CORE QUESTIONS and REPORT TEMPLATE
for
FY 2020 NSF COMMITTEE OF VISITOR (COV) REVIEWS

Guidance to NSF Staff: This document includes the FY 2020 set of Core Questions and the COV Report Template for use by NSF staff when preparing and conducting COVs during FY 2020. Specific guidance for NSF staff describing the COV review process is described in the "COV Reviews" section of NSF's Administrative Policies and Procedures which can be obtained at https://inside.nsf.gov/tools/toolsdocuments/Inside%20NSF%20Documents/Policy,%20Procedures,%20Roles%20and%20Responsibilities%20for%20COV%20Reviews%20and%20Program%20Portfolio%20Reviews.pdf[1].

NSF relies on the judgment of external experts to maintain high standards of program management, to provide advice for continuous improvement of NSF performance, and to ensure openness to the research and education community served by the Foundation. COV reviews provide NSF with external expert judgments in two areas: (1) assessments of the quality and integrity of program operations; and (2) program-level technical and managerial matters pertaining to proposal decisions.

The program(s) under review may include several sub-activities as well as NSF-wide activities. The directorate or division may instruct the COV to provide answers addressing a cluster or group of programs – a portfolio of activities integrated as a whole – or to provide answers specific to the sub-activities of the program, with the latter requiring more time but providing more detailed information.

The Division or Directorate may add questions relevant to the activities under review. Copies of the report template and the charge to the COV should be provided to OIA prior to forwarding to the COV. In order to provide COV members adequate time to read and consider the COV materials, including proposal jackets, COV members should be given access to the materials in the eJacket COV module approximately four weeks before the scheduled face-to-face meeting of the COV members. Before providing access to jackets, the Conflict of Interest and Confidentiality briefing for COV members should be conducted by webinar, during which, NSF staff should also summarize the scope of the program(s) under review and answer COV questions about the template.

Suggested sources of information for COVs to consider are provided for each item. As indicated, a resource for NSF staff preparing data for COVs is the Enterprise Information System (EIS) –Web COV module, which can be accessed by NSF staff only at http://budg-eis-01/eisportal/default.aspx. In addition, NSF staff preparing for the COV should consider other sources of information, as appropriate for the programs under review.

For programs using section IV (addressing portfolio balance), the program should provide the COV with a statement of the program's portfolio goals and ask specific questions about the program under review. Some suggestions regarding portfolio dimensions are given on the template. These suggestions will not be appropriate for all programs.

Guidance to the COV: The COV report should provide a balanced assessment of NSF's performance in the integrity and efficiency of the ***processes*** related to proposal review. Discussions leading to answers of the Core Questions will require study of confidential material such as declined proposals and reviewer comments. ***COV reports should not contain confidential material or specific information about declined proposals.*** The reports generated by COVs are made available to the public.

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[1] This document has three parts: (1) Policy, (2) Procedures, and (3) Roles & Responsibilities.

We encourage COV members to provide comments to NSF on how to improve in all areas, as well as suggestions for the COV process, format, and questions. For past COV reports, please see http://www.nsf.gov/od/oia/activities/cov/.

FY 2020 REPORT TEMPLATE FOR
NSF COMMITTEES OF VISITORS (COVs)

Date of COV: June 9th and 10th, 2020

Program/Cluster/Section:

- **COV Group I: Academic Programs:**
  - *Industry-University Cooperative Research Centers Program (IUCRC) (ENG Managed Only)*
  - *Innovation Corps (I-Corps) Program (Teams, Sites and Nodes)*
  - *Partnerships for Innovation (PFI) Program*
  - *Non-Academic Research Internships for Graduate Students (INTERN) Supplements*

- **COV Group II: Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR) Programs**

Division: Industrial Innovation and Partnerships (IIP)

Directorate: Engineering (ENG)

Number of actions reviewed: *(Competitive Proposals, Supplements, Returned without Review, and Withdrawn)*

	IIP Academic Programs	IIP SBIR/STTR Programs
Awards:	112	112
Declinations:	84	123
Supplements:	38	45
Other:	11 *(Returned without Review)* 2 *(Withdrawn)*	36 *(Returned without Review)*

Total number of actions within Program/Cluster/Division during period under review: *(All action types.)*

	IIP Academic Programs	IIP SBIR/STTR Programs
Awards:	1,570	1,744
Declinations:	995	8,473
Supplements:	627	867
Other:	13 *(Returned without Review)* 12 *(Withdrawn)* 1 *(Contract)* 497 *(Continuing Grant Increments)* 474 *(Preliminary Proposals)* 173 *(Other)*	483 *(Returned without Review)* 4 *(Withdrawn)* 1 *(Contract)* 8 *(Other)*

Manner in which reviewed actions were selected: (*Stratified Random Sampling*)

The 2020 IIP Academic Programs (COV Group I) focused on fiscal years (FY) 2016 through 2019 for the following programs: Industry-University Cooperative Research Centers (IUCRC), Innovation Corps (I-Corps), and Partnerships for Innovation (PFI). Non-Academic Research Internships for Graduate Students (INTERN) supplements were included as part of the larger set of Academic Programs supplement proposal actions. COV members were assigned proposal jackets by way of a stratified random sampling of all FY 2016 through FY 2019 IIP Academic Programs competitive and supplement proposal actions, including awards, declines, returned, and withdrawn actions. In order to achieve a balanced representation of the actions administered by the IIP Academic Programs during the period under review, proposal actions were first binned by program, then by FY, and finally by action type (award, decline, returned, withdrawn, and supplement). Proposal actions were then randomly selected from each category to achieve a representative selection for each COV member to review (resulting in approximately 20-30 actions per member). For sampled actions in which a COV member had a conflict of interest (COI), those actions were blocked from the member's review and replaced with the next randomly assigned proposal.

