NSF Future Manufacturing Webinar Transcript

Recorded February 26, 2021

Good afternoon everybody welcome to the future manufacturing webinar. I am joined today by my colleagues, Andy Wells, a program director in engineering and Chi-Chi May, a program director in the Bio directorate and John Jackman, a program director in EHR and I am Bill Olbricht. I'm a program director in engineering. You can see the solicitation page for future manufacturing, it is 21-564 and that link will take your right to the page. You can also search it in Google and it will come up just make sure you're using you find this year's solicitation 21-564 and of course most important question everybody wants to know: the proposals are due on May 14th, 2021. If you're thinking that's pretty soon and I have not submitted a letter of intent, don't worry about it, letters of intent are not required this year and Andy will be talking about the changes in the program for this year. I just wanted to point out, letters of intent are not required.

Please use the Q&A panel in Zoom to send questions. We will answer as many as we get to at the end and if we don't get to your question or you're unclear about an answer, we can send questions to futuremanufacturing@NSF.gov and it will be answered and you can also consult the solicitation and the final list of program officers and if you have a question that should be directed to a specific program officer you can do that too. And the captioning is at this website shown below and again the solicitation page.

So NSF is strongly interested in advancing manufacturing in the U.S. and has a number of programs along with other federal agencies. The idea behind this future manufacturing is that the next generation of manufacturing will require some radical changes, new materials, devices, processes and so forth and also it will require beyond just that kind of fundamental research; it will require research into social structures and business practices to anticipate the adoption of new manufacturing in the long run.

So one change that has been made this year: we have slightly changed the definition of what we mean by future manufacturing. So future manufacturing as defined for the purposes of this solicitation is fundamental research and education of a future workforce to overcome scientific, technological, educational, economic and social barriers to enable new manufacturing capabilities that do not exist today. When you're thinking about potential projects to respond to the solicitation, please keep that specific definition in mind. We will be asking reviewers of proposals to evaluate how well a proposal responds to this specific definition of future manufacturing. When translated to practice the results should have a variety of outcomes including formation of new industries and organization structures, new manufacturing capabilities, enhanced U.S. competitiveness and an important part of the education of students and other workforce participants with skills required for leadership in future manufacturing. We are taking a fundamental research approach for the duration of the award but part of your activity during the award should be anticipating the translation of the research to

practice and the people that will be required in order to implement that kind of manufacturing.

So we have a very specific definition we just told you for Future Manufacturing and we would like to draw distinctions between this solicitation and other programs. This solicitation is looking for new potentially transformative capabilities. I think a proposal to this solicitation should be a significant change from current practice not improvements or incremental changes to existing processes. It's complementary to advanced manufacturing but it is distinguished from advanced manufacturing in a variety of ways. One is having a very low technical readiness level. We think of it as a TRL of 0. This is a larger scale program and we expect that the intellectual merit and broader impacts are commensurate with the size of the award, and we expect multidisciplinary teams and a convergence research approach and the convergence research approach if you're not familiar with that term, you can look at the solicitation there is a reference in one of the footnotes to tell you about convergence at NSF. If you have a proposal please think whether or not it meets these criteria. One of the most common criticisms that reviewers had of the proposals we elaborated last year in this program was that the proposal was a great idea, well thought out, but it was not future manufacturing. Please try to remember the definition and the outcomes that we are looking for as you prepare a proposal in response to this solicitation and if it does not meet the definition that we have just explained then look for an alternative program and there are plenty of them in manufacturing.

The participants in this solicitation span almost the entire foundation. Engineering, math, and physical sciences and biological sciences and education, human resources, computer information science and engineering, social behavioral economic studies, the office of international science and engineering, office of integrative activities and I mentioned these explicitly because if you read the solicitation, all of these directorates participating have had input onto that solicitation and please try to be aware of the interests that they have in the solicitation and work that into the proposals as best you can.

