files/documents/2016/10/26/fy2014\\_federal\\_tech\\_transfer\\_report.pdf](https://www.nist.gov/sites/default/files/documents/2016/10/26/fy2014_federal_tech_transfer_report.pdf).

<sup>6</sup> U.S. Department of Energy. (2016, Nov. 4). “U.S. Department of Energy Projects Win 32 R&D 100 Awards for 2016.” *Energy.gov*. Retrieved: <https://science.energy.gov/about/honors-and-awards/rd-100-awards/>.

percent of voters said they would support an effort to convert scientific and medical research into new businesses and jobs, helping to bring the benefits of the innovation economy to the American people. This support was nearly equal across political parties.<sup>7</sup>

While terms like tech transfer, translation and commercialization are used within the community of practice to distinguish specific stages in the development and transformation of innovation, these distinctions are often lost or unclear to the broader public. “Commercialization” is specifically problematic for much of the public as it is easily confused with “commercialism.” To avoid potential confusion for readers of different experience with transfer activities, the authors use the term “tech transfer” solely as a simplification. Readers accustomed to more specific language should focus on the activity and partnership model being presented and consider how this aligns with the reader’s experience of the tech transfer process.

## Beyond Traditional Tech Transfer

The activities discussed in the following pages go beyond the four buckets of tech transfer activities commonly engaged by the federal labs for two reasons.

1. *How innovation is moving to the market is evolving and new tools are emerging.* Transforming innovation into new products, businesses and jobs often requires support beyond joint research or even licensing and may include more advance work in preparing an innovation for market (later stage development and market analysis). More “hands on” collaboration with the scientist, researcher or product developer may be required to improve the likelihood of successful technology deployment into the market. Examples include entrepreneurial training, business investment skills and customer identification.
2. *Partnerships with external organizations will help federal labs conduct more, and more effective, tech transfer activities.* Federal labs can establish tech transfer relationships with their peer institutions and other innovation economy-focused organizations that help provide these services for target markets will help create new clients for the laboratories’ core activities and help existing clients be more successful in their applications of lab technologies. Therefore, even tech transfer offices that are strictly concerned with CRADAs and licensing can find further success through partnerships focused on providing other activities that are necessary for a robust innovation economy.

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<sup>7</sup> Polling project of 1,000 U.S. adults and focus group research conducted on behalf of SSTI in 2015 by Greenberg Quinlan Rosner Research and TargetPoint Consulting. SSTI. (2015, Dec. 10). “SSTI: New Survey Finds Bipartisan Support for Innovation Initiative Designed to Bolster U.S. Economy.” *SSTI Weekly Digest*. Retrieved: <http://ssti.org/blog/ssti-new-survey-finds-bipartisan-support-innovation-initiative-designed-bolster-us-economy>.

## Strategies for Lab Partnerships

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Federal labs are tasked with achieving greater and greater tech transfer outcomes without the benefit of proportionate increases in administrative or programmatic funding. Partnerships with government entities and private nonprofits and businesses can provide additional resources and opportunities for tech transfer outcomes with minimal additional financial investment by the labs. In addition to facilitating final outcomes, effective partnerships expand stakeholder commitment, improve community awareness, generate new customers and expose unique opportunities. The question for federal labs is not *whether* to establish partnerships with outside organizations but *which* partnerships will be the most effective.

There are three broad considerations for federal labs seeking effective partnerships:

- *Which types of partnerships could provide the greatest tech transfer outcomes and other lab benefits in return for the investment?* Cost-efficient partnerships are addressed in the “Key Partnership Models” section of this report.
- *What tech transfer activities and organizations already exist in the lab’s direct and indirect network?* More about this assessment is discussed in the following subsection.
- *How can organizations be prioritized for potential partnerships?* A quick scheme for making this decision is provided in the following “Prioritizing Potential Partners” subsection.

### Assessing Labs’ Existing Networks

A wide variety of organization types conduct work related to the broad tech transfer continuum. Figure 2 illustrates a generic network of regional innovation organizations that can serve as a guide for labs that have not previously charted their innovation network.<sup>8</sup> Relevant organizations may include government offices, institutions of higher education, research institutes, venture development organizations and seed investors, among others. A federal lab will already directly partner with many of these organizations, and the lab’s partners will work with other organizations, creating an even larger indirect network of potential relationships for the lab. Understanding this broader network is key to identifying the best partners.

This network analysis can be conducted to varying degrees of specificity. For example, a few hours spent reviewing recent deals and activities of the lab, then the lab’s partners, and then the partners’ partners will be very helpful for an office that has never previously considered this approach. The state profiles included in this report identify many organizations that labs in the region will want to either locate on their current tech transfer network or consider how these organizations can be incorporated in the near future.

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<sup>8</sup> Image courtesy of the Regional Innovation Acceleration Network © 2017.

In many states, a research-focused organization may have already completed at least a partial network of available resources. The Illinois Science and Technology Coalition, for example, develops detailed network maps for state resources that are even categorized by industrial sector.<sup>9</sup> Some of the research-focused organizations described under the “Statewide” label on the state-by-state profiles may have conducted similar reviews in their own footprints. Labs that desire a complete understanding of their tech transfer network will want to invest their resources into a project specifically targeting the lab’s partners and initiatives along its own key points of emphasis. However, even an informal analysis of related organizations will be an effective starting point for institutions that have not conducted a previous network analysis.

Figure 2. Generic model of regional innovation network.



## Prioritizing Potential Partners

Potential partners for federal labs can be assessed along two dimensions (see Figure 2):

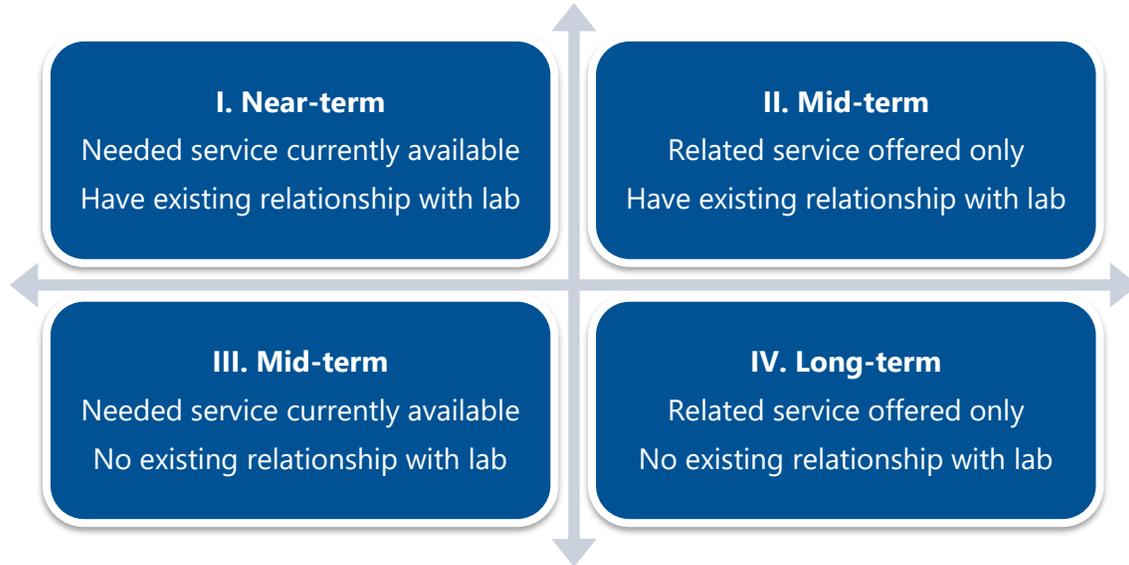
- How well the tech transfer services of the organization under consideration align to the lab’s needs—organizations that already offer a service missing from the lab’s toolkit will be more efficient near-term partners; and,
- The existence and quality of any existing relationship with the lab—organizations that currently work with the lab, particularly under a formal partnership, will be more immediately able to extend that relationship.

The most immediate successes can be realized with organizations that have both a needed service and an existing relationship. For example, a regional venture development organization (VDO) provides co-working space for a lab’s researchers and a new partnership could provide access to the VDO’s entrepreneurship training. In the mid-term, organizations that have an existing relationship may be interested in understanding how developing a new service could be

<sup>9</sup> See <http://www.illinoisinnovation.com/find-services-resources> and [https://www.istcoalition.org/wp-content/uploads/2017/03/ISTC\\_RoadmapFINAL.pdf](https://www.istcoalition.org/wp-content/uploads/2017/03/ISTC_RoadmapFINAL.pdf) for publicly-available network resources from the Illinois Science and Tech Coalition.

mutually beneficial; similarly, organizations with a needed service but no experience with federal labs may require communication to understand the benefits a partnership could provide.

Figure 3. Matrix for assessing timeline for potential tech transfer partnerships.



Organizations with neither a needed service nor an existing relationship will require significant effort to convert into new partnerships, but a strategy of low-cost outreach to and monitoring of these organizations could lead to better identification of opportunities in the future. Working with new organizations is worthwhile, even if more time intensive, because it will result in exposure to new potential clients and stakeholders.

## Efficient Partnership Models

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Labs can, and do, partner with external organizations to conduct a wide variety of activities, including communications, mentoring, research among many other services. The preceding discussion of network and partner analysis can be applied to any type of partnership.

Under ideal circumstances, a lab will use a strategic planning process to evaluate primary opportunities and develop a set of potential partnerships tailored to the specific needs and network of the lab. This report cannot, and does not, provide a strategic partnership plan for each federal R&D facility in the region. However, several common themes emerged over the course of interviewing federal labs and other tech transfer organizations in the development of this report, and this section presents models that are broadly applicable across institutions.

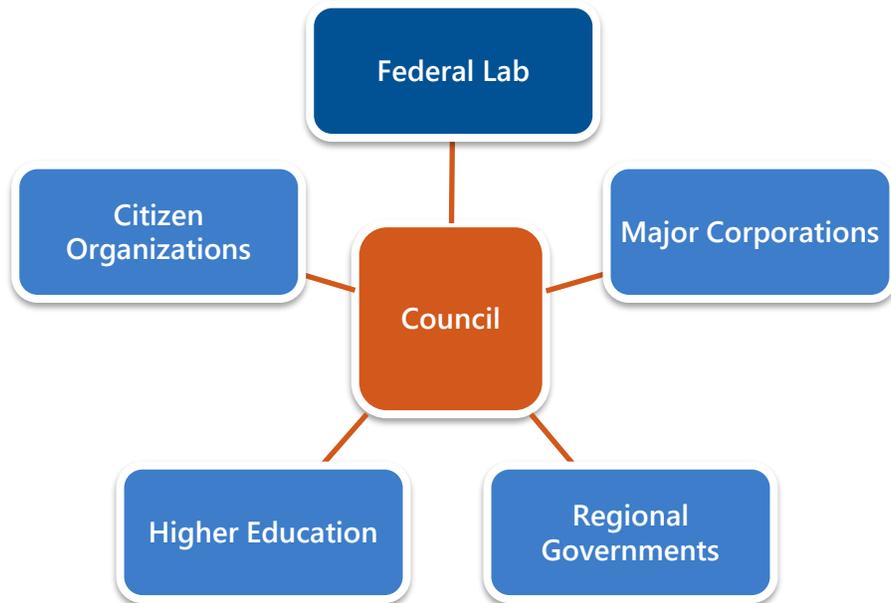
Further, the following partnership models were selected specifically for their balance of impacts with cost. Most labs are bound by finite staff and financial resources that compel efficiency as well as effectiveness in pursuing tech transfer outcomes. These models can be achieved with relatively limited costs, in most cases because the partners will also see benefits from the relationship beyond, or instead of, payments from the lab. These structures will therefore enable most federal R&D facilities to expand their tech transfer reach and impact efficiently.

