



***DOE's  
Small Business Innovation Research (SBIR) and Small  
Business Technology TRansfer (STTR) Programs***

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**Advanced Scientific Computing Advisory Committee**

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**Arlington, VA**

# Outline

- Overview of the DOE SBIR/STTR Programs
- Recent Operational Changes
  - Phase 0 Program
  - Streamlining the Application and Award Process
  - Sequential Phase II Awards
  - ASCR SBIR/STTR Research Topic Innovations
- Assessment of the DOE SBIR/STTR Programs





# OVERVIEW OF THE DOE SBIR/STTR PROGRAMS

# Program Goals

## **Small Business Innovation Research (SBIR)** *est. 1982*

- Stimulate technological innovation
- Use small business to meet Federal R&D needs
- foster and encourage participation by socially and economically disadvantaged small businesses (SDBs), and by woman-owned small businesses (WOSBs), in technological innovation
- Increase private-sector commercialization of innovations derived from Federal R&D

## **Small Business Technology Transfer (STTR)** *est. 1992*

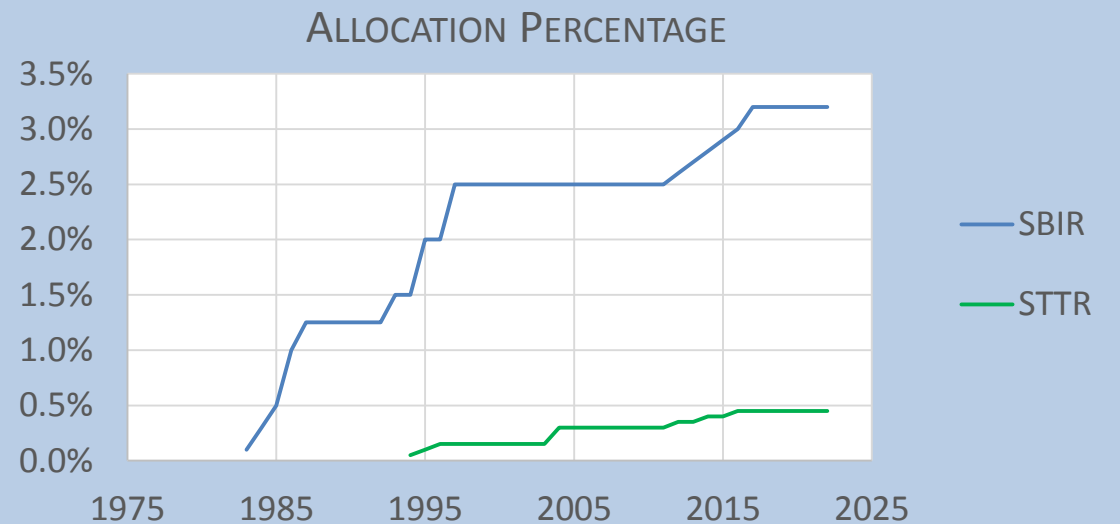
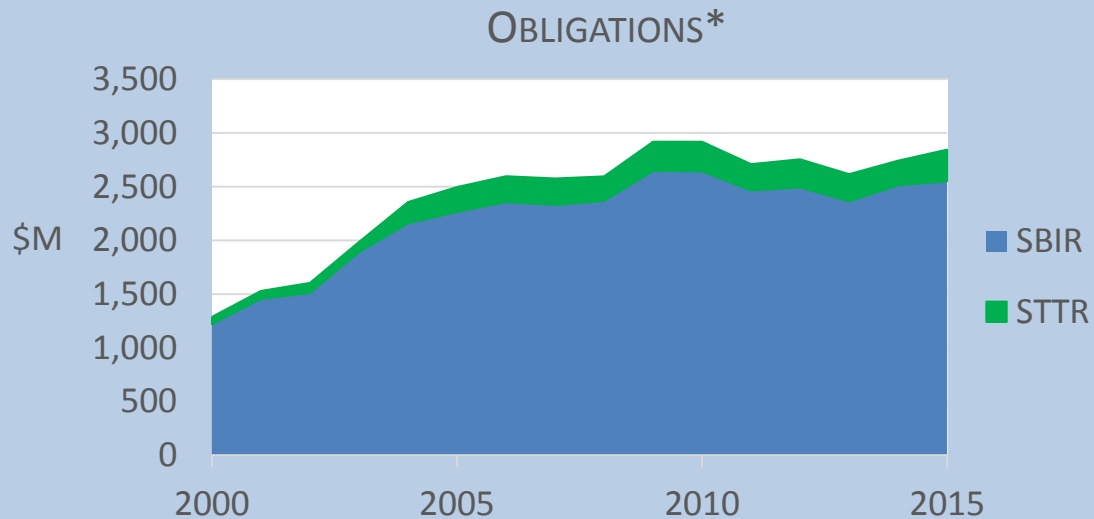
- Stimulate and foster scientific and technological innovation through cooperative research and development carried out between small business concerns and research institutions
- Foster technology transfer between small business concerns and research institutions

*SBIR and STTR were reauthorized on December 23, 2016 (P.L. 114-840) through September 30, 2022*



# SBIR & STTR Funding Levels

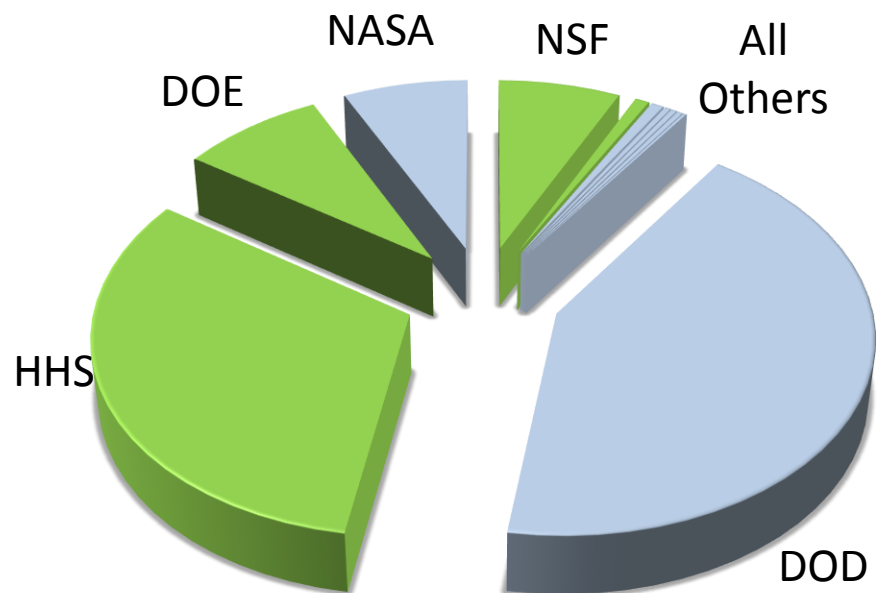
- Agencies allocate a percentage of their extramural R/R&D budgets for the SBIR & STTR programs
  - SBIR: 3.2% (FY 2018), for agencies with >\$100M in extramural R/R&D
  - STTR: 0.45% (FY 2018), for agencies with >\$1B in extramural R/R&D
- Congress has increased the allocation percentages since the programs were initiated



