RE: RFI Response: Federal Technology Transfer Authorities and Processes
Docket Number: 180220199-819-01

Via email: roi@nist.gov

Response to NIST Request for Information: Federal Technology Transfer Authorities and Processes

Submitted by: Lawrence Berkeley National Laboratory

Lawrence Berkeley National Laboratory (Berkeley Lab) is a U. S. Department of Energy Office of Science national lab managed by the University of California. Located on a 202-acre site in the hills above the UC Berkeley campus, the lab employs over 3,000 scientists, engineers and support staff. Thirteen Nobel prizes are associated with LBNL. Seventy lab scientists are members of the National Academy of Sciences, and thirteen have won the National Medal of Science.

LBNL researchers, combining advanced research facilities with world-renowned expertise in materials, chemistry, physics, biology, environmental science, and computing, develop technologies for next-generation batteries, bio-based chemicals and fuels, energy efficient buildings, high performance computing, and many other applications. The responses provided in this document come from LBNL's science community as well as technology transfer staff.

1. What are the core Federal technology transfer principles and practices that should be protected, and those which should be adapted or changed?

PROTECTED:

The right of the recipient institution to retain benefits from federally-funded research through the enactment of Bayh-Dole has incentivized innovation in the US and is increasingly being adopted by other national R&D systems around the world. Therefore, key aspects *e.g.* the right to own inventions made with federal funding, should be protected.

It is also important to maintain the practice of sharing FFDRCs' scientific discoveries as widely as possible with the public through open publication and communications because most of the research is paid for with federal funding. Pre-competitive projects with the private sector should continue to be encouraged as long as they are collaborations and the results are freely disseminated. Should companies want access to facilities or expertise for proprietary projects, the practice of full cost recovery to cover the time of the personnel and contribute to the maintenance of the facilities should be continued.

In contrast to the private sector where inventors normally do not share in downstream royalties from their inventions, providing scientists with a small royalty share derived from their licensed inventions is a very good incentive and motivates many scientists as they share in the success of their discoveries.

ADAPTED/CHANGED:

Outcomes related to technology transfer and industry engagement could be enhanced if federally funded projects were aligned with private sector needs. For example, federal agencies should

review the industry landscape and market development needs of potential partners and stakeholders to be aware of market size and to ensure that the funded projects align with industry partner needs and opportunities.

In addition, successful technology deployment may include industry processes, tools, methods and software systems in addition to the hardware "invention." Often both technology and "know how" are required for successful market development, and the transfer of both should be facilitated in tech transfer mechanisms in order to enable federally funded technology integration and technology adoption successfully in the private sector.

Technology transfer and IP licensing should be considered a core mission for the technology development approach of national labs and an integral part of scientific project management and program development. Metrics that measure the impact of technology transfer activities should be clearly defined, and a distinct technology transfer workflow that is transparent, consistent and predictable should be created and communicated.

Improvements to connections with technology "user communities" (end-users, technical specifiers, vendors, supply-chain decision makers, installers and service technicians, etc.) are needed to facilitate interactions between the national labs and the private sector. Such interaction would facilitate IP licensing and industry engagement between relevant parties.

2. **What are the issues that pose systemic challenges to the effective transfer of technology, knowledge, and capabilities resulting from Federal R&D, and**
3. **What is the proposed solution for each issue that poses a systemic challenge to the effective transfer of technology, knowledge, and capabilities resulting from Federal R&D?**

INDUSTRY ENGAGEMENT:

Technology transfer and industry engagement is closely managed at the federal level, with many layers of permissions being required for even the smallest engagement at national labs. This practice ensures good stewardship of discoveries created with federal funds. However, it makes collaborative engagements at the normal speed of business almost impossible. For example, corporations commonly encounter commercial technology development and deployment problems that require a fast response using specialized expertise not available in house. The national labs could play a crucial role in providing short term support in these cases, if a standard, flexible and rapid contracting mechanism was deployed.

CRADAs are an extremely effective technology transfer mechanism for industry engagement that should be retained and improved upon by delegating decisions, such as approval of CRADA agreements under a certain threshold dollar value, to the local (lab) level and, generally, streamlining the approval process. In addition, a formal program making federal funds available as a cost share, including a competitive proposal process, would provide an additional incentive to companies wanting to collaborate with the national labs.

Cross-agency collaboration as well as industry engagement would be facilitated if all agencies adopted standard procedures and agreements for CRADAs and other collaboration mechanisms e.g. the DOE's Strategic Partnership Projects (SPP). Such standard agreements must be made available on a public website so that industry understands the terms and conditions under which national labs use when working with industry before they engage.

In many cases, there is a mismatch between what federally funded research in advanced technical areas and the needs of industry. Unlike eras during which industrial labs engaged in a mix of activities spanning the TRL scale, many today offer technologies at or below TRL 4-5. Over the past 30 years, a large gap has emerged between basic discovery science and technology development in the US. Companies interested in national labs' capabilities are often disappointed the labs are not performing any scaleup or durability work and are not interested in more fundamental research collaborations. Successful tech transfer will not happen if the early feasibility work having been done in collaboration with the private entity.