### Councils for Lab-related Stakeholders

One motivation for establishing partnerships is to grow the breadth and depth of the lab's relationships with potential stakeholders. Broader awareness will bring more opportunities for tech transfer and other activities to the lab's attention, while deeper bonds will translate to greater support for the lab's needs and initiatives. A stakeholder council brings this motivation to the forefront by providing a forum for interested parties to work collaboratively in areas of interest to the lab.

A federal lab is a significant institution in its region—often one of the largest employers and sources of investment in its footprint. As such, lab staff should be capable of convening key decision-makers from other important organizations in the region, including major corporations, state and local governments, universities and community colleges and citizen organizations. The specific participants are important, as an impactful council will include both high-profile organizations and active individuals—neither is independent of the other.

Figure 4. Councils can improve collaboration among a wide range of lab stakeholders.

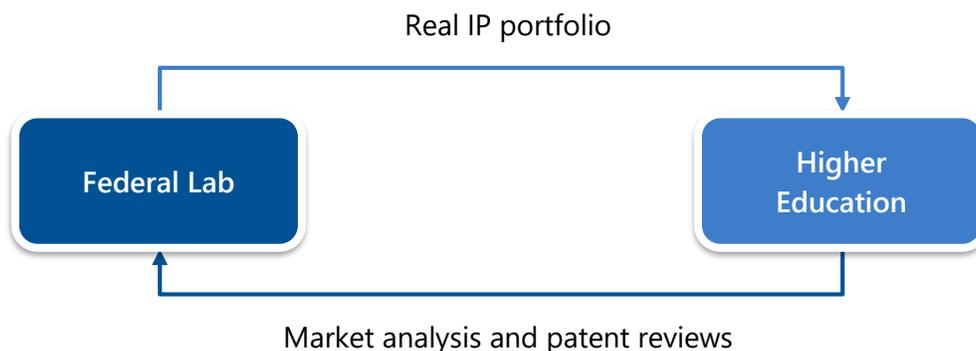


To attract the right participants, the call for this council should be a focus on an issue of regional importance that coincides with the lab's interest, but does not (and, perhaps, should not) exclusively relate to the lab. One council that the Kansas City National Security Campus cultivated focuses on recruiting engineers to the region and has participation from major engineering firms. Other labs, such as the U.S. EPA National Risk Management Research Lab in Cincinnati, organize regional stakeholders interested in specific clusters of innovation. By focusing on these broader issues, each stakeholder can bring their own interests to the council while still operating for the good of the region. For example, a federal lab's tech transfer office should be focusing on how the council can expand the pipeline for potential transfer activity and/or improve the efficiency of the lab's operations by prioritizing potential deals for the lab's resources. These motivations do not need to be exclusive of, for example, a local government's desire for additional economic activity or a corporation's interest in acquiring new technologies.

### Classroom Studies of Lab Needs

Most federal labs have an innovation portfolio that far exceeds the tech transfer office's capacity to support its full commercialization potential. In many cases, the tech transfer office will not have market analysts or legal advisors on staff and available for wide-ranging reviews of the lab's innovations. Both shortcomings can be addressed through a partnership that provides institutions of higher education with access to real lab innovations for class projects and the federal labs with exposure to the students' analysis and recommendations.

Figure 5. Classroom partnerships can improve student experiences and provide low-cost IP analysis.



For assistance with the lab’s review of potential patent filings, universities’ law schools are the best target. Many law schools provide students with real, but completed, cases to analyze for their projects. This model simply replaces this focus with a study of legal work that is in progress. The Naval Surface Warfare Center, Crane Division (Crane), has established a network of these schools that implement curriculum developed by a lab IP attorney; the classwork includes reviewing the lab’s IP caseload, and the student projects help reduce the time that the lab’s attorneys spend with each case.

A wider variety of classes at both universities and community colleges may be able to assist tech transfer offices with reviewing the commercial potential for lab innovations. Market studies, business planning and related analyses are standard activities for many classes located in a communication or business school, and some institutions will offer entrepreneurship classes in a STEM department or through a dedicated, on-campus center. Crane has implemented a broad “academy” approach with two in-state universities and provides real examples of lab IP for projects at other universities around the country; the U.S. Bureau of Reclamation works with MBA classes at Denver for business plan development; other labs throughout the country have similar models. The concept may not be foreign for schools that have not participated with labs previously as a number of universities, including Rice University in Houston, provide entrepreneurship classes with examples from the school’s own patent portfolio.

### Experiential Learning for Researchers and Staff

Developing an innovation into a commercial technology and the translation of that technology into a growing startup often requires skills that are both different from those leading to the invention and difficult to acquire without entrepreneurial experience. Without these skills, the lab’s tech transfer efforts are likely to operate inefficiently—researchers may not easily identify an innovation’s potential and staff may not identify important opportunities or challenges until late in the process. Experience-focused training can help to supplement these skills.

One strategy for providing researchers and staff with experiential learning is to partner with an organization, such as an institution of higher education, that offers the National Science Foundation’s (NSF) Innovation-Corps (I-Corps) or other Lean LaunchPad®-focused program. This curriculum focuses on a model of startup development that emphasizes talking and working with customers from the outset to identify real market needs and how the innovation can best provide a solution. These programs will often require participants to contact at least 100 potential customers for input, in addition to business plan development.

The I-Corps model typically engages teams of a principal investigator, entrepreneurial lead and industry mentor. An intriguing partnership would be for the lab to partner with one of these programs to either include lab researcher as the investigator or staff to be/support the entrepreneurial lead. NSF provides teams with \$50,000 grants to participate, but the funding description describes training costs as approximately \$1,500 per team member. Ohio and Utah have implemented state versions of I-Corps that provide smaller awards to in-state teams, and the federal labs would be logical partners for similar models in other states. While one goal of the program is a successful startup, universities are appreciating that professors who serve as investigators often remain at the school but now better-understand the entrepreneurial mindset.

Figure 6. Innovation training models for lab researchers and staff.



\* Note: some venture development organizations will also provide lean-focused training.

A second strategy to provide entrepreneurial experience to lab researchers and staff is to work with a venture development organization (or incubator, accelerator or venture capital firm) to establish a fellowship/internship program for lab staff. The focus of this model is to place lab researchers or tech transfer staff with a startup, providing an opportunity to experience the demands of new business creation and development first-hand. Meanwhile, the venture development organization and startup benefit from the technical expertise that the lab employee provides. Versions of these programs exist at a variety of institutions around the country, including the James R. Swartz Entrepreneurial Fellows program at Carnegie Mellon University and the fellowship and internship programs at Fannin Innovation Studio in Houston. The concept is also similar to the office hours or on-site expert approach taken at many

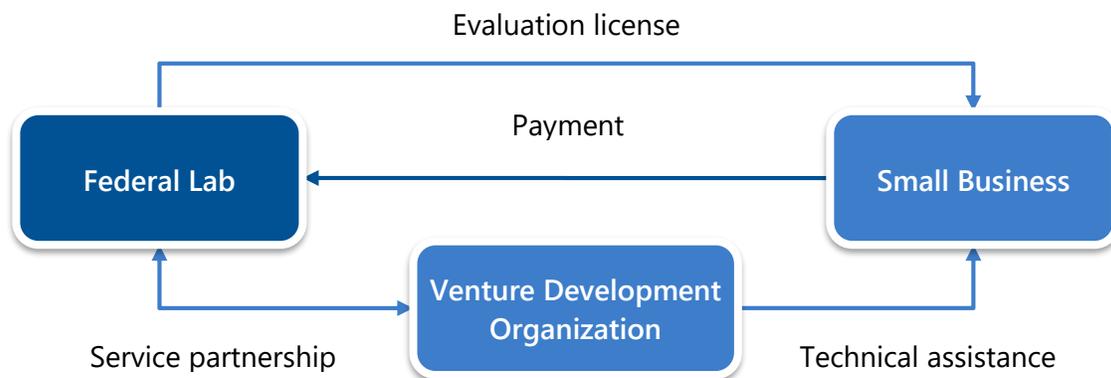
incubators, such as 1871 in Chicago, but instead of one person being generally available for questions, the lab employee would be partnered more intentionally with a startup.

## Evaluation Licenses of Lab Technology

A common concern of many federal labs is how to work more effectively with startups and small businesses. Economic realities dictate that many of these companies have limits on time and financial resources that make lab partnerships challenging at best. For this reason, many federal agencies and specific labs have implemented specific programs and models designed to meet small business on their terms; SBIR/STTR, the U.S. Department of Energy's Small Business Voucher program, and the U.S. Department of Defense's small business contracting requirements are just a few of the vehicles designed to address this challenge. One model that holds particular merit for federal lab-small business relationships is the evaluation license.

The concept of an evaluation license is simple: the lab provides non-commercial, non-exclusive rights for a business to work with a lab technology for a set, flat fee. This arrangement allows the business to work with the technology and conduct development activities around the innovation without the costs of a full commercial license. In the meantime, the lab is not tied to an exclusive arrangement with a business that may fail to develop a commercial product. Once the business model is in place, the lab and business can negotiate the full license. This is the model implemented at NASA's Glenn Research Center. The structure effectively complements the market-driven approach that is advocated by most current entrepreneurial training programs.

Figure 7. Federal lab trial license program with support partner.



To supplement the existence of an evaluation license (or, perhaps, any other small business program), labs could improve the viability of their licensees through a partnership with venture development organizations, or other entrepreneurship-focused organizations. For the lab, the goal of this arrangement is for the small business to receive technical assistance that will improve the likelihood of successful commercial development and the business' continued

viability, both of which also benefit the business. The venture development organization benefits from exposure to investment opportunities and from fee-for-service activities supported by either the lab or the small business. The concept of partnering a service with technical assistance is common across federal programs for small businesses, such as the U.S. Small Business Administration's microloan program. Some federal labs already engage a partner to support SBIR recipients, and the National Institutes of Health's arrangement with BioHealth Innovations, Inc. is one example. For a license program, which is a fee-for-service activity instead of a grant, the lab may prefer to either make the receipt of technical assistance optional or provide a lower fee to companies that accept assistance from registered partners.

## Next Steps

In order to move forward in developing these partnerships, labs will need to identify the potential partners. As discussed in the network analysis discussion in the preceding section, labs will have the greatest short-term success in developing partnerships with organizations they both know and meet their needs. However, mid-term and long-term relationships with organizations that address critical needs may ultimately be the most beneficial for both the lab's technology transfer office and the region as a whole. The following section identifies key organizations in the regional innovation economies of each state in the FLC Mid-Continent region.

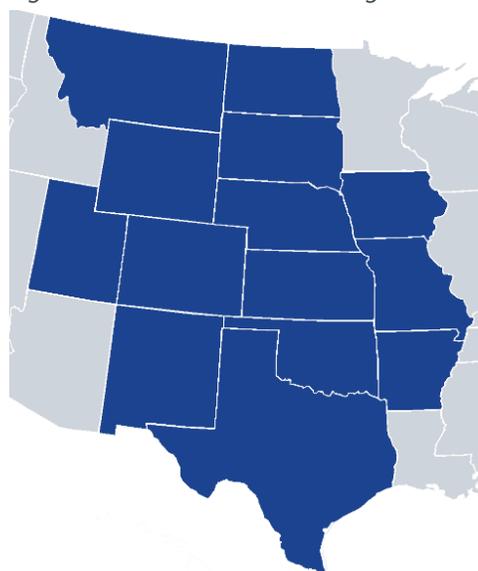
## FLC Mid-Continent Region

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The FLC Mid-Continent region is comprised of more than 100 federal labs and R&D facilities in 14 states: Arkansas, Colorado, Iowa, Kansas, Missouri, Montana, Nebraska, New Mexico, North Dakota, Oklahoma, South Dakota, Texas, Utah and Wyoming. The region provides a variety of resources to support tech transfer activities at these facilities, including participating in national and regional innovation-focused events and communicating success stories and other relevant news to lab staff and the broader innovation community.

