Small Business Vouchers Evaluation

Round 2 Awardees Preliminary Results

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research into action inc

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Acronyms and Abbreviations

ANL	Argonne National Laboratory
CAP	Central Application Platform
COI	Conflict of interest
CRADA	Cooperative Research and Development Agreement
DOE	U.S. Department of Energy
EERE	DOE Office of Energy Efficiency and Renewable Energy
FOA	Funding Opportunity Announcement
IP	Intellectual property
INL	Idaho National Laboratory
LANL	Los Alamos National Laboratory
LBNL	Lawrence Berkeley National Laboratory
MR Lab	Merit Review Lab
MTA	Material Transfer Agreement
NFS	Non-federal sponsors
NREL	National Renewable Energy Laboratory
ORNL	Oak Ridge National Laboratory
PI	Principal Investigator
PNNL	Pacific Northwest National Laboratory
POC	Point of Contact
RFA	Request for Assistance
TAPA	Technical Assistance Pilot Agreement
SBIR	Small Business Innovation Research program
SBV	Small Business Voucher pilot
SNL	Sandia National Laboratories
SOW	Statement of Work
SPP	Strategic Partnership Projects
STTR	Small Business Technology Transfer program
TTO	Technology Transfer Office
WFO	Work for Others Agreement

Glossary

This glossary defines terms that may be specific to the Small Business Vouchers Pilot. The glossary also serves as a primer on key Small Business Vouchers concepts and activities (from inception through its second round of SBV requests for assistance). DOE continues to refine the pilot, so details may change over time.

Central Application Platform (CAP)	Software to support a single web portal that small businesses use to request technical assistance from any participating national lab in any technology area providing SBV vouchers. This software is also used to support the storage, retrieval, eligibility screening, and merit review of the requests.
Conflict of Interest (COI)	A personal, professional, organizational, or financial relationship or interest that unduly impacts the impartiality of a party. Conflicts of Interest can be actual (i.e., a relationship exists that affects a party's impartiality) or apparent (i.e., a relationship does not actually result in a conflict, but the nature of the relationship is such that a third party with an understanding of the facts would have cause to question the impartiality of a party to the relationship).
Cooperative Research and Development Agreement (CRADA)	A collaborative agreement that allows the Federal Government, through its labs, and non-federal partners to optimize their resources, share technical expertise in a protected environment, and access intellectual property emerging from the effort. CRADAs offer both parties the opportunity to leverage each other's resources when conducting mutually beneficial research and development (R&D).
Intellectual Property (IP)	Intellectual property (IP) refers to creations of the mind, such as inventions, literary and artistic works, designs, symbols, names, and images used in commerce. Lab IP that transfers to the commercial sector is commonly patented and licensed.
Lab	A DOE national laboratory.
Lab Call	*Small Business Vouchers Pilot Laboratory Call for Proposals,* March 23, 2015.
Lead Lab	Labs selected by DOE in response to a Lab Call to implement the SBV pilot.
Material Transfer Agreement (MTA)	An MTA is a contract that governs the transfer of tangible research materials between two organizations when the recipient intends to use it for his or her own research purposes. The MTA defines the rights of the provider and the recipient with respect to the materials and any derivatives.
Participating Lab	Labs that are available to work with small businesses through the pilot.

Principal Investigator (PI)	Serves as the technology team's technical lead and overall project manager.
Point of Contact (POC)	Lab pilot manager team staff assigned to answer questions about the pilot and technology areas overall, as well as lab technical staff assigned to answer lab-specific technology-specific pilot questions.
Requests for Assistance (RFA)	Small businesses apply for an SBV voucher by submitting a Request for Assistance describing, among other things, the technical problem for which they are seeking lab assistance.
SBIR	The Small Business Innovation Research Program (SBIR) is a highly competitive program that encourages domestic small businesses to engage in federal research and/or research and development (R/R&D) that has the potential for commercialization. (See STIR, below, and Appendix D.2.7.)
SBV	The Small Business Voucher pilot provides U.S. small businesses with unparalleled access to the expertise and facilities of DOE's national labs by awarding vouchers valued between $50,000 and $300,000 to competitively selected small businesses to cover the cost of lab services.
SBV CRADA	A standard ten-page CRADA agreement developed by EERE for all SBV cooperative research and development agreements. To participate in the pilot, all parties (the labs, the small businesses, and DOE) must agree to use this contract for applicable research.
SBV TAPA	A standard three-page Technical Assistance Pilot Agreement developed by EERE for all SBV technical assistance agreements. To participate in the pilot, all parties (the labs, the small businesses, and DOE) must agree to use this contract for applicable research.
Site Office	Site Offices are organizations within the U.S. Department of Energy's Office of Science with responsibility to oversee and manage the Management and Operating (M&O) contractor for the national lab (www.science.energy.gov/about/field-operations). DOE's Office of Science oversees ten labs; other DOE offices similarly manage M&O contractors for the labs under their purview. Contracts for all SBV voucher awards must be approved by the performing lab's Site Office.
Statement of Work (SOW)	Statement of Work (or SOW) is a formal document that defines the entire scope of the work involved and clarifies deliverables, costs, and timeline.

SPP	Strategic Partnership Projects (the successor to WFO; see below) is a policy to encourage and facilitate DOE and the national labs to pursue projects in partnership with other federal government agencies, state and local institutions, universities, private companies, and/or foreign entities.
STTR	Small Business Technology Transfer (STTR), like SBIR, expands funding opportunities in the federal innovation research and development (R&D) arena. Unlike SBIR, it requires small businesses to formally collaborate with a research institution. STTR's role is to bridge the gap between the performance of basic science and commercialization of resulting innovations. (See Appendix D.2.7.)
Technology Readiness Level	Technology Readiness Level, or "TRL," is a widely-used indicator of degree of development of a technology toward validation at commercial scale in the actual operating environment; degree of development is described on a scale of 1-9, with 9 being fully deployment ready.
Technology Transfer	The process by which technology or knowledge developed in one place or for one purpose is applied and used in another place for the same or different purpose.
Technology Offices (also known as Program Offices)	EERE develops research agendas and directs and funds research through its Technology Offices: Advanced Manufacturing Office (AMO), Bioenergy Technologies Office (BETO), Building Technologies Office (BTO), Fuel Cells Technology Office (FCTO), Geothermal Technologies Office (GTO), Solar Energy Technology Office (SETO), Vehicle Technologies Office (VTO), Water Power Technologies Office (WPTO), and Wind Energy Technologies Office (WETO).
Technology Transfer Offices (TTO)	Offices in federal labs staffed with "highly competent technical managers" who are "full participants [along with the innovating scientist or engineer] in the technology transfer process." They are empowered to develop and promote the key partnerships necessary for technology transfer.
User Facility Agreement	Agreement enabling businesses or universities engaged in areas of commercial and basic science research to use facilities at all DOE national labs with approved designated user facilities.
Voucher Performing Lab	A lab that partners with a small business to perform the statement of work for which the voucher was awarded.
WFO	Work for Others (WFO) was the predecessor to SPP. WFO was a policy to enable national labs, which are owned and directed by DOE, to partner on projects with other (non-DOE) entities.

Executive Summary

The Small Business Voucher (SBV) pilot, one of a handful of U.S. Department of Energy (DOE) programs within the National Laboratory Impact Initiative, is intended to accelerate the commercialization of clean energy technologies from small businesses by providing them access to staff and facility resources at DOE national laboratories (labs). Selected small businesses work with the labs to resolve technical issues that are hindering their technologies (i.e., the technology for which participants and nonparticipants completed an RFA for a voucher). The DOE Office of Energy Efficiency and Renewable Energy (EERE) provided roughly $20 million (fiscal year 2015) for the SBV pilot, which launched March 23, 2015, with a request for lab participation. The pilot comprises three rounds of competitions; Round One awards were announced in March 2016, Round 2 awards were announced in August 2016, and Round Three awards were announced in April 2017.

This report presents the Round 2 awardees preliminary impacts; a subsequent report, currently being drafted, will present the early stage impacts of Round 1, 2 and 3 awardees. A baseline and process evaluation of SBV was completed in December 2016.[1]

The findings in this report are based on a survey of Round 2 SBV awardees and a comparison group of unsuccessful applicants, henceforth referred to as "non-participants." Awardees and nonparticipants were asked questions on a range of topics, including previous commercialization activities, experience with the application process, impacts of SBV on the commercialization process for the SBV-technologies,[2] and future engagement with the SBV program The Round 2 survey was conducted nine months after the announcement of the Round 2 award.[3] Throughout this report, we indicate when differences between the Round 2 awardees and non-participants are statistically significant.

FINDINGS

Prior Commercialization Experience

The majority of SBV participants and non-participants reported that they had previous commercialization experience. Eighty-one percent of SBV awardees and 83% non-participants said that one or more company staff had taken a single technology to commercialization in the past, and more than three-fifths of awardees (64%) and non-participants (67%) had taken multiple technologies to commercialization in the past. More than one-half of both groups also said that one or more members of their staff had taken a course on commercialization.

[1] RIA, NMR and Gretchen Jordan. 2016. Baseline and Process Evaluation of Small Business Vouchers Pilot. DOE/EE-1574. SBV Baseline and Process Evaluation

[2] For both participants and nonparticipants the team refers to the technologies specified in the SBV application as their SBV-technology or SBV-related technology.

[3] The survey was administered from May 25, 2017 to June 20, 2017. Round 2 opened in March 2016, while the awards were announced in August 2016. The evaluation team notes that 15 of the 35 non-participants had also applied to Round 1 of the SBV pilot (and were not selected for Round 1), and that Round 1 opened October 2015.

High percentages of awardees and non-participants had researched SBV before applying (84% of awardees and 89% of non-participants), and just over three-quarters (76%) of awardees and 60% of non-participants had a previous Lab partnership (before SBV). The most common type of partnership before SBV was an SBIR award (33% of participants and 30% of non-participants), or another arrangement such as Cyclotron Road or the New Mexico Small Business Assistance program.

Experience with Application Process

SBV Awardees most commonly reported that they learned about the SBV opportunity from Lab staff outreach or a press release from the DOE.

- Awardees most frequently indicated they learned about SBV opportunity from Lab staff (84%), a DOE press release (71%). Awardees also commonly reported that they learned about SBV from a friend or another small business (42%).

SBV awardees found that the aspects of the application process and funding opportunity notice met or exceeded their expectations. Awardees were pleased with the multiple calls for applications, which exceeded expectations of over one-half of respondents. The majority of awardees (88%) also found the fairness of the selection process and criteria to meet or exceed their expectations. Awardees additionally reported that process of applying for SBV was easier (48%) or much easier (28%) than applying for other federal awards.

Most SBV awardees reported positive experiences with the Central Assistance Portal (CAP). On the whole, awardees found the CAP to be both comprehensive and useful for addressing the topics such as the SBV program, the contracting process, application selection criteria, the application process, and lab capabilities.

- When asked about the overall ease of navigating the CAP, 18 out of 25 awardees (72%) said the SBV CAP was easy or very easy to navigate (mean of 4.0 out of 5). Seven respondents gave the ease of navigating the SBV CAP a rating of 3 out of 5, the lowest rating selected by any respondent for this metric.

The majority of awardees stated that the SBV contracting process met or exceeded their expectations. Eighty percent or more of awardees stated that their expectations were met or exceeded by the courteousness of Lab staff involved in contracting, the expertise of Lab staff involved in contracting, the definition of tasks, the definition of task outcomes or milestones, the understanding of small business needs by Lab staff involved in contracting, the contract and Statement of Work process overall, and the setting of deadlines.

- Notably, 92% of awardees' expectations were met or exceeded with the amount of time it took to develop the statement of work (SOW), whereas only 40% of non-participants with a CRADA (two of five) reported the same (a statistically significant difference).

Commercialization Outputs and Outcomes

Lab partnerships fosters the development of new relationships, knowledge, and skills.

- Eighty-six percent of awardees said they developed new relationships as a result of conducting the SBV project, 73% said they gained knowledge, 68% developed a favorable attitude about working with the Labs, and one-half gained skills.
- Only non-participants who indicated that their firm had been awarded a CRADA or a different type of cooperative assistance from a Lab in the recent past (2015 or 2016) were asked the parallel follow-up question regarding their experiences. This was only applicable to four non-participants. Three said that they had gained knowledge and skills and developed knew relationships, and two said they had changed policies or procedures pertaining to working with the Labs. None of the four non-participants indicated that they had developed a favorable attitude related to working with the Labs. However, the small sample of non-participants who had a CRADA or other type of cooperative assistance from the Labs makes it hard to draw meaningful conclusions for this group relative to SBV awardees.

On average, non-participants reported more patents, copyrights, trademarks, and scientific/technical publications applied for/submitted or received/published than awardees.

- Since applying for SBV, 25 non-participants reported *applying for/submitting* an average of 1.7 patents, 1.1 trademarks, and 1.6 scientific technical publications. Non-participants also reported *receiving/publishing* an average of 0.8 patents, 1.4 trademarks, and 1.4 scientific/technical publications. Only two non-participants reported applying for a copyright, and just one non-participant reported receiving one.
- Only one SBV awardee said they had received a patent, one said they had submitted a scientific publication, and one said they had received a scientific publication.

Awardees reported making more advances in the stage of development (i.e., Technology Readiness Level [TRL]) and commercialization than non-participants.[4]

- Nearly half (48%) of awardees reported that their technologies were in the concept exploration or definition stage at the time of the award – only 10% remained at the concept definition stage nine-months after the award announcement. Eighty-five percent of awardees reported that their technology had advanced at least one stage of development, and, as a group, the stage of development increased by an average of approximately 1.4 levels since before their SBV award. The majority (55%) of non-participants reported that they were at the same levels of development at the start and end of the study period.
- In addition, the average TRL of awardees increased from 3.2 at the time of the award to 4.7 nine-months after the award announcement, compared to nonparticipants' average TRLs of 3.4 at the time of the award and 4.2 nine-months after the award announcement.

[4] Awardees were asked to assess the stage of development of their technology 'now' (nine months after the SBV award announcement) and to assess the stage retrospectively at the time they applied to or received the SBV award. The survey included a nine-stage scale (similar to Technology Readiness Levels). See Appendix C for a comparison of the stages of commercialization used in this survey and TRLs.

- It is important to note many of the awardees and non-participants were at relatively advanced stages of technology development according to their applications to SBV. Applicants were asked a series of questions about their technologies during the application process. According to their applications, all Round 2 awardee survey respondents had demonstrated the feasibility of the technology in the lab compared to 83% of nonparticipant survey respondent, 80% of awardee survey respondents and 77% of nonparticipant survey respondents had created a prototype, and nearly half of Round 2 awardee survey respondents (44%) reported achieving sales of some kind related to their SBV-technology, while more than a quarter of non-participants (26%, or nine non-participants) had achieved sales before applying to SBV.

Financial Outcomes

The percentage of SBV awardees who reported receiving or investing additional developmental funding in their SBV-supported technology (i.e., follow-on funding) was less than half the percentage of non-participants. Thirty-three percent of SBV awardees who responded to this item and 68% of non-participants who responded to this item received or invested additional developmental funding in their technology subsequent to the SBV award or to their SBV application. Among these respondents, six awardees and 18 non-participants specified a dollar value for funding received/invested in at least one category from the following list: non-SBV federal funds, state and local governments, college or universities, private investment, company funds, and personal funds.

- Compared to non-participants, awardees received a greater amount of private investment on average. We estimated the average private investment received by awardees to be between $2.2 million and $3.7 million, whereas we estimated that the average non-participant private investment funding amounted to $330,000 – $1.0 million per respondent who received funding.[5]
- Approximately 98% of awardee outside funding came from private investment, compared with 34% of non-participant funding.
- Other key sources of outside funding for non-participants were non-SBV federal funds (21%) or other state or local government funds (28%).

Nine months after the Round 2 award announcement, a total of four awardees and eight non-participants reported making sales of products, processes, services, or other sales (e.g., rights to technology, licensing) of their SBV-related technology[6] .

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[5] Because the funding amounts were reported as ranges (see, for example, Figure 16), the evaluation team developed a lower and upper estimate of funding received. For the lower estimate, we used the lowest value in each range, with exceptions for the first range of under $100,000, to which we assigned a conservative value of $5,000, and the largest range of $10,000,000 and more, to which we assigned a value of $10,000,000. The higher values in our reported ranges are based on the midpoint of the range presented for each category, with the exception of the largest category, to which we again assigned a value of $10,000,000. For example, the value of $50,000 is used if the respondent selected the first range of under $100,000.

[6] A SBV-related technology is the specific technology that each awardees and nonparticipants applied to the SBV pilot for an SBV-award

- Five non-participants and four awardees reported having sales of products. One non-participant reported making a sale of a process, four made sales of services, and three made other sales (e.g., rights to technology, licensing).
- No awardees reported making a sale of a process, two made a sale of service, and one made another sale (e.g., rights to technology or licensing).
- It is important to note that one of the four awardees had reported sales of the SBV-related technology in their application to SBV, while half (four of the eight non-participants) had reported sales in their SBV application, so some caution is warranted in interpreting the sales data as respondents may have been thinking of their pre-SBV sales when responding to the survey.
    - Four of the eight nonparticipants reporting sales also applied to Round 1 of SBV, which opened in October 2015, so they may have interpreted the survey to be asking about their Round 1 application to SBV rather than for Round 2.
- Among those who said they made sales and specified the value of those sales within a broad range, the average value of sales made by awardees was between $10,000 and $100,000, and the average value of sales made by non-participants was between $88,000 and $300,000.[7]

Project Status in the Absence of SBV

SBV is helping a substantial number of awardees to continue commercializing their technologies. Half (50%) of SBV awardees "probably" or "definitely" *would not have* undertaken the project (i.e., continued with advancing their SBV-related technology) in the absence of the award, while only 17% of non-participants "probably" or "definitely" *would not have* undertaken the project in the absence of applying for SBV.

- Four of the six awardees (67%) who said they would "probably" or "definitely" have undertaken their project in the absence of the SBV award, reported that the project would have been narrower in scope.
    - All six awardees estimated their project would have been delayed an average of seven months, and 67% (four of six respondents) said the duration or time to complete of the project would have been longer and the project would be behind in achieving similar goals or milestones. This suggests that even among awardees who were relatively confident that their project would have proceeded without the award, they felt the SBV award helped give the process a boost both in terms of time and in achieving goals.
- Among non-participants who "probably" or "definitely" would have undertaken the project in the absence of applying for the SBV award, we found the following:

[7] The evaluation team used the same method to estimate the average and total amount of additional funding received to estimate sales. We developed conservative estimates of sales received by using the lowest value in each range, with the exception for the first range of under $100,000, to which we assigned a conservative value of $5,000. The higher values in our reported sales ranges are midpoint estimates of funding received based on the midpoint of the range presented.

- More than one-half (54%) of the 28 respondents said their projects would have been similar in scope, and 39% said their projects would have been narrower in scope. The remaining 7% (two non-participants) said their projects would have been broader in scope in the absence of applying for the SBV award, which may reflect the resources required to apply for SBV.
- Eighteen non-participants who were able to estimate a delay in their projects specified said that their projects would have been delayed an average of 8.9 months (with a range of one month ahead to 36 months delayed); half of the 18 non-participants who specified said that their project would have been of longer duration in the absence of applying for an SBV award, but 41% said that their project would be in the same place in achieving similar goals and milestones.

Future Engagement

Awardees were more likely to report that they would work with Labs again in the future than non-participants (70% versus 31%; a statistically significant difference). This reflects well on the SBV program, suggesting that the experience makes a positive impression on most awardees.

Awardees were more likely than non-participants to report that they had or will recommend the SBV program to their Lab colleagues. Ninety-five percent of SBV awardees said they had recommended or will recommend that their colleagues work with the Labs, while only 49% of non-participants said the same (a statistically significant difference). Only one SBV awardee said they would not recommend to that their colleagues work with the labs.

Ten non-participants articulated why they will not or might not recommend SBV to their colleagues; many had negative comments about the application process or the feedback they received.

- Three said that the feedback was insufficient, three said the resources required to apply to the program are too significant, and three said the chances of getting an SBV are too small to justify the expense of preparing an application.
- Two non-participants commented that they felt the Labs were under-resourced, and one said that they felt the SBV system was designed to support only larger companies or those already doing business with the federal government.

LESSONS LEARNED, ROUND 2 AWARDEES

The key findings above indicate positive outcomes for Round 2 SBV awardees and non-participants.

1. **Survey findings show positive results for both awardees and unsuccessful applicants (non-participants).** Lab partnerships are important for the development of new relationships, knowledge, and skills.
2. **SBV appears to have created a more efficient and satisfying process for developing SOWs and subsequent work with the Labs.** Awardees expectations were met or

exceeded on a wide range of aspects of working with the Labs, including the expertise of Lab staff involved in contracting, the definition of tasks, the definition of task outcomes or milestones, and the understanding of small business needs.

3. **Awardees appear to be making more progress in advancing the stage of development of their technology than non-participants.**
4. **Despite not being awarded an SBV project, non-participants generally have made progress towards commercialization.** Non-participants were more likely than awardees to have reported that they would have undertaken the same project in the absence of applying for SBV. Non-participants also reported having applied for/submitted or received/published more patents, copyrights, trademarks, and scientific/technical publications.
5. **Awardees reported being likely to work with the Labs again in the future at a statistically significant higher rate than non-participants ; awardees were also (statistically significantly) more likely to recommend SBV to their colleagues.** This disparity in experiences likely points to the level of effort required to submit an application and insufficient follow up with unsuccessful applicants. The inadequacy of feedback is a primary concern for unselected applicants (five of 31 non-participants [16%]) and a cause of much dissatisfaction for those applicants. This could potentially damage the reputation of the Labs among small businesses.

RECOMMENDATIONS

Based on results from the preliminary impact analysis for Round 2 SBV awardees, we offer the following recommendations:

1. **Maintain the core elements of the SBV program while seeking to achieve ongoing improvement.** As noted above, awardees reported positive experiences with the application and contracting process. They also expressed satisfaction with their experience with the SBV program when provided an opportunity to provide open-ended recommendations: three said they were impressed with the results generated by the lab, and three were very satisfied with the process and outcome of the program. The critiques offered by SBV awardees centered around four main themes: managing expectations, budget concerns, timing concerns, and a desire for a simplified process. Although these issues were cited by a minority of respondents, most referenced administrative challenges that should be seriously considered, such as expectations regarding accomplishments during the grant period, Lab response time, and application processes.
2. **Consider improving the quality of feedback to unsuccessful applicants.** Non-participants very consistently reported that the feedback on their application was inadequate. Providing constructive feedback and following up with unsuccessful applicants will likely improve the quality of future submissions while furthering the goal of engaging small businesses. The Labs might also view the work of providing more thorough feedback to unselected applicants as an opportunity to provide more awareness of other

Lab programs or information about Lab expertise, as well as an opportunity to provide more general information about technology commercialization.

Section 1 Introduction

The Small Business Voucher (SBV) pilot, one of a handful of U.S. Department of Energy (DOE) programs within the National Laboratory Impact Initiative, is intended to accelerate the commercialization of clean energy technologies from small businesses by providing them access to staff and facility resources at DOE national laboratories (labs). Selected small businesses work with the labs to resolve technical issues that are hindering their technologies (i.e., the technology for which participants and nonparticipants completed an RFA for an SBV). The DOE Office of Energy Efficiency and Renewable Energy (EERE) provided roughly $20 million (fiscal year 2015) for the SBV pilot and launched the pilot March 23, 2015, with a request for lab participation.