I will just sum up the results of last year in this program for fiscal year 20 there were a total of 24 awards that were made: total value of just over $40 million. There were seven research grants, 13 seed grants, and four networks and they span a wide range of institutions, 44 institutions covering 18 states and the district. Here is a selection of the award topics by the thrust area. We had cyber, and eco and bio and then last year we also had some future manufacturing networks. There is a link above to more information about the FY 20 awards and if you want to find out about a specific award you can use the fastlane award search function and find the abstract for any of these awards and a convenient way to do it in the fast lane award search would be search on the term FMSG, FMRG, or FMNet, and you see all of these awards come up and you can read the abstracts of any of those that are of interest to you. So I will turn the discussion over to Andy and he is going to tell you about the changes we have made for this year and also the futures of the program that you will be interested in hearing.

Thank you, Bill. Like Bill said, he gave you the real overview and now I'm going to get into the mechanics and details about it. As with last year all of the proposals, the scientific and engineering research you are doing in future manufacturing must fit within one or more of three thrust areas and they are the same as last year: cyber manufacturing, eco manufacturing and bio manufacturing and there's some examples shown here of the sorts of projects which might fall into those areas and a reminder like it says in the title of the slide, the examples are not meant to be limiting. They're just examples of some possible projects and you can get some ideas of some of the other projects in each of those areas and they were shown on their previous slide and Bill described how to get to those and see them. So you have to be in at least one. You could be in more than one. We made a number of awards where it is a combination of say cyber and bio manufacturing, bringing data science to bio manufacturing or something like that.

This year we have two award tracks, we took away one from last year and those award tracks are the future manufacturing research grant and the Future Manufacturing Seed Grant. This is our opportunity, like a couple of slides ago we were talking about, these are bigger projects bringing convergence research approach and these research grant awards allow this fundamental multidisciplinary work integrative of both research and education. The awards that we will be giving out this year are for four years worth of work at up to $750,000 per year so that is a total award of up to $3 million. These awards are meant to go to larger teams at one or multiple institutions who are doing real convergence research and attacking a particular future manufacturing problem overcoming the some sort of barriers to manufacturing. The Seed Grants are a bit smaller. They’re up to two years at $250,000 per year so maximum $500,000 and are meant to hopefully prepare research or do some investigation and teambuilding ideally in order to move a group towards submitting a Future Manufacturing research grant proposal or to prove or disprove something that is again, like Bill said, the technical readiness level 0 or maybe TRL 1. So building teams, developing concepts, starting up some research and generating preliminary results that show the promise of an idea. We’ve got some specific rules here. The title of your proposal when you submit it must contain both the track and the thrust name so we are looking for the title that, as shown here, FMSG: Bio: an investigation into blah blah blah blah. When you're looking at how many proposals may I submit, a person may be a principal investigator or a co-PI listed as senior personnel on only one proposal per track. Any given person can be on a maximum two proposals: one in the research grant category the other in the Seed Grant category. There is not a limitation on the number of proposals of that a particular institution may participate on but as an individual you may be on only one proposal per track. And just a note as discussed a couple of slides ago last year we gave awards to build networks in areas of future manufacturing. We are not including that this year. Just concentrating on the research and the seed grants.

There are a number of resources, institutions and activities that you can leverage and make the most out of as you formulate your proposal. We strongly encourage you to form partnerships and if you are at a big R 1 University we encourage you to work with people at say community college, primarily undergraduate institutions, minority serving institutions and

likewise if you are at say an MSI or community college whatever, work to find other researchers in other institutions to work with. We encourage industrial collaborations and if you want you can make it a GOALI proposal or have an industrial collaborator. We strongly encourage international collaborations. We are only able to fund the US-based researchers of but certainly we encourage you to work with other international institutions. There is a network of 16 manufacturing USA Institutes out there investigating everything from bio manufacturing to process chemistry to additive manufacturing. That is a great resource for finding others to cooperate with. And many many more, NSF research engineering centers in certain areas and EPSCoR supported manufacturing collaborations including manufacturing extension partnerships. The division of undergraduate education has the advanced technological education program and improving undergraduate STEM programs that are concentrating on really building undergraduate and two your college education and we really encourage you to work with people in those areas. Leverage the fact that we give internship supplements and we give research experience for undergraduates and teachers supplements and a whole bunch of other support that the NSF offers and we encourage you to take advantage of all of that and think through what people and institutions in other areas can help bring to your project.

