



FLC

Technology Transfer **PLAYBOOK**

The effective commercialization of technology, resources, and know-how created by the government relies on the transfer of that resource to the private sector. We created a playbook of key “plays” drawn from best practices at federal laboratories across the country to share the efforts and authorities that are currently being utilized to improve the technology transfer process. As we recognize that each agency has different missions and authorities, this is not intended to be a laundry list of practices that an agency **MUST** be doing, but rather a resource to assist the tech transfer office in identifying practices and strategies that have proven to be successful at other agencies, which they may want to incorporate into their own commercialization efforts. The play details and examples here are intended to be a reference for agencies to support their program implementation goals, to document and demonstrate how other agencies are already using particular authorities and tech transfer mechanisms. Key questions will assist in determining what to consider within their own program as a tech transfer office draws on other agencies’ experiences to implement new initiatives or improve existing ones.

Key technology transfer plays compiled
by the **Federal Laboratory Consortium**
for Technology Transfer

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Technology Transfer Playbook

Play 1 – Understand what all the players need

We must begin by understanding and measuring the goals, tasks and needs of each person that we engage with during the course of business. This should include other agencies, laboratories, scientists, researchers, executives, analysts, policy makers and collaborators of all types. Our efforts support research and development and agency programmatic objectives both internally and externally, and we must ensure that we fully understand our customers. Our support of our agency and its researchers often facilitates new discoveries, inventions, or ideas that lead to innovation and attract collaborators or commercial partners. Our efforts also help our agency achieve its objectives. An understanding of the needs of potential collaborators or commercial partners is important to establishing fruitful relationships. Facilitating projects that address the needs of the agency, the public (including both the academic and business sectors), and the people, as well as consideration of the unique details of the science itself, should drive technical and contractual decisions. The staff of each federal Llab's technology transfer office play a central role in identifying these needs and aligning the mission-related priorities of their agencies' researchers and outside stakeholders.

Play Details

- The tech transfer staff must work closely with their lab director and with headquarters offices that are responsible for research and development to establish an overall strategy for technology transfer.
 - Developing a plan to incorporate tech transfer strategies early in the research process is critical to fully meet both the technical needs of the project and the downstream needs of the outside parties who could take the project to a commercial end.
 - Wherever possible, incorporate your stakeholders' input – both internal researchers and external partners.
- Understand the priorities within the technology transfer strategy (e.g., intellectual property (IP) protection and income, strategic partnerships, prizes/challenges) to better focus the program.
 - Recognize that priorities may change as missions evolve – it will be important to get feedback from the researchers who are working on the project, as well as the tech transfer and licensing staff.
 - Recognize and understand pushing and pulling markets and their effects on tech transfer – this will affect how you evaluate potential stakeholders and their needs.

Agency Examples

The United States Department of Agriculture's (USDA) Agricultural Research Service (ARS) Tech Transfer Strategic Plan and Tactical Plan Approach include efforts to increase the effectiveness of tech transfer and the research impact of ARS. This included the formation of a cross-functional group

of scientists in different programs, tech transfer professionals, research leaders and program leaders. The group discussed a new approach to tech transfer whereby once a particular research project is contemplated, the tech transfer office is consulted as to how to best achieve the desired research outcome. Once the desired outcome is identified, the tech transfer office works with the scientists to decide the best mechanisms to achieve the goal. After determining if the efforts should focus more on IP versus non-IP strategies, the tech transfer office will focus on the licensing strategy for new IP, or field days, publications, collaborations, and public releases for non-IP outcomes.

The Food and Drug Administration (FDA) established a network of federal and state public health labs to use whole genome sequencing technology to identify pathogens associated with foodborne disease outbreaks. The sequences of bacterial strains isolated from food sources are put in a public database established by the FDA called GenomeTrakr, a valuable tool for identifying the source of foodborne pathogens responsible for outbreaks to protect the food supply. To establish the collaborative network of laboratories, the FDA's Technology Transfer Program worked with the program's researchers to create and execute agreements tailored to the project concept and goals. The GenomeTrakr network is a great example of the mission-related success that can be achieved when agency researchers and technology transfer staff work in coordination together and with external partners.

The National Aeronautics and Space Administration (NASA) developed integrated technology roadmaps, incorporating input from the public, industry, and independent expert panels.

NASA's Strategic Space Technology Investment Plan is a comprehensive strategic plan that prioritizes space technologies essential to the pursuit of NASA's mission and achievement of national goals.

The Foundation for the NIH (FNIH) brings together a consortium of Health and Human Services agencies (National Institutes of Health, Food and Drug Administration, and Centers for Medicare and Medicaid Services), 15 companies, and 13 nonprofit organizations dedicated to the discovery, development and regulatory approval of biomarkers to support new drug development, preventative medicine and medical diagnosis. The Biomarkers Consortium supports projects leading to published scientific articles, biological markers and tools to facilitate research and development and clinical care across the biotechnology sector in areas such as Alzheimer's, standardized carotid artery MRI scans, metabolic glycemic control, atherosclerosis modeling, as well as predictive markers of osteoarthritis progression and acute kidney injury. www.biomarkersconsortium.org

The Environmental Protection Agency (EPA) developed Microbial Source Tracking technology to identify microbial contamination in source waters. This research resulted in a patented process that is particularly useful for communities in identifying specific animal sources of microbial contamination downstream. This technology was developed in response to a known need by communities.

The Federal Laboratory Consortium for Technology Transfer (FLC) has hosted a series of workshops to connect stakeholder technology needs in a region with solutions in federal labs.

Key Questions

- What technology is needed, i.e., what is the “widget”?
- What scientific or commercialization goal is being pursued?
- What problem related to your agency mission are you trying to solve?
- What will be the research outcome?
- Who is your target or current partner?
- Will this research be unique? Are there related research efforts, patents, publications, etc.?
- What authorities are available to achieve the goal?
- What authorities are the best fit for the needs of the project?
- What is the reason for the market pull or push?
- Can a current mechanism be easily adapted to better fit the goals?

