



Evaluation of *Bright Solar Futures*: Year 1 Annual Report

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Year 1 Annual Report

Evaluation of the Bright Solar Futures Program

1. Introduction

In May 2019, the Philadelphia Energy Authority (PEA) hired Actus Policy Research (Actus) to conduct a third-party independent evaluation of Bright Solar Futures (BSF), a program funded by the U.S. Department of Energy, Solar Energy Technologies Office (SETO). One of the objectives of SETO is to support projects that pursue initiatives to grow and train the solar workforce.

The primary objective for the overall evaluation of the BSF program is to assess how well the program does in achieving its intended outcomes by analyzing program participants' educational and labor market outcomes. A secondary objective is to examine implementation activities throughout the three-year funded period. This report provides a formative assessment of the work performed during the program's early start-up phase of implementation and primarily focuses on the second objective – examining the program's implementation progress to date.

The data that informs this report was collected through a range of qualitative and quantitative sources, including interviews, document reviews, participant data, and classroom and follow-up surveys. During the early phase of program implementation, the program has successfully:

- Facilitated collaboration among a wide range of program partners,
- Iterated several expansions of the training curriculum,
- Recruited, engaged and retained early program participants,
- Placed students in internships and implemented pilot and expanded training,
- Received early stage approval from the Pennsylvania Department of Education (PDE) on a Career and Technical Energy (CTE) curriculum for solar energy training,
- Identified the School District of Philadelphia (SDP) high school to implement the CTE program, and
- Leveraged resources to enhance the program through commitments from community partners.

Areas in which the program staff are continuing to make progress include:

- Helping to facilitate the process of establishing the program as a CTE Program of

Study (POS)¹,

- Recruiting and implementing training for future cohorts, and
- Leveraging resources and sustaining the program beyond the current award cycle.

During the next phase of implementation, it is recommended that program staff consider increasing efforts to expand participation of young women, provide more information to prospective and existing students about career pathway opportunities, and provide support to troubleshoot issues related to implementing the CTE program in the public school environment.

In the following pages, we provide a program overview and describe the strategies used to operationalize program objectives and achieve intended outcomes. We then discuss each strategy individually, addressing progress towards implementing the strategy, and any issues related to implementation. Finally, we provide recommendations on areas in which program staff could work to make some strategies more effective.

2. Bright Solar Futures Program Overview

2.1 U.S. Department of Energy Award

In 2019, the U.S. Department of Energy (DOE), through its Energy Efficiency and Renewable Energy Solar Energy Technologies Office, funded innovative research projects – including the BSF program, to support a growing solar workforce. The overarching goals of the BSF program include the following:

- Leveraging the talent pool of young Philadelphians to fill the reported shortage of workers in the solar industry, having the impact of diversifying the industry with more people of color and women.
- Positioning program graduates to obtain and retain quality jobs in the solar industry.

2.2 Program History

In 2016, PEA, an independent municipal authority that supports the City of Philadelphia on issues of energy affordability and sustainability, launched the Philadelphia Energy Campaign, an initiative designed to invest \$1 billion over 10 years in energy efficiency and clean energy projects in Philadelphia, with the goal of creating 10,000 jobs. One of the projects resulting from this initiative is *Solarize Philly*, a solar group-buying program designed to provide discounted pricing for solar while providing social and environmental benefits. In addition, *Solarize Philly* was identified as generating a demand for a trained

¹ This designation will establish the curriculum as a standardized state-wide program, enabling all Pennsylvania school districts to access Carl D. Perkins (Perkins) CTE Improvement Act program funding.

workforce skilled in solar installation.² In 2017, in partnership with Solar States and the Energy Coordinating Agency (ECA), PEA piloted *Find Your Power*, a 120-hour classroom training for CTE high school students. Building on this curriculum, PEA is leading the development of BSF, to offer a robust, expanded curriculum focusing on CTE students and out-of-school youth, a significant portion of whom are from disadvantaged backgrounds.

2.3 Bright Solar Futures Program Objectives

The following program objectives were designed to achieve the program's overarching goals, as described in Section 2.1. These include:

Objective 1: Establishing a three-year POS in Solar Energy available to SDP CTE program.³ Once approved by the PDE, PEA will seek to share the curriculum with other school districts in Pennsylvania interested in offering the POS to their own CTE students. The training can be sustained through the Carl D. Perkins (Perkins) CTE Improvement Act program funding.