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This report presents the Round 2 awardees preliminary impacts; a subsequent report, currently being drafted, will present the early stage impacts of Round 1, 2, and 3 awardees. A baseline and process evaluation of SBV was completed in December 2016.[8]

1.1 SMALL BUSINESS VOUCHER PILOT OVERVIEW

The SBV pilot offers U.S.-based and -owned small businesses in the clean energy sector the opportunity to receive world-class, tailored technical assistance in bringing their next-generation technologies to market. The pilot awards vouchers to competitively-selected small businesses, defined as those that employ fewer than 500 people. The vouchers enable small businesses to access national lab staff expertise and specialized equipment that are not readily available in the private sector. The pilot aims to support new technology development by small businesses, bolster U.S.-based clean-energy efforts through public-private partnerships, and create jobs.

The goals of the pilot and a potential broader SBV program include the following:[9]

- Increase engagement between the labs and small businesses that have high growth potential by providing targeted access and services to further EERE's mission.[10]
- Broaden lab awareness of small business technological development and technical needs.
- Encourage labs to recognize and assist with the successful commercialization of potential technologies across a wide spectrum of application areas.

[8] RIA, NMR and Gretchen Jordan. 2016. Baseline and Process Evaluation of Small Business Vouchers Pilot. DOE/EE-1574. SBV Baseline and Process Evaluation

[9] *Small Business Vouchers Pilot Laboratory Call for Proposals,* March 23, 2015. Hereafter, "SBV Lab Call."

[10] The mission of the EERE is to create and sustain American leadership in the transition to a global clean energy economy. Its vision is a strong and prosperous America powered by clean, affordable and secure energy. http://energy.gov/eere/about-us/mission

- Strengthen U.S. economic competitiveness in high-technology industries to support small business development and job creation.

EERE, through a competitive lab call selection process, selected five national labs to lead the effort (termed "lead labs") for the SBV pilot, as follows:

- Lawrence Berkeley National Laboratory (LBNL)
- National Renewable Energy Laboratory (NREL)
- Oak Ridge National Laboratory (ORNL)
- Pacific Northwest National Laboratory (PNNL)
- Sandia National Laboratories (SNL)

The pilot seeks Requests for Assistance (RFAs) from small businesses that are looking to partner with labs to solve the technical challenges they face in their efforts to bring innovations to market. The selected businesses receive vouchers for $50,000 to $300,000 each.[11] The lead labs collaborate to pair each selected business with a lab and principal investigator or project manager to provide the requested assistance. The paired lab is chosen from among 13 national labs as the lab best positioned to conduct the research.[12] Businesses are not restricted to working with the lead labs; the "lead" designation signifies the labs' role in pilot implementation, not in voucher work. A few businesses have been paired with two labs for their voucher work, rather than a single lab; these RFAs were best addressed by the complementary activities of two labs.

Participating businesses may use their vouchers for up to 12 months of work at the paired national lab. The selected businesses are required to contribute a minimum of 20% to the overall project cost (more if closer to development). Businesses' contributions to the cost-share may be in the form of in-kind labor, materials, equipment, data, or travel.[13]

Vouchers are available for the critical technical challenges of small businesses relating to every EERE Technology Office; each office designates the specific topic areas for which it will award vouchers. Table 1 provides the SBV funding caps by technology area as of December 2016.[14]

[11] Vouchers are estimated to provide between six weeks and one year full-time-equivalent research time. A small business may receive more than one voucher, but no more than $300,000 in voucher funding.

[12] In addition to the lead labs, small businesses can partner with Ames Laboratory, Argonne National Laboratory, Brookhaven National Laboratory, Fermi National Accelerator Laboratory, Idaho National Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory, and Savannah River National Laboratory.

[13] Cost-share requirements are statutory. Energy Policy Act (EPAct) of 2005, Section 988.

[14] The budgets cover both vouchers and SBV administrative costs incurred by the lead labs. Lab pilot administrative costs include developing pilot processes, developing and updating the pilot website, conducting pilot outreach, conducting the merit review of submitted RFAs, and working with the EERE Technical Offices to select awardees. In addition to the funding amounts shown in the table, total pilot funding includes money for the development of the web-based program platform for accepting RFAs and for pilot evaluation, bringing the total SBV pilot funding to about $20 million. As of February 2018, the SBV pilot reported making awards of approximately $22 million (https://www.sbv.org/index.html).

Table 1: SBV Topic Areas and Initial Pilot Funding Caps*

Topic Area	Funding Covers	Funding Cap ($ millions)
Advanced Manufacturing	Next-generation materials to render factory processes cleaner and smarter	$4.4
Bioenergy	Research and development of renewable biomass resources into commercially viable, high-performance biofuels, bioproducts, and biopower	$2.1
Buildings	Products that reduce energy use or provide demand side management and interoperability in residential and non-residential buildings	$1.9
Fuel Cells	Fuel cell materials and performance; hydrogen production, delivery, and infrastructure technology storage; manufacturing; infrastructure analysis	$2.9
Geothermal	Products that harness energy from enhanced geothermal systems, low temperature geothermal, or geothermal systems analysis	$1.4
Solar Energy	Products and services associated with photovoltaics, balance of system, systems integration, concentrating solar power, and technology to market	$1.0
Vehicles	Products that produce cleaner, more efficient transportation in: advanced combustion engines, battery research and development (R&D), electric drive R&D, vehicle systems, lightweight and propulsion vehicle materials, or vehicle fuels and lubricants	$2.4
Water Power	Products using waves, tides, and waterways for environmentally safe power in: marine and hydrokinetics, or hydropower	$2.2
Wind Energy	Products that advance distributed wind or utility-scale wind	$1.0
Total		**$18.3**

Sources: Descriptions from www.sbv.org. Funding amounts from U.S. Department of Energy National Laboratory Network Notice of Opportunity: Small Business Vouchers (SBV) Request for Assistance (RFA) – the Notice of Opportunity for Round One.

The pilot awards vouchers for such activities as the following:[15]

- Prototyping
- Materials characterization
- High performance computations

[15] U.S. Department of Energy National Laboratory Network Notice of Opportunity: Small Business Vouchers (SBV) Request for Assistance (RFA) – the Notice of Opportunity for Round One.

- Modeling and simulations
- Intermediate scaling to generate samples for potential customers
- Validation of technology performance
- Designing new ways to comply with regulations

EERE seeks to award small businesses with high impact potential, that is, to fund research that will hasten the commercialization of next-generation clean energy technologies with the potential to advance the clean energy economy through important innovation, substantial product sales, and increased employment.

The pilot comprises multiple rounds of competitions. Round One opened for RFAs in September 2015 and awards were announced in March 2016, Round 2 opened in March 2016 and awards were announced in August 2016, and Round 3 opened in October 2016 and awards were announced in April 2017.[16]

Each round is initiated with pilot outreach (inviting small businesses to apply). The small businesses apply by submitting a short (about five-page)[17] RFA that includes descriptions of (1) the company, (2) the technical challenge faced and how the requested assistance would help to overcome the challenge, (3) the potential project impact (such as cost savings or increased performance; issues related to DOE EERE mission areas), (4) how the company will use the project results, (5) key company team members, and (6) how the firm will provide the required 20% cost share. As part of the application process, the company needs to register on the CAP portal and complete a few steps, including providing contact and other requested information.

The lead labs and the EERE Technical Offices work together in a process that includes eligibility screening and merit review of RFAs, ranking of RFAs by merit score, matching of small businesses to labs, and development for meritorious RFAs of outlines of work statements that suggest how the project would unfold.[18] The process concludes with the EERE Technology Offices awarding the vouchers to selected small businesses.

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[16] The pilot launched with about $20 million in FY2015 funding and the intention to conduct up to three rounds of RFA voucher awards, contingent on funding remaining after the prior round. EERE subsequently added FY2017 money to the SBV pilot, augmenting the FY2015 funding remaining for Round 3 and enabling a fourth open call round.

[17] The page length restriction has varied slightly across rounds. Round One RFAs were limited to five pages of text, two pages of supporting documentation (such as graphs, tables, and images) presented in an appendix, and three resumes. Round 2 RFAs were limited to four pages of text, including graphs, tables, and images; and three pages of supporting documentation, consisting of resumes and/or support letters.

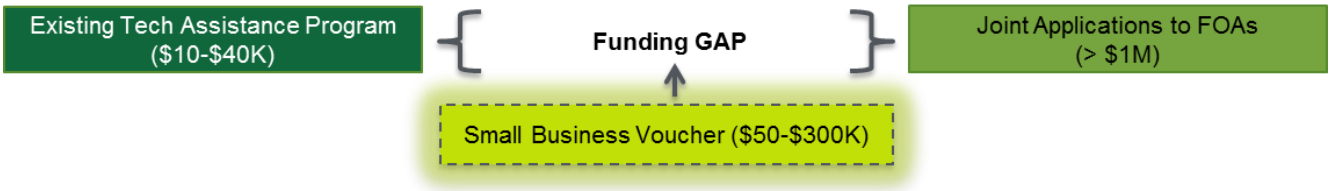
[18] Although the pilot awarded vouchers to about 9% of firms that submitted RFAs, many more RFAs were judged to be of sufficient quality (potentially warrant a voucher were substantially more funding available. One knowledgeable lab pilot manager estimated that about half the RFAs received had some merit – that is, described a technical challenge for which a solution might yield technology innovation, which in turn might have commercialization potential. For both rounds of the open call, experts scored each RFA on its merits and the lead labs ranked the RFAs in decreasing order by merit score. For both rounds, the EERE Technology Offices received the scores and rankings of all RFAs and then more closely examined what they determined to be the upper tiers, from which they made their final selections. The details of the selection process differed between the two rounds. The description given here corresponds with the Round 2 process. For Round 2, the labs developed sketches of work statements for the top quartile (25%) of RFAs. Because the proportion of RFAs carefully considered for vouchers differed both between rounds and among the EERE

1.2 CONTEXT FOR THE SBV PILOT

The DOE national labs are home to world-class scientists, engineers, and managers, and house unique, advanced instruments. The labs partner with private sector firms through such mechanisms as CRADAs, Technical Assistance (TA) Agreements, Work for Others (WFO) Agreements, and Agreements for Commercializing Technology (ACT), among others (see Appendix D).[19] Through the Lab Impact Initiative, launched in December 2013, EERE aims to substantially increase the impact the national labs have on the U.S. clean energy sector.

Several of the labs have been working with small businesses for the past decade or so to provide access to lab resources to help validate technologies and to provide other support, yet these resources are limited in both the assistance available to an individual small business (award sizes may be on the order of $10,000 or 40-hour equivalent) and in the total number of businesses that can be assisted each year (total program funding). The SBV pilot builds on these validated programs, including the New Mexico Small Business Assistance program supported by Los Alamos National Laboratory (LANL) and SNL, the Technical Assistance Programs of Idaho National Laboratory (INL) and PNNL, and NREL's Commercialization Assistance Program. At the other end of the funding spectrum, some labs are working with small businesses on projects attained through joint (lab-small business) applications to Funding Opportunity Announcements (FOAs). EERE designed the SBV pilot to fill an identified gap in funding for mid-size projects, as illustrated in Figure 1.[20]

Figure 1: Funding Gaps



Source: National Research Council. 2008. *An Assessment of the SBIR Program*. Washington, DC: The National Academies Press.

Technology Offices, the report uses the term *meritorious* in the general sense of having some merit. The term as used in this report does not correspond to a specific proportion.

[19] Other mechanisms include User Agreements, Technology Licensing Agreements, Material Transfer Agreements (MTA), and Small Business Innovation Research (SBIR) and Small Business Technology Transfer (STTR). Source: *Guide to Partnering with DOE's National Laboratories.*

[20] *Small Business Vouchers Pilot Laboratory Call for Proposals,* March 23, 2015. *DOE Small Business Voucher Pilot White Paper,* January 2015. Provided to the evaluation team by the Lab Impact Initiative. Program URLs: http://www.nmsbaprogram.org; http://www.pnl.gov/edo/assistance/techassist.stm, https://inlportal.inl.gov/portal/server.pt/community/technology_transfer/269/technical_assistance_program, *and* http://www.nrel.gov/technology transfer/ncap.html.

Section 2 Methods

The goals of the pilot and a potential broader SBV program include the following: [21]

- Increase engagement between the labs and small businesses that have high growth potential by providing targeted access and services to further EERE's mission.
- Broaden lab awareness of small business technological development and technical needs.
- Encourage labs to recognize and assist with the successful commercialization of potential technologies across a wide spectrum of application areas.
- Strengthen U.S. economic competitiveness in high-technology industries to support small business development and job creation.

This report presents the Round 2 awardees preliminary impacts and outcomes, particularly pertaining to the pilot's three principal near-term goals, as follows:[22]

- **Engagement of small businesses:** Assessed the extent to which the pilot increased engagement between labs and small businesses to further EERE's mission.
- **Lab awareness:** Assessed the extent to which the pilot broadened lab awareness of small business technological development and technical needs.
- **Lab commercialization assistance:** Assessed the extent to which the pilot encouraged labs to recognize and assist small businesses with the successful commercialization of a wide spectrum of potential technologies.

2.1 OVERVIEW OF METHODS

This report is based on findings from the following:

1. A survey of Round 2 SBV awardees and a comparison group of unsuccessful Round 2 applicants, henceforth referred to as "non-participants." [23] The Round 2 survey was conducted nine months after the announcement of the Round 2 award. [24] The evaluation team notes that 15 of the 35 non-participants had also applied to Round 1 of the SBV pilot (and were not selected for Round 1).[25]

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[21] *Small Business Vouchers Pilot Laboratory Call for Proposals,* March 23, 2015.

[22] Not addressed in this evaluation are pilot long-term goals, including the fourth pilot goal to support small business development and job creation.

[23] The survey was administered from May 25, 2017 to June 20, 2017.

[24] The survey was administered from May 25, 2017 to June 20, 2017. Round 2 opened in March 2016, while the awards were announced in August 2016.

[25] Round 1 of SBV was announced in October 2015, (19 months before the survey was conducted) and selections were announced in March 2016 (14 months before the survey was conducted).

The evaluation team is in the process of reporting on the surveys of Round 1 and Round 3 SBV awardees and will issue an updated report in the spring of 2018 that includes survey responses from all three SBV rounds.[26]

The team will complete interim progress reports later in 2018 and 2019. These reports will be based on web-surveys, as well as data collected by the labs from the participating small businesses.

The evaluation team used the merit review rating for Round 2 awardees to develop the comparison group. The average merit review rating for Round 2 awardees was 4.35. The team developed the comparison sample of non-participants by establishing a cutoff rating of 3.5, which is slightly lower than the overall average rating for awardees, in order to ensure a large enough sample of non-participants. Overall, 25 awardees and 35 non-participants responded to the surveys (response rates of 57% and 28%, respectively). Table 2 shows response rates by EERE Technology Office.

Table 2: SBV Survey Response Rates

EERE Technology Office	Awardees			Non-participant Sample		
	Total	Number of Responses*	Response Rate	Total	Number of Responses**	Response Rate
Advanced Manufacturing	6	4	67%	26	6	23%
Bioenergy	5	3	60%	10	4	40%
Buildings	4	2	50%	19	3	16%
Fuel Cells	11	8	73%	2	0	0%
Geothermal	4	1	25%	4	1	25%
Solar Power	2	2	100%	20	9	45%
Vehicles	6	3	50%	18	5	28%
Water Power	4	1	25%	13	4	31%
Wind Power	2	1	50%	9	3	33%
Total	**44**	**25**	**57%**	**125**	**35**	**28%**

*One awardee who began but did not complete the survey was excluded from this count.
*Four non-participants who began the survey but did not respond to any questions and two additional non-participants who failed to pass survey screening questions were excluded from this count.

For the final report, we will conduct a final survey with all SBV participants and non-participants in the fall of 2019. We will also be reporting on interviews with the lab researchers who worked with the small businesses on their voucher projects, and follow-up interviews with the lead-lab pilot manager teams.

Lastly, for the final report, we will benchmark outcomes and degree of program influence with selected DOE SBIR Phase I projects, calculate benefit-cost ratios for commercial successes for

[26] Due to missing data on the merit review scores for about half of the population of Round One non-participants, the team is unable to develop a comparison group for this cohort.

both the SBV and SBIR Phase I groups, and compare these for the final report.[27] This comparison will be based on the corresponding project data from the 2014 survey of DOE SBIR recipients.

2.2 EARLY OUTCOME METRICS AND DATA SOURCES

The peer-reviewed technical evaluation plan established performance metrics for assessing SBV early outcomes in the areas of engagement of small businesses, lab awareness, and commercialization assistance. Table 3 provides the process and early stage impact metrics and our data sources addressed by the surveys, including some metrics which will be addressed in the final evaluation report.

Table 3: Process and Preliminary Outcome Metrics and Data Sources

Outcome Area	Metric	Data Sources
Engagement of small businesses (process metrics)	Satisfaction of small businesses with website; knowledge gain; ease of use	Participant and non-participant surveys
	Satisfaction of small businesses with application process	Participant and non-participant surveys
	Satisfaction of small businesses with contracting process	Participant survey
	Satisfaction of small businesses with partnership experiences	Participant survey
	Satisfaction of small businesses with quality of work provided	Participant survey
	Proportion of small businesses interested in repeated work with lab	Participant survey
	Proportion of small businesses recommending to colleagues	Participant survey
Lab awareness of small business technical needs	Numbers of lab personnel at all levels of the organization engaged in small business technology assistance or collaborative R&D partnerships	Lab staff interviews
Lab commercialization assistance	Proportion of small businesses whose knowledge/skills increased through lab engagement	Participant survey
	Small business assessment of value of lab engagement	Participant survey
	Number of small businesses reporting they had overcome a technical hurdle	Participant and non-participant surveys
	Proportion of small businesses for which Intellectual property (IP) was created or licenses obtained	Participant and non-participant surveys; CRADA comparison*

[27] SBIR Phase I selected in discussion held between the SBV pilot manager and DOE's SBIR program manager as most comparable to SBV, given the size of the vouchers. Source: March 4, 2015, interview with Zack Baize, EERE.

Outcome Area	Metric	Data Sources
	Proportion of small businesses for which technology readiness advanced	Participant and non-participant surveys; CRADA comparison*
	Proportion of small businesses obtaining additional investment	Participant and non-participant surveys; CRADA comparison*
	Proportion of small businesses with pilot technologies commercially launched	Participant and non-participant surveys; CRADA comparison*
	Number of startup companies	Participant and non-participant surveys; CRADA comparison*
	Proportion of small businesses adding staff due to technology; quantity of staff added	Participant and non-participant surveys; CRADA comparison*
	Number of small businesses with reduced costs or increased revenues due to pilot technology	Participant and non-participant surveys; CRADA comparison*
	Number of small businesses reporting emissions reductions due to pilot technology; quantity of reductions	Participant and non-participant surveys

* CRADA comparisons will be included in the final evaluation report.

Section 3 Preliminary Round 2 Awardee Process and Impact Findings

This section presents results from surveys of Round 2 awardees and non-participants. The surveys covered a range of topics, including previous commercialization activities, experience with the application process, outcomes associated with Lab partnerships, and future engagement with the SBV program. Throughout this section, we indicate when differences between the Round 2 awardees and non-participants are statistically significant.

3.1 BASELINE: PRIOR COMMERCIALIZATION EXPERIENCE

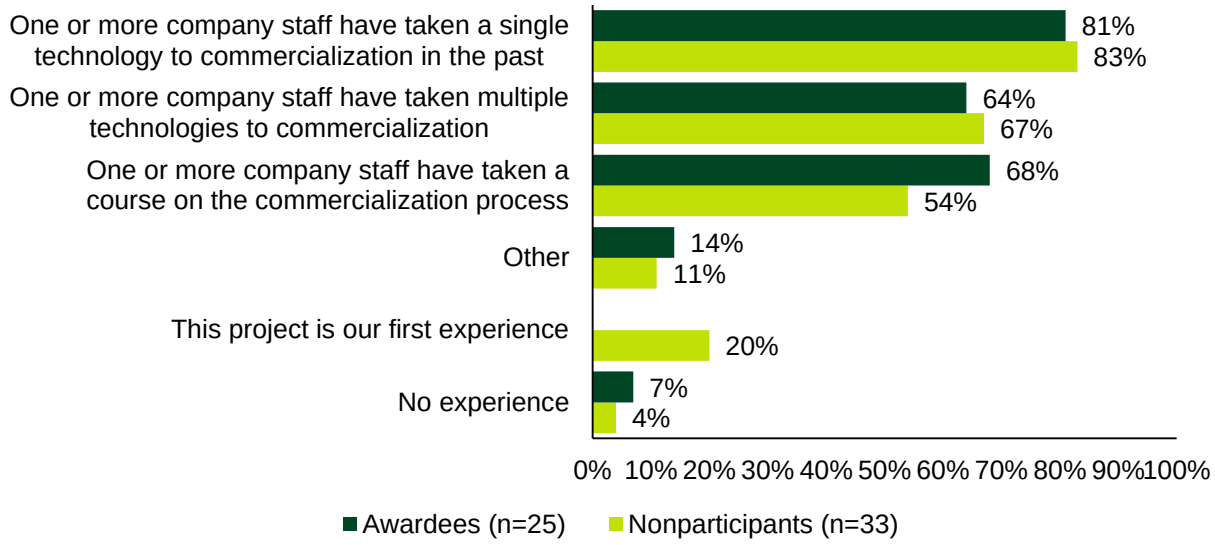
Table 4 reports the average age and average number of full time employees (FTEs) for the Round 2 awardees and non-participants, as reported in their application materials to the SBV pilot.

Table 4: Characteristics of Round 2 Awardee and Non-participant Firms

Firm characteristics	Awardees (n = 25)	Non-participants (n = 35)
Average Age of Firm (years)	6.6	8.2
Average # of Full Time Employees (FTEs)	12.2	15.1

The majority of SBV awardees and non-participants reported that they had previous commercialization experience (Figure 2). The majority of SBV awardees (81%) and non-participants (83%) said that one or more company staff had taken a single technology to commercialization in the past, and more than three-fifths of awardees (64%) and non-participants (67%) had taken multiple technologies to commercialization in the past. More than one-half of both groups also said that one or more members of their staff had taken a course on commercialization.

