**MIT and Lincoln Laboratory Comments in response to NIST Return on Investment RFI**

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INTRODUCTION

The Massachusetts Institute of Technology (MIT) and MIT Lincoln Laboratory write in response to the National Institute of Standards and Technology (NIST) Request for Information (RFI) on Federal Technology Transfer Authorities and Processes Docket No. 18022019-819-01 posted on May 1, 2018.

We appreciate the opportunity to comment on this important issue. In general, we think the current NIST-led effort should focus more on improving technology transfer in federal laboratories than in universities because greater change is needed at the labs, and the labs are federal entities. In our comments, however, we discuss universities as well as federal laboratories (and issues that apply to both), drawing, in part, on how MIT has approached tech transfer, since MIT is often seen as a leader in this arena. These comments are also based on Lincoln Lab’s experience, while keeping in mind that each federal lab and agency may have its own specific issues.

We hope this formal RFI is just the beginning of a continuing series of conversations between federal officials and experts from a wide variety of backgrounds outside the government on how to increase the transfer of technologies developed with federal funding into the marketplace and on how to measure their impact.

At the outset, we want to make clear that we **endorse** the comments submitted jointly by several higher education organizations (AAU, APLU, COGR, and AAMC), as well as those submitted by AUTM[[1]](#footnote-1) in response to this RFI. We have not brought up some issues here because we feel they were dealt with more than adequately in those other submissions, and we have nothing in particular to add. Our silence should not be taken as a sign that we do not consider those issues important.

We believe that any effort to improve tech transfer should be informed by four key understandings:

1. Effective technology transfer requires an ecosystem and culture of innovation.

Technology transfer is not a matter of undertaking just one narrow activity, such as patenting inventions. It is a set of connected practices through which technology moves from idea to invention to innovation. Tech transfer thrives when there is an entire system in place, encouraging and facilitating each of the many steps involved in moving technology from laboratory to marketplace and supporting the people who move it.

2. People are the critical ingredient in technology transfer.

Tech transfer happens on two feet. Transfer occurs when individuals share ideas, when inventors work with or join companies, when tech transfer professionals know to whom they should pitch a particular technology. All the people who participate in tech transfer must be adequately trained, encouraged, respected and compensated – from senior researchers to post-docs, grad students, and lab assistants, to tech transfer officials –– if tech transfer efforts are to be optimal.

3. Technology transfer costs money.

Just like invention, tech transfer does not happen for free. It requires skilled professionals, not only to conduct the research, but to understand the business implications and to move technology along. And tech transfer rarely pays for itself. Many innovations can reach the marketplace and contribute to our nation without becoming revenue bonanzas. Simply throwing money at tech transfer will not be effective, but neither will trying to do it on the cheap.

4. Metrics are important, but they can help or hinder.

Metrics can be important indicators of the success of federal technology transfer, valuable to both research funders and research performers. But as the old adage goes, “You get what you measure.” Metrics can distort behavior. Measuring just the number of patents, for example, can encourage researchers to generate patents without adequately considering the value of their inventions. Also, it can lead to patenting ideas that could be better disseminated through other means. This can hinder tech transfer rather than facilitating it.

Those designing metrics need to keep in mind the ultimate goal – getting innovations out into the world where they can benefit the American public – rather than over-focusing on mechanisms. Federal agencies should look at metrics designed to measure the broad impact of investments (e.g., economic growth and job creation; sustainability), rather than simple outcomes (e.g., number of patents; licensing revenue), and attempt to measure impacts aligned with the mission of the funding agency.

There is no single, obvious way to measure the success of tech transfer that everyone has somehow been missing. Metrics themselves should be seen as experimental, and their impact needs to be monitored. At the same time, metrics should not be altered lightly because stability is needed to make comparisons over time.

Finally, metrics are inherently burdensome, whatever their value. Tech transfer efforts should not be overwhelmed with reporting requirements; mandates should be kept to the minimum needed to move the system forward.

QUESTION 1:  
WHAT ARE THE CORE FEDERAL TRANSFER PRINCIPLES AND PRACTICES THAT SHOULD BE PROTECTED, AND THOSE WHICH SHOULD BE ADAPTED OR CHANGED?

The most important principles are those enshrined in the Bayh-Dole Act of 1980, which Congress later extended to federal labs. Bayh-Dole has been an enormous success, altering the culture of universities and the assumptions of industry, and enabling numerous federally funded technologies to find their way in the marketplace. We see no reason to reopen the statute, and there are many risks in doing so.