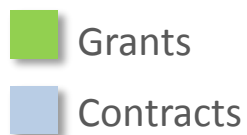
\*source: SBIR.gov, 8/22/2016



# SBIR/STTR Budgets by Agency, FY2015



~ \$2.5B in FY2015 across all agencies



| Agencies with SBIR and STTR Programs  | Budget     |
|---|------------|
| Department of Defense (DOD)   | \$ 1.070 B |
| Department of Health and Human Services (HHS), including the National Institutes of Health (NIH)*   | \$797.0 M  |
| Department of Energy (DOE), including Advanced Research Projects Agency – Energy (ARPA-E)   | \$206.1M   |
| National Aeronautics and Space Administration (NASA)  | \$ 180.1 M |
| National Science Foundation (NSF)   | \$176.0 M  |
| Agencies with SBIR Programs   | Budget     |
| U.S. Department of Agriculture (USDA)   | \$20.3M    |
| Department of Homeland Security (DHS): Science and Technology Directorate (S&T) and Domestic Nuclear Detection Office (DNDO)              | \$17.7 M   |
| Department of Commerce: National Oceanic and Atmospheric Administration (NOAA) and National Institute of Standards and Technology (NIST)* | \$8.4M     |
| Department of Transportation (DOT)  | \$7.9 M    |
| Department of Education (ED)  | \$7.5 M    |
| Environmental Protection Agency (EPA)   | \$4.2 M    |

\*NIH also issues contracts

# 3 Phases

## PHASE I: FEASIBILITY, PROOF OF CONCEPT

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



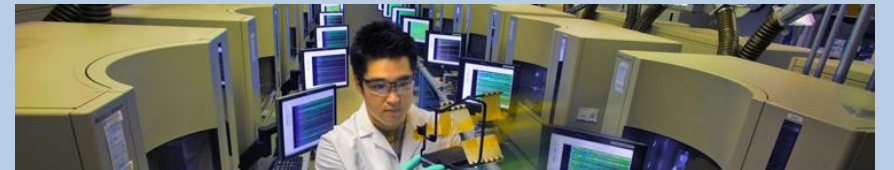
## PHASE II: CONTINUE R/R&D FOR PROTOTYPES OR PROCESSES

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



## PHASE III: COMMERCIALIZATION

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



# U. S. Department of Energy Mission

- **The mission of the Department of Energy** is to ensure America's security and prosperity by addressing its energy, environmental, and nuclear challenges through transformative science and technology solutions.
  - **Goal 1:** Catalyze the timely, material, and efficient transformation of the nation's energy system and secure U.S. leadership in **energy** technologies.
  - **Goal 2:** Maintain a vibrant U.S. effort in **science and engineering** as a cornerstone of our economic prosperity, with clear leadership in strategic areas.
  - **Goal 3:** Enhance **nuclear security** through defense, nonproliferation, and environmental efforts.

