

# **Nuclear Physics SBIR/STTR Program :**

SBIR/STTR Exchange Meeting  
August 7-8, 2018  
Rockville, MD

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# Outline

- NP Mission Statement
  - Executing the Mission Statement
- Exchange meeting goals and agenda
- DOE SBIR/STTR organization and administration
- NP SBIR/STTR Applications and Grants (FY 2018)
  - Funding trends
- NP SBIR Topics
  - Sequential Phase II A and IIB
- The DOE NP SBIR/STTR Program in FY2019
  - New commercialization and outreach efforts
- A note on Final Reports
- Presentation Notes
- Expectations for Professional Conduct
- Conclusions

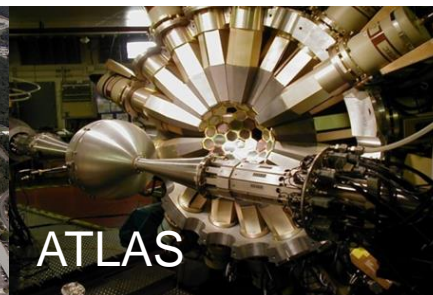


# Nuclear Physics Mission

Discovering, exploring, and understanding all forms of nuclear matter

## The Scientific Challenges

- The existence and properties of nuclear matter under extreme conditions, including that which existed at the beginning of the universe
- The exotic and excited bound states of quarks and gluons, including new tests of the Standard Model
- The ultimate limits of existence of bound systems of protons and neutrons
- Nuclear processes that power stars and supernovae, and synthesize the elements
- The nature and fundamental properties of neutrons and the neutrino and their role in the evolution of the early universe





# NP Isotope Program Mission

The **mission** of the DOE Isotope Program is threefold:

- Produce and/or distribute radioactive and stable isotopes that are in short supply, associated byproducts, surplus materials and related isotope services.
- Maintain the infrastructure required to produce and supply isotope products and related services.



Isotope Production  
Facility (LANL)



Brookhaven Linac  
Isotope Producer

- Conduct R&D on new and improved isotope production and processing techniques which can make available new isotopes for research and applications.
- This can relate to the Isotope Topic
- Attend Dr. Ethan Balkin's presentation for more details

# The NP Mission translates into SBIR/STTR Topics

- NP's major physics research areas are:
  - Heavy Ion Nuclear Physics
  - Medium Energy Physics
  - Nuclear Structure-Nuclear Astrophysics } Low Energy Nuclear Physics
  - Fundamental Symmetries
  - Nuclear Theory (**not involved in the SBIR/STTR Program**)
  - Isotope Development and Production for Research and Applications
  - Accelerator Science and Technology

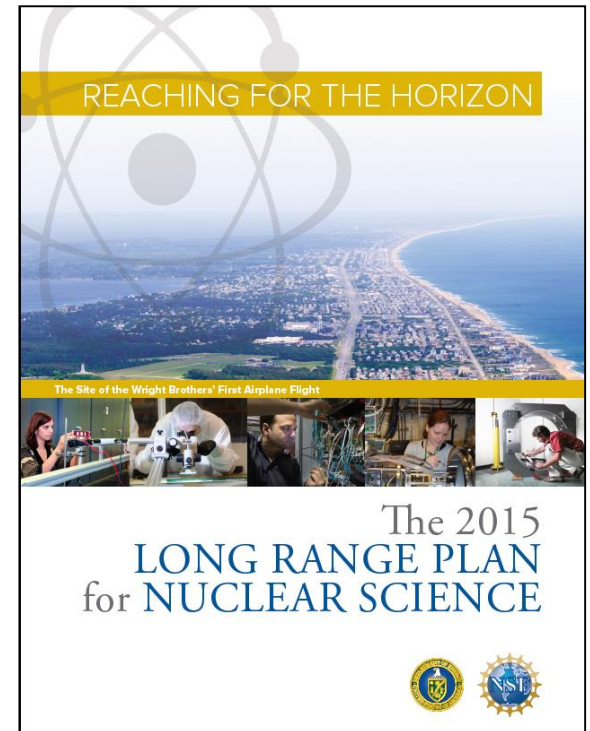


# The 2015 Long Range Plan for Nuclear Science recommendations helps prioritize our R&D

The recommendations provide input to the SBIR/STTR Topics

- ***The highest priority in this 2015 Plan is to capitalize on the investments made.***
- ***We recommend the timely development and deployment of a U.S.-led ton-scale neutrinoless double beta decay experiment.***
- ***We recommend a high-energy high-luminosity polarized EIC as the highest priority for new facility construction following the completion of FRIB.***
- ***We recommend increasing investment in small-scale and mid-scale projects and initiatives that enable forefront research at universities and laboratories.***

[http://science.energy.gov/~media/np/nsac/pdf/2015LRP/2015\\_LRPNS\\_091815.pdf](http://science.energy.gov/~media/np/nsac/pdf/2015LRP/2015_LRPNS_091815.pdf)



NP is making progress towards implementing these recommendations.