QUESTIONS 2 AND 3:  
WHAT ARE THE ISSUES THAT POSE SYSTEMIC CHALLENGES TO THE EFFECTIVE TRANSFER OF TECHNOLOGY, KNOWLEDGE, AND CAPABILITIES RESULTING FROM FEDERAL R&D? WHAT IS THE PROPOSED SOLUTION FOR EACH ISSUE?

For Federal Laboratories

In thinking about ways to improve tech transfer at federal labs, it is important to keep in mind the strictures imposed on those that are Federally Funded Research and Development Centers (FFRDCs). FFRDCs are not allowed to compete with the private sector and, in some cases, are also limited by the role they play as neutral arbiters in awarding contracts. These restrictions do not necessarily need to be changed, but they do inherently set limits on tech transfer activities. But even with such parameters in place, the following steps would improve tech transfer at FFRDCs (as well as at other labs).

Clarify rules on lab staff work with companies

As noted above, people are the key to successful tech transfer. But at federal labs, it is often unclear how much latitude lab staff have to contribute to tech transfer – because of conflict-of-interest rules and other policies. For example, a company is less likely to be interested in commercializing a technology if the inventor is not available to work with them. Yet lab personnel frequently cannot take time – paid or unpaid; brief or extended – for such work. This is in marked contrast to universities, where (within limits) faculty can contribute to a company’s efforts to commercialize their ideas. At the labs, even graduate students and post-docs may be restricted from working with companies, or discouraged by senior researchers from doing so. The problem may have a basis in both rules (at all levels of governance) and culture.

*Recommendation:* Federal agencies and labs should clarify their policies on how personnel can interact with companies, including their conflict-of-interest policies. To the extent practicable without creating undue conflicts, agencies and labs should enable such arrangements as lab staff working as consultants (paid or unpaid) with companies on ideas that originated in the lab, and entrepreneurial sabbaticals to enable lab staff to develop the commercial potential of their ideas. In short, conflict of interest needs to be seen more as something to be managed, rather than simply avoided.

Clarify policies on licensing

The optimal licensing arrangement to transfer a technology depends on the specifics of that technology, the relevant industries, etc. Federal labs, like universities, need access to the full complement of licensing options, including exclusive licenses. Sometimes labs hesitate to offer exclusive licenses – even when they would be the best or even only way to transfer technology, or are the norm in an industry – because the lab is wary of the reaction of other companies to a federal entity working with just one firm. This may be a matter of policy, culture or both. While federal labs should be transparent about how they are making licensing decisions, they should not have to forgo – and should not make themselves forgo – optimal licensing opportunities.

*Recommendation:* Federal agencies and labs should clarify their policies on licensing options with the goal of ensuring that all licensing options are on the table, to be used when appropriate. Agencies and labs should then make sure the policies are well known and understood and that use of the full complement of licensing types is encouraged.

Make it easier for small businesses to engage with federal labs

One way that small businesses can learn about promising new technologies at federal labs is by working with the labs as contractors on lab projects. (This also benefits the labs, which can take advantage of the businesses’ expertise.) And small businesses may be more willing to work on higher risk technologies, and have increasingly done so as corporate labs have been scaled back or eliminated. Yet federal contracting rules often present an insuperable barrier for smaller companies, which often do not have the time, money, staffing or expertise to comply with the Federal Acquisition Regulation (FAR). Working with a lab can involve compliance with as many as 180 FAR clauses.

In addition, federal policies for licensing intellectual property can sometimes intimidate small businesses because they have no way to gauge what they mean in practice. (Unlike the FAR issue, this may be a problem more of perception than reality.) For example, statutory march-in rights and mandatory licenses for government use may scare away small companies, though in practice they are rarely used.

*Recommendation:* Federal agencies (or, if necessary, Congress) should give more federal labs the option of using Other Transactions Authority and/or other mechanisms that would facilitate engagement with smaller businesses. Another possibility would be to deem research engagement with a small business a “commercial procurement” of services, a category to which the FAR does not apply.

*Recommendation:* NIST or some other federal entity should compile and disseminate statistics on how often the federal government has exercised march-in rights or taken advantage of government use clauses. That would help labs put the language in perspective when dealing with small businesses.