## Program Offices Participating in the DOE SBIR/STTR Programs

Electricity Delivery & Energy Reliability

Energy Efficiency & Renewable Energy

Fossil Energy

Nuclear Energy

Advanced Scientific Computing Research

Basic Energy Sciences

Biological & Environmental Research

Fusion Energy Sciences

High Energy Physics

Nuclear Physics

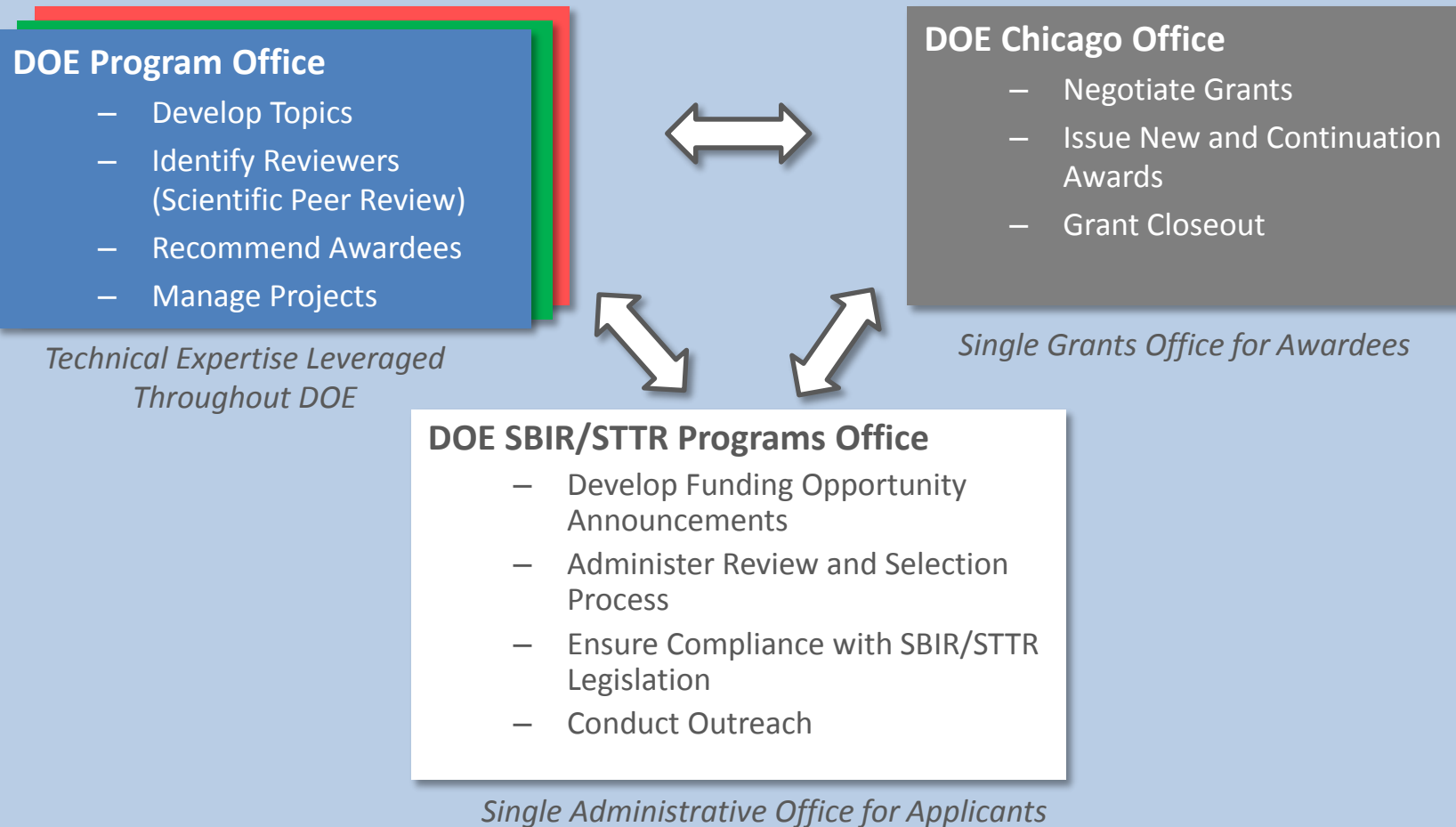
Defense Nuclear Nonproliferation

Environmental Management





# Operation of the DOE SBIR and STTR Programs





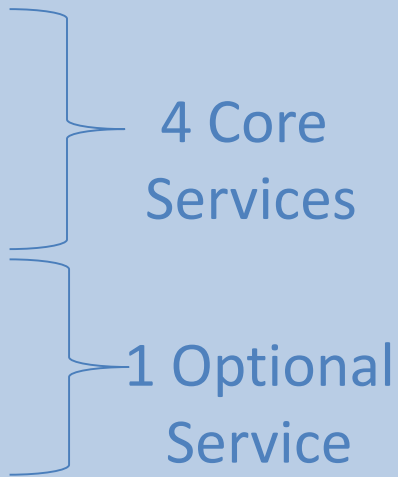
# RECENT OPERATIONAL CHANGES

# PHASE 0 PROGRAM

- MOTIVATION
  - Address one of the four programs goals for the SBIR/STTR programs:
    - *Foster and encourage participation socially and economically disadvantaged small businesses and women-owned small businesses in technological innovation*
  - Address National Academies assessment of the DOE SBIR/STTR Programs to improve participation by under-represented (UR) groups
- FUNDING AUTHORITY
  - Administrative Funding pilot (use of SBIR funds)
- GOAL
  - Increase the number of **responsive, high quality** proposals submitted to the DOE from:
    - Women-owned small businesses
    - Socially and economically disadvantaged small businesses (minority-owned)
    - Small businesses in states with historically low SBIR/STTR applications to the DOE



# DOE Phase 0 Services

- Implemented in FY 2015
  - Contractor-Provided Services: 4 core and 1 optional
    - Letter of Intent (LOI) writing assistance
    - Phase I proposal prep., review, & registration assistance
    - Small business development training & mentoring
    - Communication and market research assistance
    - Technology advice and consultation
    - Indirect rate and financial information
    - Travel Assistance
    - IP Consultation
  - Up to \$5000 in support
- 
- The diagram consists of two blue brackets on the right side of the list. The top bracket groups the first four items of the Contractor-Provided Services list and is labeled '4 Core Services'. The bottom bracket groups the last three items of the Contractor-Provided Services list and is labeled '1 Optional Service'.



# Phase 0 Participation

- Participation in Phase 0 has grown as we have expanded outreach, but still remains a small fraction of the applicant pool
- Distribution of participants
  - There is significant overlap among the under-represented categories
  - Larger representation of small businesses from under-represented states compared with women-owned (WO) or minority-owned (MO)

|       | Phase I Applications from Phase 0 Participants | % of Total Applications |
|-------|--|-------------------------|
| 2015* | 43   | 4%                      |
| 2016  | 74   | 4%                      |
| 2017  | 96   | 6%                      |

\*2015 data for second half of the year

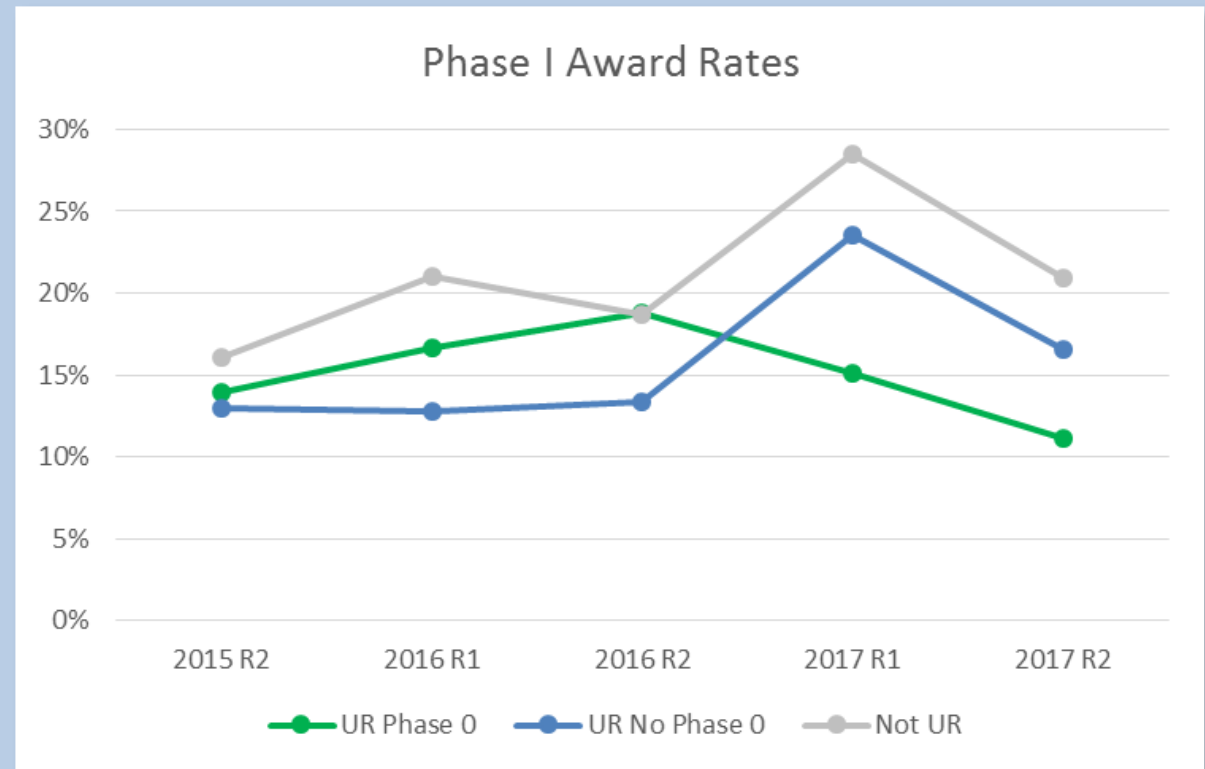
|                    |      |
|--------------------|------|
| UR State + WO + MO | 4%   |
| UR State + WO      | 8%   |
| UR State + MO      | 8%   |
| WO + MO            | 9%   |
| UR State           | 43%  |
| WO                 | 14%  |
| MO                 | 15%  |
| total              | 100% |