# SBIR/STTR Exchange Meeting

- NP is seeking to effectively assess the performance of NP supported SBIR/STTR projects in contributing to the NP mission and goals. Started in FY2010, the Exchange meeting is designed to serve that purpose and to achieve the following goals:
  - To **provide a platform** for small businesses to present the status of NP-supported Phase II grant work to the NP community and Federal Program Managers.
  - To offer an opportunity to **exchange information** regarding the **companies' capabilities** and the technical needs of the NP programs.
  - To **strengthen the ties** of the SBIR/STTR businesses **with the community** and enhance the possibilities for commercialization.
- For this year's meeting, all Phase II awardees at the end of Year-1, Year-2 (started in FY17 and 16) and awards still active under "no cost extension" are invited. A total of **27** SBIR/STTR presentations will be given in 2 days.
- FY 2018 Phase II awardees are invited as participants only and will be invited to present in the next two year's meetings.
- Also included are four keynote talks related to the NP user facilities, their capabilities and needs in view of the NP SBIR/STTR program.
- A talk by the DOE SBIR/STTR Program office's AD will be at the end of the meeting.
- Abstracts for the PI presentations are available:  
[http://science.energy.gov/~media/np/pdf/sbir%20sttr/SBIR\\_STTR\\_2018/Presentation\\_Abstracts.pdf](http://science.energy.gov/~media/np/pdf/sbir%20sttr/SBIR_STTR_2018/Presentation_Abstracts.pdf)

# 2018 Exchange Meeting Agenda (Day 1)

## Meeting Agenda-Day 1

Time	Dur. (min)	Grant Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
<b>Tuesday, August 7, 2018</b>						
8:30 AM	5	Welcome and Opening Remarks	Gillo, Jehanne	DOE, Office of Nuclear Physics		
8:35 AM	5	Introductory Remarks	Farkhondeh, Manouchehr	DOE, Office of Nuclear Physics		
8:40 AM	35	NP SBIR/STTR Program Overview	Shinn, Michelle	DOE, Office of Nuclear Physics		
9:15 AM	20	A Magnetized Injector for Electron Cooling Applications	Mayes, Christopher	Xelera Research LLC, NY	Accelerator	End Year 1
9:35 AM	20	Low Cost, High-Density Digital Electronics for Nuclear Physics	Skulski, Wojciech	SkuTek Instrumentation, NY	Electronics	End Year 1/PH IIB
9:55 AM	20	Diamond Strip Detectors for Charged Particle Tracking	Tabeling, Joseph	Applied Diamond, Inc., DE	Instrumentation	End Year 1
10:15 AM	25	Coffee Break				
10:40 AM	35	NP Low Energy Facilities and the SBIR/STTR Program	Bollen, Georg	Michigan State University		
11:15 AM	20	Software-Driven Network Architecture for Synchronous Data	Hulett, Terry	Crossfield Technology LLC, TX	Software	End Year 1
11:35 AM	20	Development of Gen-II LAPPDTM Systems For Nuclear Physics Experiments	Foley, Michael	Incom Inc., MA	Instrumentation	End Year 1
11:55 AM	75	Lunch Break (on your own)				
1:10 PM	35	Jefferson Lab and the NP SBIR/STTR Program	Spata, Michael	Thomas Jefferson Accelerator National Facility		
1:45 PM	20	Isotopic Carbon Graphene Foil Targets	Pavlovsky, Igor	Applied Nanotech, Inc., TX	Instrumentation	End Year 1
2:05 PM	20	High power, high repetition rate, 700–850 nm pulsed laser	Tian, Wenyan	Q-Peak, Inc., MA	Accelerator	End Year 1
2:25 PM	20	Design and Fabrication of the ASoC: a System-on-Chip Data Acquisition System	Mostafanezhad, Isar	Nalu Scientific, LLC, HI	Electronics	End Year 1
2:45 PM	20	Pixel Array Germanium Detectors for Nuclear Physics	Kiser, Matthew	PHDs Co., TN	Instrumentation	End Year 1
3:05 PM	25	Coffee Break				
3:30 PM	20	Novel Position-Sensitive Particle Tracking Gas Detector	Friedman, Peter	Integrated Sensors, OH	Instrumentation	End Year 2/NCE
3:50 PM	20	Dynamic friction in magnetized electron coolers for relativistic beams	Bruhwieler, David	RadiaSoft LLC, CO	Accelerator	End Year 1
4:10 PM	20	A novel ionizing particle beam fluence and position detector array using the Micromegas technology with multi-coordinate readout	Holmes, Jason	Radiation Detection and Imaging Technologies, LLC, AZ	Instrumentation	End Year 1
4:30 PM	20	Robust Wire Scanner for High Intensity Beam Profile Diagnostics	Ruelas, Marcos	Radiabeam Tech., LLC, CA	Accelerator	End Year 1
4:50 PM	20	Flat Field Emitter Based on Ultrananocrystalline Diamond (UNCD) Film for SRF Technology (Topic Nuclear Physics)	Montgomery, Eric	Euclid Techlabs, LLC, OH	Accelerator	End Year 2/NCE
5:10 PM	60	Optional Gathering to Discuss Challenges and Best Practices for Commercialization				

Given the positive feedback, we are continuing the informal discussion between interested participants on best practices for commercialization at the end of the first day.