As Bill mentioned at the start, the proposals are due on May 14th, by 5:00 p.m. local time and local time, meaning the time at the institution submitting the proposal so if you are working remotely, think about where your institution is. We assume that many if not most or nearly all of these proposals will involve collaborations between people at different institutions whether academic institutions, businesses, and so on. And there are two ways of submitting collaborative proposals that are overall allowed by the NSF. We ask you only use the one way and that is submitting a single proposal with one lead institution and the other institution be listed as sub awards, rather than submitting two or three proposals that all have the same title and “collaborative research” at the start.

As Bill also mentioned earlier, last year we required letters of intent. This year those letters will not be required. And we aim to review all the submissions and make awards by the end of September. And last year we announced the awards on manufacturing day which is the first Friday in October.

There are some specific things that we are asking for in your proposal so please pay attention to this and include these. They are required and if you're missing a required section, we will return a proposal to you without review. The solicitation has all the details so I strongly encourage you to read that solicitation. Last year we allowed proposals in a particular track to have greater than the 15 page standard project description. This year that is not true so everything has to be within 15 pages. Within that project description you need to include the basic research description: why are you doing it, how are you going to approach it? What are your plans? For future manufacturing research grants where you have a bigger team and you're asking for more resources than in our standard awards, we ask that you include a section that talks about the scope and the scale of the research. Not rehashing your particular plans but really a justification of why you need the resources you're asking

for, particularly how many people are going to be working on it. You are required to have a section about how the research and educational development enables future manufacturing. You should highlight those significant changes from existing practice and as well talk about how you're going to investigate the social economic and educational impacts of the changes in manufacturing, and the newly developed manufacturing. We also ask that you put your research into a global context by looking at who all else out there within and outside of the U.S. are doing research, what publications are there, what centers of excellence are there and how is manufacturing in this area be translated into practice. Things like that. We ask for a project management and collaboration plan especially on these larger projects, it really helps to see how the work is split up and how it is based. Describing the roles which each of the coinvestigators have, what each institution will be responsible for, what they're contributing, and how it's being coordinated. And finally, we ask for an education and workforce development plan. Again, we are looking not just for specific research into a particular area of manufacturing but to think about how we're going to have a workforce in the future that will be able to leverage those new modes of manufacturing and we ask you to look at how we're going to train that workforce and how are the research and the education going to be integrated. The education workforce development plan for a research grant we are asking you to put that into a supplemental document of up to three pages because we expect that research grant proposals are going to be delving deeper and broader into education research. For the seed grants that are smaller projects we ask that you put this plan into the project description itself, and that 15 pages.

How are these proposals are going to be evaluated? All proposals that we get at the NSF are evaluated upon their intellectual merit and the broader impacts of the research but we also have specific criteria in which future manufacturing proposals will be evaluated, and we will be asking the reviewers to look at each of these four criteria. First how does the research eliminate the barriers that limit manufacturing today and enables new manufacturing capabilities. So really is it future manufacturing? Second, will the educational activities equip people with the skills for future manufacturing and broaden the participation within the workforce? Third, is work being done to understand and anticipate the effects of these new Future Manufacturing methods on the economy, the labor force, industry, and/or the society at large including in that global context that I described. And forth, is the team is being put together appropriate? Do they have the right concentrations and expertise and are the activities that you are engaging in well-integrated? On our merit review panels we will likely also include educational and social science experts to complement the technical experts to ensure we are looking very closely not just at the technical part but at the educational and the social portions and societal portions of the proposals.

Looking forward if you actually receive an award, there are a few special conditions. There will be a mandatory kickoff meeting for all the PIs and co-PIs to let everybody meet each other and learn about the other projects and get a good start, and there will be an annual awardee meeting afterwards every year, at least one PI per award needs to be able

to attend that, so be sure to include costs of that in your budget. The pros and cons of COVID: it is cheaper to get together virtually but hopefully in the coming months and years we will be getting together face-to-face.

Just a reminder for more information there is a link to the funding opportunities page that's been pasted into the chat and when we post these slides, you will be able to your reach it there. As Bill said you can email us at FutureManufacturing@nsf.gov with questions or contact all the program officers listed in the solicitation from across the NSF. We will be posting the recording and transcript of the webinar along with the slides on the event page where you had to go to access the link to register. We should be getting that up there within the next couple of days.

And now we are going to move on to questions and answers. I am going to stop sharing here and I think Bill and Chi-Chi and John have been busily collecting all of the open questions that you have been typing into the Q&A and we will be able to start answering some of those.