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Play 2 – Encourage entrepreneurship internally by utilizing rehire authorities

As great as it is to work in our labs, there are some people who would consider giving entrepreneurship a try; but it can be hard to make the jump to the private side without a parachute. Ethics rules, tenure, and other factors often discourage federal workers from trying to make a go with new ideas. But federal employment rules are more flexible than many people imagine, and every federal employee has reinstatement rights. While formal leave programs will have to carefully evaluate ethics issues in order to be successful, all agencies have the authority to rehire eligible individuals without posting a vacancy announcement (5 CFR 315.401) if a position is relevant to the agency’s mission and former federal employee’s skills. This authority can be used to encourage current federal employees who have entrepreneurial interests to attempt to spin out a technology or start a business of their own. There is no time limit on reemployment for employees with veterans’ preference or career tenure (3 years of continuous federal service); all other federal employees have a three-year period of eligibility for reinstatement from the date they left federal employment. Additionally, some agencies have specific direct hire authorities and sabbatical programs that can be used to encourage entrepreneurial efforts for current federal employees.

Play Details

- Encourage entrepreneurially minded employees to have a good rapport with their management and not burn bridges – they must want the employee back for this to work!
- Encourage employees to stay in contact with management after their separation; they may be eager to have the employee back with new experience.
- Federal career employees with more than 3 years of creditable service have a LIFETIME eligibility for reinstatement.

- Career employees can apply and be rehired as a government employee.
- Career employees can be included on a non-competitive certificate for rehire.
- Some agencies have direct hire authority for scientific and technical positions.
- Employees retain credit for all time and seniority earned as a federal employee for leave, retirement, and other benefits.
- These rights extend to every federal job, not just the one an employee is leaving. BUT – there are no guarantees someone will be rehired.
- Career conditional employees with less than 3 years still have opportunities.
 - The above conditions apply, but are time limited rather than lifetime.
 - Without tenure or veterans preference, career conditional employees have 3 years from the date of separation from federal service to be reinstated.
- Government-owned, contractor-operated labs can institute entrepreneurial leave programs.

Agency Examples

The Army Research Laboratory (ARL) Entrepreneurial Separation Program is a pilot program that allows ARL researchers to take a formal leave of absence to pursue entrepreneurial projects on their own. Lawrence Livermore and Sandia National Laboratories Open Campus (<https://www.llnl.gov/doing-business/open-campus>) allow Livermore and Sandia researchers to collaborate seamlessly with industry and academia onsite on research projects without national security implications.

The Air Force Research Laboratory (AFRL) is initiating a new entrepreneurial program to encourage scientists and engineers to pursue their technology toward commercialization. Shaping Holistic Innovative Future Technologies is designed to allow entrepreneurial-minded Air Force researchers to pursue technologies into creating new businesses. Inventors can work part-time on developing a small business, without having to pay back the time to the Air Force, or they can take the leap and leave the Air Force to start a new company and have the option to return in the future.

Key Questions

- Are specific authorities outside of reinstatement available at my agency that will better fit the employee's scenario?
- Does the employee have career tenure or veterans' preference?
- Are there qualified reemployment priority consideration candidates available for the designated position? (requirement for reinstatement and direct hire)
- Is the entrepreneurial effort open-ended or intended to be of a short and specific duration and nature? (A sabbatical may be more appropriate.)

Play 3 – Ensure effective and adequate staffing and resources

The center of the technology transfer effort is the staff. For this office to operate effectively, staff must be equipped with adequate tools and resources. Laboratories should consider not only the staff, but the overall structure of the office.

Play Details

- A full-service tech transfer office would include a program manager, a technology transfer specialist, and a licensing specialist; however, not all organizations or labs have the need or the workload for an individual dedicated to each of these functions.
 - Some offices with substantial technology transfer activities may be organized by tech transfer functions, where one staff member is responsible for Cooperative Research and Development Agreements (CRADAs), one for patents, one for licensing, etc.
 - Other offices may be organized by program or laboratories, where an assigned tech transfer representative is responsible for all of the needs of that particular group.
- Access to a patent attorney and an attorney for agreements is essential. These services can be shared, obtained through contracting, or accessed through an interagency agreement. Check with your agency to see if a patent attorney is on staff.
- Providing initial and continuing training is essential.
 - FLC resources for training include both in-person, virtual meeting, and static content on a number of topics.
 - Some agencies have developed successful internal training programs.

Agency Examples

The Department of the Navy Tech Transfer offers in-person Tech Transfer/Legal Training Workshops and web-based tech transfer training to their employees and publishes a CRADA Handbook online (<http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Technology-Transfer-T2/Partnership-Options/CRADA-handbook.aspx>). In addition, the Office of Naval Research provides funding to naval laboratories for the implementation of novel T2 processes to enhance the development of IP and to encourage scientists and engineers to submit their ideas to foster successful tech transfer collaborations. The results of the pilot projects are captured in reports and provided as guidance documents for other laboratories to utilize in their tech transfer efforts.

The NASA Technology Transfer Program has intra-agency working groups for professionals working within core technology transfer work areas, such as new technology reporting, software release, licensing, and outreach. These groups meet regularly to share best practices, explore new initiatives, make recommendations to agency-level policies and processes, and take on agency-level goals of common interest.

The AFRL has a Lab 101 course taken by all incoming scientists and engineers. This two-day course includes an introduction to the lab and organizational structures, an overview of Air Force research and development, and a tech transfer section on tech transfer offices, agreements, IP, patenting, licensing, and a list of points of contact.

The FLC offers extensive training in government tech transfer, printed literature, and networking opportunities to support tech transfer offices: <http://www.federallabs.org/flc/education/> and <http://www.federallabs.org/flc/education/webinars/>.

The USDA-ARS has presentations prepared for training staff. It also provides technology transfer services for other federal agencies that would not have sufficient work for a technology transfer staff of their own, including the Bio-Oils Research Unit, the USDA Forest Service, and the Animal and Plant Health Inspection Service.