# 2018 Exchange Meeting Agenda (Day 2)

## Meeting Agenda-Day 2

Time	Dur. (min)	Grant Title	Speaker	Organization	NP SBIR/ STTR Topic	Grant Status
<b>Wednesday, August 8, 2018</b>						
8:30 AM	20	Design and manufacture of tunable permanent magnet based quadrupole for next generation electron-ion colliders	Jasinski, Melania	Electron Energy Corporation, PA	Accelerator	Year 1/FastTrack
8:50 AM	20	Scintillating Bolometer Crystal Growth and Purification for Neutrinoless Double Beta Decay Experiments	Tower, Jason	Radiation Monitoring Devices, Inc., MA	Instrumentation	End Year 1
9:10 AM	20	Long length welded NbTi CIC superconducting Cable for Accelerator Applications	Tomsic, Michael	Hyper Tech Research, Inc., OH	Accelerator	End Year 1
9:30 AM	20	Acid-Free Electropolishing of SRF Cavities	Taylor, E. Jennings	Faraday Technology, Inc., OH	Accelerator	End Year 2/NCE
9:50 AM	20	Data Processing Electronics for Silicon Photomultipliers	Skulski, Wojciech	SkuTek Instrumentation, NY	Electronics	End Year 2/NCE
10:10 AM	25	<b>Coffee Break</b>				
10:35 AM	20	Low Z Thin Film Stripper Foils, Targets and X-Ray Windows	Kumar, Nalin	UHV Technologies, Inc., KY	Instrumentation	End Year 2
10:55 AM	35	<b>The Relativistic Heavy Ion Collider Facility and its SBIR/STTR Opportunities</b>	Liu, Chuyu	Brookhaven National Laboratory		
11:30 AM	20	A novel injection-locked amplitude-modulated magnetron at 1497	Neubauer, Michael	Muons, Inc., IL	Accelerator	End Year 2/NCE
11:50 AM	75	<b>Lunch Break (on your own)</b>				
1:05 PM	20	Thermo-Mechanically Stable Tungsten Powders as Solid Catchers for the Fast Release of Stopped Rare Isotopes	Sampathkumaran, Uma	InnoSense LLC, CA	Instrumentation	End Year 2/NCE
1:25 PM	35	<b>DOE Isotope Program and Facilities and the SBIR/STTR Program</b>	Balkin, Ethan	DOE Office of Nuclear Physics & DOE Isotope Program		
2:00 PM	20	Charge collection physics in very large diameter germanium crystals	Hull, Ethan	PHDs Co., TN	Instrumentation	End Year 2
2:20 PM	20	Refractory Oxides with Tunable Porosity and Geometry as Versatile Fast-Release Solid Catchers for Rare Isotopes	Sampathkumaran, Uma	InnoSense LLC, CA	Instrumentation	End Year 2/PH IIB
2:40 PM	25	<b>Coffee Break</b>				
3:05 PM	20	Multi-scale modeling for beam-beam depolarization	Cowan, Benjamin	Tech-X Corporation, CO	Accelerator	End Year 2
3:25 PM	20	Radiation Hard High Speed Camera System for Accelerator Beam Diagnostics	Engelman, Matt	Alphacore Inc., AZ	Instrumentation	End Year 2
3:45 PM	20	GaN Class F Power Amplifier for Klystron Replacement	Smirnov, Alexei	RadiaBeam Systems, CA	Accelerator	End Year 2
4:05 PM	35	<b>Update on the Department of Energy SBIR/STTR Program, Q/A</b>	Oliver, Manny	DOE, SBIR/STTR Office		
4:40 PM	0	<b>Adjourn</b>				

# SBIR/STTR Program

**SBIR:** Small Business Innovation Research      **STTR:** Small Business Technology Transfer.

- SBIR:** Set-aside program for U.S. small businesses (SB) to engage in Federal Research and Development (R&D) with potential for commercialization. (Participations: **SB: minimum 66 % for Phase I and 50% for Phase II, Research Institution (RI): optional** )
- STTR:** Set-aside program to facilitate cooperative R&D between SB and U.S. RI with potential for commercialization. (Participations: **SB: minimum 40%, RI: minimum 30%**)
- 
**“Both”:** submitted for consideration as SBIR or STTR (both). Must satisfy the minimum participation requirements listed above for both SBIR and STTR.
- Congressionally-mandated programs, funded by a small percentage of the extramural R&D budget set aside within each DOE technical program that participates.
- 2016 reauthorization bill has provided funding for the program until September 2022**

	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	----	FY2022
SBIR	0.0270	0.028	0.029	0.0300	0.0320	0.0320	----	0.0320
STTR	0.0035	0.004	0.004	0.0045	0.0045	0.0045	----	0.0045
<b>Total</b>	<b>3.05%</b>	<b>3.20%</b>	<b>3.30%</b>	<b>3.45%</b>	<b>3.65%</b>	<b>3.65%</b>	----	<b>3.65%</b>



# The DOE SBIR/STTR Phases

## PHASE I: FEASIBILITY, PROOF OF CONCEPT

- Award Amount: \$150,000 (guideline), \$225,000 (max.)
- Project Duration: 6-12 months



## PHASE II: CONTINUE R/R&D FOR PROTOTYPES OR PROCESSES

- Award Amount: \$1,000,000 (guideline), \$1,500,000 (max.)
- Project Duration: 2 years



## SEQUENTIAL PHASE IIA OR IIB: CONTINUE R/R&D FOR PROTOTYPES OR PROCESSES

- **PHASE IIA:** FOR CERTAIN PROTOTYPES, PRODUCTS, OR PROCESSES THAT NEED MORE DEVELOPMENT
- **PHASE IIB:** FOR R&D FUNDING REQUIRED TO TRANSITION AND INNOVATION TOWARDS COMMERCIALIZATION.
- Award Amount: \$1,000,000
- Project Duration: 2 years

## PHASE III: COMMERCIALIZATION

- Federal or Private Funding (non-SBIR/STTR funds)
- No dollar or time limits



# Current SBIR/STTR award funding levels and requirements on Research Institution participation

## Phase I

Grant	Max award (\$k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	150	Min 66%	Optional
STTR	150	Min 40%	Min 30%

## Phase II

Grant	Max award (\$k)	Small Business (Level of Effort)	Research Institution (Level of Effort)
SBIR	1000	Min 50%	Optional
STTR	1000	Min 40%	Min 30%