Thank you, Andy. I am going to share my screen now and we will show the questions that we have accumulated. We want to advise you that there are a lot of questions and it looks like we may not be able to get to them all, and we have tried to get as many questions as we can. If we don't get to your question please email FutureManufacturing@nsf.gov, all one word.

This was not really submitted by people but it's just a reminder for me to tell you that letters of intent are not required. So can an institution submit both a research and a seed grant? There are no limitations on the institution, and an institution can submit as many proposals as it likes.

Is the intent of the education component to develop a workforce that can create or develop next-generation manufacturing capabilities or a workforce that can use next-generation manufacturing capabilities or both?

My first reaction is both.

Yes, I think that's both. Andy and I both agree. And Chi-Chi and John will chime in when they have comments to but I think the answer here is both.

TRL 0 level, will NSF say my idea is fantasy? Does proposal need to have preliminary results? These are always considerations for a lot of proposals. I think having preliminary results may be great but there may be some cases where there are good reasons why you don't have preliminary results and those cases, sometimes computational models or something like that may fulfill the purpose of having preliminary data or preliminary data from literature may be helpful too. So I think we're looking for something very different and we try to train the reviewers in our goals so we hope the reviewers will respond and take that into account that we

are looking for something very different and transformative. Andy, do you have any comments?

We definitely want to encourage those proposals that can be high risk and potentially high reward in the long-term and reviewers as Bill said we will coach them to say if it's just a sure thing or just incremental improvements in something, that's not Future Manufacturing, and we are really looking for you to overcome big barriers and there is some risks all the time in failing at that, failing sometimes is okay. On the other hand we encourage you to make a good argument in your proposal for why you think that something that really is sort of pie in the sky is going to work in such a way that reviewers who are knowledgeable in the area can be convinced that this does have a chance of working.

And I guess I can add to that just feasibility. You always have to demonstrate feasibility in terms of prior work that supports the feasibility of the idea is important as well.

One of our participants represents a community college which might lack research infrastructure. And were wondering if given that our college and most other committee colleges lack a sophisticated research infrastructure, and how future manufacturing is defined here it would be best for us to apply as a supporting partner with a local research university as the lead applicant. I think that's a great strategy and universities that participate in this solicitation should be on the lookout for you as a community college or organization that can contribute to the workforce development and I think this would be a great partnership.

John, do you want to add something to that?

I think that again, that needs to be aligned with what you're trying to accomplish proposal so don't make it appear that oh, this is going to make a proposal a winner because we tacked on a community college. If it is not clear that it's integrated with your proposal, that would be a concern.

How many submissions were there last year? This question came up over and over again and the answer is that we are not supposed to say. We'll just say that this is a highly competitive program.

Is transferred to practice encouraged? Maybe I misunderstood but doesn't low technical readiness contradict transfer to practice? It could in some cases be a contradiction but maybe not in every case. I think what we're looking for is, remember the definition of Future Manufacturing is fundamental research but at the same time is very helpful for us and to our reviewers to see what your vision is for translation even if that's not part of the proposed research. Andy, do you have a comment on that?

No. I think you actually put that quite well.

When it is stated that new manufacturing capabilities that do not exist today, should it be assumed that it is not existing in practice, in the field, such that topics which are currently researched but are not ready for manufacturing or are broadly disseminated may not be suitable for the solicitation? I think the answer is yes. Andy?

This is maybe asking a question similar to the language that we used last year for the definition of Future Manufacturing. Last year's language was defined more in the negative: it's manufacturing of stuff that can't be made today or isn't viable either economically or viable for some other reason. And this year we are really trying to emphasize: identify the barriers that we are running into or we will run into that keep us from making something and we're going to overcome those barriers. In a sort of positive definition of Future Manufacturing.

This might be a question for Chi-Chi. I was surprised to see medicine - related FY 20 awards because health medicine is typically not in NSF's domain. Can you discuss this? What is and is not acceptable for health and medical research? And Chi-Chi can chime in but I think that fundamental research on human health is conducted at NSF all the time but there is a delineation between fundamental research and clinical studies, something like a clinical study would definitely not be the purpose.