The National Cancer Institute (NCI)/NIH offers employees an internal tech transfer course covering a number of job-related topics. They have also created a tech transfer manual that contains agreement negotiation, containing negotiated clauses, and examples of both acceptable and unacceptable alternate language.

The Foundation for Advanced Education in the Sciences (FAES) offers a number of formal tech transfer courses and a tech transfer certificate: http://www.faes.org/grad/advanced_studies/technology_transfer.

Key Questions

- Given resources available and anticipated work load, how are the functions of the tech transfer office best organized and managed?
- Does the staff have sufficient training and resources to execute their functions?
- Where is the best organizational fit for placing the tech transfer office for the best visibility and effect?
- Is the tech transfer office adequately staffed for the needs of the agency?
- Is the professional development of the staff supported and encouraged?
- Are opportunities available for networking with other tech transfer professionals?
- How does the tech transfer staff interact with other departments (General Counsel, Contracts, etc.)? Can efforts be made to continue to improve and grow these relationships?
- Will your office function better with a structural organization (supporting specific labs or programs) or a functional organization (training people to support individual tech transfer activities)?
- Does your office have sufficient funding and leadership support for engagements with both internal and external customers? If not, what mechanisms exist to improve the scenario?

Play 4 – Empower, train, and reward researchers

Technology transfer does not exist without the efforts of our researchers generating data, inventions, and reports. It is essential that these researchers are not only trained in the basics of technology transfer, but also rewarded for participating in the process of commercializing their inventions. Rewards do not have to be large or elaborate – even just recognition in front of the researcher's peers can go a long way towards building productive relationships between the researcher and the tech transfer staff.

Play Details

- Agencies should determine what tech transfer authorities should be incentivized to best support their mission.
 - For example, research may be extremely useful, but not patentable or licensable; therefore, only incentivizing patents would be detrimental to the overall tech transfer efforts of the agency.
 - Research impact, disclosure, and collaboration can be other areas to recognize.
- Check agency authorities and ethics office policies to see if cash awards for technology transfer activities are possible, e.g., cash award for new disclosures, patent application, or other effort to disseminate IP.
 - If cash awards are not possible, options like plaques or mugs could be other ways to recognize researchers.
 - There are also a number of low/no-cost options like posting reported inventions or issued patents on a website or in an agency newsletter, or having the laboratory director send letters congratulating researchers on their patents.
- Use tech transfer training as an opportunity for R&D discovery in the lab.
 - Where possible, consider adding a tech transfer module or other information to the new employee hiring process.
 - Proactively reaching out to labs at lab meetings or annual retreats can be a great way to deliver tech transfer training to the research staff.
- Fund a booth at a convention or industry event to feature employee inventions.
- Include tech transfer participation as part of the employee review process, which can help emphasize the importance of commercialization at an agency level.

Agency Examples

The National Institute of Standards and Technology (NIST) holds joint training sessions with its tech transfer office, General Counsel, and laboratory Operating Units to explain roles and responsibilities and empower researchers. NIST also incentivizes intramural inventions by issuing plaques for awarded patents.

The National Oceanic and Atmospheric Administration (NOAA) issues annual Technology Transfer Awards and patent plaques.

Department of the Navy presents a plaque and \$5000.00 to an inventor(s) for special recognition of a patent that has been adopted for Navy use and provides cost savings, increased military capability, or increased quality of life of Navy personnel.

The USDA-ARS has performance and research annual review systems for scientists. Performance standards have tech transfer elements, and promotion is based on research adoption and impact. The USDA-ARS annually recognizes first-time inventors and U.S. patent recipients on World Intellectual Property Day and inventors whose technology has been licensed during Global Entrepreneurship Week. This information is also posted on the USDA-ARS internal website. An ARS Technology Transfer Award is part of its annual recognitions.

NASA has an Inventions and Contributions Board that rewards inventors with significant monetary sums through a series of high-profile awards, such as an Agency Commercial Invention of the Year Award and a Software of the Year Award.

The NASA Technology Transfer Portal highlights the accomplishments of a new inventor each month with a feature article on that person's work. Additionally, each year NASA publishes its prestigious Spinoff report, which highlights 50 of the top commercialization successes from agency-funded research. These articles also focus on the enabling work of the inventors.

NASA field centers host annual inventor awards ceremonies where agency senior officials present inventors with patent plaques. Field centers have also established practices like giant novelty checks for royalty payments, posters featuring the inventors, and even a Technology Transfer Employee of the Month parking space.

NIH hosts an annual honorary Technology Transfer and Innovation lecture by an NIH scientist who has made a significant impact on public health through technology transfer. The lecture brochure includes a list of inventors whose patents have been issued during the year.

NIH technology transfer staff work with FAES to support their Graduate School for Advanced Studies in Technology Transfer. This 15-credit certificate program can be transferred to the University of Maryland's University College Graduate School of Management and Technology.

The AFRL Information and Sensors Directorate have created inventors/patent walls displaying the plaques and descriptions of all their inventions/inventors.

NIST, NASA, USDA, and EPA all pay higher than mandated minimum royalty payments to their inventors.

Key Questions

- What resources are available to convey basic tech transfer and commercialization skills to federal researchers at your laboratory? (Online training, FLC resources, presentations to staff meetings, etc.)
- How are researchers rewarded for creating new IP and being involved in the commercialization process?
- How are researchers evaluated for participating in the tech transfer process?

- How does the tech transfer staff interact with the research staff? Can efforts be made to continue to improve and grow these relationships?
 - How can existing programs, such as ICorps and LabCorps, be utilized to engage researchers in the commercialization process?
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Play 5 – Capture and manage intellectual property

The first step in the tech transfer process is knowing what you have to transfer. Efforts should be made to engage researchers early in the process to identify new IP and to make quality assessments about pursuing patent prosecution. In order for this to be successful, researchers need to be educated on how to identify possible new IP in their research (see Play 4). Once identified, data on available IP should be maintained in an open and preferably automated format.