The Mid-Continent region contains more states than any other FLC region, and these states seem to represent a wider array of innovation economies than are present within other regions. While Texas is consistently one of country's top recipients of R&D investment, Colorado, Missouri and Iowa are the only other Mid-Continent states in the top of the country for total R&D from 2011-2015.<sup>10</sup> Business R&D is particularly limited in many of these states, with the average Mid-Continent state receiving about one-third as much as other states.<sup>11</sup> However, there is some evidence that state and local partners in the region are willing partners, as the average state in the Mid-Continent spent 23 percent more on R&D than other states from 2011-2015.<sup>12</sup>

Figure 8. FLC Mid-Continent Region



State budgets have been challenged throughout the region over the past few years. Declines in the energy industry have affected North Dakota, South Dakota and Wyoming while a host of factors have led to declining growth in Kansas, Missouri and Texas as well. Fortunately, these economic challenges have not entirely equated to divestments from state-supported tech transfer initiatives. New Mexico leveraged federal support to launch a fund-of-funds in 2016, Iowa and Texas invested in STEM-focused workforce and education programs in the same year, and in the most current budget cycle, South Dakota continued its funding for research centers while Wyoming invested in a new economic diversification program targeting technology as an economic driver. Utah, which boasts one of the greatest per-capita rates of venture capital investments in the country, has funded a state-level tech transfer program akin to the National Science Foundation's Innovation-Corps. This continued emphasis at the state level suggests that federal labs in the region have ample opportunities for new and expanded partnerships.

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<sup>10</sup> National Science Foundation (NSF). (2017). *Higher Education R&D Survey, FY 2015*. Retrieved: <https://ncesdata.nsf.gov/herd/2015/>.

<sup>11</sup> NSF. (2016). "Businesses Spent \$341 Billion on R&D Performed in the United States in 2014." *InfoBriefs*. Retrieved: <https://www.nsf.gov/statistics/2016/nsf16315/>.

<sup>12</sup> NSF. (2017). *Higher Education R&D Survey, FY 2015*. Retrieved: <https://ncesdata.nsf.gov/herd/2015/>.

## State Profiles

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The state profiles on the following pages provide a brief depiction of tech transfer-related activity in each state. The introductory narrative offers context for policy and structural trends. A data snapshot indicates innovation investment through the following data points:

- NSF funding for Industry/University Collaborative Research Centers (I/UCRC);<sup>13</sup>
- Funding for teams participating in NSF's Innovation Corps (I-Corps);<sup>14</sup>
- Venture capital investment in companies based in the state in 2016;<sup>15</sup>
- Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) awards from all agencies to companies based in the state in 2016;<sup>16</sup>
- Regional Innovation Strategies program awards made in the state through 2016;<sup>17</sup>
- Business investment in R&D in 2014;<sup>18</sup>
- Higher education investment in R&D in 2015;<sup>19</sup> and,
- State and local funding for higher education-related R&D in 2015.<sup>20</sup>

Finally, each profile provides information on particularly active tech transfer-related organizations and programs operating in the state. These are categorized by level of activity (i.e. statewide, local, academic) and include a brief description of notable initiatives. This list is not comprehensive and instead provides a more directed look at the actors in each state.

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<sup>13</sup> SSTI analysis of NSF I/UCRC awards data through the end of 2016 as of February 2017.

<sup>14</sup> SSTI analysis of NSF I-Corps awards data through the end of 2016 as of February 2017.

<sup>15</sup> PricewaterhouseCoopers & CB Insights. (2017). *MoneyTree*. Retrieved:

<https://www.cbinsights.com/research/report/venture-capital-q4-2016>.

<sup>16</sup> SSTI analysis of SBIR/STTR awards made in 2016 as of August 2017.

<sup>17</sup> SSTI analysis of award announcements by the U.S. Economic Development Administration.

<sup>18</sup> NSF. (2016). "Businesses Spent \$341 Billion on R&D Performed in the United States in 2014." *InfoBriefs*. Retrieved: <https://www.nsf.gov/statistics/2016/nsf16315/>.

<sup>19</sup> NSF. (2017). *Higher Education R&D Survey, FY 2015*. Retrieved: <https://ncesdata.nsf.gov/herd/2015/>.

<sup>20</sup> *Ibid*.

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## Arkansas

Gov. Asa Hutchinson (R) was first elected in 2014. Despite anticipating weak tax revenues, in 2017 he signed legislation giving the state additional tools to target growth in the innovation and technology sectors. The legislation created a \$2 million accelerator grant program for startups and established a Small Business Innovation Research (SBIR) matching funds program. The Arkansas Economic Development Commission's (AEDC) Division of Science and Technology administers the programs and is seeking corporate sponsors to provide matching funds to create accelerator events throughout the state. Grants of up to \$250,000 will be available to qualified applicants. The SBIR fund will provide funds to match up to 50 percent of federal awards for qualifying companies, up to a cap of \$50,000 for Phase One and up to \$100,000 for Phase Two. The program seeks to create and retain high-tech jobs, foster research, and increase the number of federal SBIR awards for startup and early-stage companies.<sup>21</sup>

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

The **Arkansas Economic Development Commission** (AEDC) primarily focuses on business attraction and retention, including equity investment and R&D tax credits. AEDC's **Division of Science & Technology** is the state's primary tech-based economic development organization. The division supports the transformation of research into entrepreneurial startups and innovation-focused companies. The division manages a wide range of innovation initiatives, including EPSCoR, MEP and the following:

- The **Technology Transfer Assistance Grants** (TTA grants) program provides financial support for the transfer and deployment of innovative technology. AEDC will fund up to \$3,750 of costs associated with transferring new or existing technology from a qualified

State Innovation Investment Profile	
<b>I/UCRC</b>	
4 Centers	\$2,219,278
<b>I-Corps</b>	
4 Teams	\$200,000
<b>Venture Capital (2016)</b>	
3 Deals	\$15,300,000
<b>SBIR/STTR (2016)</b>	
12 Awards	\$5,123,562
<b>Regional Innovation Awards</b>	
1 Award	\$500,000
<b>Business R&amp;D (2014)</b>	
	\$317,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$293,494,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$64,221,000

<sup>21</sup> SSTI. (2017, Feb. 23). "Arkansas targets science, tech growth." *SSTI's Weekly Digest*. Retrieved: <http://ssti.org/blog/arkansas-targets-science-tech-growth>.

applicant — such as a public or private enterprise, laboratory, college or university — to a business based in Arkansas. The effort requires that applications provide a one-to-one match. Companies may compete for two TTA grants per year.

- The **Technology Development program** provides royalty financing for qualified projects that utilize the benefits of science and technology to provide economic and employment growth potential in Arkansas. The maximum investment is \$100,000 with terms negotiated on an individual basis including a maximum 5 percent of net sales for a maximum term of 10 years.
- The **Seed Capital Investment Program (SCIP)** provides equity to tech companies in need of working capital. The SCIP fund can make investments of up to \$500,000 of the company's total financing needs. Investments made by the SCIP fund can be repaid through a variety of instruments, including direct loans, participations and royalties.
- The **Centers for Applied Technology Program** supports the creation of research centers focused on applied technologies of importance to the state. The program allows qualified centers to offer an income tax credit equal to 33 percent of qualified research expenditures to an Arkansas taxpayer who invests in an active project. Eligible projects must encompass one of these areas: advanced materials and manufacturing systems; agriculture, food and environmental sciences; biotechnology, bioengineering and life sciences; and, information technology.

The **Arkansas Research Alliance (ARA)**, operating since 2008 as a public-private partnership, invests in research that stimulates innovation, encourages collaboration, and strengthens economic opportunity. ARA supports the recruitment and retention of top research talent in areas that are commercially viable in the state through the **ARA Scholars** and **ARA Fellows** programs. Current target areas for support include: drug development, stem cell research, and cutting edge membrane technology.

The **Arkansas Development Finance Authority (ADFA)** primarily engages in traditional economic development finance but is also an active investor in startups. The organization's co-investment fund participates in funding rounds with private venture capital and angel investors. ADFA's Arkansas Risk Capital Matching Fund can provide matching investments for specific tech validation and enterprise development activities.

**Arkansas Capital Corp.** provides entrepreneurial support and capital access, primarily in the form of traditional debt and federal loan guarantee programs. The group's early stage activity emphasizes a series of business plan competitions, including the **Donald W. Reynolds Governors Cup**—a collegiate competition with one of the country's largest prizes.

## Academic / Research Institute

The **University of Arkansas** is a major research institution, encompassing a variety of transfer-related activities:

- The **University of Arkansas' Technology Ventures** helps research scientists identify, protect, and commercialize intellectual property developed from university supported activities in order to facilitate tech transfer and startup formation.
- The **Arkansas Research & Technology Park**, operated by a university-created foundation, has lab, research and equipment resources available for affiliate companies related to high performance computing, mass spectrometry and RFID.
- I/UCRC's within the university include **Membrane Science, Engineering and Technology Center, Excellence in Logistics and Distribution, Grid-connected Advanced Power Electronic Systems** and **Physics-Based Compact Modeling of Gallium Nitride Devices for Advanced Power Electronics**.

## Colorado

Gov. John Hickenlooper (D) is term limited in 2018. The state is facing a budget shortfall, with softer economic conditions due to the fall in oil prices. As a result, the state has made modest cuts to economic development and innovation programs, such as advanced industries incentives, while research authorities are expected to receive level funding.

The state has some ability to rely upon other resources to fund innovation and tech transfer. Colorado has a relatively robust private investor capital market and is regularly among the top 20 percent in the nation. The vast majority of this investment is focused on Denver, which has been able to attract several VC firms, private incubators and co-work facilities and other resources without major public investment in these services by the city itself.

Colorado's universities receive a strong level of federal R&D investment. Rather than layer many additional resources on top of these strengths, the state's investments have been more focused on training workers for high-skilled jobs and encouraging regional plans that will better-distribute some of the gains made by Denver, Boulder and some of the Front Range cities.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

### Statewide

**Colorado Office of Economic Development and International Trade** (OEDIT) is the main economic and business development agency in Colorado. Led by the governor, the office works with statewide partners to encourage business growth through financial and technical assistance. The state has identified 14 key industry sectors including seven STEM-based advance industries: advanced manufacturing, aerospace, bioscience, electronics, energy and natural resources, infrastructure engineering and information technology.<sup>22</sup> Businesses in these sectors

State Innovation Investment Profile	
<b>I/UCRC</b>	
14 Centers	\$4,762,659
<b>I-Corps</b>	
16 Teams	\$500,000
<b>Venture Capital (2016)</b>	
128 Deals	\$670,040,000
<b>SBIR/STTR (2016)</b>	
214 Awards	\$82,252,716
<b>Regional Innovation Awards</b>	
2 Awards	\$ 649,720
<b>Business R&amp;D (2014)</b>	
	\$4,551,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$1,273,753,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$39,922,000

<sup>22</sup> OEDIT. (2016). *FY17 Performance Plan*. Retrieved: [https://choosecolorado.com/wp-content/uploads/2016/08/OEDIT-Performance-Plan-FY17\\_7.27.16.pdf](https://choosecolorado.com/wp-content/uploads/2016/08/OEDIT-Performance-Plan-FY17_7.27.16.pdf).

are eligible for special **Advanced Industries Accelerator Programs**, which include proof of concept grants, early-stage capital grants, infrastructure funding to support innovation development, an export accelerator program and an investment tax credit. OEDIT also coordinates other R&D and expansion credits that can apply to a range of businesses.