|          |     |
|----------|-----|
| UR State | 62% |
| WO       | 35% |
| MO       | 36% |



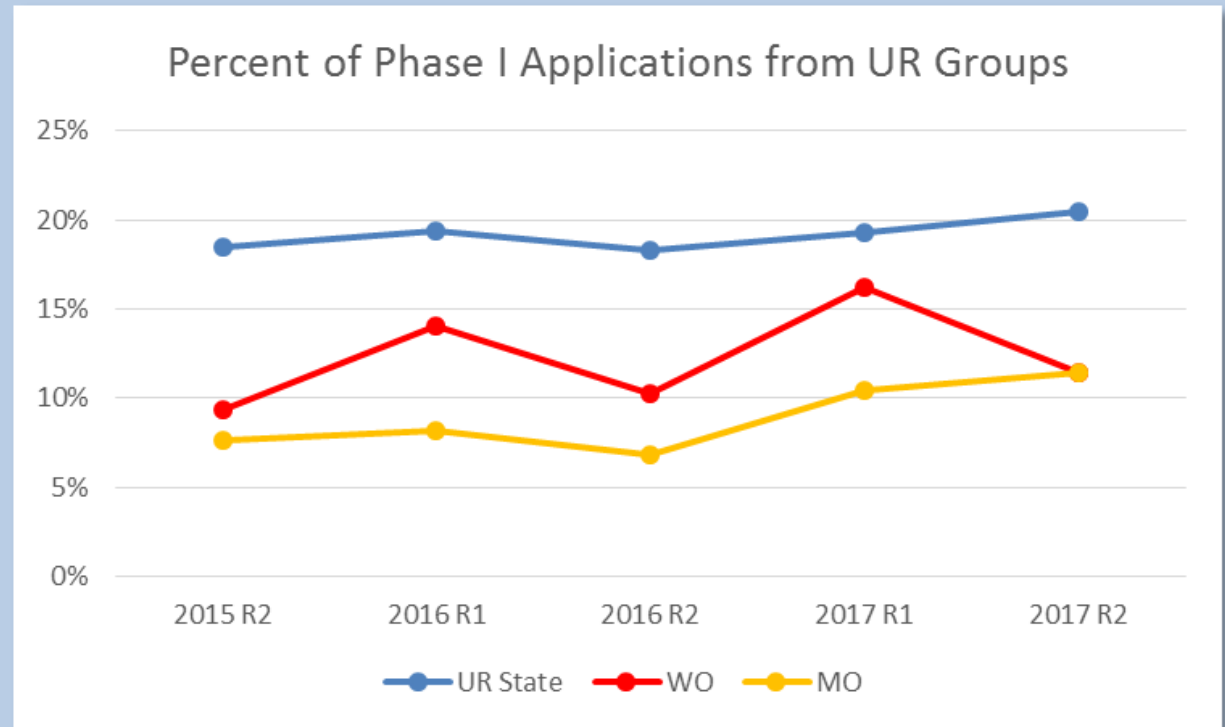
# Phase 0 Award Rate

- Award Rates
  - UR groups are observed to have lower Phase I award rates compared with non-UR applicants
  - We have not yet generated data on an appropriate peer group for Phase 0 comparison: UR applicants with no previous DOE SBIR/STTR awards



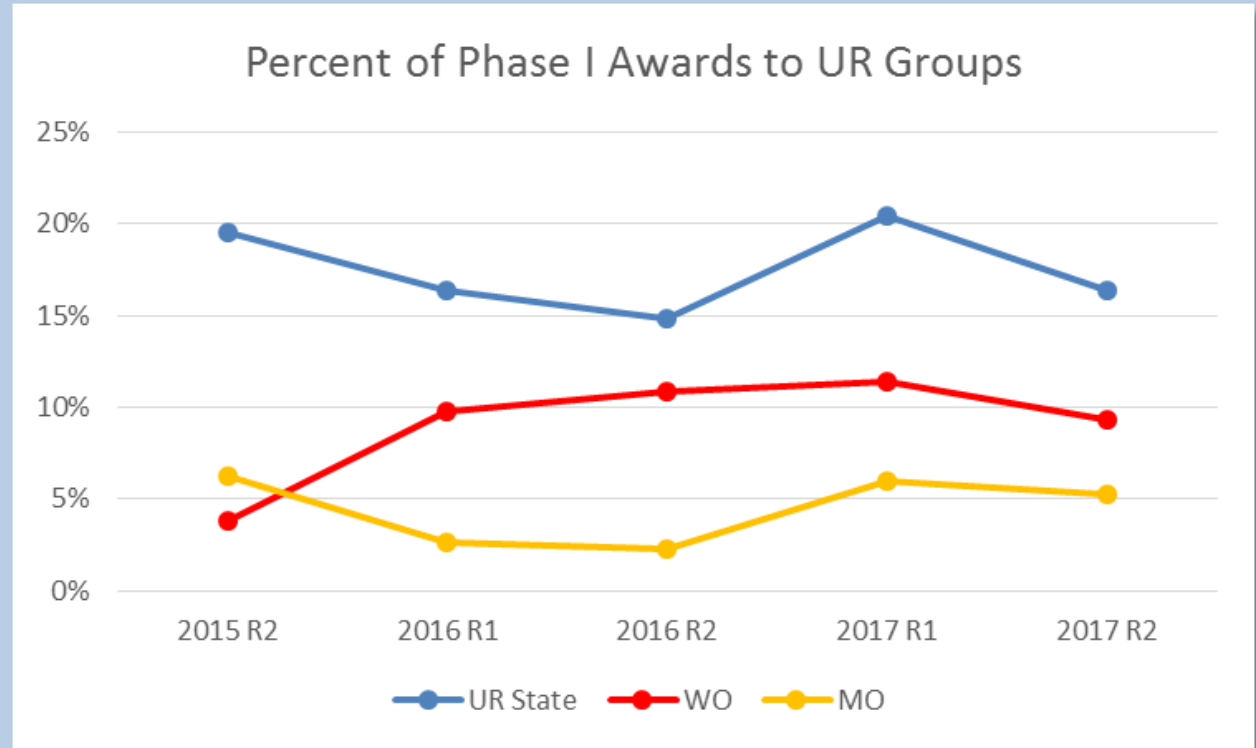
# Applications from UR Groups

- Applications from UR Groups have increased during the period we provided Phase 0 services
  - Phase 0 outreach has helped to educate all applicants about WO and MO ownership designations in applications