The 2020 IIP SBIR/STTR Programs (COV Group II) focused on fiscal years (FY) 2016 through 2019. COV members were assigned proposal jackets by way of a stratified random sampling of all FY 2016 through FY 2019 SBIR/STTR competitive and supplement proposal actions, including awards, declines, returned, and withdrawn actions. In order to achieve a balanced representation of the actions administered by the IIP SBIR/STTR programs during the period under review, proposal actions were first binned by FY, then by SBIR and STTR, then by Phase I and Phase II, and finally by action type (award, decline, returned, withdrawn, and supplement). Proposal actions were then randomly selected from each category to achieve a representative selection for each COV member to review (resulting in approximately 30 actions per member). For sampled actions in which a COV member had a conflict of interest (COI), those actions were blocked from the member's review and replaced with the next randomly assigned proposal.

COV Membership

	Name	Affiliation
COV Chair or Co-Chairs:	**Eric Johnson** *IIP Academic Programs Chair*	PalmettoNet Endowed Chair in Optoelectronics and Professor of Electrical and Computer Engineering, Clemson University
	Tom Knight *IIP SBIR/STTR Programs Chair*	Founder and Chief Executive Officer at Invistics

COV Members:	*Academic Programs*	
	Martin Bakker	Associate Professor of Chemistry, University of Alabama
	Susan Butts	President, Susan B. Butts Consulting
	Seth DeBolt	Professor of Horticulture, University of Kentucky and Co-founder and CEO, Redleaf Biologics, Inc
	Jürgen Konczak	Professor, School of Kinesiology and Director, Human Sensorimotor Control Laboratory, University of Minnesota
	Jonathan Minden	Professor of Biological Sciences, Carnegie Mellon University and Co-founder, Impact Proteomics
	Robin Murphy *ENG Advisory Committee Member*	Raytheon Professor of Computer Science and Engineering and Director of the Humanitarian Robotics and AI Laboratory, Texas A&M University
	Torbert Rocheford	Patterson Endowed Chair and Professor of Agronomy, Purdue University and Co-founder and Chief Technology Officer, NutraMaize, LLC
	SBIR/STTR Programs	
	Legand Burge	Professor of Computer Science and Director of HowU Innovate Foundry, Howard University; Managing Partner, XediaLabs LLC.
	Mariesa Crow	Professor of Electrical Engineering, Missouri University of Science and Technology
	Parviz Famouri	Professor Computer Science and Electrical Engineering; Associate Chair for Research & Graduate Studies - Benjamin M. Statler College Of Engineering And Mineral Resources, West Virginia University
	Dawit Haile	Professor of Mathematics and Computer Science; Dean of College of Engineering and Technology; Interim Dean of College of Natural and Health Sciences, Virginia State University
	Lawrence Hornak	Professor of Electrical and Computer Engineering and Associate Vice President for Research - Integrative Team Initiatives, University of Georgia

	Vahid Motevalli	Professor of Mechanical Engineering and Associate Dean for Research and Innovation, College of Engineering, Tennessee Tech University
	Rosibel Ochoa	Associate Vice Chancellor for Technology Partnerships, Office of Research and Economic Development, University of California Riverside
	Patricia Sullivan	Associate Dean for Outreach, College of Engineering, New Mexico State University
	Bridget Wadzuk	Professor of Civil and Environmental Engineering, Villanova University

MERIT REVIEW CRITERIA

An understanding of NSF's merit review criteria is important in order to answer some of the questions on the template. Reproduced below is the information provided to proposers in the Grant Proposal Guide about the merit review criteria and the principles associated with them.   Also included is a description of some examples of broader impacts, provided by the National Science Board

1. Merit Review Principles

These principles are to be given due diligence by PIs and organizations when preparing proposals and managing projects, by reviewers when reading and evaluating proposals, and by NSF program staff when determining whether or not to recommend proposals for funding and while overseeing awards. Given that NSF is the primary federal agency charged with nurturing and supporting excellence in basic research and education, the following three principles apply:

- All NSF projects should be of the highest quality and have the potential to advance, if not transform, the frontiers of knowledge.

- NSF projects, in the aggregate, should contribute more broadly to achieving societal goals. These broader impacts may be accomplished through the research itself, through activities that are directly related to specific research projects, or through activities that are supported by, but are complementary to, the project. The project activities may be based on previously established and/or innovative methods and approaches, but in either case must be well justified.

- Meaningful assessment and evaluation of NSF funded projects should be based on appropriate metrics, keeping in mind the likely correlation between the effect of broader impacts and the resources provided to implement projects. If the size of the activity is limited, evaluation of that activity in isolation is not likely to be meaningful. Thus, assessing the effectiveness of these activities may best be done at a higher, more aggregated, level than the individual project.

With respect to the third principle, even if assessment of Broader Impacts outcomes for particular projects is done at an aggregated level, PIs are expected to be accountable for carrying out the activities described in the funded project. Thus, individual projects should include clearly stated goals, specific descriptions of the activities that the PI intends to do, and a plan in place to document the outputs of those activities.   These three merit review principles provide the basis for the merit review criteria, as well as a context within which the users of the criteria can better understand their intent.