Objective 2: Piloting the training using two tracks of students: 1) SDP CTE students, and 2) Opportunity Youth (OppY). The training will include a combination of classroom time, hands-on training, and paid work experiences. It is expected that program completers will be job-ready and PEA will assist in placing program graduates in employment in the solar sector, related fields, or further training.

Objective 3: Securing funding to continue the solar training beyond the period of performance covered by the award. In addition, to accessing Perkins funding after the program is approved by the PDE as a Solar Energy POS, PEA will work with partners to secure additional funding to sustain the program through public workforce funds, private grants, and other community resources.

2.4 Training Cohorts

As shown in Exhibit 1, the BSF training involves eight cohort of students reflecting variation in such things as target population, intensity of training, and training location.

² It is estimated that every 100 solar installations result in creation of 15 associated jobs (<http://www.philaenergy.org/programs-initiatives/solarize-philly/>).

³ As discussed later in this report, the program will now implement a CTE program in Solar Energy within the School District of Philadelphia and will help to facilitate the effort to establish a CTE Program of Study statewide.

Exhibit 1: Bright Solar Futures Program Cohorts

Cohort	Participants	Program Type	Training Dates	Number of Training Hours	Training Location
SDP0	Returning trainees from <i>Find your Power</i>	Paid internship	Summer 2019	120	Host employer work sites
SDP1	Targeted SDP CTE class of 2019; open to all high school students	Paid training	Summer 2019	120	ECA
SDP2*	SDP CTE: Class of 2020 preferred	Training (as part of SDP off-site career training program)	October 2019 – May 2020; Fridays	184	ECA
OppY1	PowerCorpsPHL Alumni	Paid training	January to May 2020; Monday – Friday	680	ECA
SDP3	SDP CTE: Class of 2023 (10th graders at start of program)	Training (as part of SDP-sponsored program)	September 2020 to June 2023	1,080	Frankford High School**
OppY2	PowerCorpsPHL Alumni	Paid training	January to April 2021; Monday – Friday	680	ECA
SDP4	SDP CTE: Class of 2024 (10th graders at start of program)	Training (as part of SDP-sponsored program)	September 2021 to June 2024	1,080	Frankford High School
OppY3	PowerCorpsPHL Alumni	Paid training	January to April 2022	680	ECA

* This cohort is not included in the current evaluation.

** In coordination with the SDP, Frankford High School was identified as the host school for the CTE program.

In addition to these cohort differences, variation in the target population includes:

- **SDP0:** included both recently-graduated and current SDP students who previously completed *Find Your Power* training or the YouthBuild solar class.
- **SDP1:** included both recently-graduated and current SDP students *who may or may not have been* CTE-enrolled. Students received a stipend for participation in the training with funding leveraged through the *WorkReady* program at the Philadelphia Youth Network.
- **SDP2:** includes SDP students enrolled in a CTE program. Training is considered a school activity and participants are not paid.
- **SDP3, SDP4:** SDP students enrolled in the BSF CTE Solar Energy training program.
- **OppY1, OppY2, OppY3:** includes OppY entering the program via PowerCorpsPHL (PC-PHL). Opportunity Youth is defined as formerly out-of-school, young adults between the ages of 18 and 30 who were neither in school nor working. PEA has a recruitment partnership with YouthBuild Philly (YBP), a high school for young people who did not complete high school to pursue their high school diploma. All OppY1-OppY3 program participants, including those recruited from YBP, will have completed a PC-PHL Foundations Program which provides work readiness, career

exploration, skill building, and community service experiences. All PC-PHL possess either a high school diploma or GED, and some may have had prior justice-related experiences. PC-PHL participants receive wages and PC-PHL intensive case management and support services throughout their time in the Foundations Program and the BSF Fellowship.

2.5 Program Strategies and Activities

As shown in Exhibit 2, the program's three objectives are achieved through numerous program input and strategies. The program logic model provides an overview of program inputs and strategies as well as the program's anticipated output and outcomes. The BSF program **inputs** (i.e., resources that go into the program) include a variety of individuals, organizations, and resources that are brought together to ensure the program meets its objectives. These include experienced program staff and instructors, the Occupational Advisory Committee (OAC), the SDP, the *Find Your Power* curriculum, PEA partners, industry advisors, training facilities, the public workforce system, the Community College of Philadelphia (CCP), employers, eligible program participants, equipment, corporate partners, and funding. The team assembled the majority of these inputs during the initial stages of program implementation; however, some relationships are still being developed.