- Within OEDIT is the **Colorado Innovation Network** (COIN). COIN was created in 2011 as part of the Colorado Blueprint. COIN works to create an innovative environment in the state through the creation of a network of leaders to support and grow this innovation system. COIN is privately funded by corporate and academic partners such as Colorado State University and PricewaterhouseCoopers.
- Also within OEDIT is the **Economic Development Commission** (EDC), which was created by the state legislature to approve loans and grants from the economic development fund to attract new businesses to Colorado and grow existing companies in the state.

**Innosphere** is a high-tech incubator supporting startups in the industries of health innovation, hardware and software, life sciences, and energy and advanced materials. The non-profit is headquartered in Fort Collins with satellite offices in Denver and Boulder. Innosphere claims it has tracked a 75 percent success rate for client companies.

## Local / Regional

The **Center for Technology, Research and Commercialization** (C-TRAC) provides tech transfer services and helps to connect education institutions and industry in Southern Colorado. The intent of these efforts is to: collaborate on technology innovation/maturation; create products for the market; and, provide skill training in new technologies in the areas of aerospace, defense, and cyber security. C-TRAC has a close relationship with the U.S. Air Force Academy and Maxwell Air Force Base.

- **Tech2Market** supports public-private partnerships by providing a platform for Air Force scientists and engineers to showcase technologies to investors and industry members for the purpose of potential licenses and commercialization. Event types include “deep dive discussions” among industry, investors and Air Force R&D personnel; “innovation discovery events” presenting a select group of Air Force technologies to panels of industry and investors and “technology showcases” of larger numbers of technologies and inventors.
- The **Technology Marketplace** is a platform being developed by C-TRAC to facilitate access to intellectual property by simplifying access through centralization, categorization and robust search capability.

## Academic / Research Institute

The **University of Colorado** (CU) is active in a wide variety of tech transfer activities. The **CU Technology Transfer Office** (CU TTO) offers IP management, marketing and communications, policy development, legal advice, compliance and financial management services. In addition, it oversees industrial collaboration, research partnerships, and licensing agreements.

- The **CU Proof-of-Concept** program is comprised of grants for university researchers, early stage capital and retention grants for small businesses, including startups developing university technologies, and the chancellor's innovation awards for research with high commercial potential.
- The **University of Colorado Innovations Office at Anschutz Medical Campus** (CU Innovations) brings together industry partners, entrepreneurs and investors to advance Anschutz-developed technologies. In partnership with CU TTO, CU Innovation offers support for patents, licensing and related tech transfer services.
- Managed by CU Boulder graduate students, the **Deming Center Venture Fund** (DCVF) invests in early stage companies in Boulder and surrounding communities. The fund focuses on gap funding to develop new products and technologies, either independently or with local angel investors.
- I/UCRCs at the university include: **Center for Membrane Science, Engineering and Technology** and **Center for Unmanned Aircraft Systems**.

**Colorado State University** actively pursues the commercial development of its IP through a series of activities coordinated by the **Colorado State University Research Foundation** (CSURF). Beyond rights management and licensing, CSURF operates CSU Ventures.

- **CSU Ventures** facilitates university-related startups and transfer activities and coordinates Colorado's Advanced Industries Accelerator Grants for the university. The organization also leads CSU's NewCo Launchpad, which helps university startups develop business plans and receive support from university legal and business resources.
- I/UCRCs at the university include: **Center for Configuration Analytics and Automation**, **Wheat Genetics Resource Center** and **Next Generation Photovoltaics**.

The **Colorado School of Mines** is a research institution with an active tech transfer office and support for student entrepreneurship activities.

- I/UCRCs at the institution include: **Center for Advanced Subsurface Earth Resource Models**, **Center for Resource Recovery & Recycling**, **Center for Advanced Non-**

**Ferrous Structural Alloys and Center for Integrative Materials Joining Science for Energy Applications.**

The **University of Denver** conducts tech transfer activities and teaches lean Launchpad-based methodology to students through the **Daniels College of Business**.

- I/UCRCs at the university include: **Robots and Sensors for the Human Well-being** and **Novel High Voltage/Temperature Materials and Structures**.

## Iowa

Gov. Terry Brandstad (R) is up for re-election in 2018. He served four terms as governor from 1983 to 1999 and began a second tenure as governor when he was re-elected to the office in 2010. Advanced manufacturing ranks as the state's top business sector followed by bioscience. Higher education funding has experienced cuts and further revenue shortfalls are expected. In 2016, Iowa became the first state to implement a biochemical tax credit: a 10-year, \$10 million chemical production tax credit program intended to build new, cutting-edge industries. The state's latest economic development roadmap was completed in 2014 and looks to expand Iowa's industry clusters. The plan highlights the need to accelerate the development of Iowa's emerging entrepreneurial ecosystem, noting strong university research and development activities, but acknowledging room for improvement in its technology transfer and commercialization activities and goes on to recommend facilitating the transfer of university R&D to industry startups and increasing the amount of venture capital and seed-stage funding available to allow startups to grow as strategies to employ.<sup>23</sup>

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

The **Iowa Economic Development Authority** (IEDA) oversees economic development policy in the state and operates development finance programs, including those targeted to tech and entrepreneurial development. Transfer-related funding opportunities through IEDA include the Proof of Commercial Relevance, Demonstration and Iowa Innovation Acceleration Funds, which are designed to provide loans or royalty financing to startups throughout their early-stage growth.

State Innovation Investment Profile	
<b>I/UCRC</b>	
7 Centers	\$3,273,085
<b>I-Corps</b>	
6 Teams	\$200,000
<b>Venture Capital (2016)</b>	
4 Deals	\$39,420,000
<b>SBIR/STTR (2016)</b>	
23 Awards	\$8,244,984
<b>Regional Innovation Awards</b>	
N/A	N/A
<b>Business R&amp;D (2014)</b>	
	\$2,098,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$758,796,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$53,613,000

<sup>23</sup> Battelle Technology Partnership Practice. (2014). *Iowa's Re-Envisioned Economic Development Roadmap*. Retrieved:

<https://www.iowaeconomicdevelopment.com/userdocs/documents/ieda/2014BattelleReport.pdf>.

The **Iowa Innovation Corporation** (IIC) is the state's designated innovation organization that manages innovation programs and implements strategies developed in conjunction with the **Iowa Innovation Council**, a working group of businesses, universities and governments in the state. IIC also conducts outreach in the state for potential SBIR/STTR applicants.

### Local / Regional

The **Greater Des Moines Partnership** sponsors **Square One DSM**, a co-work space that provides mentoring and planning services for regional startups and entrepreneurs.

### Academic / Research Institute

**Iowa State University** is active in promoting tech transfer and innovation through a variety of related but distributed entities:

- The **ISU Research Park** provides space for new and established tech firms, particularly those related to the university tech transfer process. The park houses a technology incubator for early stage companies in connection with the Pappajohn Center.
- The **ISU Pappajohn Center for Entrepreneurship** provides opportunities for ISU students and recent grads to receive support for their startups and innovations. Activities include a summer accelerator, business plan competitions and connections to other university-related services and courses.
- **ISU Research Foundation** (ISURF) and the **Office of Intellectual Property and Technology Transfer** (OIPTT) provide traditional tech transfer services for university innovations.
- I/UCRC's within the university include **Center for Arthropod Management Technologies, Center for Bioplastics and Biocomposites, Center for Advanced Non-Ferrous Structural Alloys, Center for e-Design, Smart Service System for Traffic Incident Management Enabled by Large-data Innovations.**

**Iowa University** primarily engages in tech transfer through the **University of Iowa Research Foundation** (UIRF), which takes ownership of university IP and works with businesses interested in development or deploying the inventions.

- The **Iowa Medical Innovation Group** is a unique initiative of the university that connects physicians or faculty with ideas for new medical devices to interdisciplinary student teams. These teams then work on business and commercialization plans that would advance the potential device.

## Kansas

Gov. Sam Brownback (R) was first elected in 2010 and signed an income tax cut into law during his first term that was the largest cut in Kansas' history. The state has since experienced significant budget challenges, resulting in cuts to education—to a level that the state's supreme court deemed unconstitutional—and, in mid-2017, a partial restoration of the state's taxing levels. In an attempt to cover its shortfall, the state sold the \$14 million investment portfolio created over the past decade by the Kansas Bioscience Authority, ending the tenure of the quasi state-sponsored economic development agency.

While the Kansas Bioscience Authority is no longer in existence, many of the state's other development-related institutions are still available, albeit with limited funding. The Kansas Department of Commerce is the state's lead agency in the implementation of economic policy and particularly targets alternative energy, distribution, bioscience, advanced manufacturing, value-add agriculture and food processing. Network Kansas is a public-supported organization assisting entrepreneurs throughout the state. Kansas is also home to two strong academic institutions in the University of Kansas and Kansas State University.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

The **Kansas Department of Commerce** is the state's primary economic development authority. Few of the department's initiatives are designed for new businesses, but an angel tax credit seeks to induce early-stage investors to support Kansas entrepreneurs.

**NetWork Kansas** supports the growth of entrepreneurship and small businesses throughout the state, managing a network of more than 500 partner organizations. NetWork Kansas also provides capital for startups through loans and investments through StartUp Kansas, Kansas Capital Multiplier and Women & Minority Business Multiplier funds. The organization is a state-

State Innovation Investment Profile	
<b>I/UCRC</b>	
2 Centers	\$483,000
<b>I-Corps</b>	
6 Teams	\$250,000
<b>Venture Capital (2016)</b>	
5 Deals	\$13,850,000
<b>SBIR/STTR (2016)</b>	
8 Awards	\$3,226,716
<b>Regional Innovation Awards</b>	
1 Award	\$330,000
<b>Business R&amp;D (2014)</b>	
	\$1,934,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$ 562,254,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$64,826,000

chartered nonprofit that includes Fort Hays State University and Wichita State University with its founding partners.

## Local / Regional

The **Enterprise Center in Johnson County** (ECJC) provides a variety of services for entrepreneurs, including education and mentoring. The organization is able to facilitate capital access through its coordination of the Mid-America Angels network. ECJC also operates a Women's Business Center for the region.

The **Wichita Technology Corporation** (WTC) provides seed capital and business services to startups in the Wichita area and supports technology development and transfer throughout the state. WTC is able to be flexible with its capital provisions, working a fee, royalty or equity basis depending on the company. Services include SBIR/STTR consulting, market validation and research, and business plan consulting, in addition to funding through the **Wichita Technology Ventures** seed and early-stage venture capital fund.

## Academic / Research Institute

The **Kansas State University** is a leading research institution in Manhattan. The university houses the I/UCRC, Wheat Genetics Resource Center: A Public-Private Consortium. University tech transfer is led by the **Institute for Commercialization**. The institute provides a wide range of services to transfer technology for commercial use. Special initiatives include a pet food program and bulk solids innovation center. In addition, two offshoot initiatives have built tech transfer partnerships around the state:

- **TechAccel**, a joint project with private partners, provides services for certain bioscience and agriculture related innovations. Specifically, the initiative can provide science risk analysis for investors, opportunities for sponsored research and licensing to universities, and R&D support for businesses.
- **Knowledge-Based Economic Development** (KBED) works with civic, university and other entities throughout the Manhattan region to attract companies with talent, innovation and training.

Tech transfer at the **University of Kansas** primarily occurs through the **KU Innovation and Collaboration** (KUIC), which also operates a Proof of Concept Fund that makes awards to projects developing university IP. **Entrepreneurs@KU** coordinates resources to assist faculty and staff in starting companies, including training initiatives in the form of Startup School @KU and iCorp@KU, connections to KUIC funding and licensing and SBIR/STTR assistance.