# Awards to UR Groups

- Increased applications have not translated fully into increased awards across all UR groups
  - The gap is particularly pronounced for MO applicants



|  | UR State | WO   | MO   |
|--|----------|------|------|
| Ratio of Award Rate to Application Rate (2015 R2 to 2017 R2) | 0.92     | 0.74 | 0.50 |



# Phase 0 Applicant Feedback

- Survey Feedback from participants (provided after application submission)
  - *We never would have completed the application without this assistance*
  - *Overall, I had very good experience, I thought I was very lucky that I could participate in such program, and I was happy with the mentor assigned to me.*
  - *Outstanding program!*
  - *This is a great program. Dawnbreaker gave us high level comments that were crucial in my opinion to crafting a great proposal!*
  - *We prepared a very solid package of proposal content, with Dawnbreaker's good help.*
  - *The good thing was that you keep us on time and were available for questions almost any time.*
  - *I thought it was really great that DOE sponsors such program.*
  - *I was guided very efficiently through SBIR application process, and received valuable feedback and advice.*
  - *As a new company, it was great that I could learn all details of application. Furthermore, market research was extremely useful, as well as help with budget planning.*
  - *It is a great program for small businesses.*



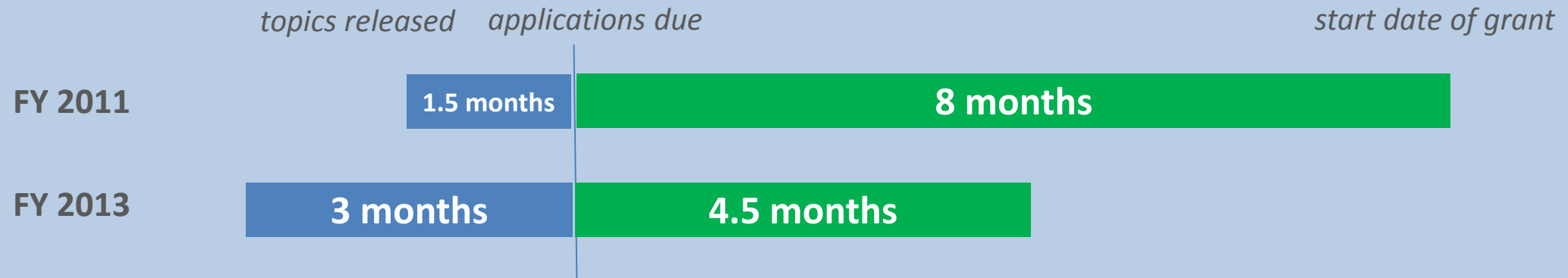
# Initial Phase 0 Assessment

- Participation
  - Increased recruitment activities are needed to attract women-owned and minority-owned applicants
- Application Quality
  - Data and participant feedback indicate that Phase 0 assistance is helping first-time, UR applicants successfully compete for Phase I grants
  - More work is needed to compare the Phase 0 group with a comparable peer group
  - Phase 0 Assistance has helped to educate all applicants about WO and MO designations
- Continuation
  - The SBIR administrative funding pilot (expires September 30, 2017) is essential for providing both Phase 0 services and outreach to under-represented groups (e.g. SBIR Road Tour)



# STREAMLINING THE APPLICATION AND AWARD PROCESS

- Increased time to prepare innovative applications; reduced time from application to start date of grant