2. Merit Review Criteria

All NSF proposals are evaluated through use of two National Science Board approved merit review criteria. In some instances, however, NSF will employ additional criteria as required to highlight the specific objectives of certain programs and activities.

The two merit review criteria are listed below. Both criteria are to be given full consideration during the review and decision-making processes; each criterion is necessary but neither, by itself, is sufficient. Therefore, proposers must fully address both criteria. (PAPPG Chapter II.C.2.d.(i) contains additional information for use by proposers in development of the Project Description section of the proposal.) Reviewers are strongly encouraged to review the criteria, including PAPPG Chapter II.C.2.d.(i), prior to the review of a proposal.

When evaluating NSF proposals, reviewers will be asked to consider what the proposers want to do, why they want to do it, how they plan to do it, how they will know if they succeed, and what benefits could accrue if the project is successful. These issues apply both to the technical aspects of the proposal and the way in which the project may make broader contributions. To that end, reviewers will be asked to evaluate all proposals against two criteria:

- **Intellectual Merit**: The Intellectual Merit criterion encompasses the potential to advance knowledge; and

- **Broader Impacts**: The Broader Impacts criterion encompasses the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

The following elements should be considered in the review for both criteria:

1. What is the potential for the proposed activity to:
    a. Advance knowledge and understanding within its own field or across different fields (Intellectual Merit); and
    b. Benefit society or advance desired societal outcomes (Broader Impacts)?
2. To what extent do the proposed activities suggest and explore creative, original, or potentially transformative concepts?
3. Is the plan for carrying out the proposed activities well-reasoned, well-organized, and based on a sound rationale? Does the plan incorporate a mechanism to assess success?
4. How well qualified is the individual, team, or organization to conduct the proposed activities?
5. Are there adequate resources available to the PI (either at the home organization or through collaborations) to carry out the proposed activities?

3. Examples of Broader Impacts

The National Science Board described some examples of broader impacts of research, beyond the intrinsic importance of advancing knowledge.[2] "These outcomes include (but are not limited to) increased participation of women, persons with disabilities, and underrepresented minorities in science, technology, engineering, and mathematics (STEM); improved STEM education at all levels; increased public scientific literacy and public engagement with science and technology; improved well-being of individuals in society; development of a globally competitive STEM workforce; increased partnerships between academia, industry, and others; increased national security; increased economic competitiveness of the United States; and enhanced infrastructure for research and education. These examples of societally relevant outcomes should not be considered either comprehensive or prescriptive. Investigators may include appropriate outcomes not covered by these examples."

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[2] NSB-MR-11-22

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

IIP Academic Programs - COV Group I

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? *Comments:* *Reviewers were provided a consistent template to structure their feedback. This provided a balanced view to the program director in determining outcomes regardless of the review method.*	*Yes*
2. Are both merit review criteria addressed *Comments:* *In general, the COV members agreed that both review criteria were adequately addressed. However, the following issues were noted:* *a) In individual reviews?* *Reviewers should provide explicit justification of their assessment of both intellectual merit and broader impacts rather than just restate assertions made in the proposal.* *b) In panel summaries?* *A small number of panel summaries do not clearly break out into strengths and weaknesses for both criteria. Many of the Program Officer reviews do not break into strengths and weaknesses, rather just describe intellectual merit and broader impacts.* *c) In Program Officer review analyses?*	*Yes*

In a minority of cases, the Program Officer review analyses do not break into strengths and weaknesses, rather just describe intellectual merit and broader impacts.	
3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? *Comments:* *The majority of individual reviews were very thorough and provided substantive comments, yet there were a number of individual reviews that were sparse in some of their assessments. Thus, some could be improved.*	*Yes*
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? *Comments:* *The panel summaries are one of the strongest parts of the overall review process. They show that there has been careful, thoughtful discussion resulting in well crafted, and well written summaries.* *However, COV members had mixed evaluations on the quality of a subset of the ejacket panel summaries. Cases were noted with a large range in individual ratings, but that it was unclear from the panel summary how the differences had been balanced or reconciled to give the overall rating.*	*Yes*
5. Does the documentation in the jacket provide the rationale for the award/decline decision? *Comments:* *It would be helpful for the Review Analysis to include more information that is relevant to the funding recommendation.* *It was noted that the PD analysis was frequently a copy of the panel summary with a cursory statement summarizing the nature of the panel and stating the PD's concurrence with the panel.* *The COV also noted that in cases where the PD was not in agreement with the panel's recommendations, a very detailed analyses stating the basis for the decision was included.*	*Yes*
6. Does the documentation to the PI provide the rationale for the award/decline decision?	Yes