## Missouri

Gov. Eric Grietens (R) was first elected in 2016. The state is facing significant budget challenges since the implementation of sizeable tax cuts, prompting the legislature to pass a budget significantly curtailing the state's involvement in research and innovation. The Missouri Technology Corporation (MTC), which oversees the state's innovation initiatives, had its budget reduced by almost 90 percent to \$2.5 million in FY 2018, and the budget significantly reduces spending for higher education. A 2010 effort by then Gov. Jay Nixon identified eight growth industries: automotive suppliers, advanced manufacturing, biosciences, information technology, energy solutions, transportation and logistics, financial and professional services, and health sciences and services.

There are several centers of promising regional activity. St. Louis has a strong bioscience emphasis with several corporations active in R&D and a variety of innovations initiatives coordinated by BioSTL. A variety of groups actively support entrepreneurship in Kansas City. The University of Missouri operates several robust transfer and innovation initiatives in Columbia.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

#### The Missouri Department of Economic Development

acts as the state's traditional economic development organization. The main responsibilities of the department are business attraction and retention, workforce development, and tourism. Additionally, the department houses the Missouri Economic Research and Information Center (MERIC), which provides economic and demographic data for businesses and researchers

The **Missouri Technology Corporation** (MTC) was established by the Missouri legislature as a public-private partnership dedicated to entrepreneurship and technology-based innovation. Through the **Missouri IDEA Fund**, MTC supports small- and medium-sized businesses by helping to commercialize research, provide seed capital, co-invest alongside venture capital

State Innovation Investment Profile	
<b>I/UCRC</b>	
6 Centers	\$1,039,896
<b>I-Corps</b>	
14 Teams	\$503,886
<b>Venture Capital (2016)</b>	
31 Deals	\$236,770,000
<b>SBIR/STTR (2016)</b>	
38 Awards	\$14,598,115
<b>Regional Innovation Awards</b>	
3 Awards	\$1,500,000
<b>Business R&amp;D (2014)</b>	
	\$6,720,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$1,074,115,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$6,764,000

groups, and offer loans for industrial expansion. In addition to investing in organizations that help build out the state's entrepreneurial capacity, MTC also operates 10 innovation centers on emerging technologies, each in a different region.

## Local / Regional

**BioSTL** supports medical and plant bioscience research and commercialization in the Greater St. Louis region. **BioGenerator**, a nonprofit subsidiary of BioSTL, makes investments in promising bioscience companies. By serving as a unifying voice for the bioscience industry, BioSTL also works to improve access to capital in the region, develop physical infrastructure, and foster the inclusion of underrepresented communities.

**KCSourcelink** works to connect entrepreneurs and small businesses with the nearly 250 business-building organizations across the Kansas City metropolitan area. Through these connections, KCSourcelink helps entrepreneurs access the right resources depending on their business' need.

- **Digital Sandbox KC** is a project of KCSourcelink in partnership with a network of public and private sponsors. The center provides proof-of-concept resources to support early-stage commercialization processes including access to technology, business and market experts and funding for early stage market validation, prototyping and beta testing services.

## Academic / Research Institute

The **Missouri University Office of Economic Development** (MU OED) in Columbia collaborates with businesses to help grow research and service contracts and seeks to enhance internships, experiential learning opportunities and job placement activities. Additionally, MU OED focuses on entrepreneurship and commercialization through connections to resources, the Missouri Innovation Center's MU Life Science Incubator, and the Office of Technology Management and Industry Relations.

- I/UCRCs at the university include: **Center for Excellence in Logistics and Distribution**.

The **Regnier Institute for Entrepreneurship and Innovation** at the **University of Missouri-Kansas City** offers multiple programs and educational offerings to support early-stage entrepreneurs. These initiatives are also available to the broader Kansas City community and include workshops and seminars, mentoring programs, and an incubator.

The **Missouri University of Science and Technology** is active in a variety of tech transfer-related initiatives. The school hosts small business development and procurement technical assistance centers and participates in Kauffman's entrepreneurial training. The Office of Technology Transfer and Economic Development, in addition to providing tech transfer services,

operates a **VentureLab** with U.S. Department of Agriculture support to develop startups and is pursuing a new incubator at the university's tech park.

- I/UCRCs at the university include: **Center for Electromagnetic Compatibility, Center for Intelligent Maintenance Systems Center** and **Risk Assessment Techniques for Off-line and On-line Security Evaluation of Cloud Computing.**

The Office of Technology Management at **Washington University in St. Louis** is the principal technology transfer at the university. Located in the Cortex Innovation District, the office manages the university's intellectual property and acts as a resource for faculty members around patent prosecution, material transfer agreements, marketing, and licensing.

## Montana

Gov. Steve Bullock (D) was first elected in 2014 and his current term expires in 2021. The state does not have particularly strong innovation economies, nor does it make comparatively significant investments in related areas. However, the governor has led efforts to secure additional funding for research that has created new commercial products and patented technologies.

The Main Street Montana Project serves to create collaborations with private sector industries, streamline government regulations and build a business plan for the state, leading to innovative partnerships with Montana’s private sector businesses.<sup>24</sup> The bioscience industry employed more than 2,500 people in 2015 and state inventors claimed more than 158 patents in bioscience and related technology areas. Montana’s technology-based economic clusters are supported by organizations such as the Montana Photonics Industry Alliance and the Montana BioScience Alliance.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

**Montana Technology Innovation Partnership** is a state initiative created to promote tech commercialization as an economic development strategy for the state. MTIP provides guidance and assistance for startups in the state. It is run through the Montana Department of Commerce and partners with the State Technology Partnership Committee.

The **Montana Board of Research and Commercialization Technology** (MBRCT) provides funding for research and commercialization projects to be conducted at centers in Montana. The purpose of the program is to encourage economic development through investment in research projects that have a clear path to commercialization.

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
N/A	N/A
<b>Venture Capital (2016)</b>	
5 Deals	\$15,350,000
<b>SBIR/STTR (2016)</b>	
22 Awards	\$5,849,051
<b>Regional Innovation Awards</b>	
1 Award	\$148,600
<b>Business R&amp;D (2014)</b>	
	\$205,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$181,680,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$11,072,000

<sup>24</sup> Montana Governor’s Office of Economic Development. (2015). *Montana Economic Development Report 2015*. Retrieved: [http://business.mt.gov/Portals/49/GOED\\_2015EcoDevReport\\_FNLScreen.pdf](http://business.mt.gov/Portals/49/GOED_2015EcoDevReport_FNLScreen.pdf).

The **Montana Manufacturing Extension Center** is a statewide manufacturing outreach & assistance center staffed by full-time professionals with degrees in engineering and extensive experience in manufacturing and business in a variety of industries.

**Bootstrap Montana** gives startup or growing companies unconventional financing allowing them to maintain control of their business. The Bootstrap Montana Loan Program provides Montana entrepreneurs with 0 percent loans for projects that provide a fast return on investment.

### Academic / Research Institute

The **Montana State University Technology Transfer Office** works to establish relationships between industry and research and creative areas of MSU, including industry sponsored research and collaborating on commercial opportunities.

## Nebraska

Gov. Pete Ricketts (R) was first elected in 2014 and continues to face budget deficits that have been compounded by weak tax revenues, making state-level investments in innovation difficult.

A 2016 analysis of Nebraska’s economic development ecosystem included an analysis of targeted industries in the state<sup>25</sup> and an assessment of its innovation ecosystem.<sup>26</sup> Findings from the report detailed that Nebraska currently enjoys low unemployment levels and a strong agricultural economy.

The state has had some success with its Talent and Innovation Initiative (Ti2), which was launched in 2011 and designed to enhance momentum in Nebraska’s fastest growing industries.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

### Statewide

The **Nebraska Department of Economic Development** (DED) Talent & Innovation Initiative resulted from the 2011 legislative session and includes several bills to create help attract and develop businesses rooted in technology and innovation. The initiatives include:

- **Business Innovation Act** Provides competitive funding for research, development and innovation, and helps expand small business and entrepreneurial outreach efforts that lead to more quality job opportunities.

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
2 Teams	\$100,000
<b>Venture Capital (2016)</b>	
11 Deals	\$31,100,000
<b>SBIR/STTR (2016)</b>	
11 Awards	\$4,196,444
<b>Regional Innovation Awards</b>	
N/A	N/A
<b>Business R&amp;D (2014)</b>	
	\$590,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$463,654,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$11,462,000

<sup>25</sup> SRI International. (2016). *Nebraska’s Next Economy: Analysis and Recommendations*. Retrieved: [http://opportunity.nebraska.gov/files/govsummit/Nebraskas Next Economy Analysis and Recommendations web.pdf](http://opportunity.nebraska.gov/files/govsummit/Nebraskas%20Next%20Economy%20Analysis%20and%20Recommendations%20web.pdf).

<sup>26</sup> SRI International. (2016). *Supporting Innovation-Led Growth in Nebraska*. Retrieved: [http://opportunity.nebraska.gov/files/govsummit/Supporting Innovation Led Growth in Nebraska.pdf](http://opportunity.nebraska.gov/files/govsummit/Supporting%20Innovation%20Led%20Growth%20in%20Nebraska.pdf).

- **Angel Investment Tax Credit** Encourages investment in high-tech start-up enterprises in Nebraska by providing 35-40 percent refundable state income tax credits to qualified Nebraska investors investing in qualified early-stage companies.

**Invest Nebraska** was created through passage of the Nebraska Venture Capital Forum Act in 2001 to assist the state's entrepreneurs, collaborate with investors and grow the state's economy. It serves early stage and middle market companies by assisting entrepreneurs and investing capital in companies with growth potential by partnering with state government, communities and post-secondary education institutions.

- **Nebraska Angel Sidecar Fund** Provides early investment capital that matches private angel fund investment in start-up businesses developing, modifying or employing new technology. Seed capital may be used for advanced intellectual property development and evaluation, advanced proof of concept work for scientific discovery, advanced prototype design and development, to hire key personnel, or related activities.

Nebraska's **Experimental Program to Stimulate Competitive Research** (EPSCoR) works to build the state's research capacity and competitiveness, invest in workforce development, and foster public-private partnerships in science, technology, engineering and mathematics, as well as biomedical research. It is housed on the campus of the University of Nebraska – Lincoln. The EPSCoR program places an emphasis on tech transfer and the research needs of business and industry.

### Academic / Research Institute

**NUtech Ventures** is the intellectual property and commercialization unit for the University of Nebraska - Lincoln. NUtech's mission is to facilitate the commercialization and practical use of innovations generated through the research activities at the University of Nebraska.

## New Mexico

Gov. Susana Martinez (R) is in her second term as governor and faces a difficult budget situation due to the state's reliance on the oil and gas industry. The executive and legislative branches have been at odds over the best way forward for the state, but economic development and higher education have been targeted by both sides, losing at least 6 percent for nearly every related initiative in the most recent budget.

The *Innovation Creates Diversification* plan was released in 2013 and focuses on innovation and enterprise as the key ingredients for the state's economic development through 2018. The primary goal of the plan is to create policies and programs that "encourage the commercialization of ideas and technologies [created or developed in the state] and [to] reduce New Mexico's reliance on federal funding to create jobs and drive the state's economy."<sup>27</sup> Key industries identified are advanced manufacturing; aerospace and defense; energy and natural resources; value-added agriculture; distribution, logistics and transportation; digital and emerging media; and back office and technical support.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

##### The **New Mexico Economic Development**

**Department (EDD)** is the state agency charged with working to enhance and leverage a competitive environment to create jobs, develop the tax base and provide incentives for business development. Their efforts also involve the retention of businesses that are already established within the state as well as working with the New Mexico Film Office. The EDD's programs also

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
8 Teams	\$400,000
<b>Venture Capital (2016)</b>	
2 Deals	\$7,000,000
<b>SBIR/STTR (2016)</b>	
64 Awards	\$27,894,521
<b>Regional Innovation Awards</b>	
3 Awards	\$1,105,706
<b>Business R&amp;D (2014)</b>	
	\$499,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$390,913,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$26,378,000

<sup>27</sup> New Mexico Economic Development Department. (2013). *Innovation Creates Diversification: Five Year Plan for Strategic Economic Growth & Diversification, 2013-2018*. Retrieved: [http://gonm.biz/uploads/documents/NEW\\_MEXICO\\_ECON\\_DEVEL\\_DEPT\\_FIVE\\_YEAR\\_PLAN\\_FINAL\\_CORRECTED\\_3\\_14\\_14.pdf](http://gonm.biz/uploads/documents/NEW_MEXICO_ECON_DEVEL_DEPT_FIVE_YEAR_PLAN_FINAL_CORRECTED_3_14_14.pdf).

provide direct assistance to New Mexico businesses and communities, and it administers several programs that support community development.