The variety of program **strategies** (and numerous related activities not shown) draws on the resources described above. These include program administration and management, developing the curriculum, professional development of instructional staff, recruiting and selecting students, targeted case management, training delivery, internship and job placement, and leveraging resources and sustainability. BSF program staff and partners (the BSF team) has made significant progress on many of these strategies during the first year of implementation, meeting all identified milestones.

However, activities related to the sustainability of training are still in progress. This includes establishing the 1,080 CTE training as a CTE POS which involves take-up of the program by at least ten Pennsylvania school districts and the involvement of a statewide OAC. The BSF team will help to facilitate the process to establish the POS in solar energy, including developing a CTE Solar Energy program toolkit (including such things as the curriculum, lesson plans, and syllabi) to be shared with districts known to be interested in the program and helping to identify statewide OAC members. Also, in progress is securing public workforce funding and other supports to sustain training for OppY, and establishing articulation agreements with post-secondary institutions for students interested in additional training in the solar energy field. In addition, it is anticipated that during the remaining period of performance, the team will engage significantly with employers and the public workforce system to develop internship and job placement opportunities for students.

Exhibit 2: Bright Solar Futures Logic Model

Overarching Program Goals

- Leverage the talent pool of young Philadelphians to fill the reported shortage of workers in the solar industry, having the impact of diversifying the industry with more people of color and women
- Position graduates to obtain and retain quality jobs in the solar industry

Program Objectives

- Establish a three-year Program of Study (POS) in Solar Energy available to School District of Philadelphia (SDP) Career and Technical Education (CTE) students.
- Pilot the training using two tracks of Philadelphia students: 1) SDP CTE students, and 2) Opportunity Youth
- Secure funding to continue the solar training beyond the period of performance covered by the award

INPUTS

- PEA and partner organizations
- School District of Philadelphia
- *Find Your Power* curriculum
- Occupational Advisory Committee
- Instructors
- Industry advisors
- Training facilities/equipment
- Funding
- Corporate partners
- Eligible participants
- Public workforce system
- Employers
- Community College of Philadelphia

STRATEGIES

- Management/administration
- Curriculum development
- Instructor development
- Student recruitment and selection
- Targeted case management
- Internship and job placement coordination
- Leveraging resources and sustainability
- Training delivery

OUTPUTS

- Curriculum developed for POS and Opportunity Youth programs
- Instructors trained on curriculum
- Application submitted and approved by PDE
- Outreach materials and process used to recruit diverse participants
- Solar lab built at SDP school
- Toolkit for sharing with other Districts
- Participants enrolled/completed training
- Participants placed/completed internships
- Participants engage in further training
- Participants placed in employment

SHORT TERM OUTCOMES

- Trainees who complete program demonstrate:
- Increased awareness of clean energy career pathway
 - Increased interest in pursuing employment in solar or related industry
 - Increased interest in pursuing additional training in solar or related industry
 - Increased engagement with school or community
 - Job preparedness (e.g. program completion, competence in program, training-related credentials obtained/received)

MEDIUM-TERM OUTCOMES

- Trainees pursue and obtain quality jobs in training related industries
- Trainees pursue and obtain training-related credentials
- Trainees enroll in further training in solar or related industries
- Solar and related industries employers are satisfied with trainee job candidates
- Program is sustained locally and expanded outside SDP

Program **outputs** include products, activities, and services produced through the activities described above. The BSF program has either begun or is working on producing each of the outputs listed in the logic model. Some of these outputs may require support in the post-award period, such as ensuring the curriculum remains relevant to employers over time.

Program **outcomes** are specific goals of participant achievement (e.g., number/proportion of students completing the program and obtaining credentials). Section 4 explores preliminary results based on data collected to date.

2.6 Organizational Structure

To implement the BSF program, PEA relies on a range of formal and informal partners, including industry and employer representatives, educational and training experts, and other stakeholders. This section describes the organizational structure of the partnerships that constitute the BSF team. Further details on the BSF partnerships during the first year of implementation are described in Section 4.