Make tech transfer an integral part of laboratory culture

Culture is an intangible but central ingredient in a successful tech transfer system. It grows out of many individual policies, like the ones mentioned above. Lab staff, from the top down, need to believe tech transfer is an essential part of their mission, not a hobby or, worse, a distraction or a drain on laboratory resources. And while culture may be intangible, the emphasis on tech transfer needs to be felt in tangible ways. Despite decades of efforts, federal labs still do not adequately value tech transfer or have sufficient incentives to do so.

*Recommendation:*  Federal agencies and labs need to redouble their efforts to make tech transfer a central aspect of lab operations. Tech transfer should be incorporated into laboratories’ mission statements and laboratory management contracts. Lab staff, from directors on down, should be evaluated, in part, on their labs’ tech transfer activities.

Federal agencies and labs should invest in training their directors, senior staff and any students in entrepreneurialism and tech transfer. (See a fuller recommendation on that below.) Lab staff should be encouraged to think of ways that tech transfer can contribute to the lab’s other missions. Finally, federal agencies could also reach out to companies to emphasize that federal labs are interested in tech transfer, to get their ideas on how to promote it, and to discuss ways to streamline negotiations on tech transfer agreements, including the handling of IP.

**For Research Universities**

Repeal the recent Bayh-Dole requirements

Recently issued Bayh-Dole rules[[2]](#footnote-2) create new reporting requirements for provisional patent applications and modify the election timelines for non-provisional applications and international conversion. These changes place an expensive burden on universities without any apparent benefit to the federal government or the taxpayer. The new rules have doubled the workload of MIT’s Technology Licensing Office and necessitated hiring an additional staff person. The new rules also presumably place an additional burden on the government itself, assuming anyone reviews the newly reported information. Yet it is utterly unclear to us what purpose the new rules serve, and our inquiries to find out have gone unanswered.

*Recommendation:* We urge NIST to rescind the new rules and return to the previous reporting and filing requirements. Failing that, NIST should explain the purpose of the new rules; monitor their impact on universities, NIST, and the Patent and Trademark Office; and publish an evaluation of the rules within a year of their issuance (which we hope would either show measureable positive impact on technology commercialization measured against the additional resources required to implement the changes, and if not, would include a decision to repeal).

Improve the federal invention reporting system

We understand that federal agencies are now engaged in improving the federal invention reporting system. This could not happen soon enough. The iEdison reporting system used by most agencies is out of date and burdensome for users. It is difficult to navigate and has multiple required gateways. Moreover, federal agencies do not use iEdison consistently, resulting in widely different reporting requirements.

*Recommendation:* Federal agencies should redouble their efforts to develop a single, streamlined, government-wide reporting process that uses up-to-date software and database interfaces. Research institutions and companies should be consulted throughout the redesign process and informed of the progress toward a new, robust, system.

Agencies should also ensure that their staff are responsive when issues arise during reporting, especially while the current balky system remains in use. Metrics should be developed for the quality of the reporting system and agency responsiveness, and should be disseminated regularly throughout the tech transfer community.

Make money available for patenting as part of federal research grants

The cost of developing and filing patents can itself be an impediment to tech transfer. The federal government could alleviate this by making some money available for patenting costs as part of research grants. This would send a clear signal that the government values tech transfer. But steps would need to be taken to make sure such funding does not result in patenting when it is not necessary or could be counter-productive.

*Recommendation:* Federal agencies should pilot different approaches to encourage tech transfer by classifying some intellectual property protection activities as an allowable research cost.

**For Both Universities and Federal Labs**

Create More Entrepreneurial Training Programs

As previously noted, people are the key to tech transfer. Enlarging the community of tech-transfer-savvy people can improve the return on federal research investments. Graduate students and post-docs would benefit the most from training in the identification and evaluation of candidate inventions and the methodologies for advancing them. While more senior researchers can also benefit from appropriate training, grad students and post-docs – whether at a university or a federal lab – are more likely to move to a company to commercialize an invention. Providing training to them can also help instill tech transfer as part of a lab’s culture and can send a clear signal that tech transfer is valued. Finally, student training in entrepreneurialism and tech transfer is a natural extension of the graduate education already supported by the federal government. Investing more in students would provide more bang for the federal research and education buck.