I think it is kind of important to know that this is supported by multiple directorates so there is some things that are medically related supported in the directorate of engineering versus the biology directorates so we are all coming together that's why you're seeing this spectrum and there are things that are medically related but as Bill said they are the fundamental research but we also are very interested in things that push the basic biology and their understanding of the of the fundamental biology in manufacturing.

Can cell manufacturing be proposed for the bio truck? Yes.

Is it okay to resubmit the proposal from last year that has been significantly revised? Yes.

Maybe just make a note on that. As Bill said a couple slides ago it was really tight and fierce competition last year for awards. There were proposals that were very well received but we were just unable to fund them, so especially those highly competitive proposals we encourage you to go back, look at what the reviewers said about the proposal and suggestions and revise it.

That's a very good point. We were disappointed to not be able to give support to many awardees.

For research grants would you prefer projects to last four years or are you also happy for shorter projects? In the framework that we talked about: having a development of fundamental research and education plan, transformative, never been done before and interdisciplinary teams, I think most of the proposals we expect will take advantage of the full

duration of the project but you would be entitled to submit shorter proposals if you want but please be sure to really address the key elements of this solicitation.

Can I make a note also? On the seed grants because they are two years up to $500,000 people might see those and say those sound a lot like the standard unsolicited proposals you might submit to any one of our programs that are typically three years and $300-$500,000, but that's not the sort of proposal we want to see. If it can fit into a regular programs we strongly encourage you to submit it to that regular program. Those seed grants we are really looking for future manufacturing stuff that's low enough technical readiness level and big enough jump in our understanding of manufacturing to enable new manufacturing that it wouldn't necessarily fit into a standard program.

Will there be recommended preferred size of the team? Not too big or any limitation in terms of number of co-PI and senior personnel? No. The submission system allows 4 co-PIs but if you have more than that they have to be listed as a senior personnel but there is no recommendation as to the size of the team.

Is international collaboration limited to certain countries? Are foreign universities collaborating eligible for funding? There is not a limitation on countries. This came up in other questions too. You can read in the PAPPG, the guidance for proposals, about funding international organizations generally NSF does not support international organizations. NSF encourages collaborations and supports the U.S. side of the collaboration. There are certain circumstances where they will make an exception to that if the foreign entity brings capabilities that are not available in the U.S. But you can read in the details in the proposal guide which you should have access to.

Do we need to have an industry partner? No, you do not need to have an industry partner.

Does this interfere with the potential NSF CAREER proposal such as if somebody submitted both a CAREER in a different topic and a development one here? No, there is no interference there.

I will remind you that a development proposal is generally one in which you are not necessarily formulating new fundamental understanding of the manufacturing process but you're just putting things together making them work, which may be a difficult thing and it will require funding to do, but that's not where we are aiming it at. We are aiming at a fundamental manufacturing process rather than just developing something.

Does TRL 0 apply only to seed grants or can research grants also address TRL 0? Yes.

Can we have industry participants in a seed grant as a sub awardee? Is this preferable? We don’t want to say what is preferable, just do what you think is best for the project.

Can national labs be collaborators? Yes.

Do manufacturing processes at the nanoscale fit into this program? There used to be a nanoscale manufacturing program at CMMI previously. If it fits into the definition that is our concern.

Especially does it fit into cyber, eco or bio manufacturing and if it's happening at the nanoscale or at the macro scale that really does not matter.

Can private companies submit a proposal. Yes. I would advise you though to probably contact Andy or me at the FutureManufacturing@nsf.gov email and we can set up a time and talk because we would like to know what your intentions are and also we'd like to talk about strategies that you can use to meet the solicitation. That applies to everybody feel free to give us a call.

A reminder I guess again we are looking at fundamental research as well as educational development and typically a lot of proposals we get from companies alone are very much developmental or purpose oriented making something as opposed to understanding it and often times to be more appropriate and competitive in the NSF evaluation process, having academic researchers cooperating with industrial researchers often adds enough of a focus on the fundamentals to go along with the developmental portion.

Are industry collaborations encouraged to involve research actually carried out by industry partners or is the expectation that industry collaborators primarily act as consultants to inform project direction? I think the arrangement that best fits the project is the one that we would like to see. we don't have expectations on either side of them.

Are you anticipating REU be embedded within the grant? Whatever is most appropriate: if you want to have undergraduate training in the grant, or after the award supplements.

