Q: Okay. Good morning everyone. Welcome. I'd like to welcome you to the Silicon Valley West Coast Regional Office of the United States Patent and Trademark Office. My name is the Steve Koziol. I'm the assistant regional director here of our office. Our regional director, John Cabeca is out travelling today, so he wishes you well in this event in his absence.

I'm very excited today to be joined by our sister agency in the Department of Commerce, NIST, in supporting their return on investment initiative here today. So I am going to step out of the way and let the program really get started and introduce Courtney Silverthorn, who will be moderating the discussion this morning and kicking things off for us here today. So without further ado, I'll turn things over to Courtney. And thank you all for being here and I look forward to a productive discussion all with you this morning. Courtney?

Q: Thank you, Steve, and good morning everyone. Thank you so much for coming out to the first public forum for support. I want to thank the US PTO for hosting us here in this wonderful building today. Just to give you a quick overview of how the morning is going to go, we'll have a short presentation to go over some background information on the return on investment initiative, that’s from Phil Singerman, who is the associate director of Innovation and Industry Services, National Institute of Standards and Technology. After that presentation, we'll be opening up the floor to all of you to hear your ideas and comments about the stakeholder information process that we're hoping to get feedback from you all on as support to this initiative.

So after the presentation, I'll return to the podium briefly, just to go over some of the ground rules, if you will, for how that process will work. We have a lot of time available for your comments, so please be prepared to share your ideas, your concerns, and your thoughts about the process.

If I can get everyone to mute their cell phones. We are recording this information today at NIST and will be transcribing that and we reserve the right to post the information in its unedited form. So just keep that in mind. But for now, I'd like to turn the microphone over to Dr. Singerman.

Q: Thank you, Courtney. Thank you, Steven and colleagues at the West Coast PTO Office for hosting us and thanks to all the people for coming this morning. My name is Phil Singerman. I'm the associate director of innovation and industry Services at the National Institute of Standards and Technology, NIST, part of the U.S. Department of Commerce.

I'm joined this morning by colleagues Shyam Sunder, who's a senior science advisor to NIST, Courtney Silverthorn, who's deputy director of the Technology Partnerships office, and David Cranmer, who's the deputy director for the Manufacturing Extension Partnership.

We have organized this public forum to solicit your views on an important national topic. [Unintelligible] return on investment, ROI from our federal investments in technology development, and by doing so, unleashing America's innovation. Before we ask you to present your comments, I want to provide some context on the ROI initiative, which I think will be useful to this audience. There will be a little bit of wonkiness from inside the Beltway but here we are.

And I think this audience is probably is as knowledgeable as any and interested in this. So let me move into the presentation.

As you may know, the federal government invests approximately, I believe, $150 billion per year in research and development. So about one-third invested in over 300 federal laboratories across the country. --NIST is one of them, Department of Energy national labs and others. And two-thirds invested at universities and industry produce huge economic gains and strong national security innovation space.

The results of this investment must be first [unintelligible] to apply research and services to benefit private companies and enhance their goods and services. Our federal technology transfer policies and procedures are based on landmark legislation that started in the 1980s, which continues to serve as the basis for U.S. innovation and have been widely emulated by other countries.

This legislation includes the Bayh-Dole legislation, Stevenson-Wydler legislation, former [unintelligible] that identified the transfer of technologies as a priority. Bayh-Dole among other things allows universities and non-profits [unintelligible]. Other legislation includes the Federal Technology Transfer Act of 1986 allows the federal government to invest in CRADAs, the National Competitiveness Technology Transfer Act of 1989 and the Tech Transfer Commercialization Act of 2000.

So there's been a series of legislation over the years and associated regulations and policies and practices which have led to our current system. But in an increasingly competitive global environment, it is important to ask whether and how current laws, regulations, and policies can more effectively promote transfer of federally developed technology transfer. As part of the government Performance Results Act, the Administration’s annually promulgated presidential management agenda with cross-agency priority goals.

And the administration's agenda now is to modernize governments for the 21st century through landmark cross-agency priority goals. And under this framework NIST has launched this initiative in coordination with the White House’s office of science and technology, to enable a greater return on investment with the federal government, $150 billion annual R&D investment.

This is a priority that has been in existence for a number of years and the current administration has emphasized. By return on investment, we don’t mean merely financial returns to the federal government but the broader returns to society and the economy for economic competitiveness and national security.

The Lab-to-Market goal as I mentioned is co-lead by the Department of Commerce, via NIST and the White House Office of Science and Technology Policy. And NIST in coordination with OSTP will advance this initiative to its [unintelligible] market capital and then [unintelligible] return on investment initiative.

The National Science and Technology Council Lab-to-Market[unintelligible] interagency working groups with its CAP goal. So, I describe this because it's important to understand that this is just not some off to the side initiative that is albeit important… It's not part of global structure of government review and assessment review and [unintelligible].

It's really embedded in the structure of government policy making and priorities. So a word about NIST. So I'm sure this audience is familiar with NIST. It's billion-dollar federal research agency, best known for industrial standards and scientific measurement. We have a major campus in Gaithersburg 600 acres, 60 buildings. We have over 3 million square feet of science laboratories, over 3000 employees, and a large number of [unintelligible]

We also have a smaller campus in Boulder. We're well-known for the scientific achievements of our support and staff since 1997, our scientists have won four Nobel Prizes. Less well known is our responsibility for leadership in promulgating and reporting on technology transfer practices [unintelligible]. And I listed some of these structures that we are responsible for coordinating committees, interagency working groups.

Some of you may be familiar with the Federal Lab Consortium and the Association of American Universities and federal technology and Association of University Technology Managers, so we’re the host agency for that though. So NIST is particularly well-placed to influence how companies interact and influence and advise other agencies on their policies. And it is through this authority that we are advancing the ROI initiative.

Our goal is [unintelligible] just some [unintelligible]. Thank you. Thank you. The goal is to assess, streamline and accelerate the transfer of technology from federal labs to the marketplace, marketplace broadly defined, by identifying the critically needed improvements in federal technology transfers, policies, practices, efforts, by seeking more interest in federal R&D technologies and intellectual property and technology [unintelligible].

We are looking at a number of areas. This is an illustrative list. It's not an exclusive list. I will let you look at that. And in order to get your input on that process we have, as you may know, issued a request for information through the Federal Register. It was issued, I believe, on May 1st and it will be open until July 31st. So it's open for 90 days.

And we are eager to hear your views on these specific questions and other questions and issues that you are interested in and think would be valuable to provide. So we're -- we don't have a-- obviously because of our work. We have thoughts about what kinds of issues need to be addressed, but you understand that there's a much broader stakeholder community that has a diversity of views and we are very interested in hearing those views.

We have a formal website which you can provide your responses. And it’s important to mention that this is the first of four public forums [unintelligible]. We will be -- as Courtney mentioned, we'll be recording this information and we may choose to publish it as part of our final report. [Unintelligible].

We're delighted to have our very first public forums here and in Denver. Just a word about the timeline of the discussion for this session. We're moving forward on this. We'd like to do this quickly [unintelligible]. But as I mentioned, the RFI is open until end of July. We're already preparing background information on various issues, law and regulations, government issues [unintelligible] has been identified so far.

And then subsequently we'll be preparing a report. I can't predict the timing of that, but people were looking forward to having a draft by the fall. We really haven't determined a full implementation plan and of the strategy of this but we are eager to move it ahead relatively quickly.