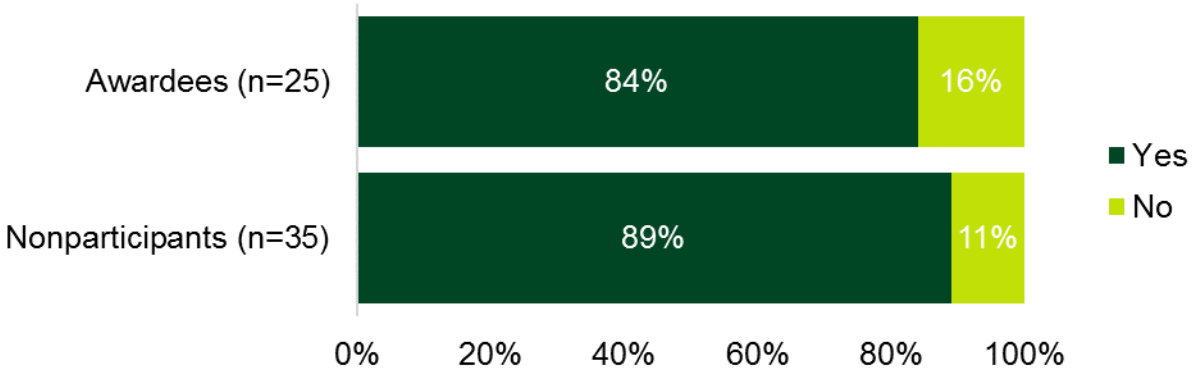
Figure 2: Firms Previous Experience with Commercialization (Awardees n=25; Non-participants=33; multiple responses permitted)



3.2 PROCESS FINDINGS

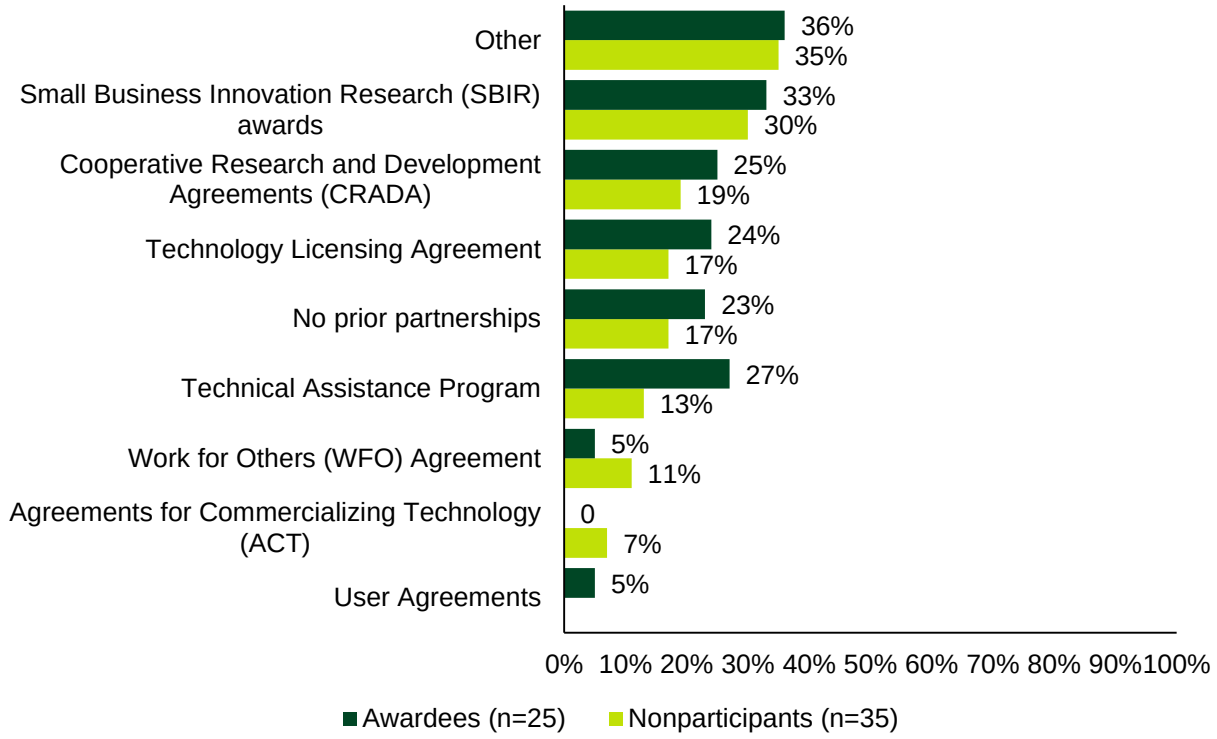
Most awardees (84%) and non-participants (89%) had sought information about energy-related technologies, facilities, or staff expertise at a Lab before applying for SBV or current CRADA, as shown in Figure 3.

Figure 3: Sought Information About Energy-Related Technologies, Facilities, or Staff Expertise at any U.S. DOE Laboratory Before SBV Pilot or Application for SBV (Awardees n=25; Non-participants n=35)



Just over three-quarters (76%) of awardees and 60% of non-participants had a previous Lab partnership (before SBV). The most common type of partnership was a SBIR award (33% of participants and 30% of non-participants), or another arrangement (Figure 4).

Figure 4: Lab Partnership Before SBV Training or Application to SBV (Awardees n=25; Non-participants=35; multiple responses permitted)



Several awardees and non-participants specified their 'other' type of Lab partnerships, ranging from formal awards with Cyclotron Road or the New Mexico Small Business to informal working arrangements. The other partnerships identified are listed below.

Awardees:

- Another award:
  - Cyclotron Road, LBNL[28]
- Informal working arrangement:
  - Sharing samples/materials for lab testing
  - Coordination at conferences
- Formal working arrangement:

[28] Cyclotron Road is an early-stage energy technology incubation program at Lawrence Berkeley National Laboratory (http://www.cyclotronroad.org/).

- Paying for use of Lab equipment

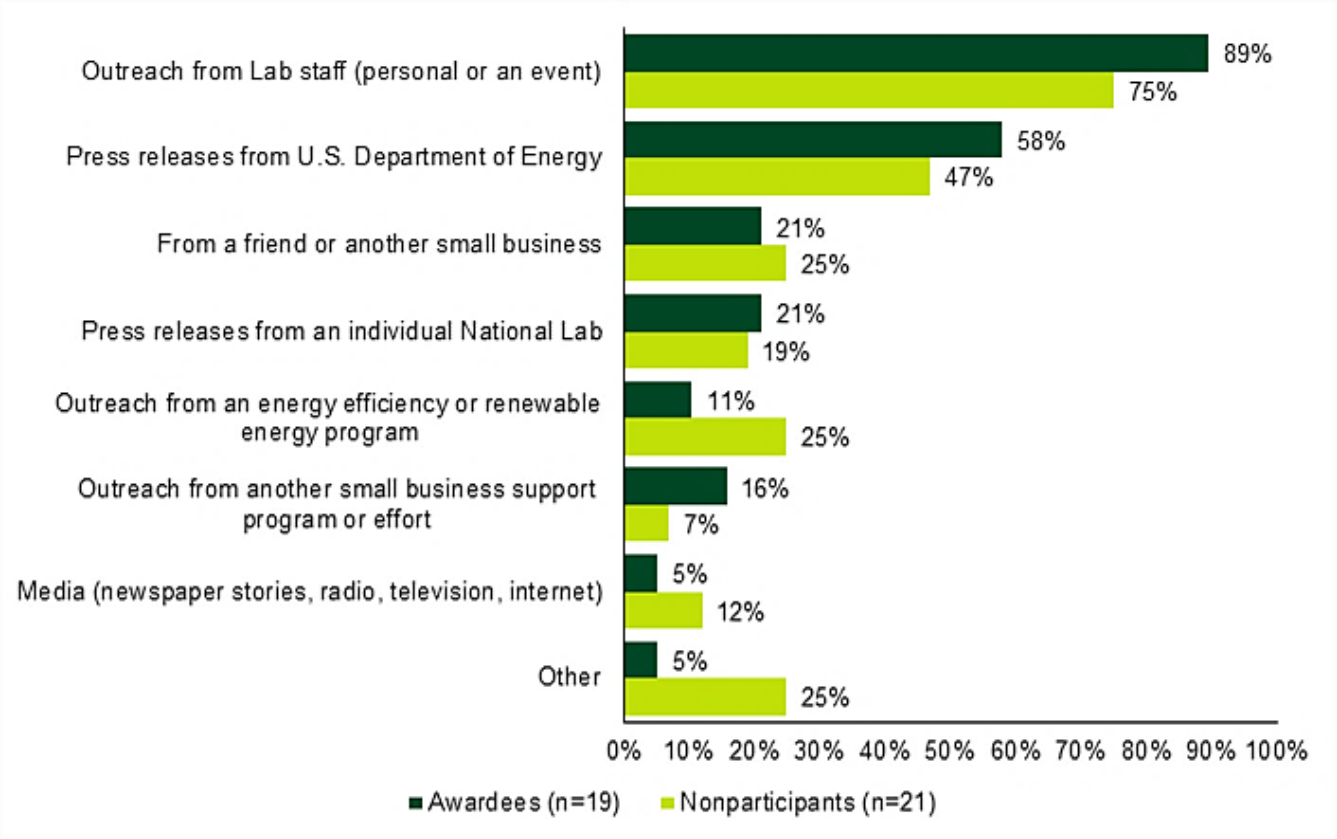
Non-participants:

- Another award:
  - Cyclotron Road, LBNL
  - New Mexico Small Business Assistance[29]
  - Unspecified DOE award
- Informal working arrangement:
  - General informal working relationships
  - Sharing samples/materials for lab testing
- Formal working arrangement:
  - Former employment at a Lab
  - Consultation
  - Unspecified R&D collaboration

SBV awardees and non-participants most often said they learned about their earlier Lab partnership through outreach from Lab staff (89% and 75%, respectively) or a press release from the DOE (58% and 47%, respectively) (Figure 5).

[29] The New Mexico Small Business Assistance (NMSBA) Program is a small businesses program supported by Los Alamos and Sandia National Laboratories (http://www.nmsbaprogram.org/).

Figure 5: How You/Your Firm Learned About the Earlier Lab Partnership Opportunity (Awardees n=19, Non-participants n=21, multiple responses permitted)

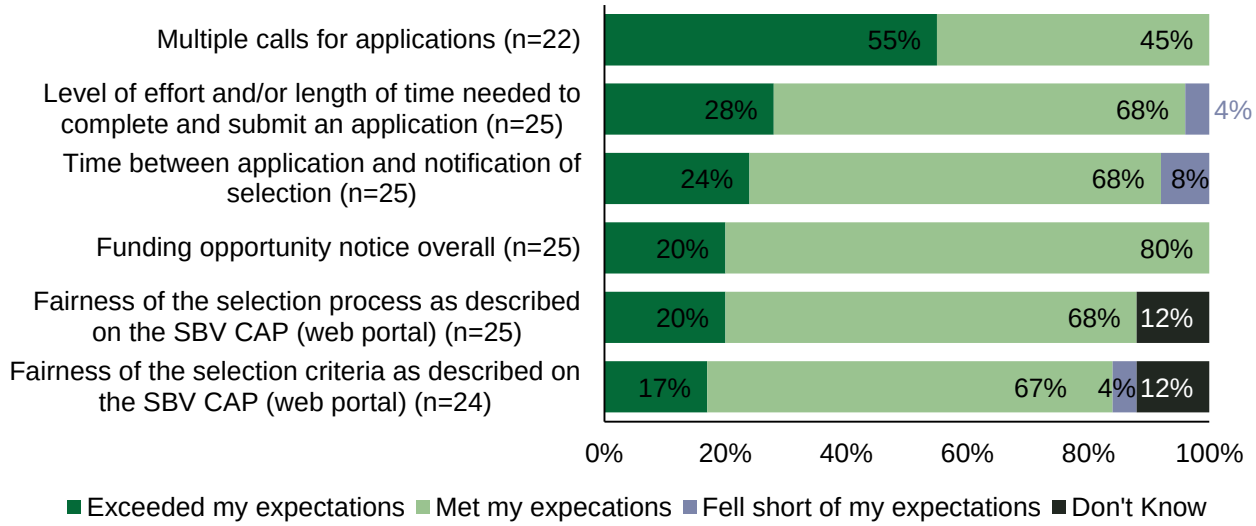


3.2.1 Application and Onboarding Experience

The application process is key to encouraging small businesses to collaborate with the Labs.

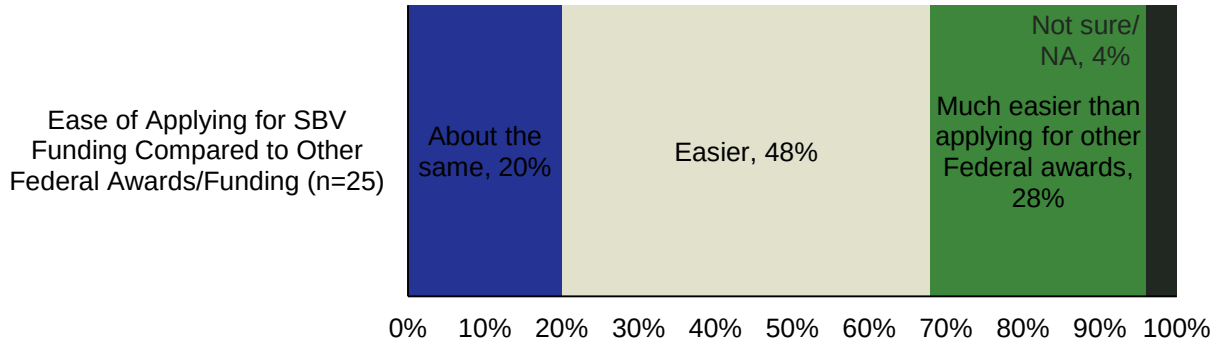
SBV Awardees found that the aspects of the application process and funding opportunity notice met or exceeded expectations overall; in particular, awardees were pleased with the multiple calls for applications, which exceeded expectations of over half of respondents (Figure 6). The majority of awardees also found the fairness of the selection process and criteria to meet or exceed their expectations. Although non-participants were not asked to evaluate their experience in applying for SBV, many provided feedback about their experience in the recommendations section of the survey and/or over email directly to the evaluation team (see Section 3.5).

Figure 6: Extent to which Awardee Expectations Were Met by the Following Aspects of the Voucher Application Process and the Funding Opportunity Notice



Awardees found the process of applying for SBV to be easier (48%) or much easier (28%) than applying for other federal awards.[30] This suggests that the SBV application process may be contributing toward the Lab goal of increasing engagement between the Labs and the small businesses that have high growth potential, by providing targeted access and services to further EERE's mission. It also suggests that working with the labs helps small businesses overcome barriers, such as the resources required to prepare an application for federal assistance (Figure 7).

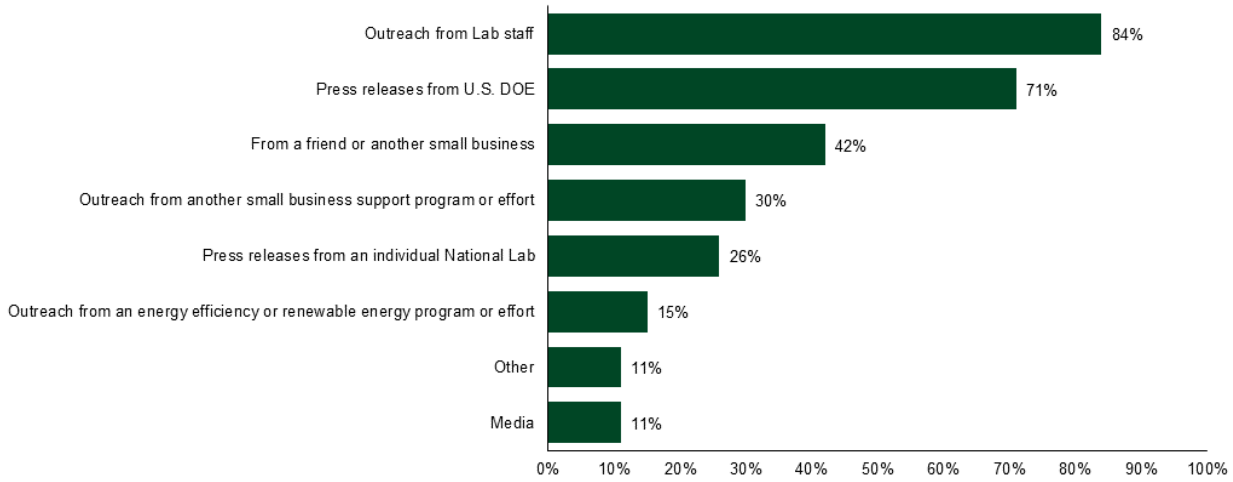
Figure 7: Awardee's Opinion of the SBV Application Process Compared to Other Federal Awards or Federal Funding (n=25)



SBV awardees most often said they learned about the SBV opportunity from outreach from Lab staff (86%), a press release from the DOE (67%), or from a friend or another small business (40%) (Figure 8).

[30] Non-participants were not asked to compare the SBV application process to other federal awards.

Figure 8: How You/Your Firm Learned About SBV (Awardees n=25, multiple responses permitted)



3.2.1.1 Satisfaction with Statement of Work (SOW) Process

Awardees and non-participants who had indicated that they had been awarded a CRADA or another type of assistance from the lab during the same period were asked to assess their experiences with developing their statement of work and the subsequent work with the labs. Five of the 35 non-participant respondents had been awarded a CRADA or other type of assistance.

First, respondents were asked to specify the type of agreement they had with the labs. Eighty-four percent of awardees and 80% (four of five) of the non-participants had short CRADAs (Table 5).

Table 5: Type of Contract or Agreement with Lab

Type of Contract / Agreement	Awardees (n = 25)	Non-participants (n = 5)
CRADA	84%	80%
TAPA	8%	0%
Don't know / refused	8%	20%
Total	100%	100%

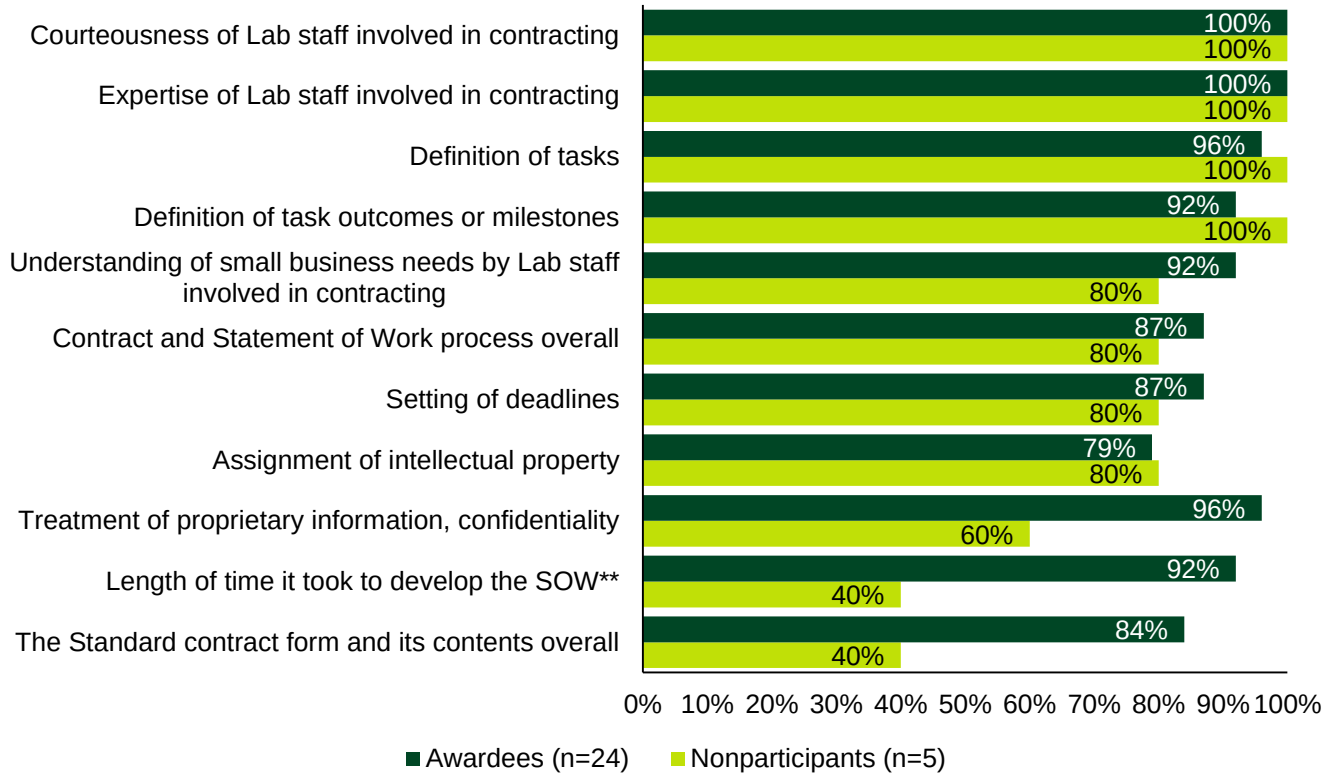
One barrier faced by small businesses wishing to partner with the Labs is the amount of time it takes to reach an agreement to the terms of CRADAs, technology assistance agreements, and other agreements. However, awardees' expectations about the SBV contracting process were almost all met or exceeded on a range of elements associated with settling the terms of the assistance and the statement of work (Figure 9). One element to note is that 92% of awardees' expectations were met or exceeded with the amount of time it took to develop the statement of work (SOW), compared to only 40% of non-participants (a statistically significant difference).

On the whole, 80% or more of awardees and non-participants both stated that their expectations were met or exceeded by the courteousness of Lab staff involved in contracting, the expertise of Lab staff involved in contracting, the definition of tasks, the definition of task outcomes or

milestones, the understanding of small business needs by Lab staff involved in contracting, the contract and Statement of Work process overall, and the setting of deadlines (100% of both awardees and non-participants expectations were met or exceeded by these first two items, Figure 9).

It is important to note that only a small number of non-participants (five) stated they had been awarded a CRADA or another type of cooperative assistance from the Labs and were subsequently asked to assess their experiences with the contracting process, making it difficult to draw meaningful conclusions about differences between awardees and non-participants.

Figure 9: Extent to which Expectations Were Met by Aspects of your Firms' SBV Contract and the Associated Statement of Work/Cooperative Assistance from the Lab* (Awardees n=24; Non-participants n=5)



*Percent who said that their expectations were met or exceeded.
**Statistically significant difference between Awardees and Non-participants at the 95% confidence level.

3.2.1.2 Awardees' Experience with Central Assistance Portal (CAP)

The majority of SBV awardees found the Central Assistance Portal (CAP), on the whole, to be comprehensive and useful for addressing topics such as the SBV program, the contracting process, application selection criteria, the application process, and lab capabilities (Table 6).

Table 6: Comprehensiveness and Usefulness of the Topics Addressed on the SBV "Central Assistance Portal"

CAP Topics	Comprehensiveness (n=25)		Usefulness (n=24)	
	Percent "4" or "5"*	Mean	Percent "4" or "5"*	Mean
SBV program	80%	4.1	75%	4.0
Contracting Process	80%	3.7	75%	3.5
Application Selection Criteria	64%	3.8	67%	3.8
Application process	56%	4.2	58%	4.0
Lab capabilities	56%	3.6	58%	3.7

*Percent that gave a "4" or "5" rating on a 5-point scale, where 1 is "not at all comprehensive/useful" and 5 is "very comprehensive/useful"

When asked about the overall ease of navigating the CAP, 18 out of 25 awardees (72%) said the SBV CAP was easy or very easy to navigate (mean of 4.0 out of 5). Seven respondents gave the *ease of navigating the SBV CAP* a rating of 3 out of 5, the lowest rating selected by any respondent for this metric.

3.3 OUTCOME FROM EXPERIENCES WITH THE NATIONAL LABS/SBV PILOT

3.3.1 Commercialization Outputs and Outcomes

Awardees and non-participants were asked several questions to assess the impact of the partnership on the commercialization process for their technologies (i.e., the technology for which participants and nonparticipants completed an RFA for a voucher), such as knowledge or skills gained, changes in Technology Readiness Level (TRL), intellectual products applied for/submitted or published/received, number employed at firm, and estimated project status in the absence of the program.