Play Details

- This should be part of the office's overall strategic plan.
 - Depending on the mission of the laboratory, there may be substantial IP outside of just patents and collaborations.
 - Various agencies may have to determine ways to capture and manage software, know-how, trademarks, and useful discoveries that will not be patented.
- Formalize research to commercialization as an additional track in the applied research project life cycle.
 - This will help researchers to understand what constitutes an invention, making it easier for them to know what to report and making it easier for the tech transfer office to capture the IP that is being produced.
- Automating the process as much as possible can reduce the administrative burden on both the lab and the tech transfer office.
- Patent boards can be a resource for scientific evaluations of a particular technology and how it should be managed to best fit the mission of the agency.

Agency Examples

The Department of the Navy has developed and implemented an Innovation Discovery process and implementation handbook designed to raise the visibility of tech transfer with senior management, build outside awareness of the laboratory's capabilities, embolden the science and engineering community by increasing the number of invention disclosures, and improving the number and quality of patents that will lead to more commercialization opportunities. The Innovation Discovery tutorial videos and handbook are available via <http://techlinkcenter.org/articles/innovation-discovery-resources>.

NOAA issued an Administrative Order on the Transition of Research to Operations/Application/Commercialization: http://www.corporateservices.noaa.gov/ames/administrative_orders/chapter_216/216-105.html.

The USDA-ARS Tech Transfer Strategic Plan and Tactical Plan Approach require scientists to notify the agency of manuscript submissions. USDA tech transfer professionals review these submissions to identify possible inventions that may be present and ask that an invention disclosure be submitted if needed. The tech transfer office also reviews national program annual reports on downstream research outcomes for possible inventions.

The Energy Innovation Portal (<http://techportal.eere.energy.gov/>) from the DOE is a one-stop resource for DOE Energy Efficiency and Renewable Energy (EERE) technologies. This application enables users to locate technologies developed with DOE funding and available for licensing. These technologies can be viewed as marketing summaries, which provide business-friendly descriptions of the technology, or the patent itself. When you find a technology you are interested in, simply fill out the contact form to directly contact the licensing representative from each laboratory.

The DOE's Visual Patent Search tool (http://techportal.eere.energy.gov/visual_patent_search) is designed to provide a facilitated search of the patent content contained in the Energy Innovation Portal. This content comprises published US patent applications and issued U.S. patents created using DOE funding.

Significant progress has been made at NASA towards implementing a coordinated agency-wide strategy for technology transfer and commercialization. Information is available on NASA's Tech Transfer Portal, <http://technology.nasa.gov>, and on Data.gov.

The NASA electronic New Technology Report website is simple and intuitive. It explains with plain-language text and video who should report new inventions, when, why, and how. The system provides guided step-by-step instructions for entering information into the form: <http://invention.nasa.gov>.

NASA has established intuitive agency-wide taxonomies for bundling its patent and software portfolios. Rather than organize the portfolio by center of origin, it is now categorized by technology type, such as optics or sensors or materials. Within these topic areas, NASA has provided additional data, like technology maturity indicators, that is relevant to potential users. This data is available via <http://technology.nasa.gov> and updated in real-time.

NASA has made its entire portfolio of software (everything from open source to those codes restricted to government project uses) searchable through an online software catalog, and is in the process of building a companion repository. The catalog contains over 1,000 entries describing programs ranging from advanced design software to image processing to project scheduling tools: <http://software.nasa.gov>.

Air Force labs are creating new or utilizing existing patent and IP review boards examine and evaluate disclosures for patentability and commercialization opportunities.

NIST, NIH, and other agencies use patent review committees to allow peer evaluation of all inventions and recommend whether patent protection is needed.

Key Questions

- How is IP identified and defined at each agency?
- What efforts can be made to increase the intake of new IP (meetings, publication reviews, etc.)?
- For applied research, are researchers also considering commercial clients when determining the end user(s) for their research?
- How are patenting decisions made at your laboratory, and can additional input be sought from parties outside the tech transfer office?
- Can the technology be transferred via mechanisms that don't require patent protection?
- How can your agency automate the process of updating public-facing data regarding available inventions?
- How do customers interact with your agency's published innovations? Are there both on- and off line catalogs available for your customers?
- Is your IP organized in a fashion that makes faceted browsing possible by domain, agency, innovator and/or facility?
- Is a uniform text-based search the only discovery mechanism for IP at your agency?

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Play 6 – Use tech transfer mechanisms to their full potential

Existing tech transfer mechanisms can sometimes be adapted to fit new uses and projects. A CRADA can be used to facilitate personnel exchange between a federal laboratory and a university or private company, or it can be adapted to receive proprietary materials. Internal policies are often more restrictive than authorities allow. Learning about the practices at other agencies can help expand the use of authorities within your own agency.

Play Details

- Two documents might be combined to produce an agreement that manages a collaborative project better than either document by itself.
- An existing template can be stripped down to provide a more streamlined way to accomplish a particular project.

- Many agencies use their existing authorities (particularly the CRADA authority) to accomplish goals beyond those of the traditional research collaboration, such as personnel exchanges.
- Authorities might also be combined to accomplish more than what a single authority could do alone (such as combining a CRADA with a prize competition) to better fulfill an agency's goals.

Agency Examples

Examples of combining authorities or portions of multiple documents to create an agreement that better suits the agency and the public's needs include the following: NIST personnel exchange via CRADA; NIH and Air Force Research Laboratory Materials CRADA; USDA's Material Transfer Research Agreement (MTRAs); USDA's and NIH's Small Business Innovation Research (SBIR) Tech Transfer Program incentivizing the development of technologies through SBIR grants.

NIST has signed an MOU with Maryland Technology Development Corporation (TEDCO) under the Stevenson-Wydler Act to have Entrepreneurs-in-Residence on the NIST campus at no cost to the government.

The EPA has used the CRADA authority to collaborate with external partners on non traditional research projects such as the development of water reuse guidelines.