Finally, there's a website that is Technology Partnerships Office at NIST is responsible for. There's a great deal of background information that is located on that and we’ll be adding information as it becomes useful.

So I think that is the end of my presentation and now I'm going to turn the podium back to Courtney so that you can begin this forum. Thank you very much.

A: Thank you, Phil. The NIST TPO ROI website has information on the federal register notice, the press release that announced the public stakeholder engagement process. There's also a video of our April 19th event which I think a few of you in the room attended. You are able to see the entire two-hour presentation online program [unintelligible]

It also has the slides that you just saw today. So if you're interested in copies of those, those are available under the public forum section of the ROI's website. So I'm really excited about this process. I was involved in the first iteration of the lab-to-market priority goal, and we did not go out and do this process the first time.

So the fact that we had the opportunity to do this today and over the next few months, I think, will really prove very fruitful as we move forward in the [unintelligible] stage. So I just kind of wanted to turn the floor over to the audience today. The way that we'll be doing this, there's a microphone over to the left side of the room.

We will allow three minutes per speaker. Since we don't have quite a full house today, we can come up to the microphone a second time if you'd like for a second session. We'll put the ROI questions back up on the screen. You can comment on any of those, any other information that you've heard. You can comment on somebody else's comments if you'd like to clarify something that they said or perhaps bring a counterpoint to that.

I will be your official timekeeper as the NIST keeper of the U.S. time [Laughing--unintelligible]. I will give you a 30-second warning and a time up warning, so keep an eye on that. But we're very excited to get your feedback and your ideas today.

Q: Don't be shy. We'll have this microphone on the other side of the room.

Q: Okay. Thank you. Yes.

A: Good morning. My name is Roger Werne. I'm the deputy director of industrial partnerships at the Lawrence Livermore National Lab and so I'm one of the federal lab folks who is involved in tech transfer. In reading some background information that you folks generated on this ROI initiative, one of the things that struck me was the statistic that the amount of royalties generated by university-related research versus that of federal lab-related research was way out of whack with respect to the money given each.

So one of the questions I have, has anybody ever done a study as to why that's the case? Are there any federal studies or any private sector studies that describe why there is a difference in the royalty success rate for university-based research versus federal lab based research?

The reason I ask that is because in both cases the maturity of the research is probably somewhat similar. You know it’s a TRL level 2 or 3 kind of a maturity level. And so the question is, what is inhibiting the national labs from being more successful when it comes to commercializing the research?

Q: This is Shyam Sunder from NIST. At this particular session, the request for information session, I don't mean to not answer that question. We don't mean to not answer that question. It's really -- this is an opportunity for you to ask us questions and provide your insights or issues you need to address, this is not an opportunity for us to engage in Q and A session for --

A: No. I understand.

Q: So I think we will take that, your question, and clearly that is your input to the process. We expect.

A: The reason I ask the question is, that the answer to that question will significantly affect what you propose, at least it should.

Q: The audience is welcome to respond to that question, however, if they have insights.

Q: I always kind of back up Roger [?].

A: I'm Alan Northrup and I’ve actually seen the benefit of licensing and entrepreneurship and -- of the technology at Livermore. I think, maybe this is closer, and I’m sensitive to the we in Boulder. I think what you're getting at it's a kind of a cultural thing. I think spending some time with the scientists there that are unbelievably amazing and it’s similar at Livermore as I remember.

There's some -- I would say that there's some scientists that care. There's some scientists that don't care about tech transfer and there's some that just have no idea what it is. So I think, in general, I think the university is -- environment is surrounded by professors and everybody’s got a company, that’s kind of true these days, especially in microfluidics and engineering.

Whereas at NIST, in this very superficial observation, they're very happy with pushing the limits of the atomic clock. And so I think those are both good things. And so I think one of the most important things is that we -- that we as a country as in NIST are totally aware of what the -- the stakeholders are important, of course, but the people that are satisfying the stakeholders are actually more important. So I think it's very important culturally to figure out maybe what that difference is.

Q: Why don’t you give a little about your background, what you did?

A: I was born as a child in Syracuse, New York. [laughing] Anyway, so I was at the lab for about eight to 10 years and it's true that a technology there was able to make a silicon chip that did DNA sample. So we filed a patent and then a colleague of my, Kurt Peterson, and I – Kurt took the lead. We approached Livermore and got an exclusive license. That became a company called Cepheid.

We went public in 2001 and they were recently bought by $4 billion by Danaher now. I got out a long time ago. So I still have to pay for parking. [laughing]

A: So I am Elsie Quaite-Randall. I'm the chief technology transfer officer at Lawrence Berkeley National Lab. I'm also the chair of the Department of Energy's federal technology transfer working group. So thank you for the opportunity to comment today. So the Bayh-Dole and Stevenson-Wydler acts are essential tools in the translation of federally-funded research to innovative products, processes, and services for the American people.

In order to sustain this innovation pipeline, it is essential that the clear pathway that this legislation has established through patent ownership and licensing by universities, federal labs, and other nonfederal entities is maintained. Through a variety of mechanisms enabled by this legislation and developed by technology transfer professionals, the American public sees the impact of federal funding every day.

For example, the brightness of your screens in certain tablets, the bar coding that you see in your grocery stores, the use of components in baby formula, the use of GPS for us to find our way, and many, many new medical and pharmaceutical innovations that are too numerous to mention.

However, with almost 40 years behind us, it is a good time to revisit the legislation. Today, there are three particular issues that I would like to address with respect to improving the American innovation ecosystem. Treatment of federally funded know-how, federally funded software and datasets and their analysis, and the suggestion of a small step in bridging the valley of death for early stage federally-funded technologies.

So as we all know, experiential learning is an important aspect of our current educational system. We know that students learn by seeing and doing. In a similar vein, in certain cases, having license rights to a patent will not be enough for the licensee to use, exploit, or manufacture the related invention in the most efficient way.

Beyond the patented innovation, the licensee will, in many cases, need access to the unpatented technical information which relates to it. They need to confer with the inventor to learn by experience. In such cases, instead of a mere patent license, it may be worthwhile to enter into a patent know-how license in order for the licensor to grant access not only to its invention, but also to the relevant technical know-how.

This will enable the licensees to fully use and understand the invention and increase the possibility of success. The ability to license know-how in conjunction with a patent or software license in any revised legislation would enable the development of a successful product in a shorter time.

With respect to software and datasets developed with federal funding, these are now an extremely important output of federal research and development, either alone or alongside technology development. Of course, 40 years ago, no one could have imagined the impact that software and data collection and analysis would have on the lives of the American people.

Much of this work is, quite rightly so, 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 inconsistence and inefficient mechanisms that enable such a transfer.

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 the stakeholders who seek to develop novel products and services based on federally funded software and datasets.

Finally, as the innovation pipeline from federally funded research has grown over the last 40 years, mainly due to this legislation, the realization of a significant gap in this, between the outputs of federally funded research and consumer product.

In many cases, the most significant gaps at the very beginning of the development, for the value proposition of a potential product cannot be clearly defined. Often, one simple step, for example, the development of a prototype would have a significant impact on the commercial potential of a federally funded invention.

However, finding private funds for such an activity is difficult due to the inherent risk in such early stage activity. Additionally, in many cases, it is not external parties but the actual inventor of the technology who are best suited innovators to do this early-stage development work.