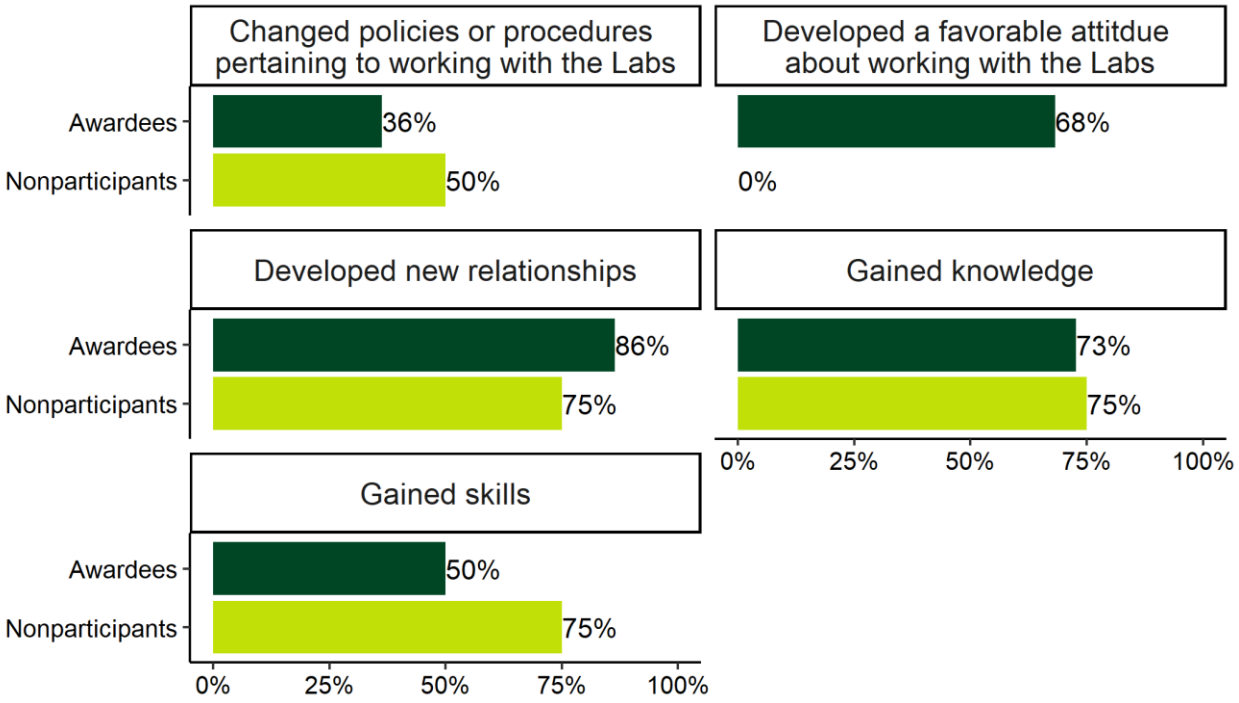
3.3.1.1 New Relationships, Knowledge, and Skills

Eighty-six percent of awardees (19 out of 22) said they developed new relationships as a result of conducting the SBV project, 73% said they gained knowledge, 68% developed a favorable attitude about working the Labs, and one-half gained skills. This suggests that the program is having a positive impact on both small business knowledge and skills and relationships with or perceptions of the Labs (see Figure 10).

Only those non-participants who said their firm had been awarded a CRADA or a different type of cooperative assistance from a Lab in the recent past (2015 or 2016) were asked a follow-up question regarding their experiences working with the labs. Three of the four non-participants who responded to this question said that they gained knowledge and skills and developed knew relationships, and two said they changed policies or procedures pertaining to working with the Labs. None of the four non-participants said that they had developed a favorable attitude related to working with the Labs. However, the small sample of non-participants who had a CRADA or

other type of cooperative assistance from the Labs makes it hard to draw meaningful conclusions about this group, or this group relative to SBV awardees.

Figure 10: Extent to which a Firm Experienced the Following Changes through Conducting the SBV project/Cooperative Assistance from the Labs (Awardees n=22, Non-participants n=4)*



*Percent "4" or "5" on a 5-point scale, where 1 is "not at all" and 5 is "a great deal"

After identifying the types of changes respondents' firms experienced as a result of conducting the SBV project, their current Lab CRADA, or other cooperative assistance, respondents were asked to describe those changes. They most commonly described an enhanced understanding of technologies, models, and processes. Table 7 shows overall responses to this survey item.

Table 7: Description of Changes Experienced through Conducting the SBV project/Cooperative Assistance from the Labs/Lab CRADA (Awardees n=16, Non-participants n=2, multiple responses permitted)

	Details
Knowledge Gained	Technical/scientific knowledge (11): • "Roll coating, analytical understanding, equipment capability, production intent quality control hardware" • "Understanding of other sensing methods that our team had not worked with before" • "Detailed knowledge of a catalyst system" • "Understanding of MEA fabrication and material testing has given us a competitive edge" • "We gained mostly scientific knowledge" • "Geothermal powerplant opportunities and specific engineering focus areas for combining our company's solar thermal productline with existing geothermal power production facilities" • "Actual loading data on our membranes" • "Insights into the material behavior under study" • "Still in process but technical details about system performance and TEA" • "Insight into the fuel cell modeling for analysis of improvements" • "New process that appears to be applicable to our business needs" Business knowledge (1): • "Cost modeling inputs" Awareness of Lab facilities (1): • "Battery test facilities"
Skills Gained	Technical/scientific skills (5): • "Capability to model the fuel cell stack physics" • "EXAFS and XANES skills gained" • "Data analysis and understanding the data" • "NREL has gained skills in modeling that our company would like to leverage in future actual powerplant design and integration efforts." • "some of the techniques used by the labs could be used in house" Business skills (2): • "Cost modeling" • "Developing strong SOW. TEA tools." Collaboration skills (2): • "The skills gained were mostly interfacing with the national lab." • "More knowledge of strengths and weaknesses of the SBV program"

Change in Attitudes about the Labs	Changed opinion of Lab staff expertise/facilities (8): • "[S]taff doing the work very cooperative" • "Very positive experience; willingness to help, flexible, and cooperative." • "We have always thought highly of researchers at the Labs but SBV gave us an opportunity and avenue to tap into their expertise" • "Not just basic science, but ability to advance commercialization/applications" • "Our company has had a very good working relationship with NREL. This SBV project added additional lab personnel that have been very high quality and very productive. This experience has only strengthened our existing relationship with a national lab" • "Availability of valuable facilities. Expertise and professionalism of staff" • "Some talented folks, perhaps not as in tune with small start-up companies as I thought they would be" • "Familiarity of working with Lab changed company outlook to work with DOE" Discovered bureaucratic/system challenges to working with the lab (3): • "Labs have their own encumbrances and priority of the SBV work must fit into their other needs." • "The lab is a bureaucratically challenging environment to work in" • "Need more exchange of materials to get the most useful assistance"
Changes in Polices or Procedures Pertaining to Working with the Labs	Will seek additional opportunities to work with the Labs (5): • "We will actively seek other opportunities to work with the Labs for current and future projects." • "Desire to develop larger and more collaborative efforts with multiple staff members" • "Will continue more SBV or other similar methods of collaboration" • "Encourage employees to actively seek opportunities to collaborate with National Lab" • "Our company has seen NREL as a strategic partner in the technology development arena. Our company's policy focus has been to engage NREL to help bridge the gap between technology development, product development, and commercialization, particularly in an environment where 'crossing the valley of death' for technology-to-market for small businesses has traditionally been a challenge. A successful ongoing working relationship through awards like the SBV award with NREL only strengthens our company's existing policy to continue to engage and work with a national lab in our technology business development efforts."

3.3.1.2 Technological Readiness Level/ Stage of Development

Awardees were asked to assess the differences over time of the development and commercialization of their technologies. The survey asked respondents to assess the stage of development of their technology 'now' (nine months after the SBV award announcement) and to assess the stage retrospectively at the time they applied to or received the SBV award. The survey included a nine-stage scale (similar to Technology Readiness Levels).[31]

According to their self-reports, respondents appear to have demonstrated progress in the development of their technologies (Table 8). While nearly half (48%) of awardees' technologies were in the concept exploration or definition stage at the time of the award, only 10% remained at the concept definition stage nine-months after the award announcement.[32] In addition, the average TRL of awardees increased from 3.2 at the time of the award to 4.7 nine-months after the award announcement.

[31] For ease of web-survey administration, the question regarding technology advancement paraphrased DOE's TRL descriptions for brevity and simplicity. See Appendix C for a comparison of the stages of commercialization used in this survey and TRLs.

[32] The evaluation team notes that the Departments of Energy and of Defense have developed "systematic, metric-based" approach to assessing TRL levels, a methodology that was outside the scope of this evaluation. See *Technology Readiness Assessment (TRA) / Technology Maturation Plan (TMP) Process Guide,* U.S. Department of Energy, March 2008. The team also notes that the SBV pilot assigned TRL scores to applicants based on scoring responses to a multi-question battery related to the stage of development of applicant's technology. The application-calculated TRLs were moderately correlated to the self-assessed pre-SBV TRL scores for Round 2 awardees (Pearson correlation of 0.38) and a higher correlation for non-participants (Pearson correlation of 0.56.

Table 8: Awardee Stage of Development Before and After SBV Award

Stage of Development	Prior to SBV Award		Nine Months Post-Award Announcement	
	Awardee Respondents	Percent	Awardee Respondents	Percent
1. Concept exploration/preliminary investigation	5	24%	0	0%
2. Concept definition/initial investigation	5	24%	2	10%
3. Proof of concept/detailed investigation	3	14%	3	15%
4. Proof of application/initial development and verification	4	19%	8	40%
5. Validation in simulated operation environment/prototype project*	No data*	--	No data*	--
6. Validation in commercial operational environment/commercial scale	2	10%	3	14%
7. Final design/commercial production	0	0%	2	10%
8. Initial sales (sales to early adopters)	2	10%	2	10%
9. Diversification/market success	0	0%	0	0%
Average TRL	**3.2**		**4.7**	
Total	**21**	**100%**	**20**	**100%**

*The participant survey erroneously repeated stage 6 "Validation in commercial operational environment/commercial scale," so the team does not have data on stage 5 "Validation in simulated operation environment/prototype project." The error was corrected for the survey of Round 1 and Round 3 awardees.

Non-participants appeared to make less progress in the development of their technologies (Table 9). In addition, the average TRL of nonparticipants increased from 3.4 at the time of the award to 4.2 nine-months after the award announcement.

Table 9: Non-participant Stage of Development Before and After SBV Award

Stage of Development	Prior to SBV Award		Nine Months Post-award Announcement	
	Non-participant Respondents	Percent	Non-participant Respondents	Percent
1. Concept exploration/preliminary investigation	1	3%	0	0%
2. Concept definition/initial investigation	3	10%	1	5%
3. Proof of concept/detailed investigation	6	19%	7	32%
4. Proof of application/initial development and verification	6	19%	2	9%
5. Validation in simulated operation environment/prototype project	7	23%	3	14%
6. Validation in commercial operational environment/commercial scale	4	13%	5	23%
7. Final design/commercial production	1	3%	2	9%
8. Initial sales (sales to early adopters)	2	6%	0	0%
9. Diversification/market success	1	3%	2	9%
Average TRL	**3.4**		**4.2**	
Total	**31**	**100%**	**22**	**100%**

Eighty-five percent of awardee respondents reported that their technology had advanced at least one stage of development, and, as a group, the stage of development increased by an average of approximately 1.4 levels since before their SBV award. [33] In contrast, only 45% of non-participant respondents reported that their technology had advanced at least one stage of development – meaning the majority (55%) reported that they were at the same levels of development at the start and end of the study period (Table 10).

[33] There is no "typical" progression of TRL over time. Among entrepreneurs, TRL progression is highly dependent on such factors as (1) the complexity of the innovation (software may reach commercialization within a year or two, while some innovations can take more than a decade), (2) the characteristics of the market (e.g., How market-disruptive is the technology? Are there established supply chains? What is the competitive value of the innovation?), and (3) the interest of the initial target market in the innovation (How many change of direction ["pivots"] are needed? How substantial are the changes needed?).

Table 10: Change in Stage of Development (Awardee n=20, non-participant n=18)

Change in Stage of Development	Awardees	Percent	Non-participant Respondents	Percent
No change in commercialization stage of development	3	15%*	10	55%
One level increase	9	45%	6	33%
Two level increase	6	30%	1	6%
Three level increase	2	10%	1	6%

*Significantly different from non-participant respondents at the 90% confidence level.

3.3.1.3 Progress Towards Commercialization

The surveys asked respondents to report their progress toward several commercialization benchmarks.

One set of benchmarks include patents, copyrights, trademarks, and scientific publications. Only one SBV awardee said they had received a patent and a scientific publication, and another said they had submitted a scientific publication – all other respondents who answered said zero.

On average, non-participants reported more patents, copyrights, trademarks, and scientific/technical publications applied for/submitted or received/published than awardees. Since applying for SBV, non-participants reported *applying for/submitting* an average of 1.7 patents, 1.1 trademarks, and 1.6 scientific technical publications; non-participants reported *receiving/publishing* an average of 0.8 patents, 1.4 trademarks, and 1.4 scientific/technical publications (Table 11). Only two non-participants reported applying for a copyright, and just one non-participant reported receiving one.

Table 11: Number of Patents, Copyrights, Trademarks, and/or Scientific Publications for the Technology Developed by Non-participants Since Applying for an SBV Award (n=25)

	Number Applied For/ Submitted (Range)	Number Applied For/ Submitted (Mean)	Number Received/ Published (Range)	Number Received/ Published (Mean)
Patents	0 - 6	1.7	0 - 4	0.8
Copyrights	0 - 1	0.2	0 - 1	0.1
Trademarks	0 - 10	1.1	0 - 10	1.4
Scientific/ Technical Publications	0 - 5	1.6	0 - 4	1.4

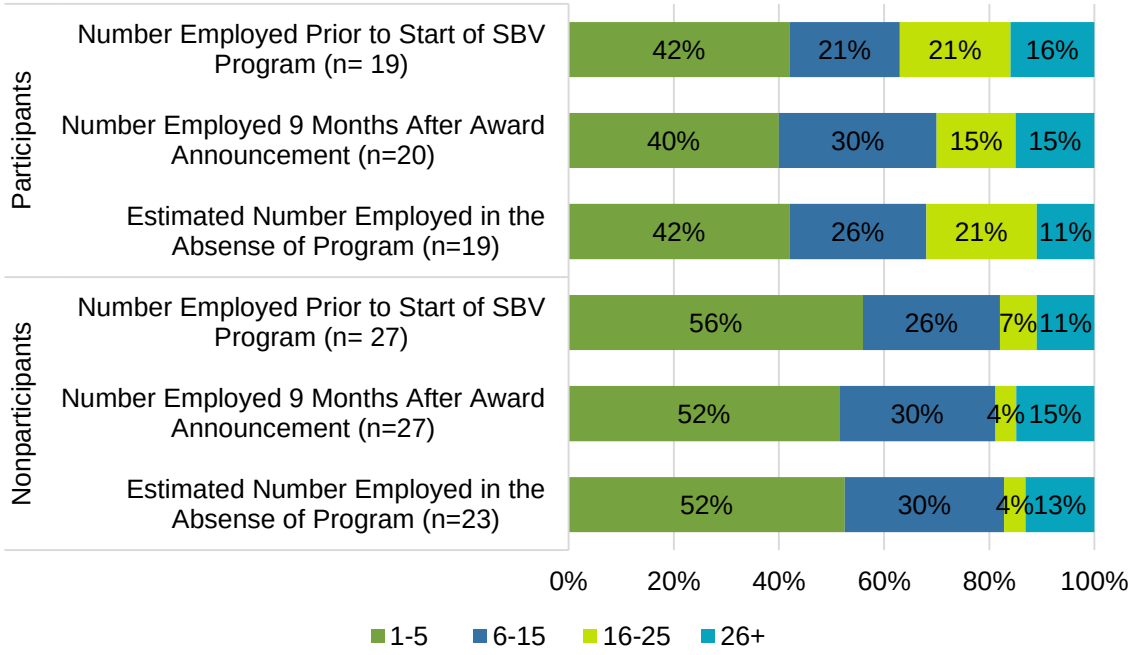
Survey respondents were also asked if their company had experienced public offerings, spin-offs, acquisition, or mergers. Nine months after the award announcement, no awardees (out of the 21 who answered) said they made or were planning to make an initial public offering, established

one or more spin off companies, or had been acquired by/merged with another firm. Three out of 28 non-participant respondents said they were planning to make an initial public offering, two said they had established one or more spinoff companies, and one said that their company had been acquired by/merged with another firm.

3.3.1.4 Changes in Company Size

The most common company size for both awardees and non-participants before and after training was between 1-5. A slightly larger proportion of awardees and non-participants reported employing between 6-15 people nine months after the announcement of the Round 2 awards. However, the change in proportion is neither significant within groups over time, nor between the participant and non-participant groups.

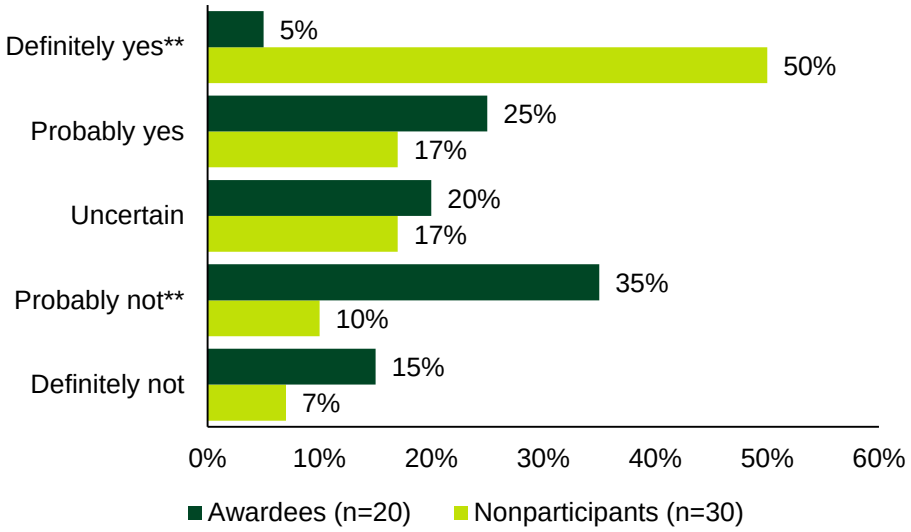
Figure 11: Number Employed at Respondent's Firm Before and After Training



3.3.1.5 Project Status in the Absence of SBV

The surveys asked respondents if they would have undertaken the same project in the absence of their SBV award or applying for an SBV award. Half (50%) of SBV awardees "probably" or "definitely" *would not have* undertaken the project in the absence of the award, while only 17% of non-participants "probably" or "definitely" *would not have* undertaken the project in the absence of applying for SBV. These findings suggest that SBV is helping a substantial number of awardees to continue commercializing their technologies and that the program appears to have identified a group more in need of the awards to continue with their technologies. Alternatively, awardees, having received funding, may have a more realistic assessment of their ability to move forward without the SBV award.

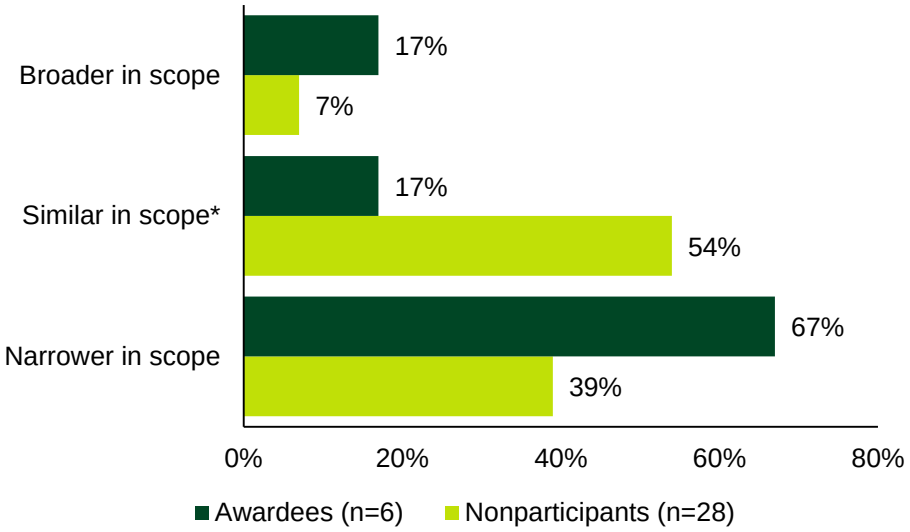
Figure 12: Project Status in the Absence of the SBV Award or Applying for the SBV Award



**Statistically significant difference between awardees and non-participants at the 95% confidence level.

Of the awardees who said they would "probably" or "definitely" have undertaken the project in the absence of the SBV award, 67% (four of the six respondents) said their project would have been narrower in scope in the absence of the program. One participant said their project would have been broader in scope, and one said the project would have been similar in scope. Among non-participants who "probably" or "definitely" would have undertaken the project in the absence of applying for the SBV award, more than half (54%) of the 28 respondents said their project would have been similar in scope, and 39% said the project would have been narrower in scope. The remaining 7% (two non-participants) said the project would have been broader in scope in the absence of applying for the SBV, which may reflect the resources required to apply for SBV (Figure 13).

Figure 13: Estimated Scope of Project if Undertaken in Absence of SBV Award or Applying for SBV Award



** Statistically significant difference between awardees and non-participants at the 90% confidence level.

Similarly, among the six awardees who "probably" or "definitely" would have undertaken the project in the absence of the SBV award, respondents estimated their project would have been delayed an average of seven months (with a range of 0-12 months specified), and 67% (four of six respondents) said the duration or time to completion of the project would have been longer in the absence of the award, and that the project would be behind in achieving similar goals or milestones (Table 12). This suggests that even among awardees who were relatively confident that their project would have proceeded without the award, they felt that the SBV award helped give the process a boost both in terms of time and in achieving goals.

Non-participants who "probably" or "definitely" would have undertaken the project in the absence of applying for an SBV award said the project would have been delayed an average of 8.9 months (with a range of one month ahead to 36 months delayed); half of the 18 non-participants who specified said that their project would have been of longer duration in the absence of applying for the SBV award, but 41% said that the project would have achieved similar goals and milestones (Table 12). Overall, these non-participant results might point to the burden of applying for the SBV award for non-participants; however, in some cases, non-participants reported that their project would have been behind in achieving similar goals and milestones had they not applied for SBV, or that the duration/time to completion would have been longer. In these cases, it may be that non-participant respondents found some value in preparing an application for an SBV even though they did not ultimately receive an award.

Table 12: Best Estimates of What Would Have Occurred in the Absence of the SBV Funding/Applying for an SBV Award

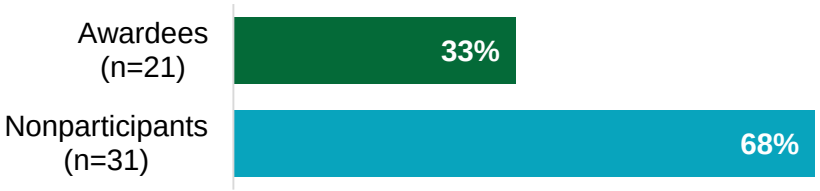
	Awardees	*n*	Non-participants	*n*
Number of Months Project Would Have Been Delayed				
Range	0 – 12	6	(-1) – 36	18
Mean	7.0	6	8.9	18
Expected Duration/Time to Completion in Absence of SBV Award/SBV Application				
Longer	67%	4	50%	13
The Same	33%	2	35%	9
Shorter	0%	0	15%	4
In Achieving Similar Goals and Milestones, the Project Would Be:				
Ahead	0%	0	22%	6
The Same Place	33%	2	41%	11
Behind	67%	4	37%	10

3.3.2 Financial Outcomes

3.3.2.1 Funding

The percentage of SBV awardees who reported receiving or investing additional developmental funding in their SBV-supported technology was less than half the percentage of non-participants: seven SBV awardees (33% of the 21 who responded) and 21 non-participants (68% of the 31 who responded) received or invested additional developmental funding in their SBV (or CRADA) project subsequent to the SBV award/applying for SBV (Figure 14).