Comments: The COV found considerable variability in the quality of rationale for declinations. There also appears to be a trend with bulleted reviews using pluses and minuses to denote strengths and weaknesses, but where the intent was not adequately explained. There was also concern that in some cases PI's did not get the necessary feedback to enable an improved submission if so desired.	
7. Additional comments on the quality and effectiveness of the program's use of merit review process: Comments: The COV noted that review criteria other than *intellectual merit* or *broader impact* were not always addressed. This is problematic, because if additional criteria can form the basis for a declination and these are not explicitly addressed by the review, then the PI lacks essential information to improve the proposal.	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: While panels generally had a good blend of reviewers with appropriate technical expertise, a significant number of panels appeared to have few or no industrial members or industrial members with no evident domain-specific expertise. This is problematic since the IIP programs are based on engagement with industry, but it may also be an artifact of the method how affiliations are designated in the records	Yes
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: NA	Yes
3. Additional comments on reviewer selection: The COV members expressed strongly that panels should have greater diversity in terms of number of females and members of other underrepresented groups in STEM, and more representation from R2 universities.	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW
1. Management of the program. Comments: Program management is very good and serves the mission of IIP. NSF staff overseeing the program has a good balance of experience in academia and industry.
2. Responsiveness of the program to emerging research and education opportunities. Comments: The I-Corps program appears to be very responsive to emerging research and education opportunities in general. In general, the supplements effectively responded to emerging opportunities. The internal Program Officer reviews were expedient and thorough. As the PFI program has a lineage requirement, there are limits on how responsive the program can be to emerging opportunities. The inclusion of I-Corps teams as satisfying a lineage requirement has enhanced responsiveness.
3. Program planning and prioritization process (internal and external) that guided the development of the portfolio. Comments: The COV members agreed that there are thorough and effective processes in place to guide portfolio development.
4.   Responsiveness of program to previous COV comments and recommendations. Comments: IIP has made a serious effort to be responsive to the previous COV. However, some of the challenges such broadening participation and reviewer demographics are very difficult to overcome, and it may take some time for improvements to be discernable.

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? Comments: It was observed that the portfolio has a strong focus on the ENG directorate. Because the academic programs link to industry, one would expect to see a broader portfolio with a stronger presence of other Directorates. This may be an artifact of how the ENG IUCRC is organized within NSF, recognizing some of the other directorates have similar programs.	Appropriate
2. Are awards appropriate in size and duration for the scope of the projects? Comments: The three academic programs under review (I-Corps, PFI, IUCRC) have very different scopes and budgets are constructed to fit the maximum award size. There was consensus among the COV members that the self-regulating nature of the IUCRC programs (I.e. industry participation) is effective, the use of supplements provides meaningful flexibility and support for successful projects in all three programs.	Appropriate
3. Does the program portfolio include awards for projects that are innovative and potentially transformative? Comments: By nature, the IUCRC awards push into areas that are potentially transformative. The awarded projects seemed to reflect this. They focus on projects that are collectively beneficial for the economic viability of the respective industry sector. The awards within the PFI program are generally translational and innovative by nature.	Appropriate

4. Does the program portfolio have an appropriate balance of awards to inter- and multi- disciplinary projects? Comments: NA	
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: There is consensus that geographical distribution of the academic programs are appropriate for the nature of the program. However, programs such as the IUCRC are largely infrastructure driven and dependent on available industry partners in the region. Thus, geographical areas without the appropriate industry representation are at an inherent disadvantage. It was noted positively that applications from underrepresented states did receive more thorough review and feedback by the PDs.	Appropriate
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments: Based on the reviewed portfolio there is a decent balance in types of institutions that receive funding. It is not surprising that PhD granting institutions receive the bulk of the awards. This seems immanent to the program. There was discussion that infrastructure and NSF lineage may be barriers for R2 and non-PhD granting institutions. However, there was no evidence that these institutions received biased reviews.	Appropriate
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? Comments: COV members agreed that the balance of awards to new and early-career investigators is appropriate for the nature of the programs with more early-stage awards being made to I-corps teams and fewer to PIs for the larger programs, especially IUCRC given its complexity. It was noted positively that the number of young investigators for I-corps teams is sizable (over 30%).	Appropriate

8. Does the program portfolio include projects that integrate research and education? Comments: There was consensus that the integration of research and education was generally good. The COV believes that the use of supplements be further encouraged as these provide an additional opportunity for these projects to offer additional training.	Appropriate
9. Does the program portfolio have appropriate participation of underrepresented groups[3]? Comments: The COV noted there were disproportionately few female PIs/CO-PIs for IUCRC, PFI and I-Corps applications. There was a nearly two-fold downward trend for the I-Corps teams, sites, and nodes in terms of female PIs and PIs from underrepresented groups. This was concerning for the COV members. With regard to engaging students many proposals relied on their institution's, or discipline's, better than average demographics or made generic aspirational statements of intent (like "will seek to recruit members of underrepresented groups into (the center's) research and educational initiatives."). However, the COV does expect to see more genuine efforts by the applicants at achieving *broader participation*. The COV suggests that the proposed activities involving underrepresented groups be explicitly addressed in the reviews and panel discussion and summary. The COV suggests that IIP stresses *broader participation* as a primary goal in its program solicitations. The COV also noted that the use of supplements was effective in increasing participation of underrepresented groups and should be further encouraged in future actions.	Not Appropriate
10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments:	Appropriate

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[3] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

The COV believes the IIP programs are well aligned the mission of the agency.	
11. Additional comments on the quality of the projects or the balance of the portfolio:	

OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

The Academic programs have a strong presence in the community and serve a critical function in providing translational opportunities for a number of its grantees. For example, the IUCRC program is in itself transformational in teaching students innovation and fostering economic competitiveness. The NSF leadership are doing a great job!

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

NSF should consider providing additional funding specifically for administrative support to enable broadening participation. This funding should be made available as part of an original funded application or as a supplement.

4. Please provide comments on any other issues the COV feels are relevant.

NA

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

The Committee of Visitors is part of a Federal advisory committee. The function of Federal advisory committees is advisory only. Any opinions, findings, conclusions, or recommendations expressed in this material are those of the Advisory Committee, and do not necessarily reflect the views of the National Science Foundation.