In addition, there should be better incentives for industry to work with national labs on early stage technology. For example, to align public and private investments and interests and promote success in technology transfer, the US must adopt models demonstrated successfully in Europe and Asia that provide sufficiently large grants to enable work in both long term and short term R&D programs. These models promote true partnerships at all stages of research and development. As people and institutions get to know and trust each other, technology transfer will become easier.

Even if all IP and contracting issues were eliminated, industry partners find it especially challenging to access federally funded assets. Many report such programs are diffuse and uncoordinated, Lacking clear focus and spanning every discipline imaginable. A searchable, central registry of capabilities and expertise that is responsive to private sector inquiries is needed.

TECHNOLOGY COMMERCIALIZATION:

Software and datasets developed with Federal funding are now an extremely important output of Federal research and development either alone or alongside an associated technology. Much of this work is provided to the public through open source licensing. However, the transfer of software and data to private sector partners who see a commercial opportunity in such software or data analysis is often difficult due to inconsistent and inefficient transfer mechanisms. Clear and uniform policy and procedures for the ownership, transfer and licensing of Federally funded software and datasets across all Federal agencies would be extremely welcome to all stakeholders who seek to develop novel products and services based on Federally funded software and datasets.

Scientists should have the opportunity to participate in activities based on IP developed in their course of federally funded scientific research. A formal entrepreneurial activity program could be managed under transparent, well defined and open conflict of interest plans, and should enable scientists to retain equity in and participate in consulting activities with spin-out companies under specific conditions, e.g., opt-out of their royalty share. This is essential in many cases for the future success of these spin-outs. Such a program places significant burdens on conflict of interest management approaches and may complicate certain lines of research. However, it is vital to the success of spin-outs and provides an excellent incentive for staff retention at national labs.

Associated with such a program would be a model, such as I-Corps, that supports scientists and program managers for a fraction of their time, or a Google-type model that funds scientists for a limited time, e.g., 20%, to explore new opportunities would allow researchers or support staff to more seriously consider taking their research in new directions more closely aligned with private sector needs.

National labs need to develop and understand the technology risk, financial valuation and the value proposition of their IP when licensing to start-ups and emerging business. This could be achieved through access to centralized resources that can help them develop and understand technology roadmaps and report findings so they can communicate and market their IP to targeted industry forums. Understanding these attributes would strengthen term-sheet negotiation and enable a more streamlined licensing process.

Currently, national lab IP is not well organized to show its potential value. Licensees often have to invest substantial resources to construct IP portfolios across multiple labs. The value of IP is best realized when it can be monetized as a technology portfolio rather than a license to a single invention. The impact of technology commercialization could be increased by creating IP pools across the national labs (or likewise other federal agencies) that could be accessed by investors and companies under common licensing agreements. The creation of a well-organized searchable database that includes a portfolio data sheet, descriptors, suggested applications and readiness level would facilitate this. Such organization would facilitate the marketing of such IP portfolios to targeted user groups.

In most cases, technology patent portfolios alone are not sufficient to enable speedy development of commercial products. The ability to include access to the inventor so that implicit know-how can be transferred in addition to the patents would increase the success of commercialization. This could be achieved by creating a formal licensing with consulting type of program, where licensees can provide additional funding for inventor engagement.

4. What are other ways to significantly improve the transfer of technology, knowledge, and capabilities resulting from Federal R&D to benefit U.S. Innovation and the Economy?

One systematic challenge is the changing nature of research and technology development, which is moving away from the stronghold of industry incumbents and towards new and emerging players such as start-ups. These new players may not be aware of federal R&D efforts or of national labs as innovation partners. With several new industry structures emerging, the established networks for industry engagement are changing. There is a need for market intelligence, industry analysis and periodic review of technology trends so that both the public and private sectors understand how to effectively engage the commercial market through multi-level industry engagement with small business and start-ups as well as big business and trade associations etc.

Clarification of US competitiveness provisions such as “substantial manufacture in the United States” and how this requirement could be waived in relation to sponsored research and licensing activities conducted by the national labs would be extremely useful for industry collaborations. Given multinational firms and global supply chains, even US companies balk at this provision, making it an obstacle to greater commercialization activities.

Industry consortia, joint ventures and strategic alliances are common collaboration frameworks in the private sector. Rather than investing in very specific projects/technologies, industry consortia and investment groups are often interested in supporting multi-party research in a given field with an umbrella arrangement to have access to emergent IP in addition to background IP. The lack of frameworks and common agreements that support such partnerships creates a barrier to the development of public private partnerships. The development of common consortia frameworks

and agreements for intra-agency, inter-agency and for external partners would be extremely beneficial for technology transfer and industry engagement.

Researchers are incentivized and rewarded for publications and journal papers, yet there is a lack of clear, well defined incentives for IP creation. For technology transfer and industry engagement to be maximized at the national labs, a formal recognition for excellence in this area must be developed both at the individual lab level and the agency level.

The national designated user facilities at DOE labs provide access to unique facilities and expertise with many users coming from industry, particularly from small companies. While DOE encourages this engagement with industry, user programs are evaluated largely on the number of peer-reviewed publications that users produce, which does not favor small business. In addition, tracking of IP produced or commercial success of work carried out at the user facilities is not required. Understanding the role that the user facility played in the IP creation of all users, including both academia and industry, would enable the full impact of these facilities to be measured appropriately.

Thank you for the opportunity to comment on this important initiative.

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