Figure 14: Received or Invested Additional Development Funding



Among these respondents, six awardees and 18 non-participants specified a dollar value greater than $0 for funding received/invested in at least one of a range of funding sources, as follows:

- non-SBV federal funds
- private investment (U.S. venture capital, foreign investment, and other private equity including angel funding)
- state and local governments
- colleges or universities
- the firm's funds, including money firm has borrowed

- personal funds

Figure 15 summarizes the proportion of the types of additional funds received or invested. Funding amounts are reported in Figure 16. Overall, these six awardees reported nine separate instances of receiving/investing funds of some amount greater than $0. The most common form of additional funding for awardees was private investment; five of the nine instances of reported funding (or 56%) were in the private investment category. There was one instance each of funding from the firm's funds (including loans); from federal, non-SBV funds; from state or local governments; and from a college or university.

On the other hand, 18 non-participants reported 44 instances of receiving/investing funds of some amount greater than $0. While private investment was also the most common form of additional funding for non-participants, it was a much smaller percentage (32% compared to 56%). While no awardees reported investing personal funds, there were nine instances of non-participants reporting doing so (or 20% of funding instances reported).

Figure 15: Proportion of Additional Developmental Funding Awards Received to Date by Source of Funding (Awardees n=6, Non-participants n=18; multiple responses permitted)

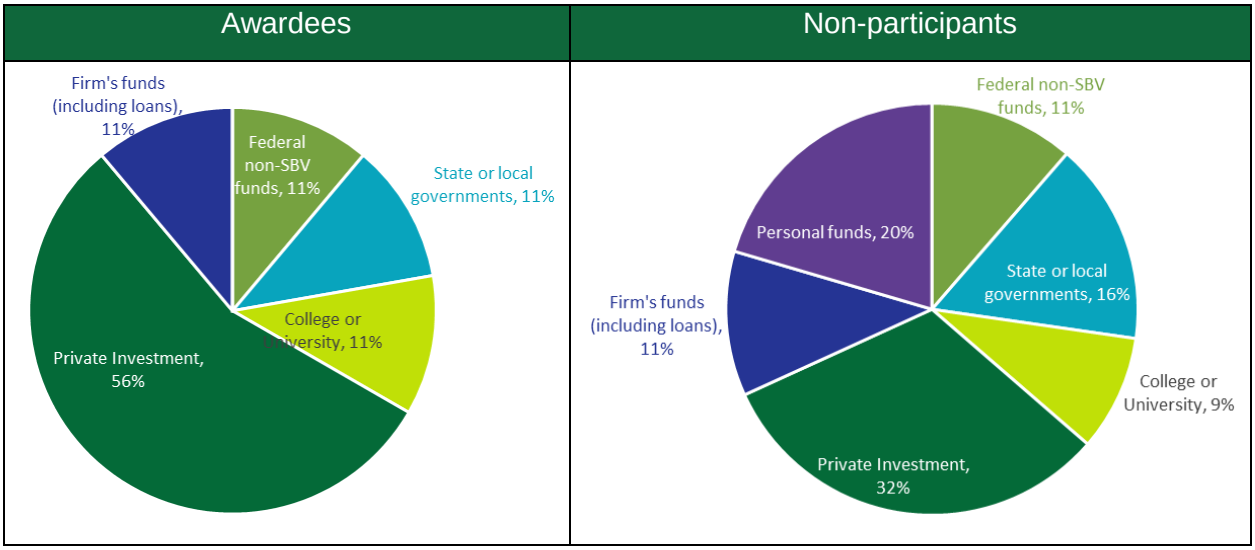
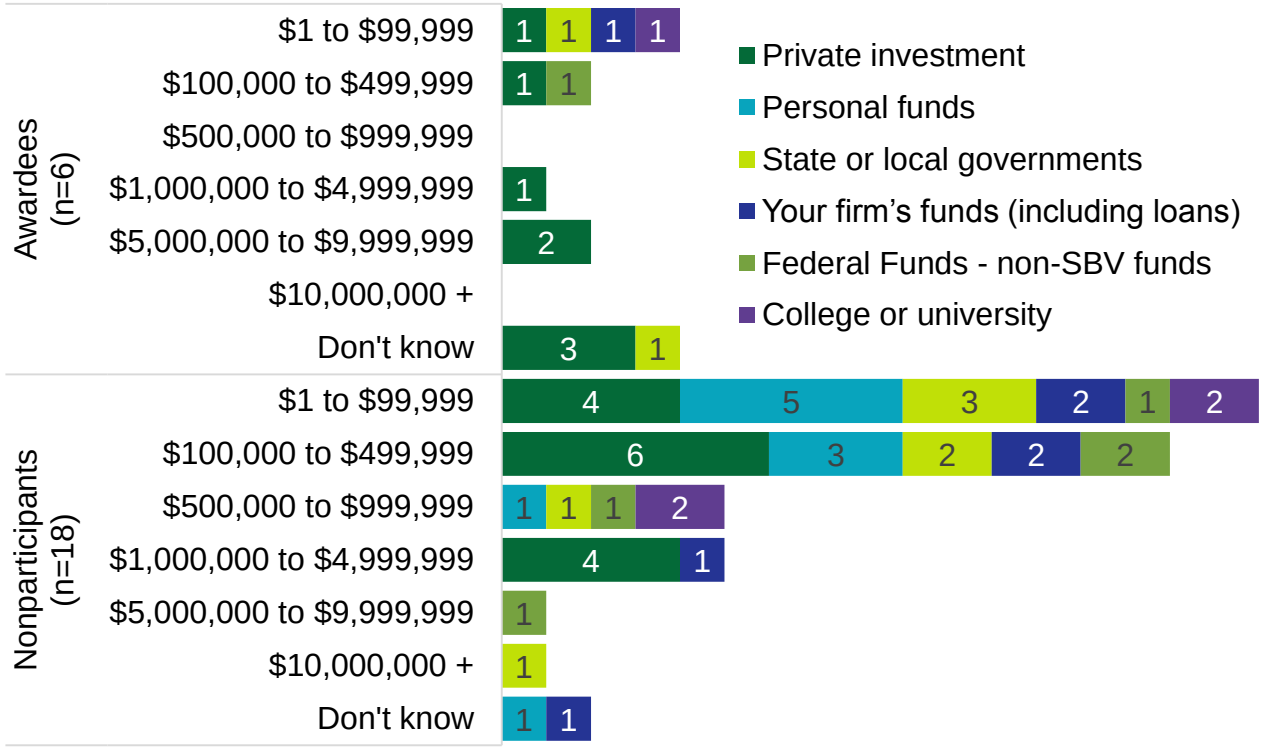


Figure 16 reports the counts of additional funding by type of funding and amount of additional funding. The counts of each type of funding are reported in the bars of the bar chart. The most common amount of additional funding for both awardees and non-participants was in the $1-$99,999 range.

Figure 16: Total Additional Developmental Funding and Sources of Funding Received to Date (Awardees n=6, Non-participant n=18; multiple responses permitted)



Because the funding amounts were reported as ranges (see, for example, Figure 16), we developed a lower and upper estimate of funding received. For the lower estimate, we used the lowest value in each range, with exceptions for the first range of under $100,000, to which we assigned a conservative value of $5,000, and the largest range of $10,000,000 and more, to which we assigned a value of $10,000,000. The higher values in our reported ranges are based on the midpoint of the range presented for each category, with the exception of the largest category, to which we again assigned a value of $10,000,000. For example, the value of $50,000 is used if the respondent selected the first range of under $100,000.

On average, awardees who received additional funding received approximately $1.9 million – $3.1 million each. Non-participants who received additional funding received on average received $1.3 million – $2.3 million each. Based on reported data, we estimate total funding received by awardee survey respondents to be between $11.2 million and $18.8 million, and total funding received by non-participant survey respondents to be $24.1 million – $41.6 million in total. We extrapolated these values out to estimate the total amount of funding received by the population based on the survey response rate (Table 13).

Table 13: Estimated Average and Total Additional Funding (Awardees n=6, Non-participant n=18, multiple responses permitted)

	Awardees	Non-participants
Average Funding per Respondent	$1.9 million – $3.1 million	$1.3 million – $2.3 million
Total Reported Funding	$11.2 million – $18.8 million	$24.1 million – $41.6 million
Extrapolated Funding Total*	$19.7 million – $33.0 million	$86.0 million – $148.6 million

* We extrapolated reported funding totals to the entire sample using the survey response rate.

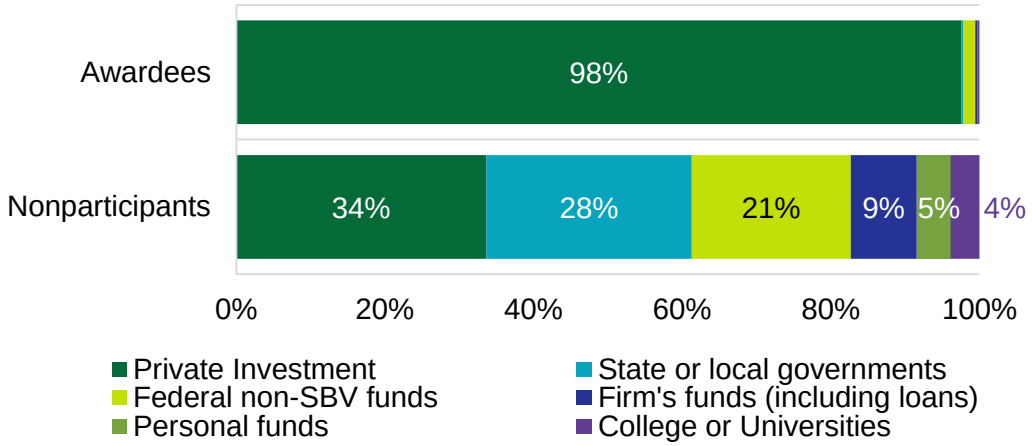
Compared to non-participants, awardees received a greater amount of private investment on average. We estimate that the average private investment received by awardees amounted to between $2.2 million and $3.7 million, whereas we estimate that the average non-participant private investment funding amounted to $330k – $1.0 million per respondent who received funding. As noted previously, no awardee reported investing their personal funds into the small business, whereas we estimate the average value of personal investment among the non-participant sample to be $825,000 – $1.9 million. We also estimate that, on average, non-participants received more non-SBV federal funds and funds from state and local governments than awardees.

Table 14: Estimated Average Funding Received by Funding Category (Awardees n=6, Non-participant n=18; multiple responses permitted)

	Awardees	Non-participants
Average Federal Non-SBV Funds	$100,000 – $300,000	$1.1 million – $1.8 million
Average State or Local Governments	$5,000 – $50,000	$1.5 million – $1.6 million
Average College or University	$5,000 – $50,000	$250,000 – $400,000
Average Private Investment	$2.2 million – $3.7 million	$330,000 – $1.0 million
Average Firm's Funds (Including Loans)	$5,000 – $50,000	$240,000 – $740,000
Average Personal Funds	--	$825,000 – $1.9 million

Using the upper range of our estimate of funding received, we estimate that approximately 98% of awardee outside funding came from private investment, compared with 34% of non-participant funding. A larger proportion of outside funding that non-participants reported receiving came from other non-SBV federal funds (21%) or other state or local government funds (28%) (Figure 17).

Figure 17: Proportion of Outside Funding from Each Funding Category (Awardees n=6, Non-participant n=18; multiple responses permitted)



3.3.2.2 Sales

As part of the assessment of commercialization outputs and outcomes, awardees and non-participants were asked about sales of products, processes or services, or other sales of their SBV-related technology. They were also asked if there were sales since the award announcement (awardees) or since applying to SBV (non-participants) in order to identify the date of the first sales and total amount.

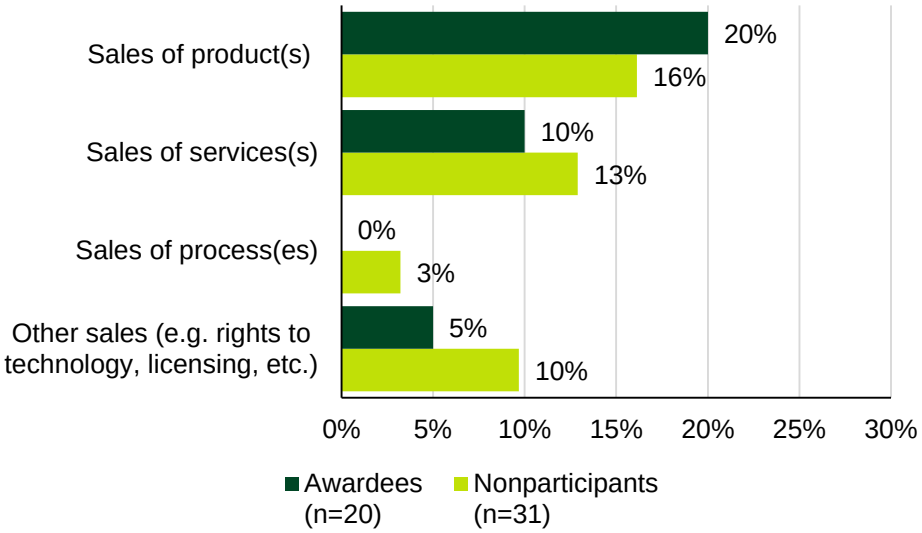
It is important to note many of the awardees and non-participants were at relatively advanced stages of technology development according to their applications to SBV (Table 15). Applicants were asked a series of questions about their technologies during the application process, and, for example, all participants had demonstrated the feasibility of the technology in the lab and 80% had created a prototype. Nearly half (44%) reported achieving sales of some kind related to their SBV-technology, while more than a quarter of non-participants (26%, or nine non-participants) had achieved sales before applying to SBV. Note that while these questions are similar to the TRL stages reported in Table 8 and Table 9, but whereas Table 15 is reporting individual achievements pertaining to their technology, Table 8 and Table 9 are reporting respondent's overall assessment of the stage of development of their technology.

Table 15: Technology Status Questions from SBV Application

SBV Application Question	% Yes, Awardees (n = 25)	% Yes, Non-participants (n = 35)
Have you demonstrated the feasibility of the technology in the lab?	100%	83%
Have you created and tested (or are in the process of testing) a prototype?	80%	77%
Have you demonstrated / Are you currently demonstrating the product/service in an initial pilot project or demonstration?	64%	54%
Have you achieved sales - more than one - and are actively seeking more sales?	44%	26%

Nine months after the announcement of the Round 2 awards, a total of four awardees and eight non-participants reported making sales of products, processes, services, or other sales of their SBV-related technology (e.g., rights to technology, licensing). Five non-participants and four awardees reported having sales of products. One non-participant reported making a sale of a process, four made sales of services, and three made other sales (e.g., rights to technology, licensing). No awardees reported making a sale of a process, two made a sale of service and one made another sale (e.g., rights to technology or licensing) (Figure 18). It is important to note that one of the four awardees had reported sales of the SBV-related technology in their SBV application, while half (four of the eight non-participants) had reported sales in the application to SBV, so some caution is warranted in interpreting the sales data as respondents may have been thinking of their pre-SBV sales when responding to the survey.

Figure 18: Sales of Products, Sales, Services, or Other Sales (Awardees n=20; Non-participants n=31)



The awardees and non-participants who reported making a sale of any kind were asked to state the date of first sale and the approximate amount of total sales.[34] The awardees reported that November 2016 and April 2017 were their dates of first sale, while non-participants reported a wider range of dates of first sale, some of which pre-date the announcement of the SBV awards in August 2016.

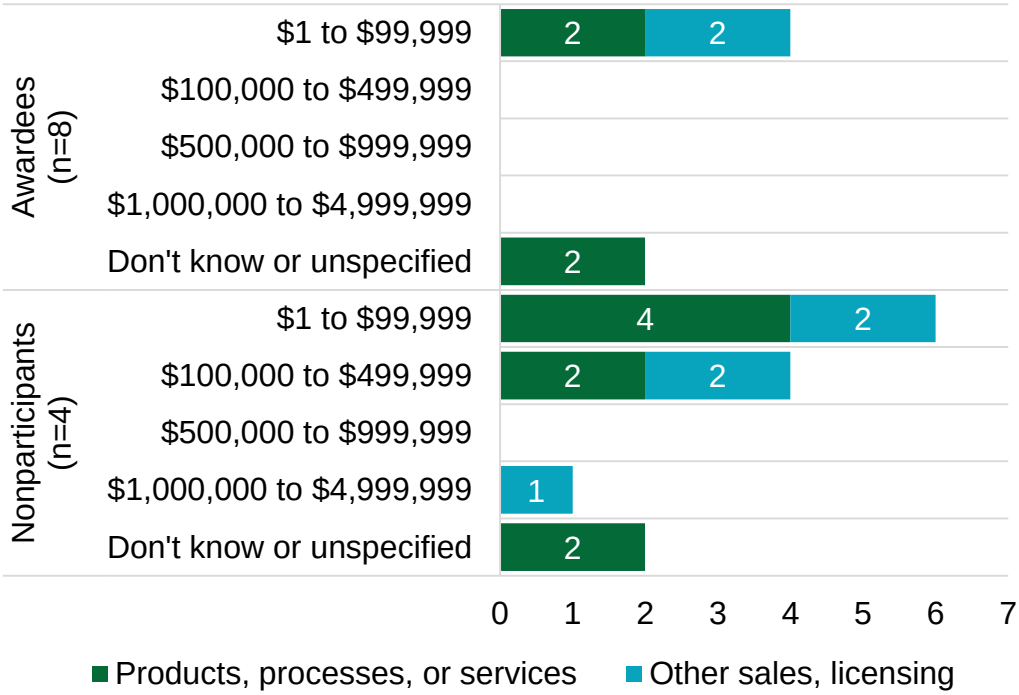
- January 2015
- August 2016;
- September 2016
- January 2017
- March 2017

Four of the eight non-participants reporting sales also applied to Round 1 of SBV, which opened in October 2015, so they may have interpreted the survey to be asking about their Round 1 application to SBV rather than for Round 2. While the respondent who reported sales in January may have interpreted the survey as asking about any sales related to their technology (rather than sales since applying to SBV).

Figure 19 reports the counts of sales by type of product and by amount of the sales. The most common amount of sales for both awardees and non-participants was between $1-$99,999.

[34] Two awardees and one non-participant who reported making sales did not disclose the approximate value of those sales.

Figure 19: Count of Reported Sales (multiple responses permitted)*



* Note: The counts of each type of funding are reported in the bars of the bar chart.

The evaluation team used the same method to estimate the average and total amount of additional funding received to estimate sales. We developed conservative estimates of sales received by using the lowest value in each range, with the exception for the first range of under $100,000, to which we assigned a conservative value of $5,000. The higher values in our reported sales ranges are midpoint estimates of funding received based on the midpoint of the range presented. For example, the value of $50,000 is used if the respondent selected the first range of under $100,000.

Among those who said they made sales and specified the value of those sales within a broad range, the average value of sales made by awardees was between $10,000 and $100,000, while the average value of sales made by non-participants was between $88,000 and $300,000. Based on reported data, we estimate the total value of sales made by awardees to be between $20,000 and $200 million, and between $530,000 and $1.8 million for non-participants (Table 16). The ranges on these values are very wide due to the small number of respondents who both made sales in the period and indicated the approximate value of these sales.

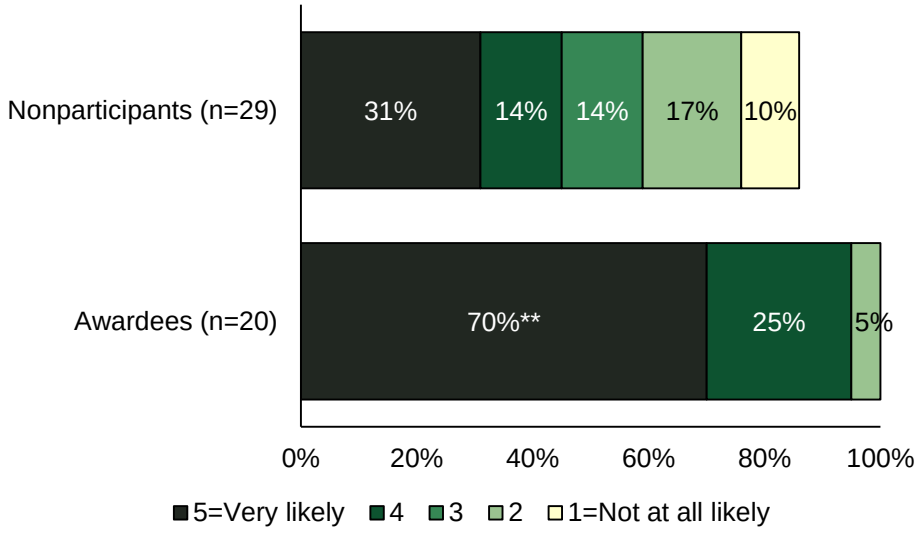
Table 16: Estimated Average and Total Sales (Awardees n=2, Non-participant n=6; multiple responses permitted)

	Awardees	Non-participants
Average Sales per Respondent	$10,000 – $100,000	$88,000 – $300,000
Total Sales	$20,000 – $200 million	$530,000 – $1.8 million

3.4 FUTURE ENGAGEMENT

Seventy percent of awardees reported being very likely to work with the Labs again in the future, compared with only 31% of non-participants (a statistically significant difference). This reflects well on the SBV program, suggesting that the experience makes a positive impression on most awardees. One awardee did rate their likelihood of working with the labs again as 2 out of 5, suggesting that there is a minority of awardees who had a less than positive experience. This same participant reported that they would not recommend SBV to their colleagues, citing delayed funds and difficulty working with lab management (see below).

Figure 20: Likelihood That You Will Work with the Labs again (Awardees n=20, Non-participants n=29)



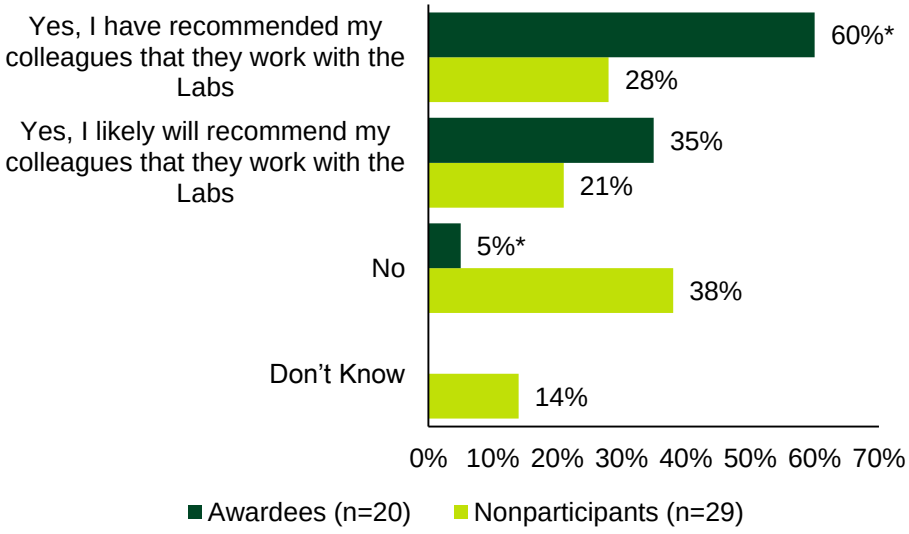
**Statistically significantly difference between Awardees and Non-participants at the 95% confidence interval.

Ninety-five percent of SBV awardees said they had recommended or will recommend that their colleagues work with the Labs (Figure 21). Only one SBV awardee said they would not recommend that their colleagues work with the labs – this individual went on to describe a difficult experience they had working with Lab management, as mentioned above. Table 17 reports the estimated number of colleagues SBV awardees said they had recommended or will recommend that their colleagues work with the Labs.