SIGNATURE BLOCK:

Eric Johnson

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For the FY20 IIP Academic Programs Committee of Visitors
Eric Johnson
Chair

INTEGRITY AND EFFICIENCY OF THE PROGRAM'S PROCESSES AND MANAGEMENT

IIP SBIR/STTR Programs - COV Group II

Briefly discuss and provide comments for *each* relevant aspect of the program's review process and management. Comments should be based on a review of proposal actions (awards, declinations, returns without review, and withdrawals) that were *completed within the past four fiscal years*. Provide comments for *each* program being reviewed and for those questions that are relevant to the program(s) under review. Quantitative information may be required for some questions. Constructive comments noting areas in need of improvement are encouraged.

I. Questions about the quality and effectiveness of the program's use of merit review process. Please answer the following questions about the effectiveness of the merit review process and provide comments or concerns in the space below the question.

QUALITY AND EFFECTIVENESS OF MERIT REVIEW PROCESS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Are the review methods (for example, panel, ad hoc, site visits) appropriate? Comments: • Information on the review mode, virtual or in-person, was not readily available.	Yes

2. Are ~~both~~ all three merit review criteria addressed
   a) In individual reviews?
   b) In panel summaries?
   c) In Program Officer review analyses?
 	
Comments:
• The CoV notes clear progress over the four years in our review. This includes adding the commercialization criteria as a new, third criteria.
• The CoV recommends PDs provide a rubric with more details to help the reviewers assess the proposals in terms of the third **commercialization criteria**. This can be a checklist of elements that should be included in the proposal, e.g., "full and complete market analysis", as well as more specific details about what each of these elements mean, e.g., "full and complete market analysis means XYZ". The CoV recommends that the PDs ensure that all elements of the rubric/guideline are fully addressed by all members of the written review panel in their summary.
• The CoV recommends PDs provide more examples to help the reviewers assess the proposal vs. the second **broader impact** criteria.
	Yes, with recommended improvements

3. Do the individual reviewers giving written reviews provide substantive comments to explain their assessment of the proposals? Comments: • The CoV found extensive and substantive reviewer comments for proposals that were funded, but less extensive and substantive comments for proposals that were not funded. • While many reviewers provided extensive and appropriate comments, other reviewers did not provide sufficient details. This was most common when reviewers were reviewing the commercialization criteria, appropriate use of resources, approach to establishing commercial and technical viability • Broader impacts reviews tended to appear as a more secondary criteria.	Yes, with recommended improvements
4. Do the panel summaries provide the rationale for the panel consensus (or reasons consensus was not reached)? Comments: • The CoV recommends the panel summary should include comments that better inform the issues that drove to panel consensus (or PD decision in the case of Ad Hoc reviews) and clearly reflect consensus from the panel discuss that was part of the discussions but not in individual panelist written reviews. The CoV found the panel summary was sometimes merely a reflection of the same written reviewer comments. The CoV found panel summaries do not provide a summative statement at the end that reflects the sense of the panel and what in the weighting of all the strengths and weaknesses was the deciding factor in the recommendation. The CoV notes the PI is sent documentation that states "The panel summary was read by the panel and the panel concurred that the summary accurately reflects the panel discussion" and yet often, the panel summary was not the consensus of the panel. • The CoV recommends either (1) removing the wording "PANEL RECOMMENDATION and PANEL RECOMMENDATION KEY: NC:Not Competitive, C:Competitive, HC:Highly Competitive" at the bottom of every panel summary or (2) retain the question but include its answer in the panel summary. The CoV notes this wording was appropriately changed in 2018 to remove words like "Definitely Fund".	Yes, with recommended improvements

5. Does the documentation in the jacket provide the rationale for the award/decline decision? Comments: • The CoV recommends the PD <u>always</u> include in the jacket justification for (1) pursuing additional information that was required by the solicitation but that was not included in the original proposal, (2) conducting any other due diligence, and (3) their award decision, <u>especially whenever the PD reaches a decision that is different from the panel consensus.</u> The CoV found some proposals were funded by the PD despite poor reviews, and some proposals were not funded by the PD despite strong reviews. In some but not all these cases, the jacket contained clear information justifying the PDs decision.	Yes, with recommended improvements

6. Does the documentation to the PI provide the rationale for the award/decline decision? Comments: • The CoV recommends PDs provide more substantive constructive feedback to PIs who were not funded, e.g., ways to strengthen the commercialization plan, approach to technical and commercialization viability or other coaching that will help the entrepreneur. • The CoV recommends IIP regularly survey a representative sample of PIs who were not funded, to ask their perspective on the proposal submission process, the feedback they received from the review process, and suggestions they have to improve the review process.	Yes, with recommended improvements
7. Additional comments on the quality and effectiveness of the program's use of merit review process: • The CoV found that some Phase II proposals going through due diligence had multiple budget revisions before award recommendation. In order to increase transparency in the merit review process, the COV recommends that IIP develop written guidance on when and how a PD may ask PIs for additional information in due diligence and what type of information may/should be requested.	