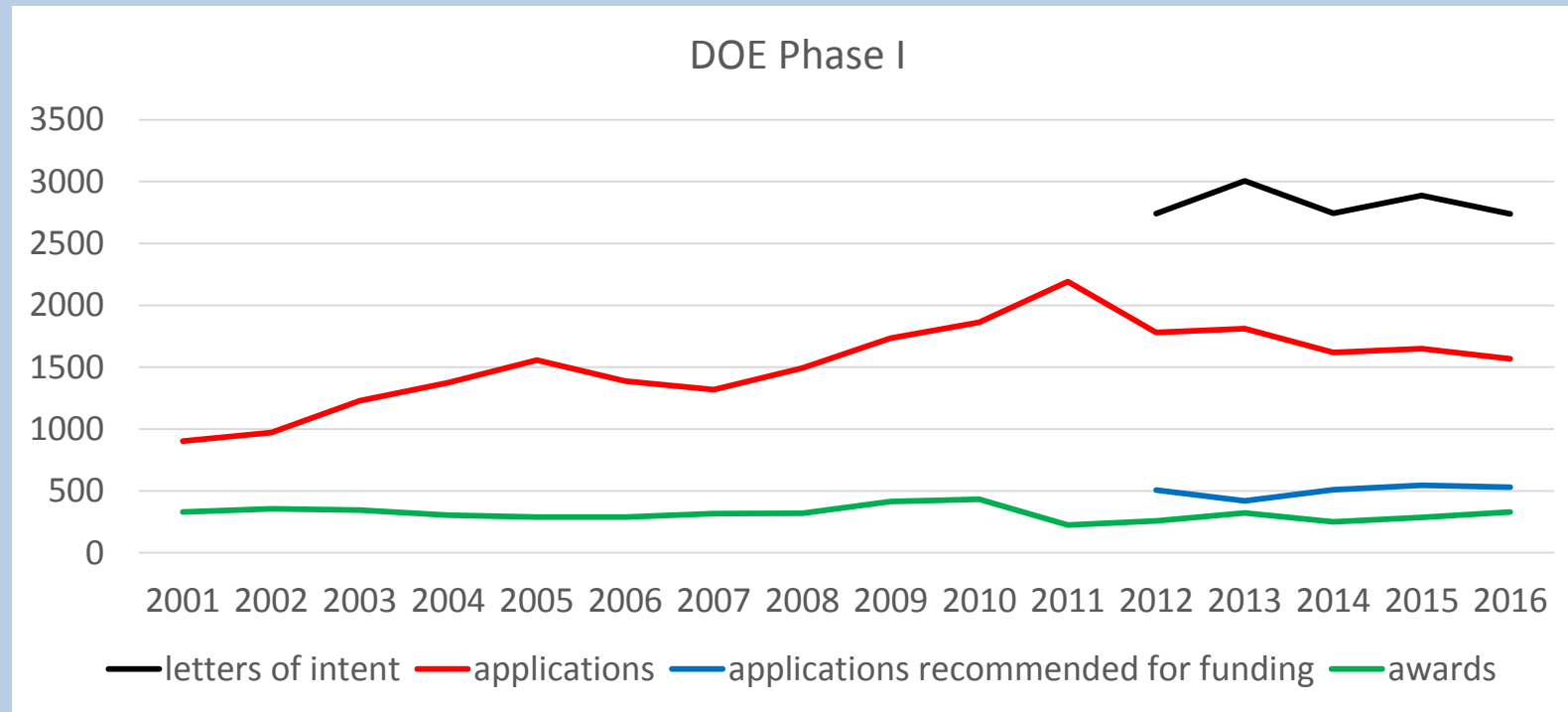
# Key Enablers for Streamlining

- Technology
  - web-based application management system
- Management practices
  - two Phase I and two Phase II solicitations annually to distribute workload
  - letters of intent
- Effective communications
  - online webinars and tutorials
  - email list (>15,000) and twitter (>1900 followers)



# Letters of Intent

- Primary Objective: Identify reviewers prior to receipt of applications
- Secondary Benefit: By providing feedback for non-responsive applications, we are able to reduce the number of non-responsive applications



# Sequential Phase II Awards

PHASE I 6-12 months

PHASE II up to 24 months

SEQUENTIAL PHASE II up to 24 months

- Sequential Phase II awards implemented in FY 2014
  - Phase IIA
  - Phase IIB
- Authorized by 2012 SBIR/STTR Reauthorization
- Maximum Award Amount: \$1,000,000

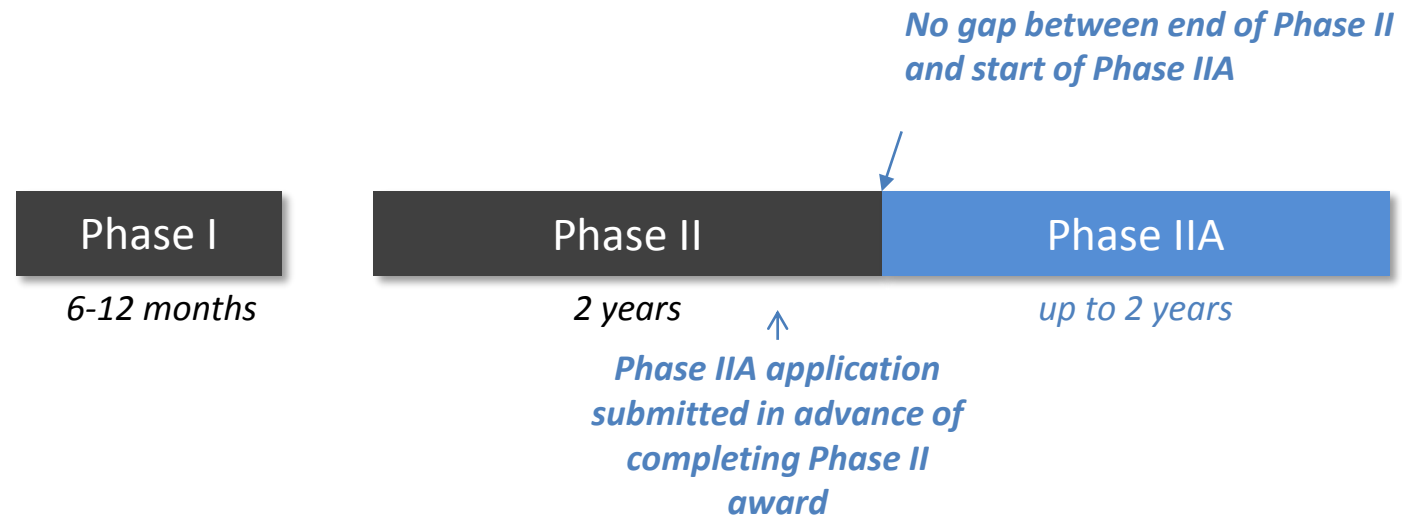


# Phase IIA

- Some prototype or process R&D efforts require more time and funding than available with a single Phase II award
- Historically such projects required small businesses to complete two or more Phase I/II cycles to complete their R&D
- Phase IIA awards will start immediately upon completion of the Phase II award