One solution to overcome this roadblock would be the availability of federal funding through a formal program to support research and development projects with recognized the technology transfer potential. These awards could be made available on a competitive basis and would allow the scientists to continue to work at their institution to develop their inventions to the next stage.

Such funding opportunities would be aligned and, in some cases, be the follow-up that other federal programs that encourage entrepreneurial activity for federally funded scientists, such as [unintelligible]. So thank you for the opportunity for bringing these three issues - licensing of know-how, treatment of software, and funding availability for early-stage commercialization to the group today. Thank you.

A: Hi. I'm Alex Hartin with TradeSpace. We provide big data and analytics to help support organizations, research institutions, and financial institutions and buying and selling personalized technologies. So we've only been up for about a year, so I can present our insights as we've started to dabble in this space.

We certainly do a lot of work at the Board and Research Institution. We're also on the other end, supporting larger operating companies that are trying to find opportunities, to identify them. So we’ve identified really three key challenges agencies that -- and the first is the fragmentation of Innovation [unintelligible].

So even though technology has broken out of the barriers to developing technologies, we find that commercialization efforts are still highly dysfunctional. So the fact that each federal lab and each university has their own technology transfer site and really, even if there is organizations like AUTM that try to bring together the professionals, largely speaking, across the board, there are no cross-cutting efforts to try to identify and commercialize technologies.

The second is a passive approach that we see, organizations and the international governments [unintelligible] to the [unintelligible]. So we've observed a lot of new policies that has supported the development of market places or portals or repositories as a way to solve these (unintelligible).

And we’ve seen especially when we work with our outreach department, that these are largely unsuccessful. First of all, operating companies don't go to these sites, and when they do, they find that they're not curated. And they have a lot of trouble actually identifying opportunities.

And the third, of course, is that there is one that everyone is familiar with, the lack of maturity in some of the technology that comes out. When we work with operating companies, we find that a lot of them are hesitant to take the first step. And that complicates the commercialization.

So we've had -- we've thought about this and figured out two different factors as far as solutions, obviously colored by our experiences. So we see that development of a body, you know, in the federal government that’s responsible for, if not coordinating, then providing an accurate picture of the data in personalization.

So it's showing what technology is present across all of the federal government and all the universities. But then also providing the support for research institutions and universities. And actually conducting outreach -- so not just taking that technology and putting it up on a web site but actually identifying legitimate partners, particularly for priority technologies.

And then the third is identifying areas of mature technologies. So how do you incentivize the industry to partner with research institutions around priority technology areas. And, you know, as we worked with some other governments, we thought about ways to provide either matching grants or access for companies that are eager to primarily cooperate and take technology to the level that they feel the risk is mitigated or fully ready. Thank you.

A: Glad to be here. Please.

A: Hi. I'm Katharine Ku from Stanford, the tech transfer officer. And so I just have some thoughts from a university perspective. I don't know the federal labs as well. But from my vantage point, it seems like the federal government has to decide if exclusive licensing is really okay or not.

So I understand the federal labs default is not to license at all. But as you all know, many of our technologies are really not mature at all and you need some sort of incentive for a company to take it on.

So I understand that the barrier for an exclusive license is quite high sometimes. So the federal labs are discouraged from doing that. I would like to see the federal labs or the federal government say proof of licensing is okay. I mean, giving the right to universities to supply something. So it's okay for universities under federally funded grants and contracts, why can't the federal labs do that?

So I think -- secondly, I think the federal government needs to decide that sometimes a champion is better than resources. I know that probably the federal labs lean licensing existing companies and they're much more reluctant, or they’re nervous about licensing to a startup. But sometimes the startup is the one who really, really cares.

And the company won't make it or break it based on the technology. Our experience is often that if you license a technology to a large company, in a couple of years they change strategy and they shelve it. So that doesn't work for us. We really want to have champions.

And, obviously, you can set up your [unintelligible] license [unintelligible], but start up with [unintelligible] and milestones. But if they're not performing, somehow you can take it back. And I think that's really important.

I also think that the federal government needs to understand that, in our area, again, innovation ecosystem, that not everything is going to be successful. And so there has to be some sort of acceptance of a failure and that just everything we license [unintelligible], the truth is [unintelligible] service.

There has to be some sort of a risk-taking or it's not going to be really worth it. If you can only license when you know for sure it's going to be successful and that's a tiny, tiny fraction of technology. I would like to see, from my vantage point, that the federal government gives the federal labs a little more autonomy.

I think each one of them are a little bit different and have -- not second guessing all the time what the tech transfer person is trying to do in their ecosystem. You hire experienced people, professionals but I think there's a sense that you don't trust them. And so there's levels and levels of review.

And it's always easy to second guess some of us. Why don't you do this? Why didn't you do that? But when you're on the ground, you're dealing with facts that are somewhat incomplete. You have to take a chance. And so, again, there's many levels of review. And it's easier to say no as you go up. So it's harder for [unintelligible].

The last thing is I do think that the major difference between universities and federal labs is the coming and going of people. Universities have two [unintelligible] and they go out and tech transfer is actually about people. Most of us we do at universities have an easier job of transferring technology because eventually [unintelligible] while we [unintelligible].

And the faculty can be involved. But, again, the people on the ground doing the work are the champions. So if there is some mechanism, and this I don't know. Being able to have some more visitors come and go into the labs. I'm familiar with Oak Ridge National Lab and they -- they are affiliated with the University of Tennessee. And so they do have students coming and going and I think they're really being quite entrepreneurs.

Q: Thank you.

A: My name is Mike Martin and I am the associate general counsel and head of patents at Oath Inc, which is formerly Yahoo and AOL. But I want to make it clear that I'm here speaking in my personal capacity as somebody who's very interested in technology transfer.

A very small part of what I do professionally now involves academic collaboration, although we do do a few. So I'm speaking on my own behalf. These aren't the views of Oath. Okay.

So just to give you a sense of my credentials, I want to just tell a little bit about my story. I did a bachelor's degree in physics at UCSD. And while I was there, I was interning in the W.E. Moerner lab, who since moved to Stanford and earned a Nobel. I did not meet him there though. I met him at IBM's Almaden research center in San Jose while he was there many years ago where my father worked as in-house patent lawyer.

So sometime in the '80s, right, IBM started to wind down its funding for its R&D labs. And W.E., along with quite a few others, moved to universities and to national labs. Okay. So while I was an undergrad I worked for W.E. I also worked at Pacific Northwest National Laboratory. I don't know if anybody is from there -- from there. As an intern.

Had a wonderful experience. Ended up going to graduate school in physical chemistry. And then for reasons that I don't need to get into, besides that maybe my dad had the right idea going into patent law. And so I moved into that profession.

And so upon graduating and getting into patent litigation, one of the earliest experiences I had working for a large litigation boutique, was to work on the defense side with universities as plaintiffs. So while this was very interesting, it appears that they've been fairly successful at patenting some fundamental ideas and am I working for the bad guys? That occurred me on one or two occasions we'll say.

Subsequently, I was recruited by very charismatic individual to come to work for venture capital and that's when things took an interesting turn. Because one observation I would like to make as part of this experience is just that there was something else that was happening in the '80s after the Bayh-Dole legislation that was passed that was very important.

And that was the rise of venture capital financing and startups. And so one question -- I mean, I understand we're supposed to be making comments. But I'm going to follow the first person who started today and ask a question. Just, when we look at the difference in the technology transfer that's happening out of the national labs versus the universities, is it possible that there's a measurement problem, right?