II. Questions concerning the selection of reviewers. Please answer the following questions about the selection of reviewers and provide comments or concerns in the space below the question**.**

SELECTION OF REVIEWERS	YES, NO, DATA NOT AVAILABLE, or NOT APPLICABLE
1. Did the program make use of reviewers having appropriate expertise and/or qualifications? Comments: - The CoV recommends IIP aim for panels with 2 or more self-reported **women** (and presenting the statistics on this to future CoV). Panelists skew to male. Statistics we were given that showed roughly 62% of panels had no self-reported female. Panelists with a female often had only one woman. - The CoV recommends IIP aim for panels with 2 or more panelists from self-reported **under-represented groups**. Statistics we were given show roughly 85% of panels had no panelist from self-reported under-represented groups. - It is recommended to add more language when a reviewer or PI is asked for demographic information to encourage responses. - The CoV notes that the strength of the technical reviewers is strong and commendable. - However, the CoV recommends IIP find more panelists with panelist who can speak to the **broader impact and commercialization** criteria: - Early stage investors, like angels - Technology start-up mentors - Manager of entrepreneurship centers - National labs - Entrepreneurs in residence, e.g., at incubators - Regional Economic Development Partnerships, recognizing conflicts of interest (COI) reviews should ensure no COIs. - Manufacturing expertise, e.g., to scale up production during commercialization - And thought leaders in the space with commercialization expertise to provide guidance on the contribution to broader impacts. - Many panelists are academics. Statistics we were given show that, among those reported their affiliations, about 14% of reviewers came from business and approximately 44% were from PhD institutions. - Not all jackets had complete information about the background/discipline of the panelists. - The CoV recommends IIP provide future CoVs more extensive data on panel make-up.	Yes

o how often panelists are re-used o when new panelists are being added	
2. Did the program recognize and resolve conflicts of interest when appropriate? Comments: - The CoV noted one excellent example where IIP found a conflict of interest (COI), and the input of that reviewer was properly and appropriately redacted and excluded from peer review. (It would have been helpful to record in the eJacket when the COI was first recognized.) - The CoV also noted that IIP did a great job preventing COIs for members of the two CoV subcommittees, and assigned COV members carefully to avoid COIs.	Yes
3. Additional comments on reviewer selection: - None	

III. Questions concerning the management of the program under review. Please comment on the following:

MANAGEMENT OF THE PROGRAM UNDER REVIEW

1. Management of the program.

Comments:

- The CoV commends IIP Staff, including Program Directors and Division Leadership for their outstanding contributions to our nation's innovation ecosystem. We are excited by their vision and happy to assist them achieve their mission.
- The CoV noted that we were provided excellent visibility for individual jackets, and many statistics and facts about the makeup of the portfolio and panels.
- The CoV noted that we were provided with documents about IIP Program Planning, the NSF Strategic Plan for FY14-18 and for FY18-22, and Outreach Goals for 2018 and 2019, but we were not provided with the following documents, would have been helpful when answering this question:
  - A strategic plan for IIP or SBIR/STTR (but we were provided with the NSF Strategic Plan)
  - Assessment data of economic impact, e.g., Key Performance Indicators (KPIs), with goals for these KPIs, including assessment data for awards made prior to the CoV review period.
  - Data from years prior to the four years of this COV to understand long term trends in the context of the division strategic plan.
- The CoV notes that IIP empowers PDs to overrule review panels, and recommends this be continued. However, it is critical that there be clear documentation justifying why the panel recommendations were overruled. In order to provide transparency into the decision-making process, the CoV recommends the following:
  - IIP's Strategic Plan include guidance for PDs on when and how they may/should overrule the review panels, e.g., as we have stated above in Part 1, Question 4.
  - Document when and how a PD may ask PIs for additional information in due diligence and what type of information may/should be requested during due diligence.
  - Continue to hire and support PDs who have the experience and the authority to make the best possible decisions about which proposals should be funded while ensuring transparency in the rationale for the decision.
- The CoV supports the use of the pitch to inform PIs about their potential fit, and recommends the pitch process be continued in the future, as it provides value both to the PI (early feedback that prevents submitted an inappropriate proposal) and the PD (eliminate of panel/review time for inappropriate proposals).
- The CoV notes we were not provided information on pitches, and that the pitch was not in our CoV's charge. Given that the pitch is now a required step for PIs prior to submitting a proposal, the CoV recommends the pitch should be documented fully in the eJacket, along with the documented result of the pitch. This will allow numerous benefits:
  - Capturing the (voluntary) demographic information about the person pitching
  - Asking "how did you hear about NSF SBIR?" and other questions to measure the effectiveness of outreach efforts to improve deal flow.
  - Transparency on the pitch process just like other steps in the review process.

○ Future CoVs to gauge the effectiveness of the pitch, and allow IIP to measure the impact of the pitch, e.g., number of pitches that were or were not invited to submit a full proposal at the time of the pitch.

2. Responsiveness of the program to emerging research and education opportunities.

Comments:
- The CoV notes some jackets leveraged other IIP programs like I-Corps or mentorship, but this was a fairly small percentage.
- The CoV recommends a greater effort on behalf of IIP to leverage and enable education opportunities for PIs and startup employees, e.g., making PIs aware of ways to voluntarily participate in I-Corps, plus other resources like I/UCRC, PFI, and other IIP programs. There are over 100 I-Corps sites that provide a national network to support current and potential future PIs.
- The CoV recommends IIP partner with (1) regional technology incubators, (2) entrepreneurship centers, and/or (3) Small Business Development Centers (SBDCs), who are already providing mentorship and entrepreneurial education opportunities and could provide technical assistance on proposal preparation, commercialization plan development and access to capital. This is particularly encouraged in areas of the United States with less developed innovation ecosystems.
- The CoV encourages further inreach within NSF and partnering, e.g., with DUE and DGE programs to improve mentorship of students around entrepreneurship and startup fundamentals.

3. Program planning and prioritization process (internal and external) that guided the development of the portfolio.

Comments:
- The CoV notes that some topics were appropriately introduced or discontinued over time.
- The CoV recommends IIP's Strategic Plan include clear policy on how Solicitation topics are added or removed.
- The CoV notes that we were not provided assessment data showing the outcomes data for program planning.