# Phase IIA Timeline



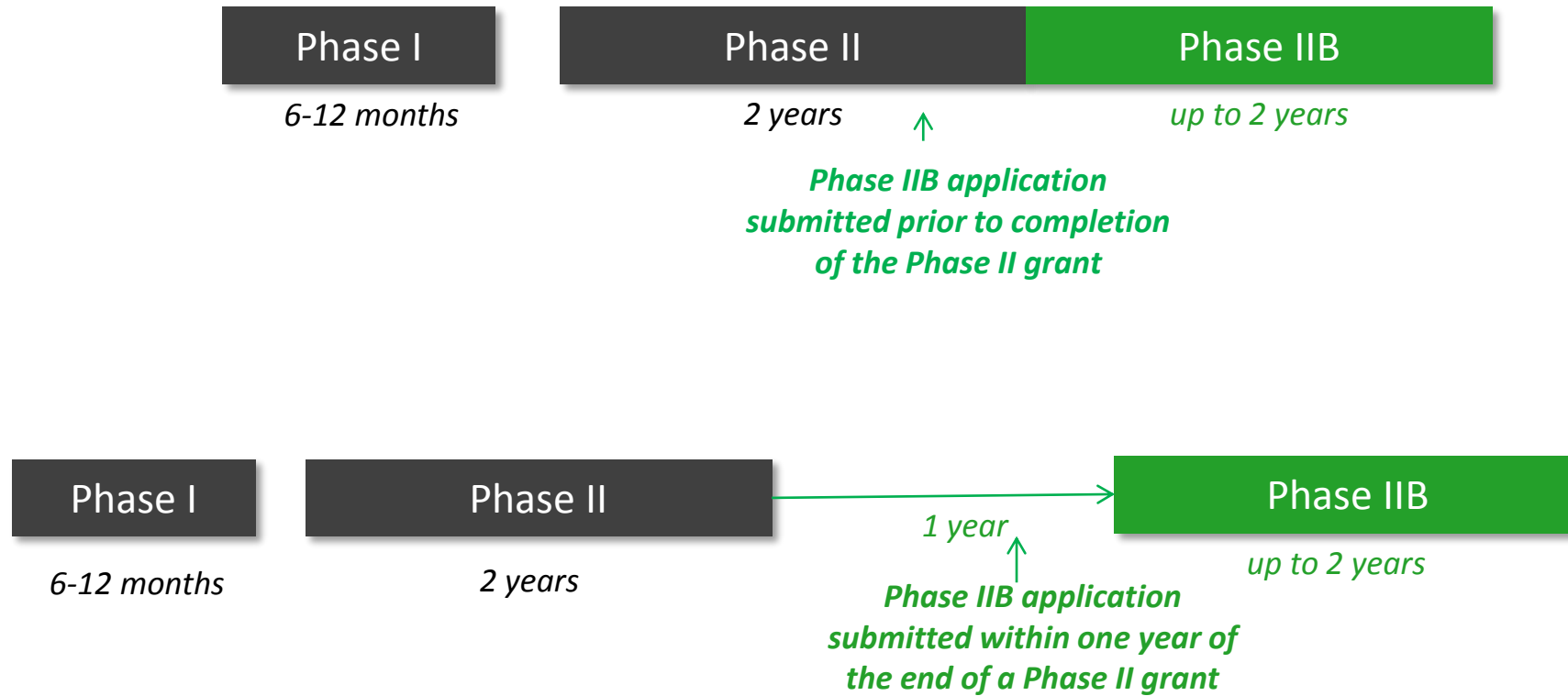


# Phase IIB

- After successfully completing Phase II R&D, some projects may require R&D funding to transition an innovation towards commercialization
- DOE is utilizing Phase IIB to increase the number of positive commercialization outcomes resulting from Phase II awards
- Phase IIB awards will start immediately after completing a Phase II or up to 1 year later

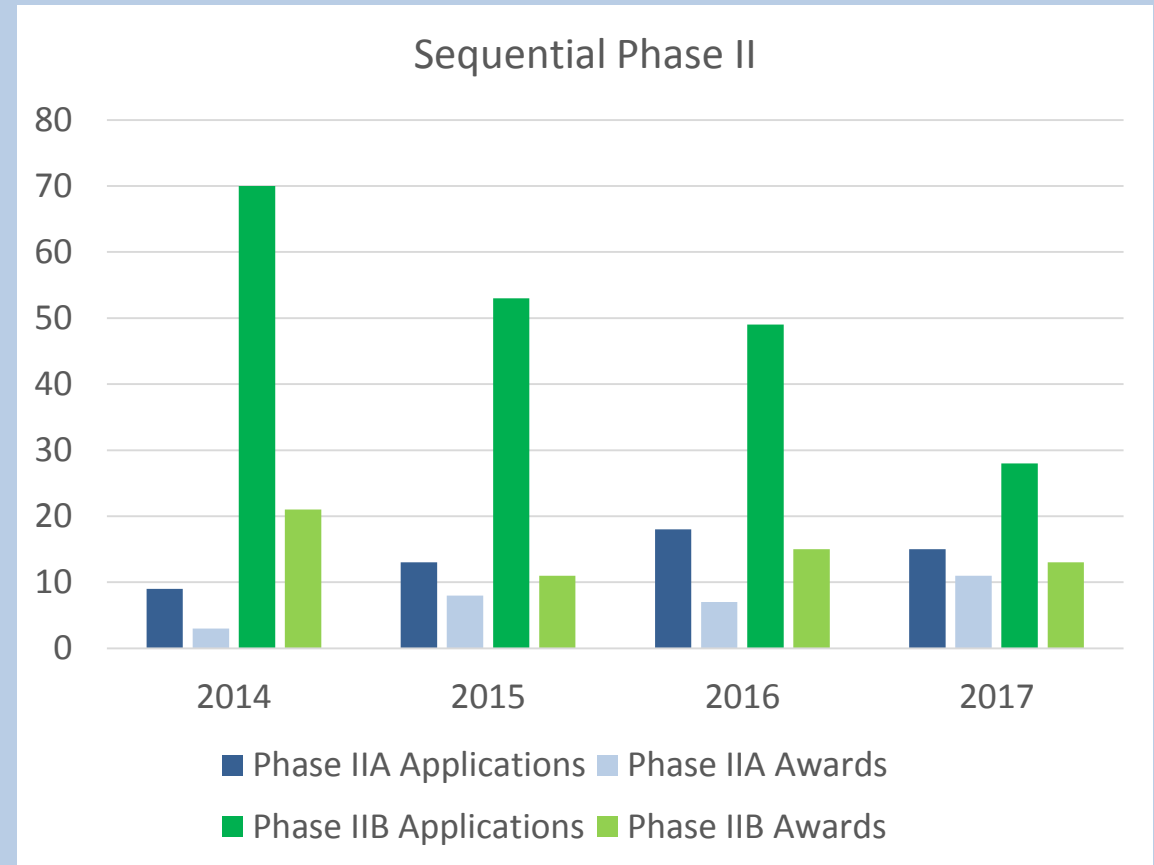


# Phase IIB Timeline: Two Options



# Sequential Phase II Awards

- Sequential Phase II awards account for less than 15% of DOE's Phase II awards
- Overall, applications and awards for Phase IIA are slowly trending upward
- Applications for Phase IIB trending downward with award levels remaining flat



# ASCR SBIR/STTR Research Topic Innovations

- Collaborative Research Topics
  - Multiple companies collaborate on a single SBIR/STTR project, but receive independent SBIR/STTR awards
    - Enables DOE to address technical challenges that require broad expertise
    - Each company submits the same collaborative proposal, but with a budget that reflects its share of the R&D
    - Collaborating companies must have an IP agreement in place prior to award
- Multi-program Topics
  - Multiple DOE programs collaborate to issue a joint topic
  - Example: FY 2018 Phase I Release 1
    - 1. BIGDATA TECHNOLOGIES FOR SCIENCE, ENGINEERING, AND MANUFACTURING (ASCR, BES, BER)