# Phase I Funding Opportunity Announcements Participating DOE Programs (FY 2018)

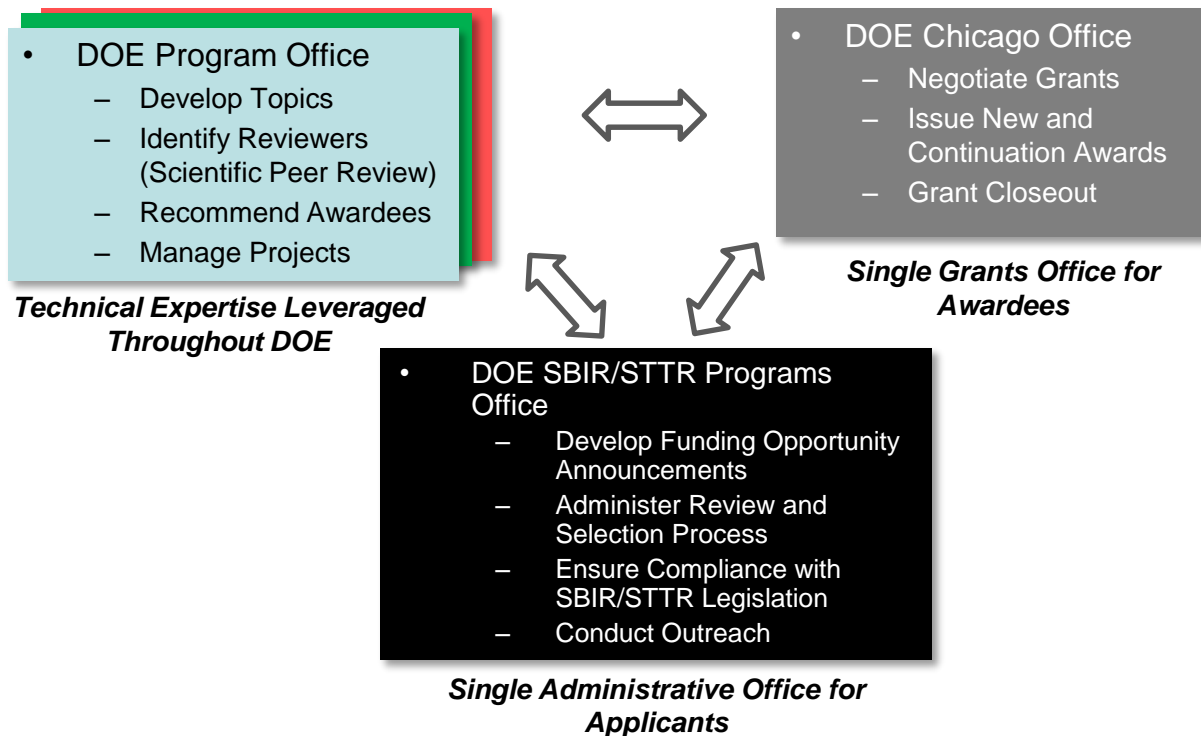
## Phase I Release 1

- Office of Advanced Scientific Computing Research (ASCR)
- Office of Basic Energy Sciences (BES)
- Office of Biological and Environmental Research (BER)
- **Office of Nuclear Physics (NP)**

## Phase I Release 2

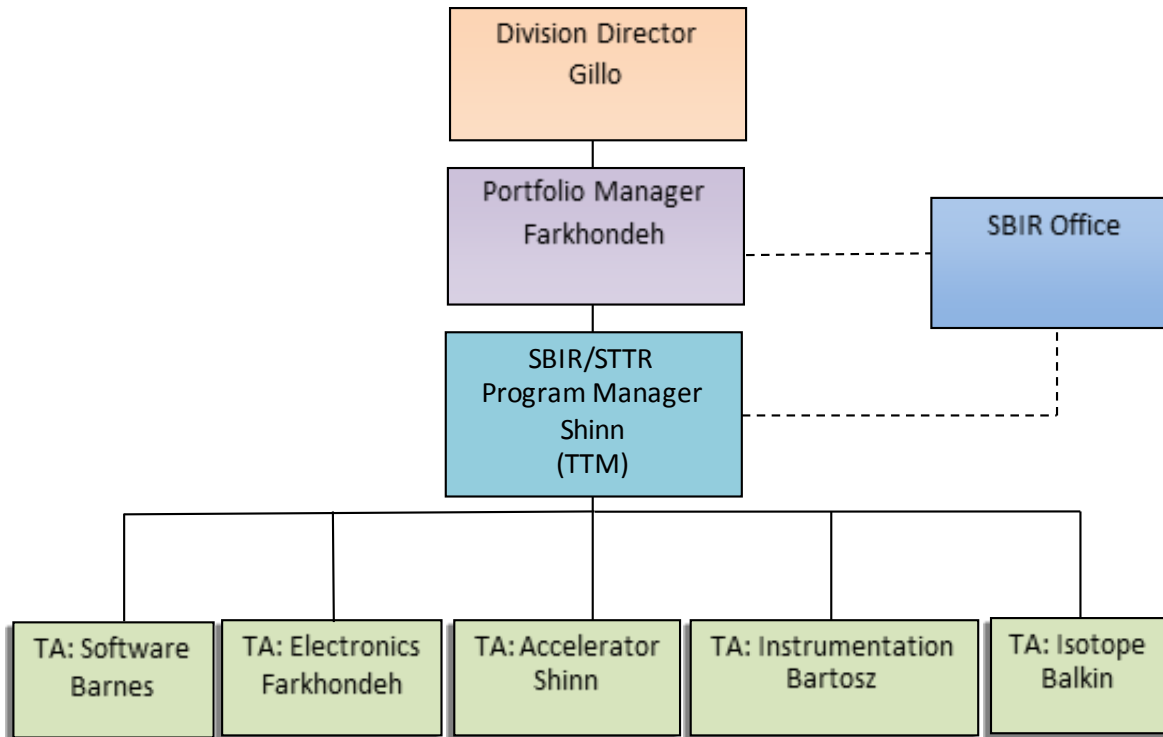
- Office of Defense Nuclear Nonproliferation (NA)
- Office of Electricity Delivery and Energy Reliability (OE)
- Office of Energy Efficiency and Renewable Energy (EERE)
- Office of Environmental Management (EM)
- Office of Fossil Energy (FE)
- Office of Fusion Energy Sciences (FES)
- Office of High Energy Physics (HEP)
- Office of Nuclear Energy (NE)