*Recommendation:* Research agencies should expand programs such as I-Corps (run by the National Science Foundation and others) and the Lab-Embedded Entrepreneurship Program (Department of Energy), and should support new programs that give researchers – especially early career researchers – new skills in entrepreneurship, business, intellectual property rights management.

QUESTION 4:  
WHAT ARE OTHER WAYS TO SIGNIFICANTLY IMPROVE THE TRANFSER OF TECHNOLOGY, KNOWLEDGE, AND CAPABILITIES RESUTLING FROM FEDERAL R&D TO BENEFIT U.S. INNOVATION AND THE ECONOMY? WHAT CHANGES WOULD THESE PROPOSED IMPROVEMENTS REQUIRE TO FEDERAL TECHNOLOGY TRANSFER PRACTICES, POLICIES, REGULATIONS, AND LEGISLATION?

The following recommendations are not specific to federal laboratories or universities, except where specified.

Develop additional funding mechanisms to bridge funding gaps, including for preliminary evaluation of commercial potential

The commercial potential of discoveries and inventions is often difficult to assess at early stages of research. “Proof of concept” studies are designed to advance research to the point where that potential can be gauged more accurately. But funding for proof-of-concept studies is scarce, and federal proof-of-concept funding, such as SBIR Phase I awards, are generally not available to employees of universities or FFRDCs. Researchers affiliated with such labs or universities would benefit from opportunities to perform early-stage evaluations before fully committing to a commercial venture. Federal support for such evaluations could provide the necessary impetus to get certain technologies out of the laboratories and make them attractive to early-stage investors.

In addition to initial proof of concept, there are several other R&D stages, such as scale-up to manufacturing, where funding gaps can appear, with considerable variation across industries.

*Recommendation:* Federal agencies should create programs that would enable more “proof-of-concept” research to be conducted at federal labs and universities. One potential mechanism for this would be to revise Small Business Technology Transfer (STTR) programs. STTR already operates in the space between universities and for-profit companies, requiring significant participation from each.

Agencies should also expand their support for competitively selected innovators striving to cross later-stage gaps with technologies derived from federally supported R&D. More federal agencies should create funding arms, such as In-Q-Tel, to help underwrite the development of innovations closely related to agency missions, especially for those that originate in federal labs. Agencies could also provide funding to help universities or non-profits start entities like MIT’s The Engine, which is designed to support the commercialization of “tough technologies” requiring longer, more patient investment than is allowed in the standard venture capital model.

Encourage more research partnerships with private industry

Tech transfer is more likely to happen when commercial entities are part of the research from the outset. That is not always appropriate, and universities and federal labs need balanced portfolios. But research that includes both universities and private companies, or federal labs and private companies can advance research (including some kinds of fundamental research) while increasing the likelihood that it will result in fairly rapid, tangible benefits.

*Recommendation:* Federal agencies should encourage more research partnerships with private industry at universities and federal labs.

Develop appropriate metrics

As noted at the outset, metrics for tech transfer are necessary, but must be closely reviewed. Merely focusing on patenting, for example, is misguided. For instance, about one-third of technology disclosures submitted to MIT’s Technology Licensing Office are not patentable. That said, looking at patents in a way that goes beyond simply counting filings can be helpful as part of a balanced set of metrics.

*Recommendation:* Federal agencies should work together to create a set of standard metrics that truly give a sense of how well tech transfer is working. (See additional comments in intro.) To the extent patents are the basis of metrics, measures like the ratio of patents filed to patents issued, and the ratio of patents issued to patents licensed can give a better sense of the efficiency and efficacy of patenting than merely counting numbers of patents. Looking at the percentage of start-ups surviving beyond five years, or receiving significant funding may also be telling.

Support Immigration

While the immigration issue is generally beyond the scope of this RFI, we would be remiss if we failed to note that a healthy U.S. research and tech transfer system is dependent on a welcoming immigration policy. The U.S. has thrived by being able to capitalize on the best minds from around the world – whether those people came to the U.S. with high skills, or came to the U.S. for schooling, or came to the U.S. in the hope that their children could advance. That is as true as ever today.

*Recommendation*: The U.S. should not shut down immigration or act in a manner that unduly deters immigrants from coming to the U.S. and contributing to its economic growth.

Help regions, universities and labs create ecosystems of tech transfer

As noted at the outset, tech transfer requires a complete ecosystem. Some regions, universities and labs are better situated to create such a system than others. MIT’s efforts give a sense of the range of tools that an ecosystem can include.