Ten non-participants articulated why they will not or might not recommend SBV to their colleagues, and many had negative comments about the application process or the feedback received. Three said that the feedback received explaining why their application was not accepted was insufficient, three said the resources required to apply to the program are too significant, and three said the chances of getting an SBV award are too small to justify the expense of preparing an application (see Section 3.5 for more discussion of the non-participants' perceived inadequacy of feedback from the Labs). Two non-participants also commented that they felt the Labs were under-resourced, and one said that they felt the SBV system was designed to support only larger

companies or those already doing business with the U.S. government. One non-participant stated that the SBV does not appear to be an effective program.

Figure 21: Respondent Recommendations to Colleagues or Other Small Businesses that they Work with the Labs



* Significantly different than non-participant respondents at the 90% confidence level

Table 17: Respondent Recommendations to Colleagues or Other Small Businesses that they Work with the Labs

	Awardees			Non-participants		
	Range	Mean	*n*	Range	Mean	*n*
Number of colleagues you made this recommendation to	2–10	4.0	11	1–10	4.0	5
Number of colleagues you anticipate making this recommendation	2–7	4.4	5	2–5	2.7	6

3.5 FEEDBACK ON THE SBV PROGRAM

Unsuccessful SBV applicants had a lot of constructive criticism to offer regarding the SBV application process. Five out fifteen non-participants who provided suggestions said they would like more meaningful feedback on why a grant was not awarded; similarly, three said that the qualities of a successful application should be made clearer.

In addition to the comments provided in the survey and detailed in Table 18, the evaluators received several responses to the survey solicitation email from unsuccessful SBV applicants who were unhappy about the feedback they received about their application.

The inadequacy of feedback is a primary concern to unselected applicants and a cause of much dissatisfaction from those applicants, potentially damaging the reputation of the Labs among small businesses. The Labs might also view the work of providing more thorough feedback to unselected applicants as an opportunity to provide more awareness of other Lab programs or information about Lab expertise, general information about technology commercialization, and constructive feedback on the application in general.

In addition to the desire for improved application feedback, two non-participants suggested that the application process contain a phone or in-person interview. Overall, non-participants had eleven different suggestions on how to improve the SBV application process, listed in Table 18.

Awardees expressed satisfaction with their experience with the SBV program when provided an opportunity to provide open-ended recommendations – three said they were impressed with the results generated by the lab, and three were very satisfied with the process and outcome of the program. The constructive criticism offered by SBV awardees centered around four main themes: managing expectations, budget concerns, timing concerns, and a desire for a simplified process. These recommendations are also reported in Table 18.

Table 18: Suggestions to Improve the SBV Program/Suggestions to Improve the Lab's Cooperative Assistance Experience for Small Businesses (n=9, 17)

Awardees	
Positive Comments	***n***
• Impressed with results generated by the lab (3) • Very satisfied with process and outcome of program (3) • Supported the development of a quarterly newsletter highlighting advances accomplished in the last quarter (1) • May encourage other participants (1) • Gained access to state of the art equipment (1)	5
Constructive Criticism	***n***

• Manage expectations
  ○ For project proposals, expect incremental change, not transformational change (manage expectations) (1)
  ○ This survey asked about IPOs, substantial sales, etc., but that's not very realistic for the time and money involved in the SBV program (manage expectations) (1)
• Budget concerns
  ○ Money should be allocated for travel so company and lab can physically work together (1)
  ○ There should be closer agreement between projected cost and dollars spent (1)
	7

○ Please publish SBV budget allocation to each DOE subprogram, some labs had expended their apportionment and could not accept proposals (1) • Improve Lab response time, other timing concerns ○ Labs need to operate more quickly (1) ○ Speed up time between accepted proposal and contracting with a lab - should be 3-5 months, not 9 (1) ○ The process for receiving funds needs to be improved, currently too slow (1) ○ Provide an explicit mechanism to support delays (1) • Simplify process ○ Simplify language in initial documentation, no "government speak" (1) ○ Make the contracting processes easier and more informal (1)	
Non-participants	
Positive Comments	***n***
• Great opportunity for small businesses (1) • Process is good overall (1)	2
Constructive Criticism	***n***
• SBV Application process ○ Give more meaningful feedback on why grants are not awarded (5) ○ Make successful application expectations clear (3) ○ Program application should include a phone or in-person interview (2) ○ Report the probability of receiving a grant early on (1) ○ Increase period for asking technical questions (2) ○ Provide a template to fill out for applicants (1) ○ Increase speed of application/approval process (1) ○ Make submission portal (1) ○ Allow for letters of support from the laboratories (1) ○ Make certain that reviewers have commercialization experience (1) ○ Process is biased against new technologies (1) • Other suggestions ○ Difficult to find the right fit between lab and business (1) ○ Increase funding available (1)	15

Conclusions and Recommendations

Results from the Round 2 awardees preliminary impacts evaluation show positive outcomes for awardees, as well as general benefits for unsuccessful applicants. Their responses also indicate some areas of improvement, particularly related to how the program follows up with unsuccessful applicants.

CONCLUSIONS

Based on results from the Round 2 awardees preliminary impacts, we offer the following conclusions:

1. **Awardees reported positive experiences with the application and contracting process.** They indicated that various aspects of the application process, funding opportunity notice, and contracting process overall met or exceeded their expectations. Awardees reported that the process of applying for SBV was easier (48%) or much easier (28%) than applying for other federal awards. They also found the Central Assistance Portal (CAP) to be comprehensive and useful for addressing topics such as the SBV program, the contracting process, application selection criteria, the application process, and lab capabilities.
2. **Lab partnerships foster the development of new relationships, knowledge, and skills.** As a result of their SBV project, the majority of awardees reported that they had developed new relationships (86%), gained knowledge and skills (73% and 50%, respectively), and developed a favorable attitude about working the Labs (68%). Only non-participants who had indicated that their firm had been awarded a CRADA or a different type of cooperative assistance from a Lab in the past were asked the parallel follow-up question, which was only applicable to four non-participants. Three said that they had developed new relationships and gained knowledge and skills, and two said they had changed policies or procedures pertaining to working with the Labs. None of the four non-participants indicated that they had they developed a favorable attitude related to working with the Labs. However, the small sample of non-participants who had a CRADA or other type of cooperative assistance from the Labs makes it hard to draw meaningful conclusions about this group, or this group relative to SBV awardees.
3. **Awardees appear to be making more progress in advancing the stage of development of their technology than non-participants.**
4. **Despite not being awarded an SBV project, non-participants have generally made progress towards commercialization.** Non-participants were more likely than awardees to have reported that they would have undertaken the same project in the absence of applying for SBV (67% versus 50%). Non-participants also reported having applied for/submitted or received/published more patents, copyrights, trademarks, and scientific/technical publications. Awardees received a greater proportion of external funding from private investment compared to non-participants (56% of funding instances reported for awardees, compared with 32% of funding instances for non-participants;

private investment also accounted for an estimated 98% of the total financial value of funding received by awardees).

5. **Awardees reported a statistically significant higher rate than non-participants of being likely to work with the Labs again in the future (70% versus 31%); awardees were also statistically significantly more likely to note that they have or would recommend SBV to their colleagues (95% versus 49%).** This disparity in experiences is likely due to the level of effort required to submit an application and insufficient follow up with unsuccessful applicants. The inadequacy of feedback is a primary concern for unselected applicants and a cause of much dissatisfaction for those applicants. This could potentially damage the reputation of the Labs among small businesses.

RECOMMENDATIONS

Based on results from the Round 2 awardees preliminary impacts, we offer the following recommendations:

1. **Maintain the core elements of the SBV program while seeking to achieve ongoing improvement.** As noted above, awardees reported positive experiences with the application and contracting process. They also expressed satisfaction with their experience with the SBV program when provided an opportunity to provide open-ended recommendations: three said they were impressed with the results generated by the lab, and three were very satisfied with the process and outcome of the program. The critiques offered by SBV awardees centered around four main themes: managing expectations, budget concerns, timing concerns, and a desire for a simplified process. Although these issues were cited by a minority of respondents, most referenced administrative challenges that should be seriously considered, such as expectations regarding accomplishments during the grant period, Lab response time, and application processes.
2. **Consider improving the quality of feedback to unsuccessful applicants.** Non-participants consistently reported that the feedback on their application was inadequate. Providing constructive feedback and following up with unsuccessful applicants will likely improve the quality of future submissions while furthering the goal of engaging small businesses. The Labs might also view the work of providing more thorough feedback to unselected applicants as an opportunity to provide more awareness of other Lab programs or information about Lab expertise, and general information about technology commercialization.

Appendix A Detailed Logic Models

Figure 22: Small Business Voucher Pilot's High-Level Logic with Metrics

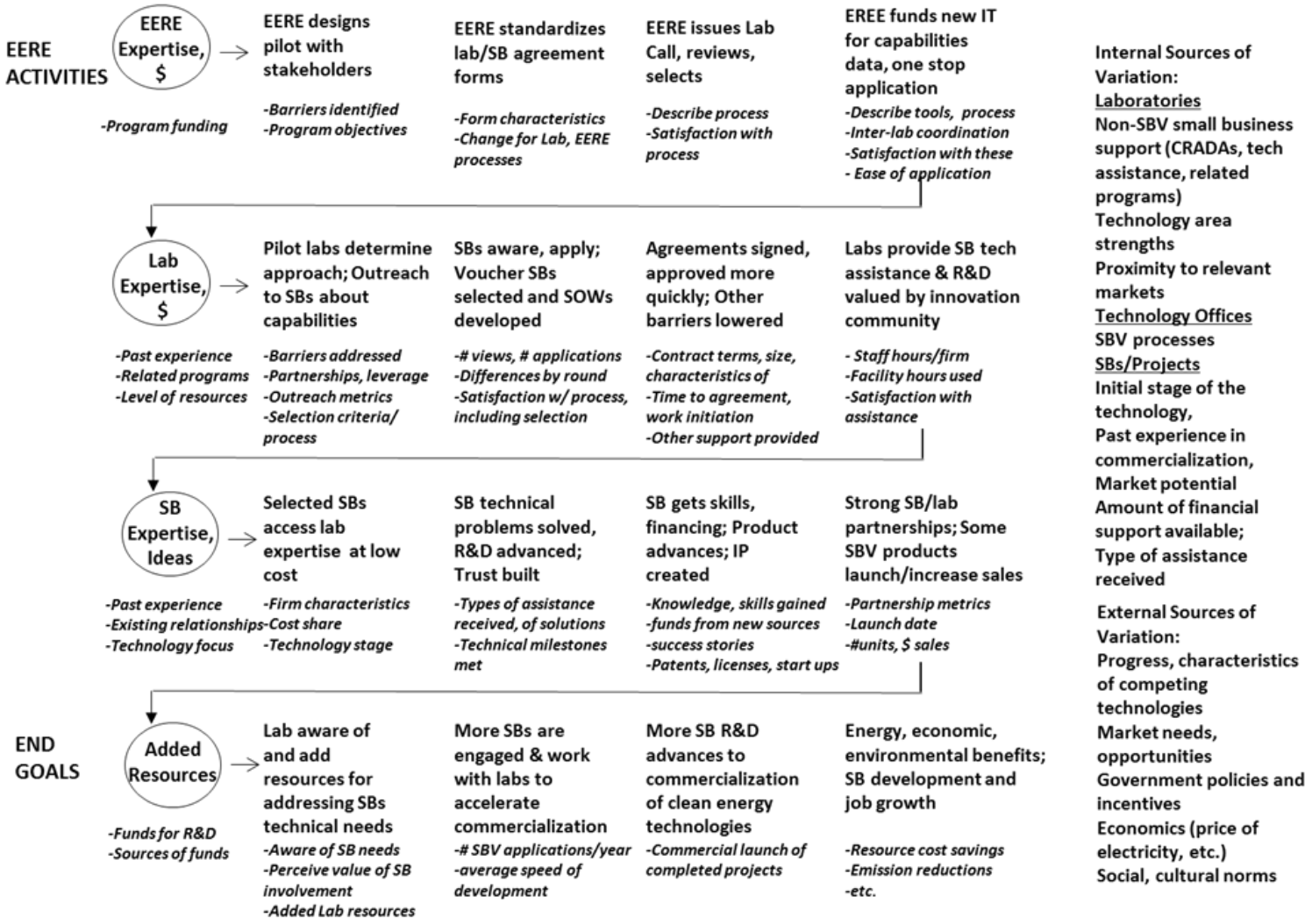


Figure 23: Small Business Voucher Pilot Logic Model for Headquarters and IT Activities

INPUTS: Expertise, Existing programs, $

ACTIVITIES	EERE designs SBV with stakeholders →	EERE Reviews, selects Labs →	EERE standardizes agreement forms →	EERE via CAP lab develops application portal →	CAP sends applications to labs/reviewers →	EERE monitors, evaluates
OUTPUTS	Lab Call reflecting ways to lower barriers, give Labs flexibility	Lab proposals reviewed on criteria; 5 chosen to lead	Drafts; DOE legal advice; Lab input; SBV CRADA, SBV TAPA	Portal with lab capabilities, on line application form, stored applications	Determine technical & high impact potential; most appropriate lab assigned	Requirements RFQ, select contractor; Tech. plan
FOR/WITH	*Lab management, external experts*	*EERE staff*	*All Lab applicants; DOE General Counsel*	*NREL IT staff*	*EERE Technology Offices; Participating labs*	*EERE program & evaluation staff; Contractor*
EARLY OUTCOMES (1 year)	Labs submit proposals; Have more understanding of barriers and how to lower them	Labs are satisfied with process; Unselected labs participate as nonlead	Time from application to start of work shortened at TO and Lab	Easier for SBs to know why, where, how to apply. More SBs apply	Labs collaborate to determine most appropriate lab	Pilot evolves; Lessons learned; Baseline, process and early impact report

Internal Sources of Variation: Laboratories: Non-SBV small business support (CRADAs, tech assistance, related programs), Technology area strengths, Proximity to relevant markets. Technology Offices: SB processes. SBs/Projects: Initial stage of the technology, Past experience in commercialization, Market potential, Amount of financial support available; Type of assistance received.

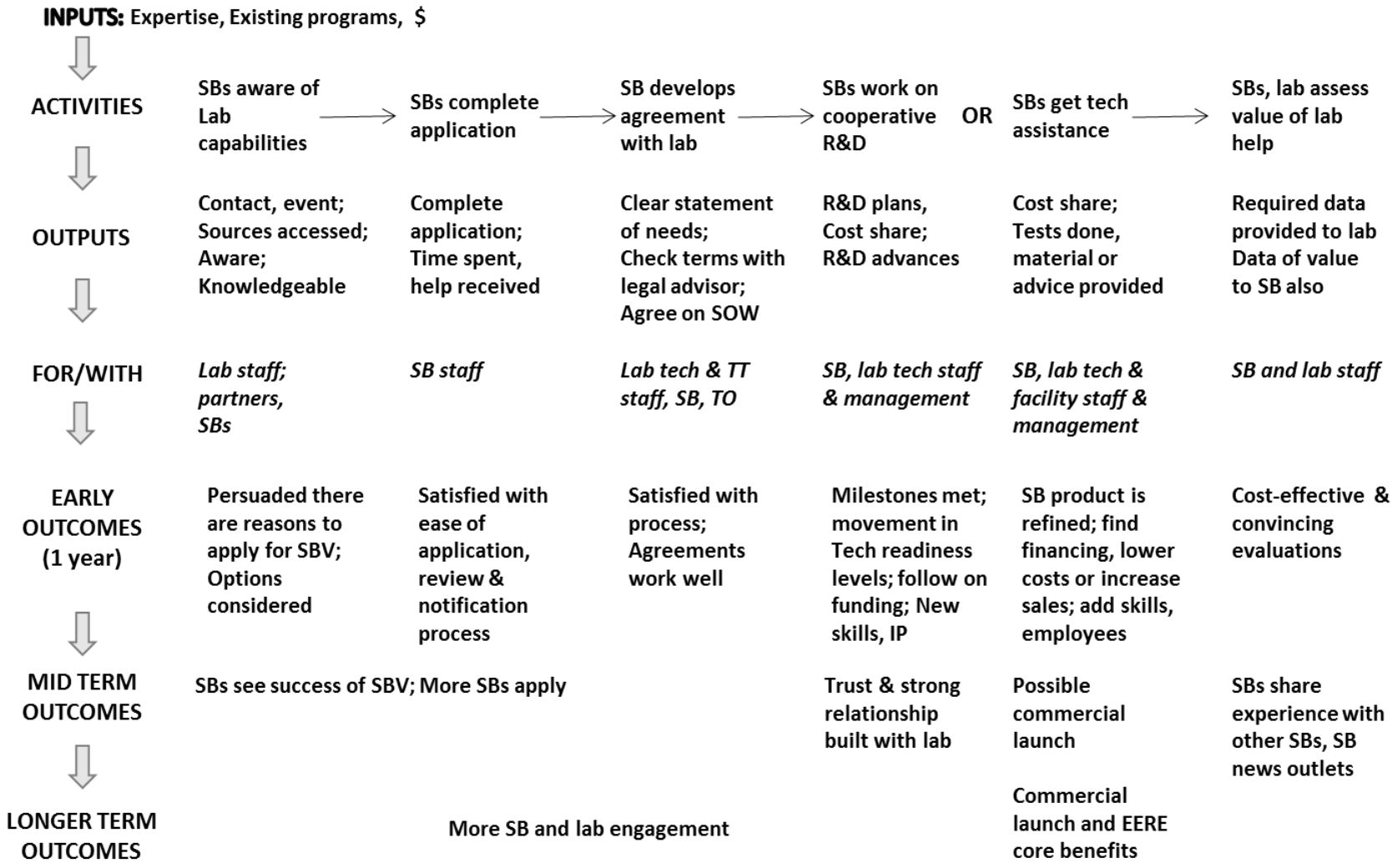
Figure 24: Small Business Voucher Pilot Logic Model for the Pilot Laboratories

INPUTS: Expertise, Existing programs, $

ACTIVITIES	Lab prepares to write proposal →	Lab submits proposal →	Lab does Outreach →	Lab develops SOWs with SBs, TOs; Contracts with SB →	Lab conducts SOWs →	Lab monitors process, success
OUTPUTS	Champion; Baseline data; Value proposition; Partner interest	Agreement on approach; Commitments to participate	Strategy; New outreach materials; New contacts made	Review to assign staff; Test new process for negotiating; TO Director approves	SOWs; PI and facility usage funded; Tech. solutions	Data collection, analysis, feedback
FOR/WITH	*Lab champion, management, leads of related efforts*	*Project champion, lead office, partners*	*SBs, clean tech networks*	*Participating lab, Site Office, TO, SB*	*Lab staff, related efforts*	*Lab management, staff; SBs, EERE*
EARLY OUTCOMES (1 year)	Better understanding of barriers, solutions	Process changes because of submission, participation	More SBs aware, interested, applying; Quality applications received	Time from application to start of work shortened; Agreements work well	SBs satisfied, value Lab assistance; Trust built; R&D advances	Evaluation is cost-effective; Success stories & lessons learned

Internal Sources of Variation: Laboratories: Non-SBV small business support (CRADAs, tech assistance, related programs), Technology area strengths, Proximity to relevant markets. Technology Offices: SBV processes. SBs/projects: Initial stage of the technology, Past experience in commercialization, Market potential, Amount of financial support available; Type of assistance received.

Figure 25: Clean Energy Small Business Voucher Pilot's Logic Model for the Voucher Firms



EXTERNAL INFLUENCES: Related programs at each Lab, Progress, characteristics of competing technologies, Market needs, opportunities; Government policies and incentives; Economics (price of electricity, etc.), Social, cultural norms.

Appendix B Factors that Affect Technology Transfer and Commercialization at Federal Laboratories

This appendix describes factors that affect technology transfer and commercialization at Federal laboratories. It draws on finding from a 2011 Institute for Defense Analyses (IDA) study - *Technology Transfer and the Commercialization Landscape for Federal Laboratories*.

1. **Laboratory mission.** Technology transfer varies across laboratories due to the diversity and scope of their missions. Some laboratories are more inclined towards technology transfer that leads to commercialization because it is in the interest of achieving the mission of the lab, agency, or sub-agency.
2. **Laboratory management.** Differences between Government-Owned, Government-Operated (GOGO) and Government-Owned, Contractor-Operated (GOCO) laboratories can affect technology transfer and commercialization activities. GOCO lab leadership is often explicitly tasked to perform technology transfer and commercialization, while GOGO laboratories must comply with certain government regulations that do not affect GOCOs
3. **Congressional support and oversight.** Despite congressional support for technology transfer at the federal laboratories, congressional action and oversight can have the unintended consequence of encouraging a risk-averse culture towards technology transfer. Furthermore, technology transfer activities can be undermined when congressional priorities shift, as technology transfer requires long-term support.
4. **Agency leadership and lab director support.** Support from agency leadership and lab directors can have a marked effect on technology transfer and commercialization activities. For example, lab directors who support technology transfer may provide resources, flexibility, and creative license to their Office of Research and Technology Applications (ORTAs). Those ORTAs who are not supported by their lab leadership can be severely constrained.
5. **Organization and coordination of technology transfer and commercialization activities.** The centralization/decentralization of technology transfer functions at the agency and lab levels affects the speed of implementation of technology transfer actions, the consistency of policies across laboratories within an agency, and the ability to share best practices. The location of ORTAs within an agency and lab can affect the visibility of technology transfer.
6. **Offices of Research and Technology Applications.** Operations that seem to affect technology transfer and commercialization include the responsibilities of the office; the science, technology, and business expertise of the staff; the processes of the office; and the legal authorities available to the lab and how ORTA staff interpreted them.
7. **Researchers.** Lab researchers, whose participation in technology transfer and commercialization processes varies across laboratories, may lack the knowledge, ability, and incentives necessary to undertake the research, administration, and business development involved in successful technology transfer.

8. **Government-industry interactions.** Federal laboratories are not visible and accessible to industry, and certain regulations make it difficult for federal laboratories and industry to interact. According to partnership intermediaries, groups designed to broker partnerships between the laboratories and industry, industry is largely unaware of opportunities to collaborate with the federal laboratories.
9. **Resources.** Resources devoted to technology transfer and commercialization vary across laboratories and agencies. Further, the extent to which the agencies and laboratories leverage federal, state, and local programs that support technology-based economic development may also affect technology transfer and commercialization.

Appendix C Technology Readiness Level

C.1 TECHNOLOGY READINESS DEFINITIONS

Technology Readiness Level, or "TRL" is a widely-used indicator of degree of development of a technology toward deployment, typically on a scale of 1-9, with 9 being fully deployment ready. EERE has at times included TRL 10 to indicate commercial production.

TRL 1 Basic Research: Initial scientific research has been conducted. Principles are qualitatively postulated and observed. Focus is on new discovery rather than applications.
TRL 2 Applied Research: Initial practical applications are identified. Potential of material or process to solve a problem, satisfy a need, or find application is
TRL 3 Critical Function or Proof of Concept Established: Applied research advances and early stage development begins. Studies and lab measurements validate analytical predictions of separate elements of the technology.
TRL 4 Lab Testing/Validation of Alpha Prototype Component/Process: Design, development and lab testing of components/processes. Results provide evidence that performance targets may be attainable based on projected or modeled systems.
TRL 5 Laboratory Testing of Integrated/Semi-Integrated System: System Component and/or process validation is achieved in a relevant environment.
TRL 6 Prototype System Verified: System/process prototype demonstration in an operational environment (beta prototype system level).
TRL 7 Integrated Pilot System Demonstrated: System/process prototype demonstration in an operational environment (integrated pilot system level).
TRL 8 System Incorporated in Commercial Design: Actual system/process completed and qualified through test and demonstration (pre-commercial demonstration).
TRL 9 System Proven and Ready for Full Commercial Deployment: Actual system proven through successful operations in operating environment, and ready for full commercial deployment.
TRL 10 production and sales. (EERE has used this added TRL)

Survey respondents assessed the stage of development and commercialization of their technologies. The Year 2 survey used a scale that paraphrased DOE's TRL descriptions for brevity and simplicity.[35] The table below compares the commercialization stages used in the SBV survey to TRLs.