Because the general observation I have is that innovation has not slowed down. Anybody who looks at Silicon Valley over the last 20 years could not make a very good argument that innovation has slowed down, right? So, perhaps, some of the technology transfer that used to be happening, through in-house R&D labs or through technology licensing, right, is happening through the startup pipeline.

And how would we know if that were the case, right? So this is something that I do have some professional experience with now as an in-house patent lawyer. How do I know that ideas are being generated that are patentable? That could lead to innovations. Somebody has to submit an invention disclosure.

And so I guess if I have a comment for this group, the comment would be, let's focus on the inventors, right? Because unless we're serving the inventors, right, nothing -- we're not going to have any paper trails. We're not going to have the people coming and going are going to come and go and they're going to take their ideas elsewhere, right?

So another fascinating thing -- I'll just finish my comment by pointing out that after the venture capital fund, I was very surprised to learn that the universities were actually one of the biggest investors in venture capital. University endowments, right?

So they're making money -- the universities are making money. Some of you here know this quite well. Both through technology transfer licensing and through equity investments and startups and through alumni donations.

And so all of these other mechanisms for technology transfer that don't involve what we do, here today, are also important. And we need to keep those in mind as we come up with policies, right? I mean, it's an interesting question. Should inventors be more involved in commercialization? Maybe the answer is yes if it's national labs and no if it's universities. Maybe the answer is no generally. Thank you.

Q: Any response from universities on the open question of venture? Any response from any of the university representatives on the question posed about the measurements of technology transfer metrics?

A: Hello. My name is Paul Roben and I'm the associate vice chancellor for innovation and commercialization at the University of California San Diego in the management. But -- so I oversee the activity for a fairly large public institution. And I just had a couple of comments maybe.

One of them is this business putting companies and universities together, it's a hard business and you have to reduce uncertainty and reduce risk for the companies, you know, to get them to come and talk to us and to do business with us.

But any opportunities to lower the barrier and the risk for companies is always welcome. So things in Bayh-Dole, for example, the march-in rights. Things to sow uncertainty and they can for larger companies to slow the process down.

And there's a lot of other things that you could talk about in terms of lowering those barriers, as well. The second kind of comment I wanted to make is the all-around incentive. I co-authored the APLU’s white paper on tech transfer evolution last year, so I had a pretty good view of the public institutions across the country.

And one thing that came out very much though across all institutions, like rural, urban, big, small and all the rest, revenues are their own incentives, right? And, in fact, Bayh-Dole to some extent actually helps drive it the revenue down that rabbit hole as well.

You know, it tends to lead to difficult negotiations over the valuation of IP. All that kind of stuff. How do we incentivize me and all the me's out there to really look at economic impact and economic development metrics, as opposed to revenues.

And then also, you know, it has to be a conversation with the leadership of all of these institutions, as well. You know other incentives, you know, on the question of incentives, they invented themselves, they’re a little bit disconnected from the whole process. There is no incentive for a lot of faculty and students to engage in tech transfer. It's hard.

It doesn't speak to their promotion within the university and [unintelligible]. It'll be interesting to think about, how could you incentivize the inventors themselves who drive the entire process, right? And to engage.

In terms of incentivizing the universities – this costs them money, you know? And most of our offices don't make money. It's a cost to chancellors and presidents that frankly a lot of them don't want to bear. So I'm not sure how to fix that one but I'm just throwing it out there, that there's probably other ways to do this. To incentivize universities. To engage in the process more and more completely perhaps.

My last comment, if I could read it -- my eyes are going. Yeah. I would agree with a lot of the comments, and Kathy said this as well. You know tech transfer is not about IP and pieces of paper for the most part, it’s about people. And there's a lot of barriers to co-locating people, to having industry people and academics in the same place.

The more that you're going to have those conversations and have those people in the same room together, the more opportunities that come out of that. You know, the more focused research becomes towards commercialization and so on. So there are barriers to that that we’ve thrown up. You know tax law is one.

You know, this idea of limiting private activities so we can't have companies on campus in certain buildings and all that kind of stuff, is one barrier. I think there's probably a lot of other ones out there, but I think this whole idea of removing the barriers, having there being incentives, having a conversation is needed.

Q: Thank you.

Q: As we all said to come back to the mic even if you've come up before.

Q: I would also add that these comments are very useful and I think it's not the first time that any of us have heard them. So I would like to encourage each of you to submit more extensive written comments to the ROI website.

We'll give you an opportunity to expand on your views in greater detail or ask questions and also supply documentary records of suggestions that we can then aggregate and analyze for our purposes.

A: When is the deadline?

Q: End of July.

Q: July 30th.

A: Yeah. Hi. Alan Northrop again. I'm an entrepreneur. So one of the themes that I'm picking up and focused on one of the comments my colleague at Lawrence Berkeley mentioned. As an inventor, as a full-time career employee at Livermore, UC at the time, I -- and this is kind of -- I had a decision to make.

We all know people in our institutions that are going in the lab at night at a startup and using the facilities at night. You know, I always say it took 15 signatures for me to leave the lab. But I did. But every entrepreneur comes up with this in university or the national labs.

You know, what should I do when there's a chance for me to join a startup? Big numbers? Who knows? Or do I stay here comfortable, continue to invent. So I think your point -- you know, we have to think out of the box, because I don't think -- I think an entrepreneur, it's a student, a professor, or a researcher, you should somehow provide them all the information -- as much as you can -- about what the options are.

And then create options that facilitate the transition through the valley of death, or the technology. It doesn't have to be the inventor but I think you should find, you know, a clone of the inventor to do this, for example.

So I think these things I don't know of existing, but I think it's an opportunity, since NIST is bringing this up kind of new, it's an idea of a new concept of -- I know Stanford has the colleagues there that take their six months off. They're very liberal about that. Pretty liberal about that, I think.

And so if the lab -- I don't know if they have those, Roger. Like a -- so I think it's an opportunity to, use the inventor -- some inventors don't want to do it. Some inventors would be all over it. Some people are I don’t know. So I think there's a chance for a new, excuse the expression, paradigm for how the inventors transition into a successful technology that they want. They go back to research because they generate good ideas.

A: Shyam Sunder here again. Again, building on what Dr. Singerman and Courtney said, it will be wonderful to hear about – from all of you, about your thoughts and opinions. Maybe not so much the formal process that we could [unintelligible] dip it into that topic. I think that you should share your opinions.

Do you have an opinion as to how tech transfer can be improved we want to hear that because we're serious about all the inputs you're providing. And you have lots of good ideas and we don't want to act on our good ideas without hearing all of yours on how to improve tech transfer.

Q: I need to quickly follow up on Alan's comment when you said think outside the box. The government doesn't do that well. We built the box. So we're hoping that you have ideas that will help us get outside of the box.

A: So again, I’m always talking through the university perspective. One of the questions was about metrics. And I had talked to Walt many times and [unintelligible] as Kim. I also said -- was worried about the term ROI because I felt the focus on -- at least, traditionally, you know, number crunching. So I think revenue is not the metric.

Stanford has done well but, again, the patent that we did the best on was probably in 1984. So the -- everything is time-delayed very much in our business, and you can't measure income because all it is a reflection of what was done 20 years ago.

So my favorite metric is actually license is [unintelligible]. And it's going to depend on the quality of the inventions and interested seeing party. Talked about that a lot because most of us have really good inventions. It's just that nobody wants them.