Can start up companies be a sub-awardee?. There's no limitation on that.

I'm moving a little quickly because I see on the screen we got over 100 questions.

What about a small business PI taking the lead and collaborating with industry and university? If it fits the goals of the solicitation, that strategy should be acceptable.

This is a long one. It involves collaborations with community colleges and basically the question is thing that community college may not have the research infrastructure to meet the fundamental research part of Future Manufacturing, but it has the workforce and education parts that could bring people in to participate down the road and the answer is really probably you want to team up with a university to take advantage

of both partners' strengths. A good collaborations as John said if it has a sound purpose and well thought out plan can be very competitive.

I will just emphasize that one of the biggest gaps we have in the manufacturing workforce is in the skilled technician level that often comes with an Associates degree, and there are really some great opportunities to work between doing fundamental research at some larger companies and universities but working with community colleges to work on curricula and development of the skilled technician workforce.

What should the partnerships with the manufacturing USA institutes look like organizationally? Not quite sure what this question means. Support only?
It could be a number of things. The institutes have a mixture of industry and academia and national labs and they are a nice place to go and identify who are key players in a certain area of manufacturing and the collaboration could be through the Institute specifically. We had four or five of the awards that we gave last year include collaboration with members of the institutes.

I think this question is going to the fact that subawards can be expensive. Can this policy be re-examined? Not for this fiscal year and the reason we did it this way we decided to have a single proposal is that we're looking for things that are new. We are looking for convergence and we're looking for an education plan and we thought we want to have one PI to be responsible for overseeing the entire project. The other mechanism of institutions all submitting their proposals can lead to cases where no one is responsible and here we really want leadership from the PI.

Can the same concept be submitted for seed and the bigger effort under this call? Subject to the PI limitations that Andy spoke about there is no limitation on the concept.

When we say future manufacturing are we referring to a new manufacturing method that will be feasible for the next 10, 50 or 100 years? We are not saying so. I think really the argument on that goes to the PI to make and I think it's reasonable to assume that we want that NSF is investing tens of millions of dollars in this initiative so it probably would like to see some results on a reasonable timescale.

Is a project management and collaboration plan part of the project description within the 15 page limit for both tracks? Yes, it is.

Could a completely educational proposal to prepare workforces be submitted to this solicitation? I don't think so because they're not really responsive to the definition involving fundamental research so a completely educational institution should look to universities to partner with so you can blend those two fundamental researcher and workforce development together in a really affect the way.

Similarly an all-technical proposal that doesn't take into account the education workforce development, societal impacts and so on that would also not be competitive.

The project description must include only 4 to 5 headings per future manufacturing criteria, or other items? You can choose other headings, how ever you want to work the proposal.

I'm going to stop sharing the screen now. We only have about 10 minutes and Chi-Chi, do you have questions that came in after we started?

So here we go. Does it matter if the PI is University or industry? No. Structure the proposal the best way you think is responsive to the solicitation.

Can an industrial partner in a small business be given a sub award. This partner has worked with several SBIRs in the past.

Whether it's a small business or medium or large, we definitely encourage the collaboration between academia and industry. Industry often has a good eye on something that could be really useful in the marketplace down the road that can help inform and motivate some of the research. And of course we definitely encourage people or companies that have received SBIR awards we definitely would like to see them leveraging that in fundamental research.

Does being a PI on a research grant prejudice review for being a PI or co-PI on a FMSG? No, it does not.

Will the education social science experts be targeted for specific backgrounds? For example economists? Those experts will cover a wide range of that.

Is it recommended to have a seed grant prior to applying for a research grant? Not necessarily. But as described in the solicitation, the depth of the research and the depth of the education and workforce development plans should be commensurate with size of the project.

How international collaborator can be funded? I think we have already discussed that. And I will refer you can back to the proposal guide for the specifics about funding international collaborations.

Is there an upper limit to the dollar value that can be budgeted for equipment?

No. And on the other hand I just point out that NSF does have particular solicitations that are meant to support the acquisition of really expensive equipment and here we are really looking for fundamental research among people so I imagine that reviewers will probably look a bit prejudicially if you're using three quarters of the money to buy equipment and not much money to support the actual people doing the research.