The Air Force Tech Transfer Program Office worked with Air Force Tech Transfer attorneys to develop several special-purpose CRADAs that are streamlined and specific to a single purpose. In addition to the standard Air Force CRADA, the Air Force now has available standard agreements for Education Partnership Agreements, Commercial Test Agreements, Material Transfer Agreements, Facility CRADAs, Non disclosure Agreements, and an Information Transfer Agreement.

Key Questions

- What is the legislative authority granting for the tech transfer mechanism in question, versus what is internal policy?
- Have other agencies used authorities in a novel way? What measures have they taken to implement that use?
- Can authorities be combined to give rise to a unique and innovative technology transfer mechanism?

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Play 7 – Market technologies and lab resources to industry

A common struggle of potential partners is simply not knowing what's available within the government. Tech transfer offices must emphasize push marketing efforts in addition to passive marketing strategies like website postings and databases. Most successful technology transfer offices engage with customers

of all types beyond the digital realms. They engage at live events, leveraging those tools of the digital realm such as online catalogs and customer relationship management solutions. Tech transfer offices should be common participants in collaborative events such as start-up and innovation conferences, as well as hack-and code-a-thons.

Play Details

- Active efforts to push technologies out to potential partners can be far more effective than simply getting the technology out to the general public.
 - Engage potential industry partners directly at their conferences and trade shows.
 - Use your researchers as a resource – they often have direct knowledge about possible collaborators.
- Develop customer-centric marketing summaries for each available technology.

Agency Examples

Laboratories in the Department of the Navy conduct technology showcases, and invite industry and academia in order to highlight and demonstrate the laboratories' capabilities and facilities that are available for partnerships. Navy laboratories also leverage technology marketing assessments to ensure that the most viable and relevant laboratory offerings are presented to the attendees at these showcases and other T2 outreach endeavors.

The USDA Agricultural Research Partnerships (ARP) Network is a network of different players in the innovation ecosystem who help with dissemination of existing opportunities and technologies to their respective stakeholders: <http://www.ars.usda.gov/business/business.htm>.

FLCBusiness collects resources from multiple agencies in a searchable format: <https://flcbusiness.federallabs.org/FLCBiz/>.

The DOE Energy Innovation Portal has become a single source for national laboratories and other stakeholders (such as university partners) to post high quality marketing summaries with the hope of increasing the flow of licensing deals. Many times potential licensees of laboratory technology had mentioned the difficulty they experienced searching for licensing opportunities. The Energy Innovation Portal was designed to help alleviate this concern and to simultaneously improve the opportunities for cross-lab IP bundling. The Portal staff is consistently present at live events, engaging with interested audiences and showcasing how potential customers can best engage with the DOE and its laboratories: <http://techportal.eere.energy.gov/>.

The NIH Office of Technology Transfer (OTT) posts on its website technologies available for licensing from the NIH, The Centers for Disease Control (CDC) and Food and Drug Administration (FDA) on the OTT website and makes them available through RSS and API feeds as a whole and by subcategory. The feeds are updated daily from its legacy operations database: <http://www.ott.nih.gov/opportunities>.

The Department of Defense (DoD) labs use TechLink (DoD national Partnership Intermediary) to facilitate the marketing of DoD technologies. They have a database of all active DoD patents and personnel certified to evaluate and develop licenses: <http://techlinkcenter.org/>.

NASA has created matching collateral for each of its available patented and patent-pending technologies. These match an agency format and, in simple language and imagery, explain the market benefits and application of a technology. These are all organized by technology type, so we have created stand-alone technology-focused portfolios. Efforts are now underway to organize the portfolio by industry application.

Examples of exploring innovative methods for licensing NASA technologies to industry include: the expansion of the QuickLaunch platform, which showcases a selection of the licensing portfolio, is available online for non-negotiated, non exclusive licenses and features modest licensing fees; a partnership with two innovative companies, Marblar and Edison Nation, whose missions are to facilitate the engagement of non traditional partners to explore novel ways of incorporating technologies; and the online databases www.software.nasa.gov, www.patents.nasa.gov, and www.technology.nasa.gov.

Key Questions

- How will technologies be selected for marketing?
- What resources and partners are available?
- How can you involve the inventors in marketing efforts?
- What online resources are available?
- Are your innovations, patents, software and facilities contextually mapped to those of other agencies?

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Play 8 – Build partnerships through Partnership Intermediary Agreements and regional networks

Outside partners, particularly those in your region, can be some of your best resources for advancing a lab's technology. They can bring marketing expertise, manufacturing capacity and expertise, scientific knowledge, fiscal resources, product development expertise, product registration experience, and business contact networks to benefit the efforts of a tech transfer office. Agencies have the ability to tap into these resources through Partnership Intermediary Agreements (PIAs).

Play Details

- State and local economic development organizations can be a tremendous resource for the tech transfer office.
- Academic institutions can be used for more than just scientific collaborations.
 - Tap into their business schools and marketing programs for collaborative efforts to evaluate technologies.

- Let subject matter experts look at an invention with fresh eyes – a novel commercialization path might be found.

Agency Examples

NIH and NIST operate Entrepreneur-in-Residence programs in conjunction with regional technology organizations to place business development and marketing experts within the federal labs to offer evaluations of newly reported inventions.

Naval Surface Warfare Center (NSWC)-Crane developed a partnership network within the state to identify and market new technologies.

The Air Force Research Laboratory formed a partnership with the Griffiss Institute for business incubator and tech transfer activities, including workforce development and STEM efforts: <http://www.griffissinstitute.org/>.

NOAA, NASA, and the Naval Research Laboratory participate in the Stennis T3 group, an informal group of federal, state, and university technology transfer offices located on or around Stennis Space Center. The group is organized by the Mississippi Enterprise for Technology, a private, nonprofit 501(c)(3) organization that facilitates regional economic development by leveraging the resources of Stennis Space Center, the state, and the region to foster business opportunities among public and private entities. The Stennis T3 group has the goal of fostering communication among technology transfer offices and labs on the Stennis campus, while simultaneously increasing outreach to and opportunities for local businesses.