4. Responsiveness of program to previous COV comments and recommendations.

Comments:
- The CoV appreciates hearing from IIP their response to the prior CoV, which was detailed and responsive to that CoVs recommendations.
- The CoV notes that IIP has made progress in nearly all recommended improvement areas, and complements IIP leadership for these significant improvements since the prior CoV.
- The CoV found additional progress is needed in two areas, and reiterates the recommendations by the prior CoV in the following two areas, as discussed further in Section V, Question 4
  1. The CoV recommends that IIP continue to increase outreach that will broaden participation from women and underrepresented groups, both in reviewer pools and PIs.

2. The CoV recommends that IIP develop and report output metrics (aka assessment) data, such as economic impact data showing jobs created, capital raised, liquidation events, revenue generated, etc., to assess the balance of the portfolio and the management of the program. To repeat the recommendation from the prior CoV: "COVs should have access to output metrics (assessment), if possible by sector, at the outset of the process."

IV. Questions about Portfolio. Please answer the following about the portfolio of awards made by the program under review.

RESULTING PORTFOLIO OF AWARDS	APPROPRIATE, NOT APPROPRIATE, OR DATA NOT AVAILABLE
1. Does the program portfolio have an appropriate balance of awards across disciplines and sub-disciplines of the activity? Comments: • The CoV notes that the portfolio has appropriate balance across a total of 20 Topic Areas in the FY19 Solicitations, commends IIP for this balance of awards across disciplines, and recommends IIP continue to be open to this broad and balanced set of Topic Areas. • The CoV notes the largest number of awards were in the Biomedical Technologies topic area	Appropriate
2. Are awards appropriate in size and duration for the scope of the projects? Comments: • The CoV notes IIP has multiple phases and a variety of supplements that provide appropriate flexibility for projects that require larger sized grants or longer grants.	Appropriate
3. Does the program portfolio include awards for projects that are innovative and potentially transformative? Comments: • The CoV notes we only had visibility on individual jackets, and did not read the actual proposals. However, we expect most funded projects will be innovative, in that they will convert research into commercialized products. • The CoV notes that very few reviewers documented that the proposals were potentially transformative. • The CoV notes were not provided any data to help us answer this question. • The CoV recommends IIP provide data to future CoVs to answer this question.	Data Not Available
4. Does the program portfolio have an appropriate balance of awards to inter- and multi- disciplinary projects?	

	Not Applicable
Comments: • Based on the comment below, the CoV did not answer this question.	
5. Does the program portfolio have an appropriate geographical distribution of Principal Investigators? Comments: • The CoV notes that geographical representation is not as diverse as our nation's population. • The CoV notes that Established Program to Stimulate Competitive Research (EPSCoR) states appear to have lower award rates. • The CoV recommends IIP leverage educational resources distributed across the nation to improve the number of quality proposals and resulting awards in underrepresented geographical areas, as discussed above in Part III, Question 2.	Appropriate
6. Does the program portfolio have an appropriate balance of awards to different types of institutions? Comments : • The CoV notes all awards were granted to small businesses, which are all appropriate. • The CoV notes that roughly 2/3 of grants are made to small businesses with an affiliation with universities, which also is appropriate.	Appropriate
7. Does the program portfolio have an appropriate balance of awards to new and early-career investigators? NOTE: A new investigator is an individual who has not served as the PI or Co-PI on any award from NSF (with the exception of doctoral dissertation awards, graduate or post-doctoral fellowships, research planning grants, or conferences, symposia and workshop grants.) An early-career investigator is defined as someone within seven years of receiving his or her last degree at the time of the award. Comments: • The CoV agrees the question above about new and early-career investigators is not the relevant question, and agrees that the relevant question is "Does the program portfolio have an appropriate balance of awards to new companies?" • The CoV commends IIP for successfully implementing myriad activities that are allowing IIP to fund significantly more new	Appropriate

companies than any other SBIR-granting agency in the federal government. Job well done! This has been a major success. NSF SBIR is the only program that provides pre-seed and seed funding for aspiring entrepreneurs to conduct early stage feasibility and proof of concept studies. • The CoV recommends IIP continue their progress and leadership in this area, including outreach efforts that will result in quality proposals from first-time PIs.	
8. Does the program portfolio include projects that integrate research and education? Comments: • The CoV agrees the question above is not the relevant question, and agrees that the relevant question is "Does the program portfolio include projects that leverage educational supplements and output from IIP academic programs and agency funding as a whole?" • The CoV feels IIP is leveraging educational supplements appropriately, e.g., Research Experiences for Teachers (RET), Research Experiences for Undergraduates (REU), Research Assistantships for High School Students (RAHSS), SBIR/STTR Phase II-CC, and other supplements, and that the coordination is yet another strength of NSF's IIP SBIR program.	Appropriate
9. Does the program portfolio have appropriate participation of underrepresented groups[4]? Comments: • The CoV appreciates that IIP provided data on the number and percentage of (1) female involvement and (2) underrepresented groups in proposals and awards. • The CoV notes that we were not provided with the "SBIR/STTR Outreach and Broadening Participation Strategy" that IIP Leadership said had been developed in response to the prior CoV. We were provided with two short but relevant documents on 2018 and 2019 Outreach Goals, and these documents did include outreach activities to underrepresented groups and geographic areas. • The CoV notes that NSF SBIR home page (at https://seedfund.nsf.gov/) includes a promising section called "We embrace diversity". However, clicking the link in that section leads to the generic "Showcase" page without mentioning diversity, and without focusing attention on PIs who are female or from underrepresented groups.	**NOT APPROPRIATE**

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[4] NSF does not have the legal authority to require principal investigators or reviewers to provide demographic data. Since provision of such data is voluntary, the demographic data available are incomplete. This may make it difficult to answer this question for small programs. However, experience suggests that even with the limited data available, COVs are able to provide a meaningful response to this question for most programs.