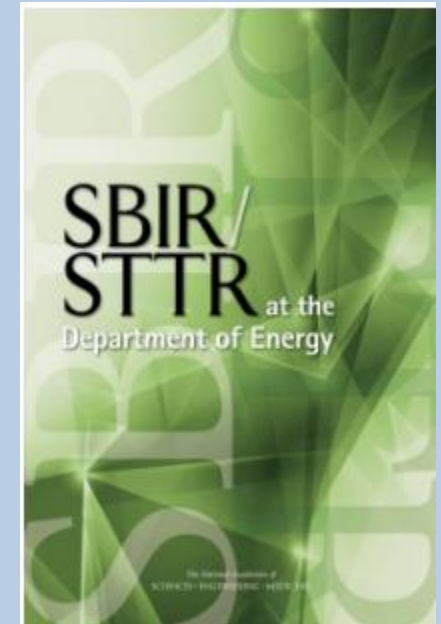




# **ASSESSMENT OF THE DOE SBIR/STTR PROGRAMS**

# ASSESSMENT OF THE DOE SBIR/STTR PROGRAMS

- 2016 Study
  - Assessment performed by the National Academies of Sciences, Engineering and Medicine
  - Report issued December 2016:  
<https://www.nap.edu/catalog/23406/sbirsttr-at-the-department-of-energy>
- Next study
  - Task order for next study issued July 2017
  - Report due to Congress December 31, 2019



# Overall Findings

- The SBIR program at the DoE is having a positive overall impact. It is meeting three of the four legislative objectives of the program with regard to
  - stimulating technological innovation,
  - using small businesses to meet federal research and development (R&D) needs, and
  - increasing private-sector commercialization of innovations derived from federal R&D.
- However, the committee finds that more needs to be done to
  - foster and encourage participation by socially and economically disadvantaged small businesses (SDBs), and by woman-owned small businesses (WOSBs), in technological innovation.
- The STTR program at DoE is also meeting the program's statutory objectives, defined above, in that it is encouraging and supporting linkages between small business concerns(SBCs) and research institutions (RIs).



# Key Findings: Program Management

- **DoE has substantially improved its SBIR/STTR programs since 2008** (the publication year of the previous National Academies report on the DoE SBIR program). A number of recommendations from the 2008 report have been adopted. (Finding I-A)
- DoE has adopted a number of other initiatives and pilot programs, which collectively have improved the program. (Finding I-A)
- DoE is seeking ways to improve its data collection and tracking. (Finding I-E)





# Key Findings: Commercialization

- **Nearly half of the respondents to the National Academies' 2014 Survey reported some sales, and a further 23 percent reported anticipating future sales.** Of those respondents reporting some sales, 25 percent had sales less than \$100,000. Six percent had sales over \$10 million, and an additional 26 percent had sales over \$1 million. The large number of companies with small-scale revenues suggests that although many companies reach the market, few can be described as successful in commercial terms. This finding reflects a deeper understanding of the limitations of the available data on successful commercialization. (Finding II-A)
- Subsequent investment in DoE SBIR/STTR projects is an indicator that they are seen as having the potential for commercial value even if they have not yet reached the market. The 2014 Survey shows that **seventy-eight percent of 2014 Survey respondents reported receiving additional investment funding in the technology related to the surveyed project.** (Finding II-C)
- SBIR/STTR funding makes a substantial difference in determining project limitation, scope, and timing. The 2014 Survey data show that **seventy-one percent of respondents reported that the project probably or definitely would not have proceeded without SBIR/STTR funding.** (Finding II-E)



# Key Findings: Fostering the Participation of Women and Other Underserved Groups in the SBIR/STTR Programs

- Current data show that **the objective of fostering the participation of women and underserved minorities has not been met by the DoE SBIR/STTR programs.** (Finding III-A)
- **Woman-owned firms accounted for less than 9 percent of Phase I SBIR and STTR awards in FY 2005-2015.** The average success rates for Phase I applications by firms owned by woman and white males were 15.7 percent and 18.9 percent, respectively, during this period. (Finding III-A)
- **Minority-owned firms accounted for less than 7 percent of Phase I SBIR and STTR awards during FY 2005-2015.** (Finding III-A)
- Among respondents to the 2014 Survey, the vast majority of “minority” firms were in fact owned by Asians. Firms owned by Blacks, Hispanics, and American Indians accounted for 2 percent of all responses (including zero Black-owned and American-Indian owned firms). (Finding III-A)
- DoE is making efforts to understand the patterns of woman and minority participation in the SBIR program, but more is needed. (Finding III-C)



# Key Findings: Stimulating Technological Innovation and Meeting Agency Mission Needs

- The **DoE SBIR/STTR programs support the development and adoption of technological innovations that advance the agency's mission.** (Finding IV-A)
- The **DoE SBIR/STTR programs connect companies to universities and research institutions.** Among SBIR awardees responding to the 2014 Survey, 43 percent reported a link to a research institution related to the surveyed project; 26 percent reported that faculty worked on the project (not as a PI); 21 percent employed graduate students for the project; and 29 percent used universities and research institutions as subcontractors for the surveyed project. (Finding IV-B)



# Key Findings: Fostering Innovative Companies

- The DoE SBIR/STTR programs encourage new firm start-up. **Forty-five percent of companies responding to the 2014 Survey indicated that the company was founded entirely or in part because of the SBIR/STTR programs.** (Finding V-A)
- **Sixty-one percent of respondents to the 2014 Survey indicated that the DoE SBIR/STTR programs “had a highly positive or transformative effect” on their company.** Another 35 percent said that it “had a positive effect.” (Finding V-C)



# Key Findings: STTR

- **STTR is meeting the program objectives** defined in the Small Business Administration's Policy Guidance for STTR. (Finding VI-A)
- Analysis of STTR in particular suggests that **National Laboratories generally do not make good formal partners for small business concerns**: their administrators do not prioritize SBIR/STTR because the funding amounts are small; and small businesses have limited leverage if the Laboratories fail to meet their obligations. (Finding VI-E)
- The **DoE SBIR and STTR programs have not made sufficient efforts to enhance collaborations between the National Laboratories and small innovative firms**. (Finding VI-E)



# Recommendations

- 21 recommendations were made in five areas
  - I. Improving Monitoring, Evaluation, and Assessment
  - II. Addressing Underserved Populations
  - III. Improving Commercialization Outcomes
  - IV. Improving Linkages to National Laboratories
  - V. Improving Program Management
- The SBIR/STTR Programs Office is working to address these recommendations