To date, the NASA Regional Economic Development Corporation has pilot initiatives in various stages of development in Colorado, Ohio, Michigan, Pennsylvania and Florida: <https://www.ars.usda.gov/business/Docs.htm?docid=24715>.

NASA Regional Economic Development program: To date, pilot initiatives are in five states, in various stages of development: Colorado, Ohio, Michigan, Pennsylvania, and Florida.

NIH partners with nearby Johns Hopkins Carey Business School to allow its students to develop business cases for particular NIH technologies that are utilized for marketing and partnering efforts.

The EPA and the Small Business Administration (SBA) teamed to initiate a water technology innovation “cluster” to focus on the region's strong reputation for water research and transformed the Cincinnati, Dayton, northern Kentucky, and southeast Indiana area into the “Silicon Valley” of water technology innovation.

The EPA guided others to initiate similar water technology innovation clusters (15 to date). Clusters are comprised of geographic concentrations of interconnected groups (academia, businesses, governments, investors, etc.) focused on innovation, technology transfer, economic development, and commercialization. The formation of clusters focuses on a region's existing technological strengths.

DoD has a network of national Partnership Intermediaries that work with dozens of local/regional PIAs that facilitate and support tech transfer operations at specific laboratories.

Key Questions

- What areas of expertise can regional parties bring to your technology transfer efforts?
 - Who is/are the champion player(s)?
 - What primary and secondary interconnected technologies is the region/area recognized for?
 - What natural and manmade resources are located and available in your region?
 - What is the best fit technology innovation for the regional cluster?
 - How can the region best leverage the interconnected groups to transfer technology?
 - Will the partnership involve an internal effort (i.e., interacting with your personnel) or an external effort (i.e., working independently to advance federal technology)?
 - What are the different formal agreement mechanisms that can be used for the partnership?
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Play 9 – Consider licensing structures that meet the needs of small businesses

Small and start-up businesses often have unique considerations that limit them from taking on the requirements of traditional technology licenses. In order to transfer technologies to these entities, agencies should consider modifying their standard licensing templates to accommodate these considerations.

Play Details

- Allowing initial costs to be deferred until certain milestones have been met can incentivize start-ups with limited cash flow to take on a technology.
 - Patent cost repayments can be postponed for a particular length of time.
 - Royalty costs might be tiered to better fit a growing company.
- Evaluation licenses can help move technologies out the door and into the hands of companies.
 - Allows a company (big or small) to determine if a technology is a good fit without a large upfront commitment.
- Federally Funded Research and Development Centers may be able to accept equity in a start-up in lieu of cash royalty payments.

Agency Examples

The NIH start-up license, DOE Start-Up America license, and NIST small business license all offer special considerations and terms to meet the needs of small businesses. These include tiered royalties, deferred patent maintenance costs, and smaller upfront fees to encourage small and start-up businesses to invest their limited funds in technology.

NIST has published a series of low-cost licensing options, including a free license to conduct either internal research or research toward potential commercialization.

NASA QuickLaunch Licensing is select portfolio of technologies is available for commercial nonexclusive licensing with a set initial fee, annual royalty and standard terms. Fees can be paid online with a credit card, and turnaround time on the license is 48 hours: <https://quicklaunch.ndc.nasa.gov>.

Key Questions

- What outcome does the agency want to see from the technology?
- What licensing structure is best for the technology?
- How can royalties and upfront payments be staggered to fairly recover agency costs while recognizing the challenges of small and start-up businesses?
- Is there a possibility for a nonexclusive, equity-only license with no royalty?
- What can we take from private sector and academia in terms of using licensing strategies to build new start-ups?

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Play 10 – Streamline agreement negotiations

Reducing the time necessary to negotiate an agreement benefits both sides of the negotiation. Model agreements must be continually reviewed to ensure that terms are reflecting the current state of an agency’s mission, projects, and anticipated partners. Efforts are underway to move towards greater harmonization of templates across agencies. Within agencies, however, actions can still be taken to reduce the time necessary to negotiate an agreement.

Play Details

- Wherever possible, automating a tech transfer process reduces the burdens on both the partner and the tech transfer office staff.
 - Fillable forms available online for simple transactions.
 - Credit card payments for small/set fees.
 - Electronic signatures.
- Where possible, delegate the review and approval processes down to the lowest possible office administration level.
 - Some agencies allow laboratory personnel to execute simple, unmodified template agreements and send the technology transfer office a copy after execution.

Agency Examples

NIH is developing a CRADA Builder tool to streamline agreement negotiation with preapproved modular terms. NIH also posts all its agreement templates online: <https://www.ott.nih.gov/forms-model-agreements>.

USDA allows the pre-negotiation of licensing parameters in CRADAs to shorten transaction times, and posts all templates online to provide a starting point for companies: <http://www.ars.usda.gov/business/docs.htm?docid=771>.

The Department of the Navy uses standard templates at all its laboratories for the CRADA (http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Technology-Transfer-T2/~media/Files/03T/std_crada_model.ashx) and Partnership Intermediary Agreement (<http://www.onr.navy.mil/Science-Technology/Directorates/Transition/Technology-Transfer-T2/Partnership-Options/~media/Files/03T/orta/examples/PIA.ashx>) to decrease the amount of time necessary to negotiate and execute these agreements.

NOAA has a Standard CRADA template that is preapproved and simplifies the negotiation process: <http://techpartnerships.noaa.gov/FAQs/TechTransferFAQs/CRADAs.aspx>.

EPA developed a fillable PDF form for nondisclosure agreements and Materials Transfer Agreements. EPA and partner organizations can use the fillable PDF forms in cases where only project-specific information needs to be included, but none of the legal language is being modified for these agreements. These documents were created in response to requests from internal customers to simplify the review and approval process where no changes are being made to the document templates, and to respond to the Presidential memo of 2012 request to streamline and accelerate the review and approval process for agreements.

NASA's Space Act Agreement Maker allows simple data entry to result in the production of a full agreement. The system also routes the document through the approval process.