That's a good point. Manufacturing USA institutes how can or should they collaborate? Typically they fund more applied research compared to the

described future manufacturing program. Andy, do you want to take that one?

I talked a little bit earlier about how you can collaborate with people in the manufacturing USA institutes and you're right, they're typically looking at TRL 4 through 7 kind of work, but the skills they have as well as their view into the translation of this fundamental research into actual production and industry can I think often be valuable as team members.

Can you tell the proposal statistics and 2020? Well, we can tell you there were 24 awards and we described those and you can look them up online. And as far as probably what the question is interested in and how many submissions they were, we cannot say that but there were quite a few.

Does NDT that could potentially help on developing the future manufacturing fit the proposal? Am not sure what this means.

I think that is a nondestructive testing. You want it to fit in a particular area and look at the manufacturing aspects of how the testing contributes to the manufacturing quality assurance so make sure you hit the thrust and make sure you hit manufacturing and ensure it is a suitable and it is future oriented.

What is the typical size team for the seed grant? We don't have many specifics in mind for that. It's up to whatever you think is best for your proposal. I would say that most of the seed grant have teams of three, four, five or something like that. Whatever is best for your proposal.

How does one name an eco-manufacturing project during submission? What we have for this year is different from last year and we would like the PI in the title of the proposal to indicate what the PI thinks is the primary thrust so if it was a seed grant the proposal title with a start with FMSG: Eco: and the rest of the title.

Do we need to request the full amount award amount?
No. I think that means do I have to ask for exactly $500,000 or $3 million and no, you don't. Rarely everyone has enough visibility and control over spending that’s exactly that amount to the dollar. Those are just maximum amounts.

Anticipated award distribution factions between research grants and FMSG?
We don't have any distribution factions in mind.

Actually in the solicitation we give our estimates of what we think we will give and if I remember right we were estimating that we will probably make around 17 seed grants and 8 research grants but that depends upon the quality of the submissions we get. The funding and any additional funding we might get through existing programs or stimuli and things like that so those numbers are definitely sort of soft, subject to being higher or lower.

For seedling grants, do you require preliminary data? No, we don't require preliminary data and if those data are not available, there are other ways of making the case that strengthens your proposal feasibility and so forth. And you can use other avenues rather preliminary data mentioned before. I like seedling.

For international collaborations could funds be allocated to support research and education? Go back to the proposal for more information.

How important is it to address the economics of the manufacturing you propose? Well, I think if you have an idea about it that could be helpful but I don't think it's a requirement especially since you're asking for things that are totally new. I think we would like to have a sense that manufacturing process would be feasible, economically feasible, but again, we are not going to require that be addressed in detail.

Are animals allowed models allowed to be used for the smaller research projects? Yes.

Are consultants allowed? Yes.

Do you allow GOALI? Yes.

For the research grant manufacturing could we include USDA ARS as sub award?
There are some specific rules about an ability of one agency to fund another agency. This is something if you are considering doing something like that, you may want to contact one of the program directors and get a little bit of guidance. You have to know more detail about that so please contact us at FutureManufacturing@nsf.gov.

And we are almost out of time and I'm not sure we going to get to all of the questions so that will be a good time to remind you to send us an email at FutureManufacturing@nsf.gov.

If a PI already has an NSF DMR grant, are the also allowed to apply to receive a grant from this program? Yes.

And that applies to pretty much any grant and of course there should not be overlap, they should not duplicate what you're looking at but you can definitely leverage existing awards.

Andy, can you take this one? Cyber manufacturing excludes manufacturing as a service which was described in the text of last year's solicitation?

I think it's just that we are trying to tighten up the description somewhat and the manufacturing as a service could definitely fit into the cyber manufacturing.
I think if you mean by exclusion it's just not there. If you look at the solicitation this year we shortened it a little bit so if something is not there, doesn't mean it's excluded. That's the disclaimer at the start of the section that these are just ideas. They are not intended to eliminate anything.

And I think we have to stop there. It is 2:00 here and we thank you very much for participating and the participants asking good questions and we really appreciate it. Andy, anything else you want to add?

Thank you very much and we look forward to fielding inquiries and seeing proposals.

Again, it is FutureManufacturing@nsf.gov and we will try to answer your questions promptly and you can certainly contact Andy and me by phone as well. Thank you very much everyone.