The **New Mexico Partnership** is a statutorily created public-private organization under contract to the state's Economic Development Department (EDD) to market the state globally in order to attract new jobs and investment. The Partnership is contracted by the EDD to be the one-stop shop for locating and expanding businesses in the state. It offers a coordinated approach and a network of economic developers to simplify the site selection process.

The **New Mexico Association of Commerce and Industry** (NMACI) is a statewide membership and chamber of commerce / business advocacy organization. According to the NMACI, it "works to promote pro-business" and business specific policies within the state to grow business opportunities and the economy.<sup>28</sup>

### Local / Regional

**Innovate ABQ** is an innovation district in Albuquerque developed in a partnership among the University of New Mexico, city and other public and private stakeholders. Spaces onsite include the **FUSE Makerspace** to support manufacturing-focused entrepreneurs, **UNM Innovation Academy** to connect students to real industry research needs and the **Air Force Research Laboratory Tech Engagement Office**, which serves as an off-lab meeting place for external research and commercial partners.

**projectY** is a co-work space located to encourage interaction between entrepreneurial researchers and community members. Membership allows startups to be connected with like-minded individuals who work to help them achieve professional and personal goals.

### Academic / Research Institute

The **Arrowhead Center at New Mexico State University** (NMSU) contains the university's Office of Intellectual Property & Technology Transfer and offers assistance for small businesses at any stage whether starting out or continuing to grow. While committed to economic development, the Arrowhead Center also has services dedicated to helping entrepreneurs and start-ups develop new technologies and partnerships.

- **Arrowhead Technology Incubator** (ATI) helps entrepreneurs reduce their startup risks with business development partners. On top of this, ATI gives startups the tools needed in order to turn ideas into a reality. They also provide additional support ranging from workshops to capital sourcing.

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<sup>28</sup> New Mexico Association of Commerce & Industry. (2017). "About ACI." Retrieved: <http://nmaci.org/about-aci.aspx>.

Technology transfer and entrepreneurship services at the **University of New Mexico** are operated through **STC.UNM**. The office advertises available IP and university-related startups, in addition to supporting traditional transfer activities. For aspiring entrepreneurs, the office also hosts resources on business development and maintains connections to regional capital providers. The **Economic Development Forum** advises STC.UNM and the university president on economic development initiatives, and a parallel **Economic Development Council** works to expand the university's economic impact on the region. The office also operates the **Joseph L. Cecchi VentureLab** incubator.

## North Dakota

Gov. Doug Burgum (R), a tech entrepreneur and real estate developer, was newly elected in 2016. He has had to make deeper cuts in the state budget than anticipated due to lower tax collections. As a result, the state has undertaken a number of significant reforms, including merging the angel and seed tax credits and defunding the state's tech commercialization program. These budget difficulties may be particularly impactful for the future outlook of innovation activity in North Dakota, which has made strong state-level investments in R&D for the region but receives relatively few resources from other sources (see the sidebar at right).

The Center for Innovation and the University of North Dakota operate highly-regarded entrepreneurship initiatives and include students as managers in fund operations. The City of Fargo has also been working to develop resources for entrepreneurs.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

Through its Research ND program, the **North Dakota Department of Commerce (DOC)** provides funds for product research, development and commercialization in nearly any industry. Industries of emphasis include manufacturing, energy, value-added agriculture, technology, aviation, and life sciences. Research ND also supports the state's Centers of Excellence and Research Excellence program, hubs of R&D on North Dakota's college and university campuses that collaborate with private businesses to generate new business opportunities. Through the Innovate ND program, the DOC provides access to education, venture tools, and additional resources to North Dakota-based entrepreneurs and innovators working on a new concept.

- **Innovate ND**, an initiative of ND DOC, provides startups with a \$2,500 service voucher to an entrepreneurial center and access to online tools for a \$250 fee. The approved centers are the UND Center for Innovation, NDSU Research & Technology Park and IDEA Center.

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
N/A	N/A
<b>Venture Capital (2016)</b>	
N/A	N/A
<b>SBIR/STTR (2016)</b>	
3 Awards	\$998,394
<b>Regional Innovation Awards</b>	
1 Awards	\$ 250,000
<b>Business R&amp;D (2014)</b>	
	\$271,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$217,926,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$59,993,000

## Local / Regional

The **City of Mandan** maintains a Growth Fund that supports business development fulfilling broader economic development goals. The fund is able to take an equity position in new companies as part of its entrepreneurial focus.

The **Incubator for Developing Entrepreneurial Activity (IDEA) Center** is one of North Dakota's certified entrepreneurial centers and provides specialty services and guidance to inventors and product based entrepreneurs, helping them attain economical solutions for research and development, prototyping and taking a product from idea to market.

Thirty-six municipalities throughout North Dakota participate in the **Red River Corridor Fund**, which is a U.S. Department of Treasury-funded small business initiative that includes a sidecar fund for a network of angel capital investors.

## Academic / Research Institute

The **UND Center for Innovation** at the University of North Dakota, formed in 1984 as one of the first entrepreneur outreach centers in the nation, provides assistance to innovators, entrepreneurs, and researchers to launch new ventures, commercialize new technologies, and secure access to capital from private and public sources. In addition to managing two tech incubators in the UND Tech Park, the center provides SBIR outreach, and houses the Dakota Venture Group, the only fully student-managed venture fund in the nation where students make the actual investment decisions.

**North Dakota State University (NDSU) Research & Technology Park** works to be a catalyst for innovation in science and technology that will contribute to North Dakota's economic development. The park welcomes high-growth companies involved in the development of new technology that are willing to establish a working relationship with NDSU. The research park is particularly interesting in companies emphasizing technology in the following fields: material sciences; biosciences and life technology; information technology; nanotechnology; and, advanced manufacturing and sensors/micro-electronics.

## Oklahoma

Gov. Mary Fallin (R), first elected in 2010 and term-limited in 2018, is facing a serious budget situation, with the state having temporarily exhausted its rainy day fund in 2017 and facing calls for tighter spending. In the face of continued revenue shortcomings, ratings agencies have downgraded the state's debt ratings, which will exacerbate its fiscal concerns.

The state attempts to be very strategic in its development investments. A 2013 intensive research process analyzed the state's economy and identified core industry clusters including energy, aerospace, defense and information systems. The state targets business retention, expansion, and recruitment for these industry clusters. *ONEOKLAHOMA* is a strategic plan for science and technology in the state, a 2016 update to the original 2012 plan, emphasizing that investment in and sustainment of science and technology (S&T) in Oklahoma is vital for the state's growth.<sup>29</sup> One of the plan's recommendations is a state summit to discuss the role of S&T innovation and investment to the state's economy and receive recommendations from stakeholders regarding future investment directions.

The Oklahoma Department of Commerce is the lead agency for economic development in the state.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

### Statewide

Created in 1986, The **Oklahoma Center for the Advancement of Science & Technology** (OCAST) serves as the state's lead tech-based economic development agency. OCAST supports researchers, entrepreneurs, and companies by providing funds for research and proof of concept, linking entrepreneurs to additional sources of capital, and connecting businesses to researchers. OCAST supports a continuum of programs that includes funding research,

<sup>29</sup> Governor's Science & Technology Council. (2016). *OneOklahoma: A Strategic Plan for Science and Technology*. Retrieved: <https://www.ok.gov/ocast/documents/2016OneOklahoma.pdf>.

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
5 Teams	\$250,000
<b>Venture Capital (2016)</b>	
2 Deals	\$4,400,000
<b>SBIR/STTR (2016)</b>	
15 Awards	\$5,206,001
<b>Regional Innovation Awards</b>	
2 Awards	\$551,149
<b>Business R&amp;D (2014)</b>	
	\$607,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$419,602,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$61,798,000

developing an idea, commercializing technology, and addressing the production stage by funding programs the agency administers and through its strategic partnerships.

Serving as the state's MEP Center, The **Oklahoma Manufacturing Alliance**, a strategic partner of OCAST, offers technical assistance and business advice to manufacturers through a statewide network of manufacturing extension agents and applications engineers. Operating as an independent, nonprofit organization, OMA receives significant funding from OCAST, as well as funding from other partners such as the Oklahoma Department of Commerce and the Oklahoma Department of Career & Technology Education.

An additional strategic partner of OCAST, **i2E** was created in 1997 to support entrepreneurs in Oklahoma and help build successful, high-growth companies. i2E works directly with entrepreneurs to help them commercialize their technologies, grow their business, and access capital. Operating as an independent, nonprofit organization, i2E receives significant funding from OCAST, as well as additional funds from the Donald W. Reynolds Foundation and the Greater Oklahoma City Chamber.

## Local / Regional

The **Oklahoma Innovation Institute** is a nonprofit organization focused on building an innovative entrepreneurial economy in Oklahoma. Founded in 2006 and spearheaded by the Tulsa Community Foundation and other community partners, the OII conducts its work through multiple initiatives. Examples include:

- **Tulsa Research Partners** is a multi-disciplinary research partnership between Tulsa's research universities: The University of Tulsa, the University of Oklahoma-Tulsa, Oklahoma State University-Tulsa, Tulsa Community College, Oral Roberts University and Northeastern State University. The partnership identifies opportunities for collaborative R&D, supports workforce development, and provides a community approach to tech transfer and commercialization.
- The **Tandy Supercomputing Center** provides supercomputing access to students, faculty, and industry partners. To support innovative entrepreneurs, the center also provides free services for startups and proofs of concepts.
- The OII partners with **BetaBlox**, a Kansas City-based accelerator, to provide early stage companies and entrepreneurs with specific, startup focused training and mentorship.

## Academic / Research Institute

The **Economic Development Office at the University of Oklahoma** oversees the university's intellectual property, economic development, and technology-based entrepreneurial activities. The office administers three main programs: public private partnerships with industry; the **Irani**

**Center for the Creation of Economic Wealth**, which provides entrepreneurial programming and support around technology industries; and the office of Technology Development, which helps license university technologies.

The **New Product Development Center** (NPDC), a strategic partner of OCAST, offers education, guidance, technical engineering assistance as an extension unit of the **Oklahoma State University** College of Engineering, Architecture, and Technology. In addition to providing pay for service engineering, programs supported by the NPDC include: The Center for Technology Commercialization, which assists technology-based entrepreneurs; Investor's Assistance Service, providing prototype assistance; and, services targeting oil and gas companies seeking industrial diversification.

## South Dakota

Gov. Dennis Daugaard (R), who is term limited in 2018, is facing decreasing tax revenues which forced a \$24 million cut to the state's FY 2017 budget and flat funding for 2018. Despite these pressures, the state has maintained its limited funding for innovation initiatives. The state's primary investment in innovation is for the Office of Research Commerce (\$4.6 million), which provides matching funds for EPSCoR, a proof of concept program and research center funding. This office is located within the Governor's Office of Economic Development, which also offers several programs and financing and tax incentive programs for businesses.