So that's the other myth that I think is out there, that there's this land grab for cool inventions that everybody wants them and that we have to choose between a startup and an existing company. No. Generally, nobody wants them. We don't get a response.

And so when a company comes forward and they're the only one who wants it, we want to really get it to them. We want them to show that they deserve to be the exclusive licensee of the technology. But honestly we don't have any other choice typically. And so otherwise it's just going to sit there.

And I know that -- you know, there's always a worry. Well the value for this technology, it’s worth more, it’s about negotiating skills. A patent is only worth -- I mean, an application was only worth what we put in in a patent office and lawyers office. All of it is potential and it's sometimes imagined potential.

So I think it's -- everyone keeps focusing on, are you getting the right value for the license? That's not worth it. It's not worth any of it. The company that puts in the effort, they get a good fit. I think that was all I really wanted to say.

A: Yeah. Roger Werne again from Lawrence Livermore. I think the idea of metrics other than royalty imcome is important. For example, at Livermore we have a thing called the entrepreneurs’ hall of fame. There's 19 individuals in there that -- and Alan is one. Alan over there. Alan Northrup.

And these are all companies that -- in which the individual left the laboratory and the company that they started had significant economic impact. I mean, hundreds of millions of dollars. And it turns out that several of our more successful companies, I'd say a third of them, were not -- did not involve patents. They involved know-how that the person had know-how that they developed over a period of five or six years or a decade.

And they took that know-how with them and went out and started a company, but had a successful entrepreneur help them along. For example, one of those companies is called Digital Globe and Digital Globe provides the imagery for Google Earth. A gentleman's name, Walter Scott, started that. But he took his know-how with him but no IP.

Another one was a piece of software called Dyna3D which revolutionized the automobile crash simulation industry. But again, no license. No revenue. And that was tremendously valuable in terms of overall economic impact.

So I think counting -- somehow counting the individuals or the individuals who left the labs and tried to start a company -- and in Livermore, we have something like 250 individuals over the last several decades that have started companies. Maybe a few -- I mean, five percent of those are still alive today.

I mean, I count the one -- I started a company back in 1995. It didn't stay started, but it was an attempt. And so now what I've got is a presentation called Anatomy of a Not-so-successful Startup Company that I give to business schools. So there isn't a long-term benefit in some cases.

But I think establishing a set of metrics that really describe the effort in technology transfer is important. Thank you.

Q: May I ask a follow-up question?

A: Of course.

Q: How are you tracking that know-how going out to the world from companies?

A: It is --

Q: Are they reporting back?

A: It's strictly me. I mean, I do it. And I know -- I've been to the laboratory about 40 years and so I know virtually everybody who is on that list personally. And so I just follow them. Then I also follow the individuals that I think could -- you know, who have left the lab recently and what are they doing?

So it's really -- it's because I care about measuring this that it gets done. And so, you know, when a laboratory wants to count stuff, you need somebody who cares about the data.

A: I feel I have to back up these people in the room. I think revenue is absolutely the wrong measure for any of this. I mean, to back up what you said over there -- you know, many of our most successful companies coming out of the campus as well had no IP experience either. No tangible patent and IP experience.

I mean, Qualcomm. It was -- no IP came out of UCSD for Qualcomm, but we have benefitted more greatly from Qualcomm than any other company, right? And that's the long-term view that we now take. You know, with the current chancellor, we started taking that view about four years ago and since then we've doubled the number of licenses and doubled the number of startup companies coming out of campus and so on.

So to measure in terms of that activity, you know, changing the philosophy, I think, does help to increase that activity. Now, whether those companies will be around 10 years from now is a different question. At least we're generating activity on the front end.

And the other thing I would just say is there is a kind of twilight zone between us and the private sector, whether it's investors or companies. You know, the -- we don’t sufficiently de-risk our technologies often for a company to then engage. So these is this piece in the middle.

And I think there is an opportunity for the federal government to help in that piece and step in there, whether it's the direct funding or matching funding or something like that, to develop programs which are not run by academics, but programs that are run together with industry or investors.

You know not solely like set something up in the university and get an academic to run it and hope that something comes out of it. But have a true kind of collaboration between us and the private sector to fund that piece in the middle which would de-risk our technology sufficiently to allow them to be then taken over by the private sector.

Q: So I'd like to take a look through this and follow-up question about this gray zone and concept mentioned by several people about de-risking technology. Does this mean technology early stage of technology or what? Surely -- I actually don't think that the term risk is the right concept. It's really uncertainty, because every investment has risk.

And what the ability of the private sector the ability of the actuary the ability to measure the risk and make a smart decision. But putting that aside, I'm interested if anyone has any comments about precisely what one should do in order to reduce the uncertainty of these early-stage technologies that come out of the federal labs.

People talk about money and technical support, business support. But is there anything more granular that one would do in order to do a proof of concept or breadboard or something that would reduce the uncertainty so that the private sector could make a market-based risk assessment of the value, of the value of the technology?

A: Are you asking me?

Q: I am. I am.

A: Well, I'll just describe one program that we have which runs on many campuses. I mean, this is probably not unusual. But we do have different concept programs where we invite our faculty to tell us about technologies they're developing which may have some commercial impacts in the next year to 18 months.

We then invite the private sector in to talk to them and to actually have that conversation, right? And they would say whether or not it does have wider applicability, whether or not they're going in the right direction. It might be a case that yes it does. But you're going in the wrong direction. You're chasing the wrong population of the patients, whatever.

And following that conversation, we allow industry to prioritize those various different research programs for us. And we act on it then to inform the next steps. So it's a very milestone-driven, commercially focused program. Not very large amounts of money.

But the outcome, if you measure it in terms of follow-on funding from the companies that were originally around the table, startup companies that came out of it, you know, all these impact metrics, we get far greater return on our investment, to use that term, than taking in more grants from the NIH.

Q: Thank you.

Q: Gentleman in the back next.

A: Just to follow up from the DoE federal lab side, you know, we don't have the ability to take that funding. We don't really have -- our PI's, you know, don't have the ability to build on that funding, to do follow-on making breadboards and the like. They are funded to do basic science and that's all we have.

So the one thing we do do is use our extremely small royalty fund sometimes to provide these innovations grants -- so that's why I'm feeling for us it would be one result would be to even have small grants for those people to make their breadboards. Because they’re not allowed to actually do that within the current context of the overlap.

A: Hi. I'm Paul S.[unintelligible]. I'm with NextFlex which is one of the Manufacturing USA institutes. We're funded by DoD. And it's an interesting model that -- directed to some of the comments that have been made, and in addition to the terms of risk and uncertainty, the one I'd like to put up for consideration is maturity.

You know, often in these complex technological systems, you need many different aspects. You need materials. You need equipment and processes. You need standards. You know, you need interoperability between different subsystems. And, yes, these things, they all have risk and uncertainty, but they're also at different levels of maturity.

Often, you might have a process that's been developed in a laboratory and the classic thing is one PhD student knows how to run that process but at least in the lab, getting it to work. But that doesn't help some small manufacturer in another part of the country because they don't have that knowledge and there's probably not a good path for that knowledge to make its way.

So you need to mature these technologies. And the Manufacturing USA program is, I think, an interesting model for this, and I should say we're happy that NextFlex, which is here in San Jose, to have, as some of our members, Stanford, UC Berkeley, UCSD, as well as participation from federal laboratories. So it is truly a government, industry, and academic collaboration.