# Operation of the DOE SBIR and STTR Programs



- NP recommends what R&D gets funded, but is otherwise freed of much of the administration of those funds.

## NP SBIR/STTR Org. Chart: (10/27/2016)



**Technical Topic Manager (TTM)**

**Activities**

- Communicate w/ SBIR Office
- Prepare annual solicitation
- Chair 1<sup>st</sup> step panel review
- Rank proposals
- Recommend funding
- Visit companies
- Read progress and final reports
- 2<sup>nd</sup> year continuation

**Topic Associate (TA)**

**Activities for Assigned Topics**

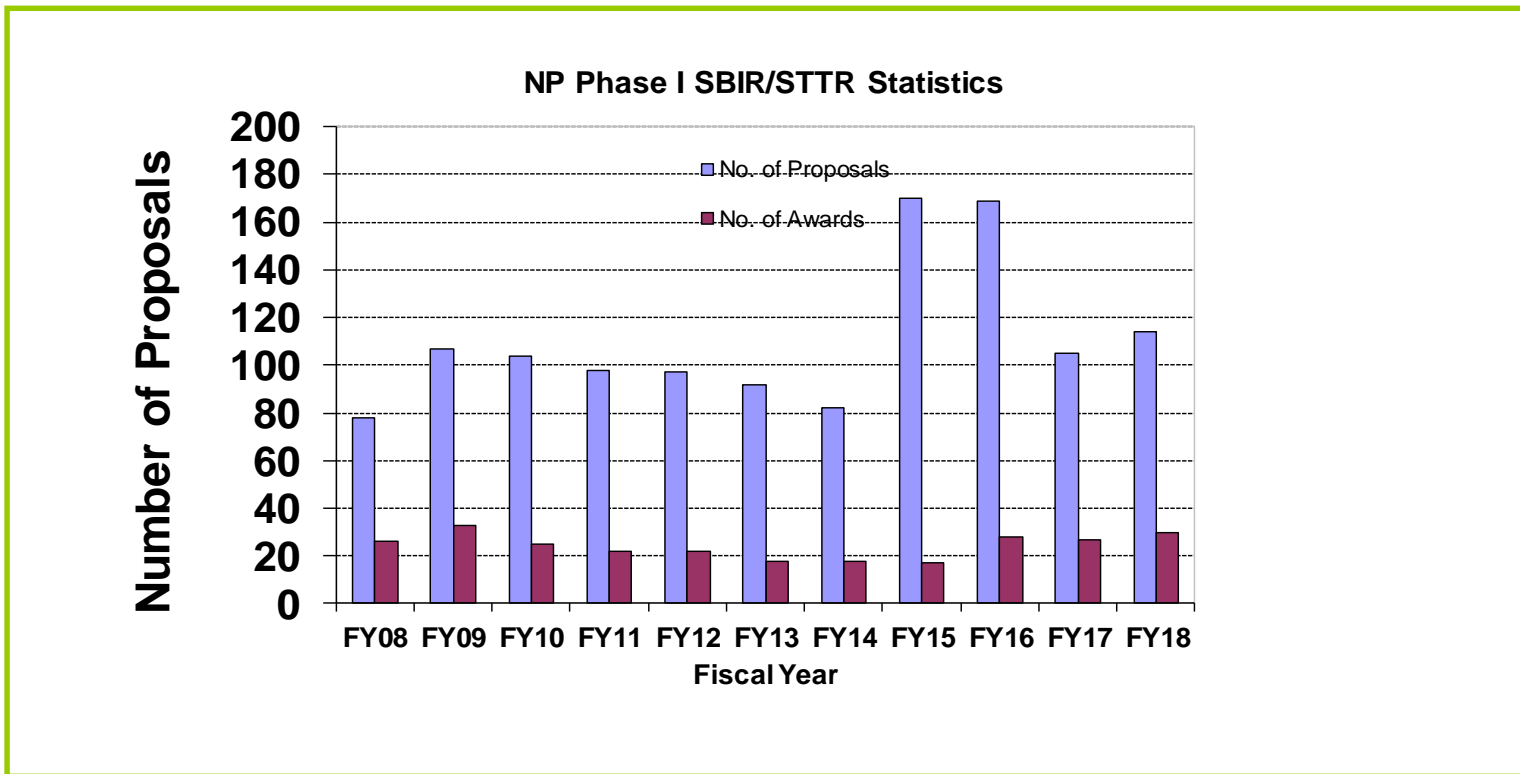
- Provide input to annual solicitation
- \*Assign reviewers
- \*Assess proposals
- Manage assigned grants
- Read reports assigned

\*Time Sensitive tasks



# NP Phase I SBIR/STTR Applications and Awards

- NP received a Total of **222** LOI and **114** phase I proposals in FY 2018, with **519** review requests for a total of **~ 235** mail reviews. Total of **30** proposals funded. (cf 27 in FY16)
- Processing the number of LOIs and proposal review process requires the full-time involvement of a Program Manager, with continued assistance from the Portfolio Manager and the Topic Associates (TA).