South Dakota sees limited investments in R&D activity, both at institutions of higher education and among businesses (see sidebar at right), and provides little money for these efforts itself. However, the state did support Fermilab's investments to convert a former mine into an R&D facility related to the lab's particle accelerator research.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

The **Governor's Office of Economic Development** (GOED) is primarily a traditional economic development offers supporting business recruitment and retention in addition to coordinating financing and incentives. The key industries for the state are: advanced

manufacturing, bioscience, energy, financial and professional services, outdoor activities and value-added agriculture. The office also works with the Office of Research Commerce on matching funds for EPSCoR, a proof of concept program and research center funding.

The South Dakota **Enterprise Institute** is a private, non-profit corporation that provides customized business development, commercialization, and market research services to entrepreneurs, inventors, and startup companies in South Dakota. Specific activities include five managed angel investment funds and an innovation expo featuring new technology. The

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
3 Teams	\$ 150,000
<b>Venture Capital (2016)</b>	
N/A	N/A
<b>SBIR/STTR (2016)</b>	
3 Awards	\$1,126,727
<b>Regional Innovation Awards</b>	
N/A	N/A
<b>Business R&amp;D (2014)</b>	
	\$135,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$103,368,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$19,330,000

institute works in partnership with the **South Dakota Technology Business Centers**, which are operated by South Dakota State University and have three centers throughout the state.

## Academic / Research Institute

The **Office of Research and Sponsored Programs** at the **University of South Dakota (USD)** supports faculty as they compete for research funding and assists with technology transfer through IP administration, market development plans and connections to industry. USD is the state's contact for supporting prospective SBIR applicants throughout the state. The university also manages the **USD Research Park** and **Signature Research Centers** for biomedical research, post-traumatic stress disorder, alternative energy and oral history.

The **Office of the Vice President for Research** at **South Dakota State University (SDSU)** supports research across the university, with particular interests in agriculture, engineering, renewable energy, pharmaceuticals, GIS, environmental sciences, nutrition and health. The office connects faculty to external funding and grant assistance and contains the Tech Transfer Office, which helps create collaboration between the university and private industry, and administers university IP. SDSU is also home to a research park that includes lab and greenhouse space, in addition to offices, as well as **Centers of Excellence** for GIS, nutrition, photonics, infectious diseases, cancer, transportation, renewable energy and water.

- SDSU hosts the **Agriculture Experiment Station (AES)**, which receives significant state funding and supports faculty in agriculture, biology, education and human sciences. The AES contains six field stations on 17,000 acres of land across the state.

**SD Space Grant Consortium** is led by the **SD School of Mines and Technology** in partnership with other universities and research institutions throughout the state with an emphasis on supporting STEM education and funding opportunities. The group is just one of several such NASA-supported consortia throughout the country.

## Texas

Gov. Greg Abbott (R), elected in 2014, has been active in education policy. The Governor’s University Research Initiative (GURI) provides funding for in-state institutions of higher education to recruit particularly talented and prolific researchers. Despite successfully attracting multiple high-profile scholars, the program has been one of the casualties of the state’s recent budget challenges. GURI, along with multiple initiatives to fund research at Texas institutions, were reduced by millions for FY 2018. Beyond the research component of innovation development, Abbott previously eliminated the Emerging Technology Fund, which helped fund high-tech startups but was criticized for a lack of transparency, but the state still operates a modest business incubator fund.

The Governor’s Office of Economic Development and Tourism serves as the state’s leading economic development organization. Abbott has pushed for the state to diversify the economy beyond the energy sector. The target industries Texas identifies for the greatest growth potential are: advanced tech and manufacturing; aerospace, aviation and defense; biotechnology and life sciences; information and computer tech; petroleum refining and chemical products; and, energy.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

### Statewide

Texas’ official economic development organization is the **Economic Development and Tourism Division (EDT)** of the governor's office. EDT focuses most of its efforts on traditional economic development efforts focused on business attraction and retention. Within the division, the **Department of Economic Development Finance (EDF)** has responsibility for financial programs and incentives, including innovation-focused initiatives.

State Innovation Investment Profile	
<b>I/UCRC</b>	
25 Centers	\$6,932,520
<b>I-Corps</b>	
89 Teams	\$3,472,254
<b>Venture Capital (2016)</b>	
201 Deals	\$1,330,040,000
<b>SBIR/STTR (2016)</b>	
217 Awards	\$94,974,268
<b>Regional Innovation Awards</b>	
4 Awards	\$1,595,892
<b>Business R&amp;D (2014)</b>	
	\$16,373,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$5,082,598,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$814,058,000

- **Governor’s University Research Initiative** is intended to attract star researchers to the state’s universities by providing matching grants to assist eligible institutions of higher education in offering competitive funding packages to candidates.
- The **Texas Product Development & Small Business Incubator Fund (PDSBI)** is a revolving loan fund that finances the development, production and commercialization of products by small businesses. Financing can be used for capital and operating expenses with preference for companies in key state technology cluster areas: nanotechnology, biotechnology, biomedicine, renewable energy, agriculture and aerospace.

## Local / Regional

The **Austin Technology Incubator (ATI)** is a local initiative of the IC<sup>2</sup> Institute supporting startups. The incubator does not provide direct funding but supports a network of investors that have a strong history of investing in ATI companies. In addition, the incubator offers business services including access to mentors and other advisors.

The **Texas Research & Technology Foundation (TRTF)** is a nonprofit organization that supports economic development in the biosciences and technology sectors. TRTF connects regional research institutions and entrepreneurs with connections to commercialization expertise and potential investors. TRTF also manages the **Texas Research Park** in San Antonio and the **McDermott Legacy Fund**, which invests matching dollars in regional startups.

The **Houston Technology Center (HTC)** is an incubator for companies in energy, information technology, life sciences, transportation and commercial space. HTC has grown to four regional locations, each applying an acceleration model emphasizing team and product development, market analysis and financing.

## Academic / Research Institute

The **University of Texas at Austin** provides a wide range of tech transfer activities. The **Office of Technology Commercialization** offers support for patents, licensing and related activities. **Longhorn Startup** teaches entrepreneurship and provides course credit to students working on startups, and the **Herb Kelleher Center for Entrepreneurship, Growth and Renewal** connects university- and community-based resources.

- The University of Texas at Austin’s **IC<sup>2</sup> Institute** supports technology transfer for regional economic development. The institute emphasizes collaboration and education for universities, government and industry. Specific IC<sup>2</sup> initiatives include:
  - The **Global Commercialization Group**, which delivers technology commercialization training and international business development programs

around the world. Services include the Innovation Readiness Series, an online curriculum for innovators.

- **IC<sup>2</sup> Advanced Commercialization Training** program emphasizing practical tools to assess technologies and use private markets to make decisions about the transfer and commercialization of innovations.
- I/UCRCs in the university system include:
  - Arlington — **iPerform - Assistive Technologies to Enhance Human Performance, Sustainable Utilization of Composites in Infrastructure Systems and Center for Energy-Smart Electronic Systems (ES2)**.
  - Austin — **Next Generation Photovoltaics and Intelligent Maintenance Systems**.
  - Dallas — **Wind Energy, Science, Technology, and Research (WindSTAR), Net-centric and Cloud Software and Systems and Assistive Technologies to Enhance Human Performance**.

The **University of Houston (UH) Division of Research** oversees the university's efforts to expand and improve its research capacity and impact. These activities include technology transfer services and coordination of UH's entrepreneurial services.

- **RED Labs** is UH's accelerator and entrepreneurship education center. Accelerator participants receive a 12-week program, co-working space and access to a mentoring network. RED Labs coordinates entrepreneurial training include NSF's I-Corps and custom curricula.
- UH's **Technology Gap Fund** is designed to support university inventors as they move their technologies closer to commercial readiness. Awards of up to \$50,000 per project enable inventors to increase the commercial value of the technology. UH requires that grant recipients receive educational training including taking part in RED Labs' offerings.
- I/UCRCs at the university include the **Center for Electromagnetic Compatibility**.

**Rice University** has developed an active set of activities through its Entrepreneurship Initiative. The **Lilie New Entrepreneurs Grant** offers \$10,000 to students from any major with entrepreneurial ideas during their undergraduate studies. **OwlSpark**, Rice University's start up accelerator, provides students with learning opportunities about entrepreneurship while working on their own startup ventures. The university is also a partner in the I/UCRC: **Center for Atomically Thin Multifunctional Coatings**.

The **Texas A&M University (TAMU)** supports an array of transfer-related activities. The **Technology Commercialization (TTC)** office provides a link between Texas A&M research

laboratories where innovative new technologies are being developed and industry partners that will bring them to fruition as a product.

- The **Center for New Ventures and Entrepreneurship** boasts 11 programs for entrepreneurs, ranging from entrepreneurial education and training to multiple business challenges, the **Startup Aggieland** incubator/accelerator and a seed fund.
- I/UCRCs in the TAMU system include: **Center on Intelligent Storage**, **Center for Next Generation Photovoltaics** and **Center for Health Organization Transformation**.

**Texas Tech University** (TTU) provides its own set of technology transfer and entrepreneurship services for university-related innovators. The **Office of Research Commercialization** (ORC) is tasked with identifying, protecting and licensing university intellectual property.

- The **Innovation Hub at Research Park** promotes and supports entrepreneurship for the West Texas region. Activities at the park include the Southwest Node of the NSF's I-Corps, the **iLaunch** business competition, mentorship services and the **BaseCamp & Rapid Prototyping Lab**.
- I/UCRCs at the university include: **Data-Intensive Scalable Computing Instrument for High Performance Computing** and Cloud and Autonomic Computing (**CAC@TTU**).

## Utah

Gov. Gary Herbert (R), was first elected to the office in a 2009 special election and, while eligible, has announced that he will not run in 2020. Over the course of his tenure, the state has solidified its reputation for innovation and entrepreneurship.<sup>30,31</sup> The state's rise in venture capital investment is particularly noteworthy, becoming one of the top five states for per-capita investment and regularly in the top 15 for total dollars.

Utah has been aggressive in developing this reputation for innovation through initiatives targeted toward tech development and transfer. The state matches one of the region's highest levels of higher education R&D funding with modest state dollars. However, the Utah Science Tech and Research Initiative (USTAR) provides a dedicated and comprehensive resource for innovation policy and programs. USTAR's initiatives include commercialization grants and a state-level version of the federal Innovation-Corps initiative. The Governor's Office of Economic Development (GOED) has overall responsibility for the state's economic development policy.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

### Statewide

The **Utah Governor's Office of Economic Development (GOED)** is the state's primary economic development organization and primarily focuses on business attraction/retention. The office coordinates the Utah Strategic Industry Cluster initiative to create sustainable advantages around aerospace and defense, energy and natural resources, financial services, life sciences, outdoor products, and software development and information

State Innovation Investment Profile	
<b>I/UCRC</b>	
6 Centers	\$2,608,131
<b>I-Corps</b>	
6 Teams	\$300,000
<b>Venture Capital (2016)</b>	
64 Deals	\$630,660,000
<b>SBIR/STTR (2016)</b>	
52 Awards	\$21,703,028
<b>Regional Innovation Awards</b>	
2 Awards	\$750,000
<b>Business R&amp;D (2014)</b>	
	\$2,809,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$733,407,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$44,760,000

<sup>30</sup> U.S. Chamber of Commerce Foundation. (2015). *States Innovate*. Retrieved: <https://www.uschamberfoundation.org/enterprisingstates/>.

<sup>31</sup> Ewing Marion Kauffman Foundation. (2017). "Smaller States." *The Kauffman Index*. Retrieved: <http://www.kauffman.org/kauffman-index/rankings?report=growth&indicator=growth-rate&type=smaller>.

technology. GOED also oversees the **STEM Action Center**, which drives research and implementation of STEM education best practices across Utah.

**Utah Science, Technology and Research Initiative (USTAR)** is the state's lead tech-based economic development organization. USTAR is the state's primary organization focused on growing the state's innovation economy by supporting the state's primary research institutions and helping industry interface with them in a way that will create jobs and spur economic prosperity. Its efforts include connecting entrepreneurs, innovators, industry, education, and the financial community with the equipment and human capital assets of the regional schools and universities. USTAR's programs focus on three areas: innovation, entrepreneurship and investment.