• The CoV understands this is a national problem, recognizes IIP supports broadening participation, and notes IIP now has resources for communications and outreach, and that those resources can be leveraged to provide outreach to women and members of underrepresented groups.
• The CoV recommends that IIP:
  o Update the 2019 Outreach Goals with a new and broader "SBIR/STTR Outreach and Broadening Participation Strategy," and publish that on their website
  o Create a new page on their website focused on broadening participation from women and unrepresented groups, and highlighting successful PIs from these groups.
  o Partner with stakeholders who will lead to more quality proposals from females and members of underrepresented groups, as was recommended in Part III Question 2.
  o Create supplements that will provide additional funding to grantees allowing them to hire woman and members of underrepresented groups to assist with their SBIR/STTR projects.	

10. Is the program relevant to national priorities, agency mission, relevant fields and other constituent needs? Include citations of relevant external reports. Comments: • The CoV enthusiastically agrees.	Appropriate
11. Additional comments on the quality of the projects or the balance of the portfolio: • None	

V. OTHER TOPICS

1. Please comment on any program areas in need of improvement or gaps (if any) within program areas.

   • Our comments are shown above in Sections I-IV.

2. Please provide comments as appropriate on the program's performance in meeting program-specific goals and objectives that are not covered by the above questions.

- The leverage of universities' participation in research by small businesses is important and can be effective. However, the reviewers and Program Directors should be aware of the potential that the heavy involvement of university partners and facilities can result in funding proposals that may not truly lead to the development of the small business.
- Our other comments are shown above in Sections I-IV.

3. Please identify agency-wide issues that should be addressed by NSF to help improve the program's performance.

   - Our comments are shown above in Sections I-IV.

4. Please provide comments on any other issues the COV feels are relevant.

   - IIP Staff were incredibly helpful to our CoV. We really appreciate their help. Thank you!
   - The CoV applauds IIP Staff on their passion for their vision and mission. We encourage them to keep up the great teamwork. We are enthusiastic supporters of their vision and mission, as shown here:
     - **Vision**: To be the pre-eminent federal resource driving the expansion of our nation's innovation capacity by stimulating partnerships among industry, academe, investors, government and other stakeholders.
     - **Mission**: By catalyzing the transformation of discovery into societal benefits through stimulating partnerships and promoting learning environments for innovators, IIP will enhance our nation's economic competitiveness.
   - The CoV has **two main recommendations** to implement the next 4 years between now and the next CoV, as noted above in Section III Question 4:
     - The CoV recommends that IIP continue to increase outreach that will broaden participation from women and underrepresented groups, both in reviewer pools and PIs.   The CoVs specific recommendations on this topic are shown above in Section II Question 1 and Section IV Question 9.
     - The CoV recommends that IIP develop and report output metrics (aka assessment) data, such as economic impact data showing jobs created, capital raised, liquidation events, revenue generated, etc., to assess the balance of the portfolio and the management of the program.
       - The CoV notes that other SBIR-granting agencies are publishing Economic Impact Studies, such as the 2018 Department of Defense Economic Impact Study, available at https://business.defense.gov/Portals/57/Documents/BPIIMPTW18%20slides/sbir%20overview%20friesenhahn.pdf?ver=2018-08-21-194211-253
       - The CoV expects similar assessment data from IIP will provide compelling evidence of the significant economic benefits seen from NSF's investments in the SBIR/STTR program.
       - The CoV recommends future CoVs be provided with this economic impact assessment data.
       - The CoV notes that grantees often need more than 4 years to show economic impact, while the CoV charge is focused on awards made just in the last 4 years. Therefore, the CoV recommends the assessment data include not only data on grants awarded during the four-year period being reviewing by the next CoV, but also assessment data on grants awarded earlier than that 4-year period.

5. NSF would appreciate your comments on how to improve the COV review process, format and report template.

   - o   The CoV members recommend future CoVs include more small business owners, particularly small businesses that have received NSF SBIR grants.
   - o   The CoV appreciated meeting with the IIP PDs, and would recommend future CoVs have additional time with those PDs, either prior to the CoV meetings, or during the CoV meetings.
   - o   The CoV recommends that IIP prepare a self-assessment in answering all questions in the CoV Report Template, and that self-assessment be provided to the CoV at the same time the CoV Charge is provided.   This will allow the CoV a review of IIP's continuous improvement plan, and will allow future CoVs to provide richer and more valuable advice to IIP as their management of the program.
   - o   The CoV recommends future CoVs be provided with:
     - ▪   Assessment data for the portfolio of awards, e.g., the broader economic impact.
     - ▪   Breakdown of SBIR vs STTR data.
   - o   The CoV recommends future CoVs be provided more direction on how to review jackets, and be given a template to fill in as they review individual jackets. This template will make it easier to understand the information CoV members should look for, and easier for the CoV member to merge their observations from individual jackets into this report template, especially Parts I and II.

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SIGNATURE BLOCK:

For the SBIR/STTR Programs Committee of Visitors
Tom Knight
Chair