It doesn't yet involve direct tech transfer from laboratories or universities, but it does -- we have implemented a model for sharing of codeveloped IP so that industries can be at the table and literally partnering with universities as well as government labs. We have examples of all these different types of partnerships.

So what that drives is a direct conversation about the relevance of a technology. And as we all know, anyone working in a laboratory setting is very focused on what's going on inside that laboratory, and, no fault of their own, doesn't always have the relevance to the commercial or larger societal needs or requirements for that technology.

And that's where, you know, industry can come in, because industry is very good at boiling it down to, can we get this to market in a timeframe so that we as industry can talk about ROI. Because that's probably where the ROI really -- in my calculation, really happens, right?

So I would say that the Manufacturing USA process, for those of you who don't know, there's 14 institutes around the country funded by DoD, DoE and Commerce. And, you know, it's an interesting experiment. I think it's only a few years old so we'll see where it ends up. But I would encourage everyone to think about programs that already exist where some of these collaborations that folks are pointing out a need for can actually happen in a productive way. Thanks.

Q: Thank you.

A: Alex Northrup again. So before [unintelligible] I spent a good deal of time Xerox PARC and worked particularly with aerospace and defense. And so one thing we've done is incredible research at PARC, especially when it comes to new technologies. And, obviously, this is probably more prevalent in these kinds of industries. But I think it's part of the problem.

And then so we have noticed that -- two factors that are really important. And the first is, you know, is there a way to demonstrate the technology? So a lot of companies -- you talk about this risk and uncertainty, no level of tech maturity is going to be enough for them to take a risk.

In some cases, yeah, they want to actually see it, you know, demonstrated. Ideally, in their house, in their facility. But otherwise in some other location. And so we spent a little bit of time working with the Canadian government, actually.

And they have an interesting program called the Build in Canada Innovation program whereby the government acts as a first customer to the US Government. And so oftentimes, just being able to, for example, fly a sensor on a government satellite or to apply something on-site or to demonstrate a technology in the field.

That acts as a tremendous force multiplier for the company to then be able to take it out to industry and say, "Look, we've actually demonstrated this." But to the other point, which is that, you know, often industry really wants to see these in their own house regardless of whether [unintelligible]. They want to see that.

So is there any way, you know, to defray the cost of that. I mean, because any time a company brings something into their lab, there's not just the financial costs, but there's an opportunity cost, it's their scientists and their researchers spending time exploring potential of that technology versus something else.

So, you know, if there's any way to either one identify priority technology groups for the government where they think that academia and labs are pretty good and strong. They want to accelerate. And, you know, whether it's providing incentives in terms of matching funding, defraying costs, or tax credits, or some sort of credit, or have a guarantee that the government may be a first in an industry that partners and matures that technology.

But there needs to be some way to defray the uncertainty for industry and it has to be not just for the technology development. It has to be demonstrated.

A: So this is Mike Martin again. I just wanted to respond to the question that Dr. Singerman raised about the gray area.

Q: Call me Phillip.

A: Phillip? Okay. Sure. Phillip. So it strikes me that we actually know the form of solution to your question and we have that in Silicon Valley in something called Y Combinator. Y Combinator, which started in the mid-2000s. And so this is a program whereby a small group of three to four students, usually, or recent students -- sometimes still students -- can apply for a very small, relatively small amount of funding. Around $100,000, $120,000 I think it is now.

And in exchange, they get time on the order of three to six months, I believe, to take their idea to -- and I believe the term is ramen profitable. Ramen profitable. So you could survive off of the instant ramen with whatever you're bringing in.

So this is what's necessary, right, to take an idea that maybe all you have is an invention disclosure, in a patent application pile and turn it into something real. And I just wanted to say, you know, you could do worse than study the example of Y Combinator, if you wanted to get some ideas for how to do such a thing with things that are coming out of national labs and universities. Actually, probably quite a few of the startups in Y Combinator came out of national labs and universities but you didn't know it because they didn't mention it. That's another story.

And the final thought I want to leave you with Y Combinator is that surprise, I think, for those who watch it. I mean, I saw -- started -- you know, I exchanged emails Paul Graham[?] and he thinks it was a good idea. But everybody is surprised at just how amazingly successful it's been. And I think the explanation is the network.

So one of the things they did very, very well is that everybody who was brought into that program got to know each other very well. They met together at least once a week so they formed friendships with one another across these companies. And so those companies have built out a major network that they help each other, right?

They are often each other's first customers. And so that's a very powerful thing, as well, and I don't see any reason why that couldn't be done by startups coming out of national labs and universities.

Q: I mean, can you share a little bit more about how the program is funded?

A: Sure. It's funded by private investors, is my understanding, who are very happy to throw in, you know, $100,000 at 20 or 30 startups. My understanding is, at this point, they've turned -- they're turning money away faster than they need to raise it, because there are pools of capital, they're very happy to take a hundred-thousand dollar bet they could turn into a billion-dollar company. That’ll pay for a lot of hundred thousand dollar investments.

Q: I noticed a couple of people have come in late in the session and I want to encourage you to step forward if you have ideas, suggestions, comments of -- in response to things that have been said here or things that you might bring forward for our consideration.

A: I would just like to comment on my colleagues from NextFlex. Consortium agreements tend to be incredibly difficult for the federal labs to do, particularly, when there are different agencies and universities and the private sector involved. We struggle with them just because all of our rules and regulations are ever so slightly different.

So if there would be any way, and I don't know if it would be possible, to formalize, you know, a public-private partnership for federal labs to move federal technologies forward, that would be greatly welcomed by a lot of my contractors.

A: [Unintelligible]

A: So, honestly, if you want to have a consortium between the Department of Energy, National Institutes of Health and the Department of Defense, we all have different – we’re M&O contractors. Our contracts are very different from the DFAR, different from NIH. The degree to which we, particularly at Berkeley, because we were operated by the University of California, we all work under the fundamental research exemption, therefore keeping things proprietary is hard whereas if you're at Lawrence Livermore, there's not an issue. And so we constantly have to discuss these very small issues. They're very small but they just hold up the contracting incredibly and it's just -- it would be lovely to see some consistency across the agencies or special program to which all of the agencies, or some of the agencies, agreed that that was the model at which they're going to work with the private sector. It would be helpful.

A: Good morning. My name is Greg Profozich and I serve as the director of advanced manufacturing technologies for CMTC. CMTC is the MEP center for California, part of the Manufacturing Extension Partnership program, a Department of Commerce funded program that works exclusively with small to mid-size manufacturers. There are 51 MEP centers around the nation, one in each state plus one in Puerto Rico and we serve about 25,000 manufacturers per year.

So I have that very much manufacturing centric perspective and I've been listening to comments and the conversations so far. And it seems to me that what's being articulated here is a federal research to startup early-stage company pipeline. And if that's what the entirety of tech transfer is supposed to be, that's fine.

But I would suggest that there might be some other opportunities for taking technologies and getting them into the economy through different methods, if we expand that model. There are roughly 414,000 startup companies, I think it was, in 2015, if I looked at my stats correctly. And the statistics are about 50 percent of those will fail after -- within five years, right?

So a lot of this R&D is going to new companies that don't have any stability, don't have any infrastructure, don't have a proven business model, they're going to end up fizzling out. Whether they’re good technologies or not is not necessarily that keep companies in business, right?

So if we looked at the fact that a lot of smaller and mid-size manufacturers, we work with our manufacturing companies in general, have been around and could be opportunities for tech transfer that might be a fruitful way to look at things.