- The **USTAR SBIR/STTR Assistance Center (SSAC)**, located at Salt Lake Community College-Miller Campus in Sandy, is a statewide resource that helps entrepreneurs and small businesses to compete for federal SBIR/STTR funding. Services include assisting in the search for opportunities, registering with federal funding portals, grant writing and training/educational programming.
- The **University Technology Acceleration Grant (UTAG)** makes competitive awards to individual researchers or teams employed at the state's colleges or universities to further develop technology from the schools' labs. Projects must have an identified market or commercialization path and have an expected timeline of no more than 18 months.
- The **Technology Commercialization & Innovation Program (TCIP)** is a grant program intended to accelerate the commercialization of promising technologies that have strategic value. Startups as well as existing companies that plan to create a new product or product line from the licensed technology are eligible for TCIP grants. Funding can be awarded in up to three funding rounds, with each grant having a maximum of \$100,000 and no more than \$200,000 going to any one technology.

## Academic / Research Institute

The **University of Utah** is active in tech transfer and advanced R&D initiatives, including hosting the I/UCRC: Center for Hybrid Multicore Productivity Research. The university's premier transfer and entrepreneurship initiative is the **Technology & Venture Commercialization's (TVC)**, which provides support services to companies and universities to help them successfully commercialize intellectual property developed at the university. TVC operates several programs to help faculty, students and industry spur economic growth and job creation in their region, including:

- The **Engine Funding Program** (“Commercialization Engine”) provides capital for early-stage discoveries. The fund is an integrated program focused on early stage vetting and developing innovations. Funding is open to any individual who has assigned his or her intellectual property to the **University of Utah Research Foundation** and participates in the program. Funding supports research and development activities.

**Utah State University (USU)** has two primary vehicles for tech transfer initiatives. The **Innovation Campus** provides tenants with research facilities, services and technology. Clients may also access university research expertise and tech transfer programs. The offices of **Technology Transfer Services** and **Intellectual Property (IP) Services** work with industry to develop relevant, practical technologies, leverage university assets and help university faculty protect their IP rights.

**Brigham Young University** has a relatively unique approach to tech transfer and entrepreneurship in the region, evidenced in its combined **Creativity, Innovation and Design Group** (CID BYU). The group provides a variety of lab spaces across university units and coordinates with the university’s tech transfer office. The **Rollins Center for Technology and Entrepreneurship** coordinates student entrepreneurship activities including courses and competitions.

- I/UCRCs at the university include: **Center for Visual and Decision Informatics**, **Center for Unmanned Aircraft Systems** and **Network-enabled Airborne Autonomy**.

## Wyoming

Gov. Matt Mead (R) is serving his second term in office and has talked about the need to “build on the recent success in establishing technology as a fourth leg of Wyoming’s economic strength.” Despite experiencing some of the same budget challenges confronting other states in the region, the governor and legislature were willing to use ‘rainy day’ funds to continue advancing innovation in the state. New legislation in the FY 2018 budget authorizes the Economically Needed Diversification Options for Wyoming (ENDOW) initiative. ENDOW is intended as a comprehensive approach to diversify the state’s economy.<sup>32</sup> Funding for the program includes \$1 million to create a strategy to grow the state’s technology economy.

The new legislation will not have many state or federal innovation resources to build upon. The Wyoming Business Council has primary responsibility for economic development in the state, and the University of Wyoming aggressively promotes tech transfer and entrepreneurship in the state. However, these institutions are operating in an environment fueled by relatively small investments in business and higher education R&D, innovation or tech transfer overall.

### Potential Partner Organizations / Programs

The following descriptions highlight some of the most active tech transfer-related organizations in the state.

#### Statewide

The **Wyoming Business Council** is the state of Wyoming’s economic development agency. The Business Council works with private businesses, state agencies, local governments, local economic development groups, partners and nonprofits to grow and diversify the state’s economy. One of the focus areas is targeting and growing advanced industries/manufacturing in the state.

State Innovation Investment Profile	
<b>I/UCRC</b>	
N/A	N/A
<b>I-Corps</b>	
N/A	N/A
<b>Venture Capital (2016)</b>	
N/A	N/A
<b>SBIR/STTR (2016)</b>	
6 Awards	\$2,434,452
<b>Regional Innovation Awards</b>	
N/A	N/A
<b>Business R&amp;D (2014)</b>	
	\$59,000,000
<b>Higher Ed. R&amp;D (2015)</b>	
	\$56,996,000
<b>State / Local Support for Higher Ed. R&amp;D (2015)</b>	
	\$3,362,000

<sup>32</sup> Economically Needed Diversification Options for Wyoming. (2017). “About: The ENDOW Initiative.” Retrieved: <https://www.endowyo.biz/about>.

The **Wyoming Entrepreneur and Small Business Development Center** provides technical assistance and network connections for new businesses throughout the state.

### Local / Regional

The **Wyoming Smart Capital Network** is a U.S. Department of Treasury-funded small business capital network focused on several municipalities throughout the state. Businesses can access capital for equipment purchases or as an investment through an early-stage investment fund.

### Academic / Research Institute

The **Wyoming Technology Transfer and Research Products Center** (WY-TTRPC) acts as the tech transfer office for the **University of Wyoming** and also has an outreach mission to assist entrepreneurs and investors throughout the state. Activities at the university include the **John P. Ellbogen \$30K Entrepreneurship Competition** for student businesses.

## Appendix I: Types of Business Partnerships

This table, developed by NSWC Crane, features descriptions of the types of business partnerships associated with federal labs, along with potential partners, its purposes and its advantages.

Type Of Agreement	Who Labs Can Partner With	Purpose and Advantage	Description
<b>Broad Agency Announcement</b>	US or foreign businesses, universities, and individuals	Used for competitive selection of proposals for scientific study and experimentation. Invitation to submit a proposal for R&D.	Provides general description of Navy needs and future requirements; not a formal Request for proposal. May be open up to a year. Contracts may or may not be awarded. Publication in the Commerce and Business Daily.
<b>Cooperative Research and Development Agreement (CRADA)</b>	Any non-federal government	Joint development and sharing of facilities knowledge, experience and/or intellectual property. Provides data and intellectual property protection from a Freedom of Information Act for an established period of time.	An agreement that provides for joint research and development; however, Crane personnel and facilities cost may be paid for by the non-government partner. Not subject to Federal Acquisition Regulations.
<b>Integrated Product and Process Development of Integrated Product Teams</b>	Parties involved in development and delivery of a product or concept.	Empowerment of a team to develop or deliver a product at best cost, schedule and quality that is supportable.	Encourages coordination, communication and innovation for development of new products or technologies for the benefit of all parties.
<b>Inter-governmental Personnel Act</b>	State or local government, universities, and qualified non-profit entities	Assigned personnel act as employees of institution to which they are assigned. Promotes intergovernmental understanding and collaboration for mutual benefit.	Personnel temporarily assigned to another organization for 1 to 4 years. Salary may be paid by receiving or assigning organization or the cost may be shared.

Type Of Agreement	Who Labs Can Partner With	Purpose and Advantage	Description
<b>Memorandum of Understanding or Agreement</b>	Any federal government entity, university or business entity	Shoes intent to work together in a partnership or collaborative manner. No funding, contracting or accounting.	A high level agreement documenting and identifying areas of potential collaboration and/or a strategy to do so. Requires approval by senior managers.
<b>Patent License Agreement (PLA)</b>	Any entity	Commercially exploit patented developed technology. Licensees have competitive advantage for commercialization of a product or process.	Assigns the right to make, use or sell government intellectual property. License fees and/or royalties may be involved.
<b>Small Business Innovative Research Program</b>	Any US small business with Less than 500 employees	Take advantage of special funding set aside by congress to develop innovative solution to Navy problems having a potential for commercial use.	Contracts are phased to permit technology feasibility and demonstration before full-scale development commercialization. Award amounts generally range from \$100I to \$750k, depending upon phase.
<b>Work for Private Parties Agreement</b>	Any business, university or private entity	Rapid contract process by whereby unique Crane facilities and personnel can be directly accessed and paid for by a non-profit government customer.	Tasking based on Statement of Work by customer and cost estimate provide by Crane personnel. Approval at local level; not subject to Federal Acquisition Regulations. Requires indemnification and advance or phased payment.

## Appendix II: Further Reading

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Numerous additional resources discuss federal labs' role in tech transfer and innovation partnerships. For additional information, readers are encouraged to consider the following:

- Andes, Scott, Mark Muro, and Matthew Stepp. (2014). "Going Local: Connecting the National Labs to Their Regions for Innovation and Growth." *Brookings Advanced Industries Series*. Available: <https://www.brookings.edu/research/going-local-connecting-the-national-labs-to-their-regions-to-maximize-innovation-and-growth/>.
- Engility Corporation, Inc. (2015). *Public/Private Partnership Guide for Indiana Military Facilities*. Available: [http://www.in.gov/iodd/files/P3\\_Guide\\_for\\_Indiana\\_Military\\_Facilities\\_9\\_July\\_15\\_Final.pdf](http://www.in.gov/iodd/files/P3_Guide_for_Indiana_Military_Facilities_9_July_15_Final.pdf).
- Koschatzky, Knut, Esther Schnabl, Andrea Zenker, et al. (2014). "The Role of Associations in Regional Innovation Systems." *Fraunhofer Institute for Systems and Innovation Research ISI, R4*. Available: [http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/arbap\\_unternehmen\\_region/2014/ap\\_r4\\_2014.pdf](http://www.isi.fraunhofer.de/isi-wAssets/docs/p/de/arbap_unternehmen_region/2014/ap_r4_2014.pdf).
- Palminteri, D. & Porter, D. (2016). *Enhancing National Laboratory Partnership and Commercialization Opportunities*. Available: [http://innovationassoc.com/files/Argonne.IA.Enhancing\\_Nat\\_Lab\\_Partnerships.Final.1.pdf](http://innovationassoc.com/files/Argonne.IA.Enhancing_Nat_Lab_Partnerships.Final.1.pdf).
- TechLink and University of Colorado Business Research Division. (2016). *National Economic Impacts from TechLink-Brokered Partnerships between the Department of Defense and U.S. Industry, 2000-2014*. Available: <https://techlinkcenter.org/wp-content/uploads/2017/01/2016-DoD-Licensing-Study-E-Publication.pdf>.

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- IC<sup>2</sup> Institute
- Innosphere
- Los Alamos National Laboratory
- NASA Johnson Space Center
- National Renewable Energy Laboratory
- National Security Campus
- project cowork Los Alamos
- Sandia National Laboratory
- Technology Ventures Corporation
- Texas Manufacturing Assistance Center (TMAC)
- U.S. Army Institute of Surgical Research
- U.S. Bureau of Reclamation
- U.S. Department of Agriculture Agricultural Research Service
- U.S. Environmental Protection Agency Office of Research & Development
- University of Houston, RED Labs

## About SSTI

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SSTI strengthens initiatives to create a better future through science, technology, innovation and entrepreneurship.

As the most comprehensive resource available for those involved in the innovation ecosystem, SSTI offers the services that are needed to help build innovation-based economies. We strive to maximize the capacity of our members to deliver successful outcomes within the context of the complex innovation communities in which they participate.

Since its inception in 1996, SSTI has developed a nationwide network of practitioners and policymakers dedicated to improving the economy through science, technology, innovation and entrepreneurship. To best assist nurturing more vibrant economies, SSTI conducts research on common performance standards, identifies best practices, analyzes trends in and policies affecting the innovation ecosystem, and fosters greater cooperation among and between all public, private and nonprofit organizations encouraging prosperity.

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