[35] The team used a Minnesota Department of Commerce memo on commercialization milestones to develop the 7-point scale used in the survey; the memo was based on US DOE and DOD commercialization metrics. http://mn.gov/commerce-stat/pdfs/commercialization-milest-success.pdf

Table 19: Comparing SBV Survey Commercialization Stage to TRLs

SBV Survey Commercialization Stage	TRL
1. Concept exploration/preliminary investigation	**TRL 1 Basic Research:** Initial scientific research has been conducted. Principles are qualitatively postulated and observed. Focus is on new discovery rather than applications.
2. Concept definition/initial investigation	**TRL 2 Applied Research:** Initial practical applications are identified. Potential of material or process to solve a problem, satisfy a need, or find application is
3. Proof of concept/detailed investigation	**TRL 3 Critical Function or Proof of Concept Established:** Applied research advances and early stage development begins. Studies and lab measurements validate analytical predictions of separate elements of the technology.
4. Proof of application/initial development and verification	**TRL 4 Lab Testing/Validation of Alpha Prototype Component/Process:** Design, development and lab testing of components/processes. Results provide evidence that performance targets may be attainable based on projected or modeled systems.
	TRL 5 Laboratory Testing of Integrated/Semi-Integrated System: System Component and/or process validation is achieved in a relevant environment.
5. Validation in simulated operation environment/ prototype project	**TRL 6 Prototype System Verified:** System/process prototype demonstration in an operational environment (beta prototype system level).
	TRL 7 Integrated Pilot System Demonstrated: System/process prototype demonstration in an operational environment (integrated pilot system level).
6. Validation in commercial operational environment/ commercial scale	**TRL 8 System Incorporated in Commercial Design:** Actual system/process completed and qualified through test and demonstration (pre-commercial demonstration).
	TRL 9 System Proven and Ready for Full Commercial Deployment: Actual system proven through successful operations in operating environment, and ready for full commercial deployment. TRL 9 can be as few as one unit produced
7. Final design/commercial production	**TRL 10 production and sales.** (EERE has used this added TRL)
8. Initial sales (sales to early adopters)	
9. Diversification/market success	

Appendix D National Laboratory Initiatives and Technology Commercialization Initiatives Having Some Indirect Lab Involvement

In addition to the SBV pilot – the subject of this evaluation study – there are other national lab initiatives. Also, there are a number of technology commercialization initiatives that indirectly involve the labs.

D.1 LAB INITIATIVES

D.1.1 DOE's Lab-Corp Pilot (2015 to Present)

Lab-Corps is a U.S. Department of Energy (DOE)-funded pilot intended to accelerate the commercialization of clean energy technologies from DOE national laboratories (labs). Office of Energy Efficiency and Renewable Energy's (EERE's) Technology-to-Market program provided $2.3 million (fiscal year 2015) to launch the Lab-Corps pilot, and received FY 2016 and FY 2017 funding to continue operations. Lab-Corps trains selected lab scientists and engineers in techniques to accelerate technology commercialization. Training occurs in a group setting with extensive individual coaching and feedback provided by experienced entrepreneurs.

D.1.2 Lab-Embedded Entrepreneurship Program (2014 to Present)

Lab-Embedded Entrepreneurship Program (LEEP) provides an institutional home for researchers to build their research into products and train to be entrepreneurs. LEEP is funded by EERE's Advanced Manufacturing Office, and co-managed with EERE's Technology-to-Market Program. LEEP takes top entrepreneurial scientists and engineers and embeds them within the U.S. national laboratories to perform applied research and development (R&D) with the express goal of launching a clean energy business. In addition to technological access and support, LEEP trains innovators to develop entrepreneurial acumen and skills, while introducing them to the ecosystem partners needed to facilitate commercial and investment opportunities. This dual focus on R&D and entrepreneurial development provides innovators with the platform they need to take their ideas from the lab and onto the commercialization pathway.

D.1.3 Agreement for Commercializing Technology (2011 to 2017)

The Agreement for Commercializing Technology (ACT) was created in response to feedback received in a Notice of Inquiry Concerning Technology Transfer at DOE National Laboratories. Initially launched as a three-year pilot program in December 2011, the ACT allows lab contractors to negotiate and enter agreements directly with the private sector sponsors using terms and conditions that are more consistent with industry practices. These privately sponsored research agreements are performed at the contractor's risk. Under ACT, the contractor may charge those parties additional compensation beyond the direct costs of the work at the lab. Some of the benefits that the contractors offered under an ACT include waiver of Advanced Payment requirements, fixed price contracting, performance guarantees, IP flexibility, and the option for a

government research license for subjects' inventions instead of the broader a government use license.

D.1.4 Technology Commercialization Fund (2005 to Present)

The Technology Commercialization Fund (TCF) is a nearly $20 million funding opportunity that leverages the R&D funding in the applied energy programs to mature promising energy technologies with the potential for high impact. It uses 0.9 percent of the funding for the Department's applied energy research, development, demonstration, and commercial application budget for each fiscal year from the Office of Electricity, EERE, Office of Fossil Energy, and Office of Nuclear Energy. These funds are matched with funds from private partners to promote promising energy technologies for commercial purposes. The goal of the TCF is two-fold. First, it is designed to increase the number of energy technologies developed at DOE's national labs that graduate to commercial development and achieve commercial impact. Second, the TCF will enhance the Department's technology transitions system with a forward-looking and competitive approach to lab-industry partnerships. TCF enhance DOE's technology transitions efforts by providing national lab technologies funds for maturation, empowering a broader set of potential industry partners to engage with the national laboratories, and focused industry engagement to identify high-quality partners. EERE is the largest contributor to this program.

D.1.5 Entrepreneur-in-Residence (2007 to 2008)

EERE began its Entrepreneur in Residence (EIR) initiative in 2007 to support clean energy technology commercialization and to address long-standing concerns that national lab inventions were not being sufficiently transferred into the marketplace. After conducting a competitive solicitation, EERE selected venture capital-sponsored entrepreneurs and placed them at key national laboratories. EERE's goal was to accelerate lab technology transfer by enabling start-up entrepreneurs to work directly with the laboratories, thereby bridging the gap between leading scientific and business talent.

D.1.6 Historical Technology Maturation Programs

For more information about the history of DOE technology maturations programs see "Department of Energy Technology Maturation Programs", IDA Science and Technology Policy Institute, May 2013 available at https://www.ida.org/idamedia/Corporate/Files/Publications/STPIPubs/ida-p-5013.ashx.

D.2 COMMERCIALIZATION INITIATIVES INDIRECTLY INVOLVING LABS

D.2.1 Build4Scale Manufacturing Training for Cleantech Entrepreneurs (2016 to Present)

The Energy Department's Build4Scale Manufacturing Training for Cleantech Entrepreneurs is a joint effort between the Clean Energy Manufacturing Initiative (CEMI) and the Office of Energy Efficiency and Renewable Energy's (EERE's) Technology-to-Market Office that provides entrepreneurs with the tools they need to identify and address manufacturing challenges early in

the process. Understanding how to navigate these challenges saves time and capital, making cleantech startups more attractive to industry partners and investors.

D.2.2 DOE's clean technology university prize competition (Cleantech Up) (2015 to Present)

DOE's Cleantech University Prize (Cleantech UP) aims to inspire and equip the next generation of clean energy entrepreneurs and innovators by providing them with competitive funding for business development and commercialization training and other educational opportunities.

Launched in 2015, Cleantech UP builds on its precursor, the DOE National Clean Energy Business Plan Competition. Eight institutions will host annual Cleantech UP Collegiate Competitions, where students receive entrepreneurial support and compete for cash prizes and services to further support the commercialization of their clean energy technologies. The Collegiate Competitions will establish team development and training that will aid students in developing the skills to move clean energy technologies from the discovery phase to the marketplace. Winners of the Collegiate Competitions will be eligible to compete in the Cleantech UP National Competition. In 2016, the National Competition included a $50,000 voucher at a National Laboratory.

D.2.3 DOE's National Incubator Initiative for Clean Energy (2014 to Present)

The National Incubator Initiative for Clean Energy (NIICE) enables U.S. companies with new clean energy technologies and business models to enter the marketplace or reach commercial readiness faster than before through technical services and connections to industry. NIICE has established a national network of more than 19 different incubators and supporting organizations. Known as the Incubatenergy Network, its members are working together to share best practices and build connections to support entrepreneurs that are driving innovation in clean energy sectors across the nation. Incubatenergy is led by the Electric Power Research Institute in partnership with the National Renewable Energy Laboratory. The initiative also funded several regional incubators that have attracted leading industry partners to help companies scale up, develop markets, and deploy energy innovations at an expedited rate.

D.2.4 DOE National Clean Energy Business Plan Competition (2011 - 2015)

DOE's National Clean Energy Business Plan Competition built regional networks of student-focused business creation contests across the country, with six regional organizations receiving a total of $ 2 million over three years to host competitions, including $100,000 each in annual prize money for the first-place teams. The regional competitions shared common objectives that included creating a new generation of entrepreneurs to address the nation's energy challenges. The regional winners competed each year for the Grand Prize in a final nationwide Competition. Sponsors of the National Competition included the National Renewable Energy Laboratory.

D.2.5 America's Next Top Energy Innovator (2011 - 2013)

To increase engagement with small businesses, the America's Next Top Energy Innovator Program was launched in May 2011. The program made it easier for start-ups to evaluate inventions and technologies developed at the DOE's national laboratories by lowering the cost of

an option agreement for up to three patents for $1,000. An option agreement is a precursor to a license agreement and allows companies time to evaluate the technology and to assemble resources required to commercialize the technology. The option duration was set at 12 months, with the potential for a three to six-month extension. Participating start-ups were invited to enter the America's Next Top Energy Innovator Competition. Each participant in the competition uploaded a short video onto the DOE website, and a public voting competition was held to select the most innovative company. The site received one-half million unique hits. Experts conducted a separate review of the companies and scored them based on their potential economic and societal contributions. The winners of the competition were featured at the 2012 Advanced Research Projects Agency-Energy (ARPA-E) Energy Innovation Summit and had the opportunity to meet the Secretary of Energy.

D.2.6 Energy Innovation Portal (2010 to Present)

The Energy Innovation Portal is a one-stop resource to locate energy-related technologies developed with EERE funding and available for licensing from national laboratories and participating research institutions. Developed and managed by the National Renewable Energy Laboratory (NREL), the Portal was created to simplify access and increase private sector licensing of energy-efficiency and renewable energy technologies at DOE laboratories. The Portal contains over 16,000 DOE-created patents and patent applications, providing streamlined searching and browsing of patents, patent applications, and marketing summaries for clean energy technologies. The Portal also allows interested parties to directly contact the licensing representative from each lab and improves opportunities for "cross-laboratory" intellectual property bundling.

D.2.7 Small Business Innovation Research and Small Business Technology Transfer (1983 to Present)

The Small Business Innovation Research (SBIR) program is a highly competitive program that encourages domestic small businesses to engage in federal research and/or research and development (R/R&D) that has the potential for commercialization. The Small Business Technology Transfer (STTR) program, like SBIR, expands funding opportunities in the federal innovation R&D arena. Unlike SBIR, it requires small businesses to formally collaborate with a research institution. STRR's role is to bridge the gap between the performance of basic science and commercialization of resulting innovations.

In fiscal year 2013, the SBIR/STTR Programs Office within the Office of Science initiated an effort to utilize the SBIR and STTR programs to assist with technology transfer. This initiative, called the SBIR Technology Transfer Opportunity Pilot, was motivated by the opportunity to combine the commercialization objectives of the SBIR and STTR programs with the technology transfer goals of the Department. Participation in the SBIR Technology Transfer Opportunity Pilot is voluntary and covered by an MOU between DOE and the participating research institution.

Appendix E Awardee and Non-participant Surveys

E.1 AWARDEE/PARTICIPANTS

Small Business Voucher Pilot Annual Participant Survey

OMB Control #: 1910-5180

Exp. Date: 10/31/19

Burden Disclosure Statement:

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Submission of this data is (voluntary).

E.1.1 Introduction

Thank you for taking the time to provide feedback on the U.S. Department of Energy's (DOE) Small Business Voucher Pilot, or SBV.

We appreciate your willingness to complete this survey. You can stop at any time. The survey should take about 30 minutes to complete. If you need to take a break before you are finished, you can exit and later click the same link again to resume where you left off.

Your input is extremely valuable and will help to improve Laboratory assistance to small businesses.

The U.S. DOE has contracted with an independent research team led by NMR Group. All reporting to the U.S. DOE will use only summary-level data and will not identify individual respondents or organizations.

E.1.2 Screening

[SURVEY PROGRAMMING NOTES: Programming instructions are in bracketed CAPS]

[ENSURE THERE IS A COMPANY ID FOR EACH RESPONDENT].

SC1. Please confirm whether your firm was awarded a Small Business Voucher (SBV) in 2015/2016.

1 Yes, awarded SBV voucher
2 No, not awarded SBV voucher (exit questionnaire)
97 Don't Know (exit questionnaire)
98 Refused (exit questionnaire)

SC2. What was your role with the firm at the time it received the SBV award? Please select all that apply [SBIR1].
1. Project lead (Principal Investigator (PI), project manager, etc.)
2. Project team member (other than lead)
3. Senior executive with the firm awarded the SBV voucher
4. None of the above, but very familiar with the project
5. None of the above (exit questionnaire)

E.1.3 Previous Experience with the National Laboratories and Commercialization

Q1 Before the SBV pilot, had you or your firm ever sought information about the energy-related technologies, facilities or staff expertise at any of the U.S. Department of Energy National Laboratories?

1 Yes
2 No
97 Don't Know
98 Refused

Q2 Before the SBV pilot, had you or your firm ever partnered or worked with the Labs in any of the following ways?

Item	1.YES	2.NO	97 DK	98 RF
a. Cooperative Research and Development Agreements (CRADA)				
b. Small Business Innovation Research (SBIR) awards				
c. Work for Others (WFO) Agreement				
d. Technical Assistance Program				
e. Agreements for Commercializing Technology (ACT)				
f. Technology Licensing Agreement				
g. User Agreements				
h. Other [SPECIFY:_____]				
i. No prior partnerships				

Q3 [IF ANY Q#2=YES (PRIOR PARTNERSHIPS)]

How did you or your firm learn about the opportunity to partner or work with the Labs?

Item	1.YES	2.NO	97 DK	98 RF
a. Press releases from U.S. Department of Energy				
b. Press releases from an individual National Lab				
c. Outreach from Lab staff (personal or an event)				
d. Outreach from another small business support program or effort				
e. Outreach from an energy-efficiency or renewable energy program				
f. From a friend or another small business				
g. Media (newspaper stories, radio, television, internet)				
h. Other [SPECIFY]				

Q4 [IF ALL Q#2=No prior partnerships] Why had you or your firm not partnered or worked with the Labs?

Item	1.YES	2.NO	97 DK	98 RF
a. Not aware of the National Labs				
b. Not aware of the relevant technical capabilities of the National Labs				
c. Not aware of the opportunities to partner with the National Labs				
d. Not aware of how to partner with the National Labs				
e. Too difficult or complicated to partner with the National Labs				
f. Too expensive to partner with the National Labs				
g. Did not have time or staff resources to seek out opportunities				
h. Other [SPECIFY:_____]				

Q5. What has been your firm's experience with commercialization? [~SBIR Q17]

Item	1.YES	2.NO	97 DK	98 RF
a. One or more company staff have taken a course on the commercialization process				
b. One or more company staff have taken a single technology to commercialization in the past				
c. One or more company staff have taken multiple technologies to commercialization				
d. No experience				
e. Other [SPECIFY]				

E.1.4 Your SBV Pilot Experiences [PROCESS QUESTIONS, FIRST YEAR ONLY]

[OUTREACH]

Q6. How did you or your firm learn about the Small Business Voucher opportunity?

Item	1.YES	2.NO	97 DK	98 RF
a. Press releases from U.S. Department of Energy				
b. Press releases from an individual National Lab				
c. Outreach from Lab staff (personal or an event)				
d. Outreach from another small business support program or effort				
e. Outreach from an energy-efficiency or renewable energy program or effort				
f. From a friend or another small business				
g. Media (newspaper stories, radio, television, internet)				
h. Other [SPECIFY]				

Q7 Please rate the comprehensiveness of the topics addressed on the SBV "Central Assistance Portal" (CAP, the web portal). [PROGRAMMER: RANDOMIZE ITEMS]

Topic	Comprehensiveness [1 = not at all comprehensive, 5 = very comprehensive]
a. SBV program	
b. Lab capabilities	
c. Application process	
d. Application selection criteria	
e. Contracting process	

Q8 Please rate the usefulness of the topics addressed on the SBV CAP (web portal). [PROGRAMMER: RANDOMIZE ITEMS]

Topic	Usefulness [1 = not at all useful, 5 = very useful]
a. SBV program	
b. Lab capabilities	
c. Application process	
d. Application selection criteria	
e. Contracting process	

Q9 Please rate how easy it was for you to navigate SBV CAP (web portal).

[1=NOT AT ALL EASY TO NAVIGATE, 5=VERY EASY TO NAVIGATE]

[APPLICATION AND SELECTION PROCESS]

Q10. Please rate the extent to which your expectations were met by the following aspects of the voucher application process and the funding opportunity notice.

Item	1=fell short of my expectations	2=met my expectations	3=exceeded my expectations	96. NA	97 DK	98 RF
a. Multiple calls for applications						
b. Fairness of the selection process as described on the SBV CAP (web portal)						
c. Fairness of the selection criteria as described on the SBV CAP (web portal)						
d. Level of effort and/or length of time needed to complete and submit an application						
e. Time between application and notification of selection						
f. Funding opportunity notice overall						

Q11. In comparison to other Federal awards or Federal funding, how would you rate the process of applying for SBV funding? Applying for SBV funding was…" [SBIR41]

1. Much easier than applying for other Federal awards
2. Easier
3. About the same
4. More difficult
5. Much more difficult
6. Not sure, not applicable, or not familiar with other Federal awards or funding

[SOW PROCESS]

Next, we have some questions about your agreements with the Lab and your Statement of Work (SOW)

Q12. What type of contract or agreement did your firm have with the Lab? [MATRIX QUESTION]

ITEM	1.YES	2.NO	97 DK	98 RF
a. TAPA – DOE-Funded Technical Assistance Pilot Agreement				
b. Short CRADA – SBV Program Cooperative Research and Development Agreement				

Q13. Please rate the extent to which your expectations were met by the following aspects of your firms' SBV contract and the associated Statement of Work.

[MATRIX QUESTION: SCALE]

Item	1=fell short of my expectations	2=met my expectations	3=exceeded my expectations	96. NA	97 DK	98 RF
a. Expertise of Lab staff involved in contracting						
b. Courteousness of Lab staff involved in contracting						
c. Understanding of small business needs by Lab staff involved in contracting						
d. Definition of tasks						
e. Definition of task outcomes or milestones						
f. Setting of deadlines						
g. Assignment of intellectual property						
h. Treatment of proprietary information, confidentiality						
i. Length of time it took to develop the SOW						
j. The Standard contract form and its contents overall [PROVIDE POP-UP INFORMATION TO RESPONDENT: *The standard contract for was either a TAPA – DOE-Funded Technical Assistance Pilot Agreement, or a Short CRADA – SBV Program Cooperative Research and Development Agreement*]						
k. Contract and Statement of Work process overall						

[WORK DURING THE PROJECT]

Q14. Please rate the extent to which your expectations were met by the following aspects of your firms' SBV project.

[MATRIX QUESTION: SCALE]

Item	1=fell short of my expectations	2=met my expectations	3=exceeded my expectations	96. NA	97 DK	98 RF
a. The quality of the facilities and equipment accessed						
c. The expertise of Lab scientists supporting your project						
d. The working relationship with key Lab project personnel						
e. The courteousness of Lab staff supporting your project						
f. The amount of Lab assistance you received						
g. The fit between your needs (including subjective needs) and Lab services received						
h. Overall voucher project experience						

Q15. How adequate was the amount of money you received through SBV funding for the purposes you applied for? Was it. [SBIR42]

1. More than enough
2. About the right amount
3. Not enough

E.1.5 Outcomes from the SBV Pilot

Q16 Please rate the extent to which you or staff in your firm experienced the following through conducting the SBV project.

[MATRIX QUESTION: SCALE]

Item	1=not at all	2	3	4	5=a great deal	96. NA	97 DK	98 RF
a. Gained knowledge								
b. Gained skills								
c. Developed new relationships								
d. Developed a favorable attitude about working with the Labs?								
e. Changed policies or procedures pertaining to working with the Labs?								

Q17. [FOR RESPONSE >2 TO Q#16ABOVE, ASK APPROPRIATE OPEN-ENDED FOLLOW UP:]

a. Please describe the knowledge gained
b. Please describe the skills gained
c. Please describe the change in attitudes about with the Labs
d. Please describe the change in policies or procedures pertaining to working with the Labs

Q18. Please indicate the stage of development/commercialization that best described your innovation at the time of SBV award, and the stage that best describes your innovation today. [CONSTRAIN TO A SINGLE RESPONSE IN COLUMN A AND A SINGLE RESPONSE IN COLUMN B]

Stage of development / commercialization	(A) Time of SBV Award	(B) Today
1. Concept exploration/preliminary investigation		
2. Concept definition/initial investigation		
3. Proof of concept/detailed investigation		
4. Proof of application/initial development and verification		
5. Validation in simulated operation environment/ prototype project		
6. Validation in commercial operational environment/ commercial scale		
7. Final design/commercial production		
8. Initial sales (sales to early adopters)		
9. Diversification/market success		

Q19. What is the current status of your firm's SBV project? Select the one best answer [SBIR30]

1. Firm has not yet completed SBV funded research.
2. Firm's efforts related to this project have been discontinued AND no sales or additional funding resulted from this project.
3. Firm's efforts related to this project have been discontinued AND the project did result in sales, licensing of technology, or additional funding.
4. Firm is continuing post-award technology development related to this project.
5. Commercialization is underway.
6. Products/Processes/ Services are in use by target population/customer/consumers.
7. Products/Processes/ Services are in use by population/customer/consumers not anticipated at the time of the award (for example, in a different industry).