Key Questions

- What language and terms are essential to the CRADA and the project? What can be preapproved for use in an agreement?
- Can extraneous terms be revised or eliminated?
- Can business related terms and acronyms be more standardized and agreed upon by agencies? (e.g., some organizations use the term ROI as report of invention; however, the business world uses this specifically as return on investment).
- Can the structure of the CRADA template be reorganized to more closely match that of other agencies?
- Can other standard agreements be built, like the Series Seed docs used in the start-up world?

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Play 11 – Utilize prize competition authority

Since 2010, all agencies have had prize competition authority under the America COMPETES Act. Additionally many agencies have authority to conduct challenges and competitions under other agency-specific authorizations. Challenge.gov has listed hundreds of short- and long-term challenges open to the public, on a wide variety of topics. Opportunities abound for using this to further tech transfer goals and

continue to develop federal inventions. Additionally, strategic Partnership Intermediary Agreements have been used by some agencies to operate challenges using private funding and federal technologies.

Play Details

- The prize competition authority, unlike a grant or a contract, allows an agency to engage innovators to come up with the best solution to a problem.
 - The agency does not have to define the requirements of the deliverable (unlike a contract).
 - The agency only has to pay for results (unlike a grant).
- Prize competitions can be very appropriate for high-risk projects.
 - The prize can incentivize participation in areas that might otherwise be neglected.
 - A participant can engage in the process without the need to guarantee an outcome.

Agency Examples

The NCI Breast Cancer Start-Up Challenge (<http://www.breastcancerstartupchallenge.com/>) and NIH Neuro Start-Up Challenge (<http://www.neurostartupchallenge.org/>) partnered with private organizations and utilized prize competition authority to incentivize new business formation around NIH/NCI technologies.

The EPA is using prize competitions to solve environmental problems. For example, the EPA initiated a prize competition via a non-profit group (InnoCentive) to develop a low cost water monitoring network.

The DOE has launched several Apps for Energy contests, challenging developers to build web and mobile apps that help utility customers understand and visualize their energy usage data in meaningful ways. The competition leveraged Green Button, an open standard for sharing electricity data that is available to millions of consumers and businesses across America. Apps for Energy submissions help consumers utilize Green Button data to save money by saving energy.

The DOE is currently running the American Energy Data Challenge initiative. This new contest – called Open Data by Design – challenges the public to create exciting new visualization designs that will make the DOE's open energy data resources more valuable and easily understood. <http://energychallenge.energy.gov/>

NASA makes liberal use of the authorities granted by the America Competes Act, and has an active website dedicated to all prize and challenge activity ongoing across the agency; NASA Solve-a one-stop shop website for opportunities available to the general public to contribute to solving tough problems related to NASA's mission through challenges and prize competitions; and crowdsourcing activities (<http://www.nasa.gov/solve/>). Other examples include NASA Centennial Challenges, NASA's Center of Excellence for Collaborative Innovation (CoECI), and "Challenges, Prize Competitions and Crowdsourcing" NASA Policy Directive.

Check out Challenge.gov for multiple agency listings: www.challenge.gov.

Key Questions

- What opportunity or problem will your prize competition address?
- What does the ideal outcome look like? (e.g., not anticipating the solution, but what are the requirements for the outcome)
- Who are your target participants? (Will affect structure, prize amount, etc.)
- Does an effective solution already exist? Is the potential solver a known entity? (May be more appropriate for a contract mechanism)

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Play 12 – Broaden the use of licensing authority for the research community

Like small businesses, research institutions like universities and nonprofits often have unique (and different) considerations for licensing federal technology. Statutory licensing authority can be used in new ways to ensure broad access to federally-developed technologies, and to enhance ongoing research at federal laboratories. This might mean having different licensing policies for different projects, rather than a one-size-fits-all license.

Play Details

- Determine in advance what types of technologies would benefit from an alternate licensing structure.
- Consider what metrics or milestones would need to be tracked, since they would likely vary from a commercial license.

Agency Examples

The EPA has used the licensing authority to provide research licenses (royalty-free) to the university research community for specific research projects. This allows the federal laboratory to see more real-world data on the use and effectiveness of a patented EPA technology, and it provides access to new technologies to the university research community.

USDA-ARS strongly supports the principle of the “research exemption” to patent rights. Accordingly, USDA-ARS does not in-license technologies or patents for use in USDA-ARS research programs, nor require others to obtain a license for use of USDA-ARS technologies in research, or permit a licensee of USDA-ARS patented technology to require licenses for research use.

The Air Force has developed an Information Transfer Agreement (ITA) designed to license software to multiple companies in an efficient manner. As long as the standard ITA is utilized, licenses can be signed to numerous companies under one ITA without going to the director for signature.

Key Questions

- What is the research organization's business plan for the use of a royalty-free license?
 - What are the metrics of these licenses e.g., how many are awarded, what is the time duration, how much data/publication is enough?
 - Who manages?
 - How does this create commercialization opportunities in the private sector?
 - What if a commercial partner licenses the technology? (What happens to the royalty-free licenses?)
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Play 13 – Support programmatic objectives

Agencies can only use technology transfer authorities in the context of their missions and the goals of their particular laboratory or program. However, we must be careful not to overly restrict the use of authorities.

Play Details

- Policies can both help and hinder technology transfer efforts.
 - On the one hand, policies provide critical guidance on how to implement the authorities an agency has been given.
 - On the other hand, policies can prevent a technology transfer effort from taking place, even if the mission that required that policy has changed or broadened.
- Remember that authorities are broad, but can't easily be changed. Policies are narrower, but can be adapted to fit the agency and its mission.
 - Both missions and the state of technology change over time – policies should reflect the current state of both, not necessarily just the way things have always been.

Agency Examples

NIH supports licensing to companies in emerging market countries for the development of drugs and vaccines in those countries to meet regional market and public health needs. NIH developed a model license agreement for nonprofit organizations that develop drugs and vaccines for neglected tropical diseases.