The *MIT Innovation Initiative*[[3]](#footnote-3) maps and connects the many resources in the MIT innovation ecosystem, which together have underpinned MIT’s success in technology commercialization. Programs include education and training to venture mentoring, business plan competitions and tech incubators. Programs are available for every level of innovator from undergraduate students to senior faculty and alumni.

The Martin Trust Center for MIT Entrepreneurship[[4]](#footnote-4) provides expertise, support and connections MIT students need to become effective entrepreneurs. The Trust Center provides entrepreneurs-in-residence, coaching, a student venture accelerator, co-working space, and more.

Some programs are focused on fostering an entrepreneurial culture, like the MIT $100K Entrepreneurship Competition[[5]](#footnote-5), a nearly 30-year-old entrepreneurship prize run by the Martin Trust Center that gives public recognition and money. The MIT Clean Energy Prize[[6]](#footnote-6) is the oldest and largest student-run business plan competition in the US, with the mission to both inspire and prepare the next generation of leaders to take on the world’s most pressing energy challenges.

The MIT Translational Fellows Program[[7]](#footnote-7)  is designed to help post-docs facilitate the commercialization of technology that originated in MIT research. The program provides professional development, training, mentoring resources, and funding for post-docs to spend 20 percent of their time to develop a viable business model.

The MIT Desphande Center for Technological Innovation[[8]](#footnote-8) provides grants, training, and advice for novice entrepreneurs and helps grantees avoid common pitfalls as they move their technologies to the marketplace.

The MIT Enterprise Forum[[9]](#footnote-9) is a global organization of dedicated professionals with local chapters, affiliated with MIT through MIT Technology Review, open to all participants of the entrepreneurial ecosystem. The Forum informs, connects, and coaches technology entrepreneurs.

The MIT Venture Mentoring Service[[10]](#footnote-10) is a free and confidential for all MIT-affiliated entrepreneurs. It harnesses the knowledge and experience of volunteer alumni and other business leaders to help prospective entrepreneurs learn what they need to know to begin and sustain a business.

*Recommendation:* The federal government could help broaden tech transfer efforts and equalize the playing field among regions and institutions by 1) providing funding to states, regions or universities to plan or initiate programs to build their ecosystems; 2) creating a clearinghouse of information for successful ecosystem ideas; and 3) by providing guidance to those interested in building out an ecosystem. Existing federal economic development programs could perhaps be deployed in such efforts.

1. AUTM comments to NIST RFI [https://www.autm.net/AUTMMain/media/Advocacy/Documents/AUTM-Comments-on-Federal-Technology-Transfer-Authorities-and-Processes-Docket-180220199‐819‐01.pdf](https://www.autm.net/AUTMMain/media/Advocacy/Documents/AUTM-Comments-on-Federal-Technology-Transfer-Authorities-and-Processes-Docket-180220199%E2%80%90819%E2%80%9001.pdf) [↑](#footnote-ref-1)
2. [New rule posted](https://www.federalregister.gov/documents/2018/04/13/2018-07532/rights-to-federally-funded-inventions-and-licensing-of-government-owned-inventions) on April 13, 2018, and effective on May 14, 2018. Rights to Federally Funded Inventions and Licensing of Government Owned Inventions. *Rule language: “Revise § 401.14(c)(3) to require a contractor to file a non-provisional application 10 months after filing a provisional application.”* [↑](#footnote-ref-2)
3. MIT Innovation Initiative <https://innovation.mit.edu/> [↑](#footnote-ref-3)
4. Martin Trust Center for MIT Entrepreneurship <http://entrepreneurship.mit.edu/> [↑](#footnote-ref-4)
5. MIT $100K <http://www.mit100k.org/#about> [↑](#footnote-ref-5)
6. MIT Clean Energy Prize <http://cep.mit.edu/> [↑](#footnote-ref-6)
7. MIT Translational Fellows Program for post-docs <http://www.rle.mit.edu/translational/> [↑](#footnote-ref-7)
8. MIT Desphande Center for Technological Innovation <http://deshpande.mit.edu/> [↑](#footnote-ref-8)
9. MIT Enterprise Forum <http://www.mitef.org> [↑](#footnote-ref-9)
10. MIT Venture Mentoring Service <http://vms.mit.edu/home> [↑](#footnote-ref-10)