Q20. Which if any of the following has the firm experienced as a result of the SBV program? [SBIR10]

[MATRIX QUESTION]

Item	1.YES	2.NO	97 DK	98 RF
a. Made an initial public offering				
b. Planning to make an initial public offering in the next year				
c. Established one or more spin off companies				
d. Been acquired by/merged with another firm				

Q21. Have you received or invested any additional developmental funding in this project subsequent to the SBV award? [SBIR33]
1. Yes
2. No [IF NO, SKIP TO Q24]

Q22. Please indicate the total additional developmental funding and sources of funding that your firm has received to date for the technology developed during this project, subsequent to the SBV award. [SBIR34]

[MATRIX QUESTION]

Funding Source	$0	$1 to $99,999	$100,000 to $499,999	$500,000 to $999,999	$1,000,000 to $4,999,999	$5,000,000 to $9,999,999	$10,000,000 and up	97 DK	98 RF
a. Federal Funds - non-SBV funds									
b. Private Investment - U.S. venture capital									
c. Private Investment - Foreign investment									
d. Private Investment - Other Private equity (including angel funding									
e. Private Investment - Other domestic private company									
f. Other sources - State or local governments									
g. Other sources - College or Universities									
h. Not previously reported - Your firm's funds (including money your firm has borrowed									

i Not previously reported - Personal funds									

Q23. [IF FEDERAL FUNDS > $0, IN Q#22 ASK:] Please specify the non-SBV Federal funds. [RECORD OPEN-ENDED RESPONSE]

Q24. Has the company and/or licensee had any actual sales of products, processes, services or other sales incorporating the technology developed during this project? [SBIR35]

Item	1.YES	2.NO	97 DK	98 RF
a. No sales to date nor are sales expected				
b. No sales to date, but sales are expected				
c. Sales of product(s)				
d. Sales of process(es)				
e. Sales of services(s)				
f. Other sales (e.g., rights to technology, licensing, etc.)				

[IF a=Y AND b=Y, SKIP TO Q#28]

Q25. For the company and/or the licensee(s), when did the first sale occur resulting from the technology developed during the SBV pilot? [RESPONSE INCLUDES MONTH AND YEAR FIELDS] [SBIR36a]

Q26. For the company and/or the licensee(s), what is the approximate amount of total sales dollars of product(s), process(es) or services to date resulting from the technology developed during the SBV pilot? [SBIR36b]

For the company [PULLDOWN WITH CHOICES: 0, <$100,000, $100,000-$499,999, $500,000-$999,999, $1,000,000-$4,999,999, $5,000,000-$9,999,999, $10,000,000-$19,999,999, $20,000,000-$49,999,999, $50,000,000+]

For any licensees [PULLDOWN WITH SAME CHOICES]

Q27. For the company and/or the licensee(s), what is the approximate amount of other total sales dollars (e.g., rights to technology, sale of spin-off company, etc.) to date resulting from the technology developed during the SBV pilot? [SBIR36c]

For the company [PULLDOWN WITH CHOICES: 0, <$100,000, $100,000-$499,999, $500,000-$999,999, $1,000,000-$4,999,999, $5,000,000-$9,999,999, $10,000,000-$19,999,999, $20,000,000-$49,999,999, $50,000,000+]

For any licensees [PULLDOWN WITH SAME CHOICES]

Q28. Please give the number of patents, copyrights, trademarks and/or scientific publications for the technology developed as a result of the SBV project. Enter numbers. If none, enter 0 (zero). [SBIR39]

	Number Applied For/Submitted	Number Received/ Published
Patents		
Copyrights		
Trademarks		
Scientific		

Q29. Thinking back to just before your Lab contract for SBV started, please estimate the number of people employed at your firm. [CONSTRAIN RESPONSES TO NUMERIC]

Q30. About how many people does the firm employ now? [CONSTRAIN RESPONSES TO NUMERIC]

Q31. Had your firm *not* undertaken the SBV project, about how many people do you estimate would be employed at your firm now? [CONSTRAIN RESPONSES TO NUMERIC]

Q32. In your opinion, in the absence of this SBV award, would the company have undertaken this project? [SELECT ONE] [SBIR24]
1. Definitely yes
2. Probably yes
3. Uncertain
4. Probably not
5. Definitely not

[PROGRAMMER: IF Q#32 = a or b, GO TO Q#33. IF Q#32 =c, d, or e, GO TO Q#35 (FIRST QUESTION IN NEXT SECTION, “FUTURE ENGAGEMENT’)]

Q33. If you had undertaken this project in the absence of SBV, this project would have been [SELECT ONE] [SBIR25]
1. Broader in scope
2. Similar in scope
3. Narrower in scope

Q34. Please provide your best estimates of what would have occurred in the absence of SBV funding. [SBIR26]
a. how long would the start of this project have been delayed? [TEXT BOX – MONTHS; ENTER 0 IF NO DELAY]
b. the expected duration/time to completion would have been… [SELECT ONE]
   1) longer
   2) the same
   3) shorter
c. in achieving similar goals and milestones, the project would be… [SELECT ONE]
   1) ahead
   2) the same place
   3) behind

E.1.6 Future Engagement

Q35. Please rate the likelihood that you will work with the Labs again. [1= NOT AT ALL LIKELY, 5= VERY LIKELY; 97 = DON'T KNOW]

Q36. Have you, or will you, recommend to your colleagues in other small businesses that they work with the Labs?

1 Yes, I have recommended my colleagues that they work with the Labs
2 Yes, I likely will recommend my colleagues that they work with the Labs
3 No
97 Don't Know

Q37. (If Q#36 = 1 (have recommended). To about how many colleagues have you made this recommendation? [CONSTRAIN TO NUMERIC RESPONSE]

Q38. (If Q#36 = 2 (will recommend). To about how many colleagues do you anticipate making this recommendation? [CONSTRAIN TO NUMERIC RESPONSE]

Q39. (If Q#36 = 3 (no). Why do you think you will not or might not recommend SBV to your colleagues? [PROGRAMMER: OPEN ENDED]

E.1.7 Recommendations for the SBV Pilot

Q40. [YEAR ONE SURVEY ONLY] Do you have any suggestions for improving the SBV program?

E.2 NON-PARTICIPANTS

Small Business Voucher Pilot Annual Comparison Group Survey

OMB Control #: 1910-5180

Exp. Date: 10/31/19

Burden Disclosure Statement:

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Submission of this data is (voluntary).

E.2.1 Introduction

[COMPARISON = 1 IF MATCHED FROM LIST OF UNSELECTED SBV APPLICANTS;

COMPARISON = 2 IF MATCHED FROM NATIONAL LAB CRADAS]

[INTRO IF COMPARISON = 1] Thank you for taking the time to provide feedback on your experience with applying to the Small Business Voucher, or SBV, pilot program and your experience with the National Laboratories. Your feedback will help with the evaluation of the U.S. Department of Energy's (DOE) SBV Pilot.

We appreciate your willingness to complete this survey. Participating in this study is voluntary. You can stop at any time. The survey should take about 30 minutes to complete. If you need to take a break before you are finished, you can exit and later click the same link again to resume where you left off.

Your input is extremely valuable and will help to improve Laboratory assistance to small businesses.

The U.S. DOE has contracted with an independent research team led by NMR Group. All reporting to the U.S. DOE will use only summary-level data and will not identify individual respondents or organizations.

[INTRO IF COMPARISON = 2] Thank you for taking the time to provide feedback on your Cooperative Research and Development Agreements (CRADA) with the National Labs. Your feedback will help with the evaluation of the U.S. Department of Energy's (DOE) Small Business Voucher Pilot, or SBV, which takes a slightly different approach to engaging small businesses with the National Laboratories.

We appreciate your willingness to complete this survey. Participating in this study is voluntary. You can stop at any time. The survey should take about 30 minutes to complete. If you need to take a break before you are finished, you can exit and later click the same link again to resume where you left off.

Your input is extremely valuable and will help to improve Laboratory assistance to small businesses.

The U.S. DOE has contracted with an independent research team led by NMR Group. All reporting to the U.S. DOE will use only summary-level data and will not identify individual respondents or organizations.

E.2.2 Screening

[SURVEY PROGRAMMING NOTES: Programming instructions are in bracketed CAPS]

[ENSURE THERE IS A COMPANY ID FOR EACH RESPONDENT].

SC1. Please confirm whether your firm was awarded a Cooperative Research and Development Agreements (CRADA) or some other type of cooperative assistance from a Lab in 2015/2016.

1 Yes, awarded a CRADA
2 Yes, awarded a different type of cooperative assistance from a Lab [SPECFICY: _____]
2 No, not awarded a CRADA voucher or any other type of cooperative assistance
97 Don't Know (exit questionnaire)
98 Refused (exit questionnaire)

SC2. What was your role with the firm at the time it [IF COMPARISON = 1 "applied for an SBV"; IF COMPARISON = 2 "received the CRADA"]? Please select all that apply [SBIR1].

1. Project lead (Principal Investigator (PI), project manager, etc.)
2. Project team member (other than lead)
3. Senior executive with the firm
4. None of the above, but very familiar with the project
5. None of the above (exit questionnaire)

E.2.3 Previous Experience with the National Laboratories and Commercialization

Q1 Before [IF COMPARISON = 1 "you applied for an SBV"; IF COMPARISON = 2 "your current CRADA"], had you or your firm ever sought information about the energy-related technologies, facilities or staff expertise at any of the U.S. Department of Energy National Laboratories?

1 Yes
2 No
97 Don't Know
98 Refused

Q2 Before [IF COMPARISON = 1 "you applied for an SBV"; IF COMPARISON = 2 "your current CRADA"], had you or your firm ever partnered or worked with the Labs in any of the following ways?

Item	1.YES	2.NO	97 DK	98 RF
a. Cooperative Research and Development Agreements (CRADA)				
b. Small Business Innovation Research (SBIR) awards				
c. Work for Others (WFO) Agreement				
d. Technical Assistance Program				
e. Agreements for Commercializing Technology (ACT)				
f. Technology Licensing Agreement				
g. User Agreements				
h. Other [SPECIFY:_____]				
i. No prior partnerships				

Q3 [IF ANY Q#2=YES (PRIOR PARTNERSHIPS)]

How did you or your firm learn about that earlier opportunity to partner or work with the Labs?

Item	1.YES	2.NO	97 DK	98 RF
a. Press releases from U.S. Department of Energy				
b. Press releases from an individual National Lab				
c. Outreach from Lab staff (personal or an event)				
d. Outreach from another small business support program or effort				
e. Outreach from an energy-efficiency or renewable energy program				
f. From a friend or another small business				
g. Media (newspaper stories, radio, television, internet)				
h. Other [SPECIFY]				

Q4 [IF ALL Q#2=No prior partnerships] Why had you or your firm not partnered or worked with the Labs?

Item	1.YES	2.NO	97 DK	98 RF
a. Not aware of the National Labs				
b. Not aware of the relevant technical capabilities of the National Labs				
c. Not aware of the opportunities to partner with the National Labs				
d. Not aware of how to partner with the National Labs				
e. Too difficult or complicated to partner with the National Labs				
f. Too expensive to partner with the National Labs				
g. Did not have time or staff resources to seek out opportunities				
h. Other [SPECIFY:_____]				

Q5. What has been your firm's experience with commercialization? [~SBIR Q17]

Item	1.YES	2.NO	97 DK	98 RF
a. One or more company staff have taken a course on the commercialization process				
b. One or more company staff have taken a single technology to commercialization in the past				
c. One or more company staff have taken multiple technologies to commercialization				
This project is our first experience.				
d. No experience				
e. Other [SPECIFY]				
Don't know				

E.2.4 Your Experiences with the National Labs [PROCESS QUESTIONS, FIRST YEAR ONLY] [IF SC1. = 3 (NO CRADA OR OTHER COOPERATIVE ASSISTANCE), SKIP TO Q18]

[OUTREACH]

Q6. How did you or your firm learn about the [IF COMPARISON = 1 "the SBV pilot"; IF COMPARISON = 2 "2015-2016 CRADA"] opportunity?

Item	1.YES	2.NO	97 DK	98 RF
a. Press releases from U.S. Department of Energy				
b. Press releases from an individual National Lab				
c. Outreach from Lab staff (personal or an event)				
d. Outreach from another small business support program or effort				
e. Outreach from an energy-efficiency or renewable energy program or effort				
f. From a friend or another small business				
g. Media (newspaper stories, radio, television, internet)				
h. Other [SPECIFY]				

[SOW PROCESS]

Next, we have some questions about your agreement with the Lab and your Statement of Work (SOW)

Q12. What type of contract or agreement did your firm have with the Lab? [MATRIX QUESTION]

ITEM	1.YES	2.NO	97 DK	98 RF
a. TAPA – DOE-Funded Technical Assistance Pilot Agreement				
b. Short CRADA –Cooperative Research and Development Agreement				
c. Other [specify]				

Q13. Please rate the extent to which your expectations were met by the following aspects of your firms' [IF COMPARISON = 1 "cooperative assistance from the Lab"; IF COMPARISON = 2 "CRADA"] and the associated Statement of Work.

[MATRIX QUESTION: SCALE]

Item	1=fell short of my expectations	2=met my expectations	3=exceeded my expectations	96. NA	97 DK	98 RF
a. Expertise of Lab staff involved in contracting						
b. Courteousness of Lab staff involved in contracting						
c. Understanding of small business needs by Lab staff involved in contracting						
d. Definition of tasks						
e. Definition of task outcomes or milestones						
f. Setting of deadlines						
g. Assignment of intellectual property						
h. Treatment of proprietary information, confidentiality						
i. Length of time it took to develop the SOW						
j. The Standard contract form and its contents overall [PROVIDE POP-UP INFORMATION TO RESPONDENT: *The standard contract for was either a TAPA – DOE-Funded Technical Assistance Pilot Agreement, or a Short CRADA – SBV Program Cooperative Research and Development Agreement*]						
k. Contract and Statement of Work process overall						

[WORK DURING THE PROJECT]

Q14. Please rate the extent to which your expectations were met by the following aspects of your firms' [IF COMPARISON = 1 “cooperative assistance from the Lab”; IF COMPARISON = 2 “CRADA”].

[MATRIX QUESTION: SCALE]

Item	1=fell short of my expectations	2=met my expectations	3=exceeded my expectations	96. NA	97 DK	98 RF
a. The quality of the facilities and equipment accessed						
c. The expertise of Lab scientists supporting your project						
d. The working relationship with key Lab project personnel						
e. The courteousness of Lab staff supporting your project						
f. The amount of Lab assistance you received						
g. The fit between your needs (including subjective needs) and Lab services received						
h. Overall project experience						

Q15. How adequate was the Laboratory support you received through the [IF COMPARISON = 1 "cooperative assistance from the Lab"; IF COMPARISON = 2 "CRADA experience"]? Was it. [SBIR42]

1. More than enough
2. About the right amount
3. Not enough

E.2.5 Outcomes from the Experiences with the National Labs

Q16 Please rate the extent to which you or staff in your firm experienced the following through completing the [IF COMPARISON = 1 "cooperative assistance from the Lab"; IF COMPARISON = 2 "CRADA project"].

[MATRIX QUESTION: SCALE]

Item	1=not at all	2	3	4	5=a great deal	96. NA	97 DK	98 RF
a. Gained knowledge								
b. Gained skills								
c. Developed new relationships								
d. Developed a favorable attitude about working with the Labs								
e. Changed policies or procedures pertaining to working with the Labs								

Q17. [FOR RESPONSE >2 TO Q#16ABOVE, ASK APPROPRIATE OPEN-ENDED FOLLOW UP:]

e. Please describe the knowledge gained
f. Please describe the skills gained
g. Please describe the change in attitudes about with the Labs
h. Please describe the change in policies or procedures pertaining to working with the Labs

Q18. Please indicate the stage of research/development/commercialization that best described your project/technology at the time [IF COMPARISON = 1 "you applied for an SBV"; IF COMPARISON = 2 "your current CRADA began"], and the stage that best describes your project/technology today. [CONSTRAIN TO A SINGLE RESPONSE IN COLUMN A AND A SINGLE RESPONSE IN COLUMN B]

Stage of development / commercialization	(A) [IF COMPARISON = 1 "Applied for an SBV"; IF COMPARISON = 2 "Beginning of CRADA "]	(B) Today
10. Concept exploration/preliminary investigation		
11. Concept definition/initial investigation		
12. Proof of concept/detailed investigation		
13. Proof of application/initial development and verification		
14. Validation in simulated operation environment/ prototype project		
15. Validation in commercial operational environment/ commercial scale		
16. Final design/commercial production		
17. Initial sales (sales to early adopters)		
18. Diversification/market success		

Q19. What is the current status of your firm's [IF COMPARISON = 1 "SBV-related project"; IF COMPARISON = 2 "CRADA-related project? Select the one best answer [SBIR30]

1. Firm has not yet completed research.
2. Firm's efforts related to this project have been discontinued AND no sales or additional funding resulted from this project.
3. Firm's efforts related to this project have been discontinued AND the project did result in sales, licensing of technology, or additional funding.
4. Firm is continuing post-award technology development related to this project.
5. Commercialization is underway.
6. Products/Processes/ Services are in use by target population/customer/consumers.
7. Products/Processes/ Services are in use by population/customer/consumers not anticipated at the time of the award (for example, in a different industry).

Q20. Which if any of the following has the firm experienced since [IF COMPARISON = 1 "you applied for an SBV"; IF COMPARISON = 2 "your current CRADA began"]? [SBIR10]

[MATRIX QUESTION]

Item	1.YES	2.NO	97 DK	98 RF
a. Made an initial public offering				
b. Planning to make an initial public offering in the next year				
c. Established one or more spin off companies				
d. Been acquired by/merged with another firm				

Q21. Have you received or invested any additional developmental funding in this project since March 2016? [SBIR33]
1. Yes
2. No [IF NO, SKIP TO Q24]

Q22. Please indicate the total additional developmental funding and sources of funding that your firm has received to date for the technology developed during this project, [IF COMPARISON = 1 "subsequent to applying for an SBV"; IF COMPARISON = 2 "subsequent to the CRADA"] [SBIR34]
[MATRIX QUESTION]

Funding Source	$0	$1 to $99,999	$100,000 to $499,999	$500,000 to $999,999	$1,000,000 to $4,999,999	$5,000,000 to $9,999,999	$10,000,000 and up	97 DK	98 RF
a. Federal Funds - non-CRADA / current cooperative assistance									
b. Private Investment - U.S. venture capital									
c. Private Investment - Foreign investment									
d. Private Investment - Other Private equity (including angel funding)									
e. Private Investment - Other domestic private company									
f. Other sources - State or local governments									
g. Other sources - College or Universities									

h. Not previously reported - Your firm's funds (including money your firm has borrowed)									
i Not previously reported - Personal funds									

Q23. [IF FEDERAL FUNDS > $0, IN Q#22 ASK:] Please specify the non-CRADA /cooperative assistance Federal funds. [RECORD OPEN-ENDED RESPONSE]

Q24. Has the company and/or licensee had any actual sales of products, processes, services or other sales incorporating the technology developed during this project? [SBIR35]

Item	1.YES	2.NO	97 DK	98 RF
a. No sales to date nor are sales expected				
b. No sales to date, but sales are expected				
c. Sales of product(s)				
d. Sales of process(es)				
e. Sales of services(s)				
f. Other sales (e.g., rights to technology, licensing, etc.)				

[IF a=Y AND b=Y, SKIP TO Q#28]

Q25. For the company and/or the licensee(s), when did the first sale occur resulting from the technology developed [IF COMPARISON = 1 "since you applied for an SBV"; IF COMPARISON = 2 "during your current CRADA]? [RESPONSE INCLUDES MONTH AND YEAR FIELDS] [SBIR36a]

Q26. For the company and/or the licensee(s), what is the approximate amount of total sales dollars of product(s), process(es) or services to date resulting from the technology developed [IF COMPARISON = 1 "since you applied for an SBV"; IF COMPARISON = 2 "during your current CRADA]? [SBIR36b]

For the company [PULLDOWN WITH CHOICES: 0, <$100,000, $100,000-$499,999, $500,000-$999,999, $1,000,000-$4,999,999, $5,000,000-$9,999,999, $10,000,000-$19,999,999, $20,000,000-$49,999,999, $50,000,000+]

For any licensees [PULLDOWN WITH SAME CHOICES]

Q27. For the company and/or the licensee(s), what is the approximate amount of other total sales dollars (e.g., rights to technology, sale of spin-off company, etc.) to date resulting from the technology developed [IF COMPARISON = 1 "since you applied for an SBV"; IF COMPARISON = 2 "during your current CRADA]? [SBIR36c]

For the company [PULLDOWN WITH CHOICES: 0, <$100,000, $100,000-$499,999, $500,000-$999,999, $1,000,000-$4,999,999, $5,000,000-$9,999,999, $10,000,000-$19,999,999, $20,000,000-$49,999,999, $50,000,000+]

For any licensees [PULLDOWN WITH SAME CHOICES]

Q28. Please give the number of patents, copyrights, trademarks and/or scientific publications for the technology developed [IF COMPARISON = 1 "since you applied for an SBV"; IF COMPARISON = 2 "as a result of your current CRADA]. Enter numbers. If none, enter 0 (zero). [SBIR39]

	Number Applied For/Submitted	Number Received/ Published
Patents		
Copyrights		
Trademarks		
Scientific / Technical Publications		

Q29. Thinking back to just before [IF COMPARISON = 1 "you applied for an SBV"; IF COMPARISON = 2 "your Lab contract for your current CRADA started], please estimate the number of people employed at your firm. [CONSTRAIN RESPONSES TO NUMERIC]

Q30. About how many people does the firm employ now?

Q31. Had your firm *not* [IF COMPARISON = 1 "applied for an SBV"; IF COMPARISON = 2 "undertaken the CRADA started], about how many people do you estimate would be employed at your firm now? [CONSTRAIN RESPONSES TO NUMERIC]

Q32. In your opinion, in the absence of [IF COMPARISON = 1 "applying for an SBV"; IF COMPARISON = 2 "this CRADA], would the company have undertaken this project? [SELECT ONE] [SBIR24]
1. Definitely yes
2. Probably yes
3. Uncertain
4. Probably not
5. Definitely not

[PROGRAMMER: IF Q#32 = a or b, GO TO Q#33. IF Q#32 =c, d, or e, GO TO Q#35 (FIRST QUESTION IN NEXT SECTION, "FUTURE ENGAGEMENT')]

Q33. If you had undertaken this project in the absence of [IF COMPARISON = 1 "applying for an SBV"; IF COMPARISON = 2 "the CRADA], this project would have been [SELECT ONE] [SBIR25]
1. Broader in scope
2. Similar in scope
3. Narrower in scope

Q34. Please provide your best estimates of what would have occurred in the absence of IF COMPARISON = 1 "applying for an SBV"; IF COMPARISON = 2 "the CRADA]. [SBIR26]

a. how long would the start of this project have been delayed? [TEXT BOX – MONTHS; ENTER 0 IF NO DELAY]

b. the expected duration/time to completion would have been… [SELECT ONE]

1) longer
2) the same
3) shorter

c. in achieving similar goals and milestones, the project would be… [SELECT ONE]

1) ahead
2) the same place
3) behind

E.2.6 Future Engagement

Q35. Please rate the likelihood that you will work with the Labs again. [1= NOT AT ALL LIKELY, 5= VERY LIKELY; 97 = DON'T KNOW]

Q36. Have you, or will you, recommend to your colleagues in other small businesses that they work with the Labs?

1 Yes, I have recommended my colleagues that they work with the Labs
2 Yes, I likely will recommend my colleagues that they work with the Labs
3 No
97 Don't Know

Q37. (If Q#36 = 1 (have recommended). To about how many colleagues have you made this recommendation? [CONSTRAIN TO NUMERIC RESPONSE]

Q38. (If Q#36 = 2 (will recommend). To about how many colleagues do you anticipate making this recommendation? [CONSTRAIN TO NUMERIC RESPONSE]

Q39. (If Q#36 = 3 (no). Why do you think you will not or might not recommend IF COMPARISON = 1 "working with the Labs"; IF COMPARISON = 2 "CRADAs'] to your colleagues? [PROGRAMMER: OPEN ENDED]

E.2.7 Recommendations for CRADAs

Q40. [YEAR ONE SURVEY ONLY] Do you have any suggestions for improving the IF SC1= 2 "Lab's cooperative assistance experience for small businesses" ; IF COMPARISON = 2 "the CRADA experience for small businesses]?

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