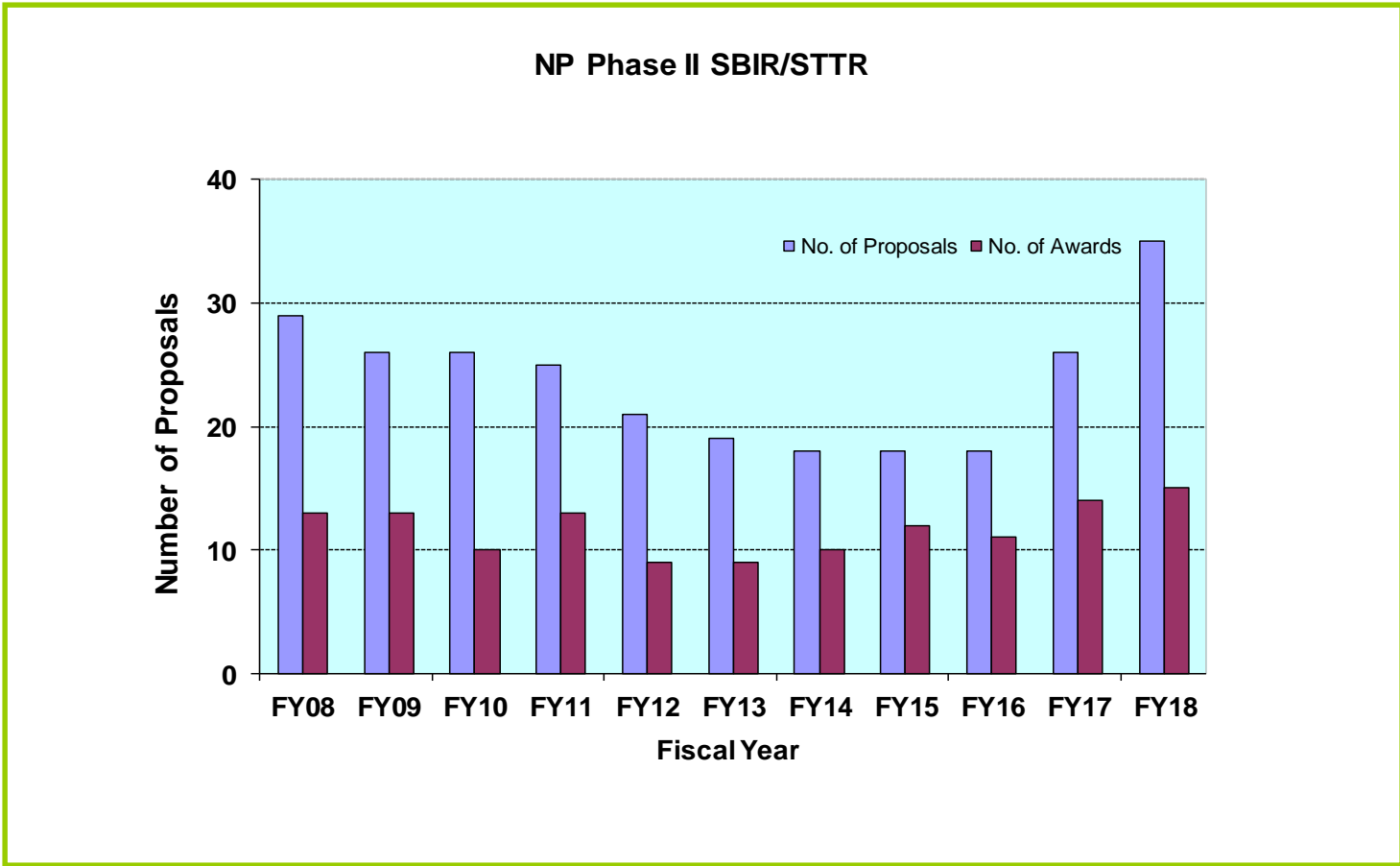






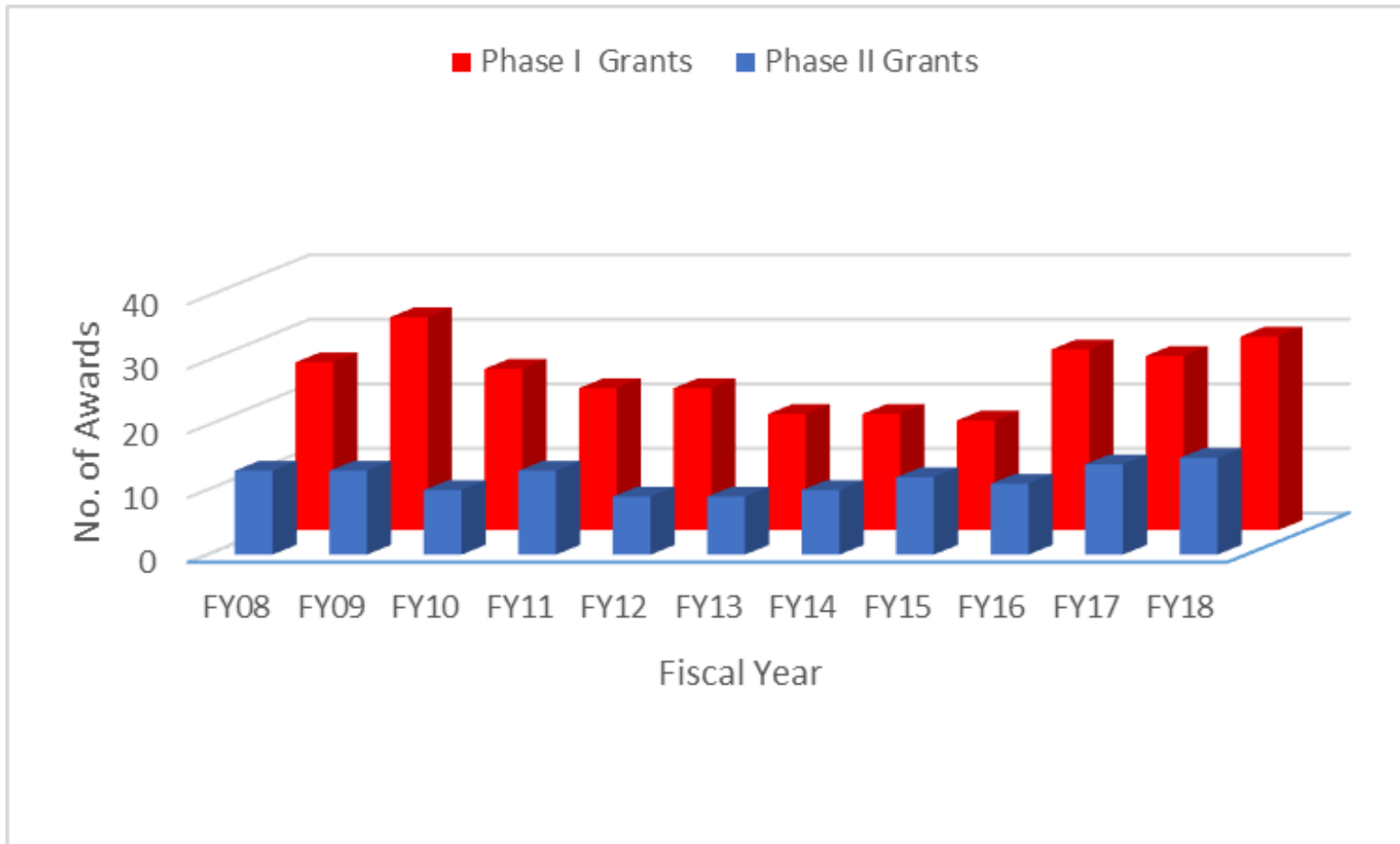
# NP Phase II SBIR/STTR Applications and Awards

The increased set aside level that occurred from FY13-16 and the last two year's authorizations has offset the decrease in awards that occurred after the FY 2011 change in maximum SBIR award amounts from \$750K to \$1M.





# NP SBIR/STTR Award Trend (FY08 – FY18)



- Total value of grants funded FY 2014 - 2018: ~\$81M
- 118 companies funded (some multiple times) during this time span.



# NP yearly SBIR/STTR topic development process

- Start with last year's published topic document and make initial revisions based on a year-round observation of needs by Program Managers and NP community input as well as,
- Request input for each topic from subject matter experts within the NP community,
- Collect and implement all inputs on existing subtopics. Add and/or delete subtopics as necessary, based on work funded and advancements in the community.
- Review HEP and BES Topics to insure we don't unnecessarily duplicate-fund the same R&D,
- Submit the revised topics to the DOE SBIR/STTR office and,
- After further formatting iterations with the SBIR/STTR office, the topics are published in mid-July
- The solicitation is published as a Funding Opportunity Announcement (FOA) typically around the middle of August