So at CMTC we serve about 1,150 manufacturers annually. And have a statewide responsibility. My job is to work with Paul S.[from NextFlex] and some others within the technology transfer world, to try to figure out how to bring technology to small and mid-size manufacturers. So my comments, of course, near and dear to my heart and they have found that limited perspective which might be a little different than others.

So if I think about this, and I’m listening to the conversation, I think there are a lot of barriers to the way the system and the institutional nature of everything is set up for the small and mid-size manufacturers. So some stats on the small and mid-size, what am I talking about?

Well, about 250,000 manufacturers, give or take a few, nationwide. 98 to 99 percent of them are less than 500 employees. A 100-employee company is still a pretty decent size. 90 percent are less than 75 employees. 90 percent of the 250,000. 70 to 75 percent are less than 20 employees, so the vast majority -- it's a very, very skewed thing, the vast majority of companies are very, very small.

If we're going to access them, we're going to have to figure out ways to get them included into what technologies are available. And sometimes not the thing that was invented and that have been tested and proven in the lab. It’s important. It's the method that was used to test it that would actually help them solve a production or resource problem.

That's another thing to consider as ways to get ROI out of the federal investment dollars right? The methodologies, the processes that are used to test and validate inventions are sometimes useful -- widely useful in other ways within industry. Something to think about.

So from a small manufacturer perspective, I think first thing is awareness. What are the labs doing? So MEP is a program that is seated within NIST in Gaithersburg, Maryland, right? And so on this campus, there are 5- 6,000 researchers if I remember correctly the numbers, who are doing different projects.

If a small manufacturer has an issue, how does he know which one of those scientists is working on something that might help? How do they come up with the way of having, some general way of cataloging and getting to the right person, right? And so at MEP, we're starting a program called the MATTR Program, which is the MEP-assisted technology and technical resource program, which is a simple pilot group. We have now a person who is a NIST scientist who's now working on the MEP side who's got relationships.

And if you have a question, you go to this individual. He goes through and figures out who within the NIST labs can help you solve that problem in manufacturing. But it's very hard and kind of a pain for me as a small manufacturer, or a large manufacturer to be sitting somewhere else, picking up the phone, and trying to dial it for the right person. How many times do I have to do that before I just stop and give up?

You know, right? So how do you get access? Awareness and access. What are they working on and how do I get connected with that person who might be doing something that could help. So those are some fundamental challenges that need to be addressed.

So the next thing on the list is really R&D versus practically applied technologies, right? If the results of federal investment are to get to TRL or MRL 3, technology readiness level, manufacturing readiness level 3, then basically we're plus or minus a little bit on this thing, new thing performs perfectly under perfectly controlled, ideal conditions, which is a long way from production right?

So if we can move more into practically applied, that's going to be necessary for the manufacturing world, the stable companies who have been around for a long time will be able to adopt and apply some technologies and recoup some of the return on investment from federal research dollars right?

We're working very closely with the Manufacturing USA institutes. I actually have a staff who sits full time at NextFlex, a staff who sits full time at CESMI, the clean energy smart manufacturing innovation institute. I have a person who's working about half-time at ARM, the robotics institute, working closely with DMDII, the digital manufacturing and design innovation institute, as well as the other 9 institutes around the nation.

And trying to figure out how we take pieces of the technologies they are developing and share those with small manufacturers. Not even small manufacturers are thinking about the fact these technologies are coming. They're moving through the TRL/MRL 4, 5, 6, 7. They're going to be commercialized soon. How is this going to impact the business? What do I need to do to get ready?

And so that kind of awareness and that foresight is also critical for adopting technologies and make sure -- making sure that they can be widely adopted and put in the economy.

And so I think the last thing that I want to comment on and offer for consideration is the IP side. So if 70 percent of manufacturers are small, it's very much the case that, especially for them, unfair generalization but it gets the point across, right? They're too busy working in the business to be working on the business.

Chances are they don't have a controller. Chances are when Joe doesn’t show up on the production line, the president of the company might leave his office to go work the machine for a while and make product. You don't have a law department. They don't have people who can figure out, how do I go through and negotiate an agreement? How do I figure out what the -- the largeness and the difficulty of IP and contracts and all those things becomes an impediment to adoption, to engagement, before you can get to engagement, before you can get to adoption, you have to go through engagement

So those are things that also have to be considered and so we need to think about that. So I hope that was clear, if you have any questions, please feel free to answer. But just again, offering the manufacturing perspective, not necessarily the global company perspective. Thank you.

Q: Thanks.

A: How many times do I get before I can't get up again?

Q: We still have ninety minutes to go. You --

A: I just -- you know, these are thoughts that are occurring to me as the conversation is going on. But in terms of broadening our perspective of what tech transfer is, beyond just transferring IP which it is, I think in most cases.

You know, designing programs that are aimed at people problems I think is something that's worth considering. So, you know companies that come to us and sponsor research and actually fund research on our campus, the biggest benefit we get from that is that the students are engaged [unintelligible].

Similarly with startups, you know, it's the students who go off and work in these companies, develop their network and get jobs, right? So if we were to design programs that were aimed at promoting that engagement between us and the other worlds out there, as a primary outcome and as a secondary outcome being students getting jobs and other measures, as opposed to what we're normally looking at in tech transfer, which is developing research and IP and licensing.

I think you’d see a huge impact on taking that kind of perspective. And, you know, examples could be those proof-of-concept programs that we're talking about. But I'm sure there are many, many other ideas around that.

The other thing about metrics. Just to mention that there's two metrics systems in the country at the moment. The IRIS, which is run out of the University of Michigan, and the IEP which is the Innovation and Economic Prosperity, I think, university accreditation which is run by the APLU. They’re just worth looking at for some broader metrics.

Q: Thank you.

A: And, of course, the Irish are rolling up on each other here. I'd just like to bring to your attention that the Department of Energy’s technologist-in-residence program. It’s a pilot program. It's already -- the idea is you bring someone from industry, that person in industry works side-by-side with the lab scientist.

It's been very successful. We just heard an update this week and so if you’re looking for examples of programs, embedded programs, that would be a good one to look at.

A: I wanted to comment on the association about risk versus commercial success and so on. At any rate -- I've talked to many, many companies over the year who are looking for technology out of Lawrence Livermore. And the first thing they want to know is, what's the technology all about?

Then they want to know -- they want to establish this idea of risk. And they -- you know, being able to establish risk is something that’s very important. So what we have done at Livermore, using some of our own money is if a company comes to us and says, "I think this technology is relevant to my needs." Okay? "Can you show me if it'll work or not?"

Well, we probably can't show them that it'll work or not, but we can probably -- so what I ask them, as I said, okay, what problem in your industry, in your company, will this technology address and what do I have to need to do in terms of a technology demonstration that will show you if this technology is relevant to your needs?

And then we negotiate back and forth and if we can come up with a small project that's going to be $50,000 or something like that and we can do it internally, we'll do it. You know, we can't do a lot of these programs, these projects, but -- these what we call tech maturation we call it the idea fund for investors. And it's really all about helping in the eyes of the company to help de-risk the technology so then they can be a little more assured that if they invest in it, it might work on their behalf.

So that's something that we've done and having a fund that would help that tech maturation process for all the national labs would be useful. The problem is is that what you also want to do is you want to make sure that, you know, the company -- all companies want freebies. You know, they're looking for something that can help them out and doesn't cost them any money.