NIH developed its Research Tools Guidelines (1999) to promote the technology transfer of research tools in a manner that optimizes their access to public and private organizations.

NIST solicits for SBIR proposals that commercialize NIST IP. This meets both SBIR and tech transfer objectives by encouraging small business to utilize government technology.

Key Questions

- What is important to your agency (i.e. new products, knowledge dissemination, etc.)?
- How can your agency’s policies and templates carry out the agency’s mission without overly restricting the authorities it’s been given?
- Does your agency have a plan to reevaluate policies and templates on a regular basis?

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Play 14 – Use agency gift authorities when appropriate

Most agencies and departments have the authority to accept philanthropic gifts. These can be important resources and partnerships to fund research and technology development.

Play Details

- Determine how agency guidelines will define the parameters of the partnership.
 - How will the finder provide input, if any, on the research project to be funded?
 - What will the funder receive in return?
- Seek long-term partners as much as possible.
- Have clearly defined goals and expectations.

Agency Examples

General Services	40 U.S.C. 3175
Energy	Energy Reorganization Act of 1974 (42 U.S.C 5817(f)).
Education	20 U.S.C. § 3481
Treasury	31 U.S.C. 321 d
Veterans Affairs	38 U.S.C. 8301
Small Business Admin.	15 U.S.C. § 633(g)(1), 15 U.S.C. § 633(g)(4), 15 U.S.C. § 634(b)(9), 15 U.S.C. § 636(k)(2-3), 15 U.S.C. § 637(b)(1)(G), Public Law 106-40, Aug. 17, 1999 Section 203 (as amended by Public Law 110-186, Feb. 14, 2008, Section 103), 15 U.S.C. § 657(c)-(d)
U.S. Agency for International Dev.	22 U.S.C. § 2151, et seq., Foreign Assistance Act
Health and Human Services	42 U.S.C. 238
Defense	10 U.S.C. 2601
Agriculture	7 U.S.C. 2269
NASA	51 USC 20113 (d)
Homeland Security	10 U.S.C. 2601 (a) and (b)
State Department	22 U.S.C. 2697
Justice	DoJ Order 2400.2

Labor	29 USC 568
Commerce	15 USC 1522
Transportation	49 USC 326
Interior	25 USC 451; 16 USC 19 e-o; 16 USC 742 a; 30 USC 1231 (b) (3); 43 USC36 a-c; 43 USC 1473
Natl. Science Foundation	42 USC 1870 (e)

Key Questions

- Are there restrictions to the gift? Will your agency permit the restrictions?
- Is it more advantageous to receive the funds directly or through an associated nonprofit?
- How will you engage the stakeholders in the project selection and communication of the results?

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Play 15 – Consider the ability to work through foundations

Some agencies choose to accept gifts through a 501(c)(3) foundation that operates separately from the agency, but on behalf of that agency’s mission. These can provide yet another avenue for partnership building, and may also reduce some of the legwork a tech transfer office needs to do to find new partnership leads for projects.

Play Details

- Foundations can be either congressionally mandated or created within the agency.
- Foundations have the ability not only to receive gifts, but to actively seek them.
- An agency foundation will have a specific mission, and seek to fund projects and build partnerships that will advance that mission.

Agency Examples

USDA Agricultural Technology Innovation Partnership (ATIP) Foundation - 501(c)(3), organically grown, agency-initiated, not congressionally mandated. ATIP is a nationally recognized, investor-based consortium of agribusinesses, universities, economic development entities, and venture funds for the development, implementation, and commercialization of USDA technology discoveries to develop and expand the agriculture industry. www.atipfoundation.com

USDA Foundation for Food and Agricultural Research - established by section 7601 of the Farm Bill 2014, congressionally chartered. The foundation will operate as a nonprofit corporation seeking and accepting private donations to fund research activities that focus on problems of national and

international significance. <http://www.usda.gov/wps/portal/usda/usdamediafb?contentid=2014/07/0156.xml&printable=true&contentidonly=true>

Department of Veterans Affairs (VA) - The authority for the creation of VA's nonprofit corporation is under 38 USC 7361-7366. There are many different nonprofit entities that work alongside the VA. The National Association of Veterans' Research and Education Foundations (NAVREF) is a nonprofit that promotes the activities of VA nonprofits, although NAVREF itself does not facilitate VA research and education. <http://www.navref.org/about-navref/>

Department of Interior National Park Service (NPS) Foundation - In terms of NPS policy, the existing Director's Order #21: Donations and Fundraising and its accompanying Reference Guide are on the NPS Office of Policy website at <http://www.nps.gov/applications/npspolicy/DOrders.cfm>.

NIH Foundation for the NIH (FNIH,) established in 42 USC 290 b. The purpose of the Foundation for the National Institutes of Health, a 501(c)(3) organization, is to support the NIH in its mission and to advance collaboration with biomedical researchers from universities, industry and not-for-profit organizations. www.fnih.org

Centers for Disease Control and Prevention, (CDC) National Foundation for the Centers for Disease Control and Prevention Inc. Established by Congress as an independent, nonprofit organization, the CDC Foundation connects the CDC with private-sector organizations and individuals to build public health programs that make our world healthier and safer. www.cdcfoundation.org

Food and Drug Administration (FDA) Reagan-Udall Foundation for the FDA, established in 21 USC 379dd - The Reagan-Udall Foundation is an independent 501(c)(3) not-for-profit organization created by Congress for the purpose of advancing regulatory science – science that is critical to helping the FDA accomplish its mission. www.reaganudall.org

Department of Defense Henry M. Jackson Foundation for Advancement of Military Medicine - The Foundation is a private, not-for-profit entity established in 1983 with the core function of advancing military medicine. The foundation supports research and education at the Uniformed Services University of the Health Sciences and throughout the military medical community. It also serves as a link between military researchers and the private medical sector. www.hjf.org

Key Questions

- Does your agency already have a foundation in place?
 - If not, it might be easier to create one within your agency than through congressional mandate.
- What will the focus of the foundation be?
- How will the foundation interact with the tech transfer office and other necessary offices?