- Letters of Intent to submit a proposal are due the day after Labor Day
- Proposals are due around the middle of October

# NP SBIR/STTR Topics for FY 2018/2019

- Software and Data Management
  - Electronics Design and Fabrication
  - Accelerator Technology
  - Instrumentation, Detection Systems and Techniques
  - Isotope Science and Technology
- 
- Once again there was a considerable amount of subtopic revision, based on community input.
  - Funding Notes: There is no fixed set aside for each topic. Proposals from all 5 topics compete with each other and highly ranked applications determined to have the most impact are funded.

# Sequential II A and IIB

2012 SBIR/STTR Reauthorization permitted agencies to issue **sequential Phase II awards**

- 15 USC 638 (ff) Additional SBIR and STTR awards. (1) Express authority for awarding a sequential Phase II award. A small business concern that receives a Phase II SBIR award or a Phase II STTR award for a project remains eligible to receive 1 additional Phase II SBIR award or Phase II STTR award for continued work on that project.
- Only Phase II awardees are eligible
- Only 1 additional Phase II award may be made per Phase II project

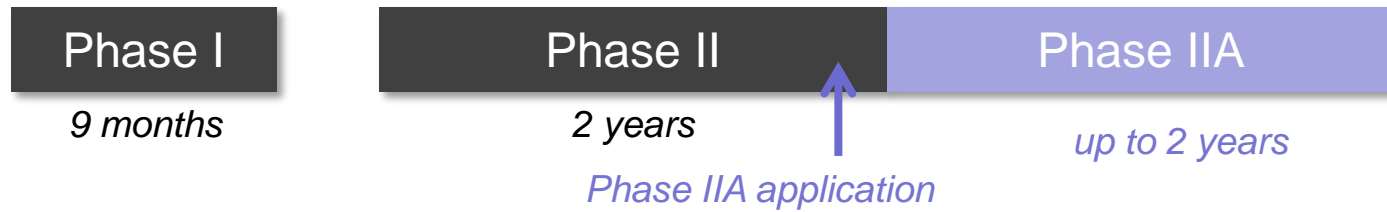
**Invitation needed** → **Phase IIA:** For certain prototypes, products, or processes that need more than a single Phase II award. Starts immediately upon completion of the Phase II.