So what you want to do is you want to have some measure of matching effort, either matching funds or a matching effort of some kind. And so you want to make sure they have skin in the game so to speak.

Q: So just to follow up on that.

A: Yes.

Q: So what do you require the companies to agree to? What's the nature of the relationship that's established? Do they ever have first rights on the

A: No. Since we are spending our money, okay, the problem that we solve is available to anybody else who wants the same access to it. Okay?

Q: You're saying your money. It's not their money.

A: That's correct. It's our money. Now, if they want to put some money in the -- some skin in the game, put some money in it, do a CRADA you know and then we can do that as well. But typically -- you know, first it's a -- there was a program about 20 years ago that DoE funded to help small business.

And at Livermore, what we had was we could spend $5,000. If a company had a question, we could spend $5,000 of effort which, at that time, was a lot more than it is today, to solve the problem for them. And I still get companies coming back wanting to know if we have that program still available because it was tremendously popular by small companies that wanted a tensile test done on an exotic material or something like that. And it was really very, very popular.

There was one other point I wanted to make also, and that is that the maturity of technology at the national labs is, you know, typically the TRL two or three. The Department of Defense, when they want to build something, they carry it, fund it all the way through all 10 levels of TRL above maturity.

And so they do exactly what we're talking about. They fund the technology through the valley of death into production and they are the customer, as well.

A: Okay, Shyam. You want the slide back just one. If you go back to the slide that preceded the [unintelligible] slide. There were a number of areas we had mentioned, a number of which address many of the comments that we make here. We are looking in our overall scope with these topics but even more that you might add. But as we can see here, we are talking about metrics conversation that we had.

The way we're looking at [unintelligible] the word return on investment, it's a return on investment to the nation, be very careful how it's used. It is referring to the nation that might be national security or economic benefits it might be and include health care and include many different ways to measure. So I wouldn't necessarily use investment in terms of royalties that somebody gets out of licensing, so let’s look at that definition.

And that's why we're really interested in what kind of methods should be used to really as we know a lot of what is done is based in quantitative, it’s easier to do but this is a little harder than what should we be using. So if any of you are interested in finding that out so maybe if there is, a lot of you have good ideas that might help shape what we do. And the same is true, you know, I think I might have said at the symposium on April 19th. There was a comment about the valley of death and one of the persons who ended up getting in said, "I want to come to one of these conferences and not hear about the valley of death."

And so the classic issue we have here in the valley of death issue is the federal investments where the boundary line the government and the private sector. [Unintelligible] and most universities play into that. And in the case of Department of Defense as the case has been pointed out, there is the mission requirement for national security that’s driving all these TRL levels. In the case of some other areas where the private sector is invested in commercialization and innovation inertia[?] it's not so quick.

And in terms of policy that the government has, the general policy is that our private sector is supposed to have that role. Is to -- the government shouldn't be encroaching on the private sector prerogative of creating innovation. And of course [unintelligible] does innovation. So what we're trying to do is, in that framework, figure out how can we do a better job of increasing the terms limit. So I think we really have good questions that are in the end really are to help us figure out what are new ways of doing business.

What are the constraints the existing approaches have? What are the principles we should protect? And then, you know, how can we motivate increases? There is a federal investment. $150 billion. So that is being invested right now, let's not forget that. It's not on top up. There is a [unintelligible] investment. Your government is [unintelligible] this enables more innovation for the [unintelligible]. So that's example how to calibrate [unintelligible].

A: Just a quick observation. These sure are a lot of really exciting and very top-down approaches to tech transfer. I think you really need to have an equally important and defined bottom-up approach from the scientists -- they know what's going on. Nobody wants to spend 20 hours in the lab a day to be told the policy that they don't exactly either understand or agree with. So if you can do a really good bottom-up, giving options and flexibility, these will meet somewhere in the middle and it could be very successful.

Q: So our room is spinning a bit but I know that there's still quite a few people in the audience who have not at this time commented. We want to make sure that you all have the opportunity to share your thoughts.

A: Hi. My name is Chia Chen Hsu (?). I'm with [unintelligible] Ventures. So we are the corporate VC arm of [unintelligible] which is a semiconductor company. So revenue last year was about $30 billion. So we invest our [unintelligible]. So, one of which I was fortunate to work with was Lyle Star and licensed technologies of UCSD, Stanford, UC Berkeley, some of national universities across the country. We also work globally outside of the United States. So maybe I will want to share my experience about, you know, different models that I have seen.

And the exact technology transfer of process. So for example, I am the [unintelligible] from Belgium [unintelligible]. So they set out their own fund so I do not how much is from their government and how much from private sector. But they do open up to corporations from private investors to participate in those fund. And I think that helps to kind of cover their gray area, or those gray zones some of you had mentioned before. And, you know, to fit the private sector earlier into the game.

You overcome that. You know, this -- I see that, you know, look at overall pipeline. There's [unintelligible] masters, there's theorem APC and up to IPO and they [unintelligible] as a great -- the largest ecosystem to take care of that process. But the challenging thing is that before the early investors show up. Before the people show up in the incubators of Y Combinators, those professors that we work with that Ph.D students that we talk to, they don't understand or you know --

I mean they understand they're developing their product very well and they're mentioned very well but they don't understand resources and the tools they can use to take them to the next stage. And some of the startups that we work with in Europe that kind of facilitate, in my view, facilitate our process to overcome that barrier. I don't know -- and we see some of the universities set up their own great type of -- UC Berkeley has a [unintelligible]. Stanford has a [unintelligible] accelerator but it is unclear to me how much of federal government is involved in that process to helping, you know, facilitate that technology transfer process.

So maybe that's another way to looking at, you know, how to increase the ROI or to increase people's awareness of what are the resources internally that university, and researchers, and scientists. What are the two other resources out there and also for the private sector to look at what are the technologies happening in the university and research institutions. I also, you know, sit still in theory, read through the journal papers that published from university and research institutions.

But very often I found, you know, this is a great idea but I, you know, it's not at the right stage for me to reach out to you, the professors, or scientists because I know this is just a research paper and I worry that this is not proof of concept stage. Right? So but we are not at the stage to put in money to help them to go without proof of concept stage. So we are ready if they are, you know, has the proof of concept, we are there to, you know, provide the tools and resources to take them through that, you know, the journey to, you know, generate great impact later on the road down the road.

Q: Thank you.

Q: Any other comments, guys?

Q: So we end -- so what? Okay. But I think I we'll be here until noon because that's what the Federal Register said we would be. So [unintelligible] but I think [unintelligible] was the last speaker or unless someone else will pull a chair out the meeting and [unintelligible]

A: I wanted to add to what Evelyn said about flexibility at the lower levels. I've been in this business a long time and every time the federal government gets interested in tech transfer, I get anxiety. [laughing] Because I think they want to manage us from the top which cannot be done. What you really want to do is develop policies which enable and empower the offices within the various organizations and remove the barriers. You know, I mean, for example, one barrier that companies have kept to is, you know, the indemnifying the federal government.

You know, a small company doesn't care because there's no way they can do it, but a big company does care. And so indemnification is an issue that pops up on occasion. So anyways, there's a number of policies like that that I hope you address. But please remember you must empower the working level. Thank you.

Q: So I think we're going to take a recess in our forum for the next 10 minutes. And then we'll reconvene with any further discussions or any additional comments. So I want to thank all of you for coming. The comments have been extraordinarily useful to the panel. Thank you very much to everyone. Again, I encourage you to submit comments [unintelligible].