- *DOE NP Program Managers will select the topics/subtopics for which Phase IIA applications will be accepted (By subtopic invitation only)*

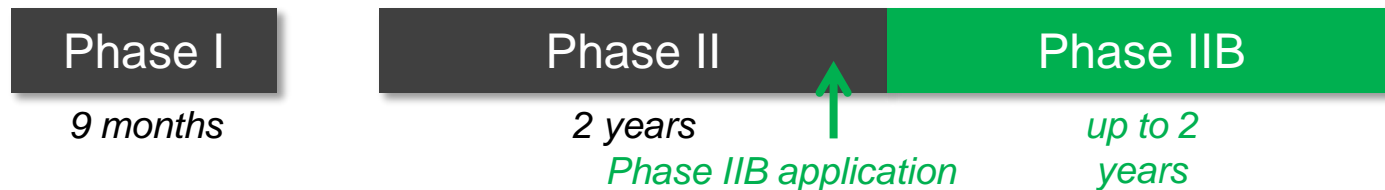
**No Invitation needed** → **Phase IIB:** For R&D funding required to transition an innovation towards commercialization. Starts immediately after completing a Phase II or up to 1 year later.

**In the FY 2018 Phase II cycle: NP received 5 Phase IIB applications, peer reviewed all and 0 were funded. We received 4 Phase IIA applications and funded 1 of them. Sequential IIA and B compete with new Phase II applications.**

# Sequential Phase IIA



# Sequential Phase IIB



# No Fund Extensions and Sequential Phase II Eligibility

- A company can only receive a Sequential Phase II award if their Phase II project has completed.
  - Phase IIA applicants should not request no fund extensions
  - Phase IIB applicants should not request no fund extensions if they are still working on their Phase II project at the time of application.



# NP SBIR/STTR Program Updates - FY18/19

- We wish to better connect businesses to the NP community.
  - Plan to establish a publications page, arranged by Topic, on our website.
  - You'll see a request from me soon.
- We provide the link to the SBIR/STTR Office awards page to all reviewers, as well as Lab managers and Center points of contact.
- Holding Phase I project kickoff meetings by request. Specifically reaching out to PIs who were new to the NP SBIR/STTR Program.
- We are contemplating some changes to this meeting –
  - Returning to 25 min PI talks will force this meeting to 2.5 days or it means dropping the talks from PIs who are working under a NCE.
  - This meeting conflicts with other professional conferences, user workshops, and summer vacations. Is the last week of August better?
    - Send responses to me and Brenda ([SC.SBIR-STTR\\_Exchange@science.doe.gov](mailto:SC.SBIR-STTR_Exchange@science.doe.gov))





## Notes on “Final Reports”

- When preparing the “Final Report” for your grant, make sure the following items are included in addition to what the instruction explicitly asks for.
  - a. List the original tasks** with brief description of each as they were originally proposed in the grant application.
  - b. A short description of accomplishments** for each task indicating the degree to which each task was accomplished. Include a short description if a listed task was not accomplished or was modified.
  - c. Add to the cover page the phrase “Grant supported by DOE Office of Nuclear Physics”.**
- These items should add only a few pages to the report but provide a valuable reference and structure in the report by connecting the original tasks to the accomplishments.
- Reports are normally returned for revisions if above items not included.

# Presentation Notes

- We have a tight agenda and must stay on time for each presentation.
- Sessions will start sharply at the time stated on the agenda. Please take your seat a few minutes before the start of each session to allow the first presentation to begin on time.
- Make sure your presentation file is uploaded on the display laptop before the start of your session. We do not want you to use your own computer.
- For Q&A sessions, please make your comments/questions short and use the coffee and lunch breaks for follow ups.

Total presentation (min)	Presentation (min)	Q&A (min)	5 and 2 minutes warning (min)
35	25	10	20 & 23
20	17	3	12 & 15



# Expectations for Professional Behavior

The Office of Science is exploring the development of an official statement regarding expectations for how individuals it interacts with should conduct themselves.

In the interim, The Office of Nuclear Physics embraces the Code of Conduct adopted by the American Physical Society, and it will remind attendees at meetings it convenes, including review panels, site visits, etc., that it expects a standard for professional behavior that is consistent with the APS declaration.

## The APS Code of Conduct

It is the policy of the American Physical Society (APS) that all participants, including attendees, vendors, APS staff, volunteers, and all other stakeholders at APS meetings will conduct themselves in a professional manner that is welcoming to all participants and free from any form of discrimination, harassment, or retaliation. Participants will treat each other with respect and consideration to create a collegial, inclusive, and professional environment at APS Meetings. Creating a supportive environment to enable scientific discourse at APS meetings is the responsibility of all participants.

Participants will avoid any inappropriate actions or statements based on individual characteristics such as age, race, ethnicity, sexual orientation, gender identity, gender expression, marital status, nationality, political affiliation, ability status, educational background, or any other characteristic protected by law. Disruptive or harassing behavior of any kind will not be tolerated. Harassment includes but is not limited to inappropriate or intimidating behavior and language, unwelcome jokes or comments, unwanted touching or attention, offensive images, photography without permission, and stalking.

# Conclusions

- NP uses the Congressionally-mandated SBIR/STTR Program –
  - To fund R&D that benefits the NP community
  - To build and sustain a US-based commercial infrastructure that serves society in areas other than nuclear science
- Three years of funding is equivalent to that of a large research effort
  - With input from Program Managers and the community, the NP SBIR/STTR program uses those funds for R&D that advances our core technologies as well as new initiatives
- NP uniquely fosters the connection between the NP community and the small businesses that serve it through an annual meeting
  - This in turn enhances opportunities for commercialization