2.6.1 BSF Team Organization

PEA provides overall leadership to program implementation, coordinating activities across a range of project-funded partner and vendor organizations (Exhibit 3). Among others playing a key role in project implementation are: Solar States, the Energy Coordinating Agency (ECA), YBP, PC-PHL the Philadelphia Education Fund (PEF), and Faces and Voices of Reason (FAVOR). In addition, other critical program stakeholders include the SDP and members of the program's Occupational Advisory Committee (OAC). The BSF team's organizational structure has been designed to maximize team member capabilities and ensure successful implementation of all program strategies and activities.

3. Research Questions and Data Collection

The report is designed to provide an assessment of BSF program implementation during the first year of implementation. This early, or formative, assessment uses both qualitative and quantitative data to answer research questions related to program implementation, to date. In contrast, the summative assessment (provided at the end of program funding) assesses the degree to which the program achieves its intended goals and objectives, identifies best practices and lessons learned, and assesses program sustainability.

Exhibit 3. BSF Team

Member	Description	Funded Activities
The Philadelphia Energy Authority (PEA)	Independent municipal authority supporting the City of Philadelphia on issues of energy affordability and sustainability.	▪ Strategic engagement, partnership efforts, and major donor solicitation ▪ Partner coordination, program planning and evaluation oversight ▪ Program participation oversight ▪ Award administration ▪ Internship/job placement support
Solar States (SS)	Philadelphia-based firm providing solar installation and technical training for careers in solar installation.	▪ Curriculum development ▪ Solar Photovoltaic (PV) instruction and equipment donation ▪ Student recruitment/selection and internship/job placement support
The Energy Coordinating Agency (ECA)	Non-profit organization providing technical training for careers in solar, HVAC, energy efficiency, and green construction; provides energy conversation and heating repair services to low-income residents.	▪ Curriculum development ▪ Construction and Energy Efficiency instruction ▪ Student recruitment/selection and internship/job placement support ▪ Equipment and facilities support
YouthBuild Philadelphia Charter School (YBP)	Alternative education program helping Opportunity Youth with education and occupation goals.	▪ Strategic engagement and partnership efforts ▪ YBP student selection and student support
PowerCorpsPHL	A City of Philadelphia AmeriCorps initiative designed to support the City's environmental stewardship initiatives, youth violence prevention and workforce development priorities; annually enrolls 160 individuals, ages 18-26.	▪ Facilitating student pipeline for BSF solar training ▪ Participating in student recruiting ▪ Case management
Philadelphia Education Fund (PEF)	Non-profit organization that facilitates STEM education opportunities across the city of Philadelphia.	▪ Curriculum development ▪ Professional development for instructors
Faces and Voices of Reason (FAVOR)	Non-profit programming providing youth etiquette, self-esteem building and goal setting services, implemented in schools and faith-based organizations.	▪ Case management and support services
School District of Philadelphia (SDP)	Comprised of 19,000 staff and 203,000 students, the SDP is the 8 th largest district in the country.	▪ Marketing support for CTE solar training ▪ BSF training and facility support for on-site CTE students ▪ Facilitates off-site CTE-student training
Occupational Advisory Committee	Advisory committee comprised of subject matter experts from ECA, SS, SDP, YBP, and PEA and other industry and employer representatives and educational organizations.	▪ Curriculum development for Solar Energy POS

3.1 Research Questions

The framework for the overall evaluation involves five main research questions.

Question 1: Was the program successful in reaching its target population? Examines the extent to which the program was successful in achieving its recruiting goals and in contributing to the diversification of the workforce in energy and related sectors.

Question 2: Did the program deliver training activities as planned? Assesses the extent to which the program was implemented as planned and identifies changes made along the way, the implementation process, challenges encountered, responses to those challenges, and emerging best practices.

Question 3: What are the training outcomes of program participants? Examines participant training outcomes (e.g. program completion, credentials earned, high school graduation/GED, internship participation, and enrollment in additional related training).

Question 4: What were the program-related outcomes of participants after program entry? Examines shorter-term participant outcomes after program participation, such as enhanced participant awareness of green jobs or related career pathways, interest in pursuing careers in solar energy or related industries, interest in pursuing further related education or training, and engagement with the school or community.

Question 5: What were the participants' labor market outcomes following program entry? Assesses the labor market outcomes experienced by program participants after program exit, such as employment, employment in the energy or related industry, job retention, earnings, and earnings growth.

3.2 Data Collection Activities

Below is a description of the types of quantitative and qualitative data used to examine the questions relevant to the cohorts implemented thus far.⁴ Related data collection protocols can be found in Appendix A.

Quantitative Data

Program participation data. Collected by PEA program staff, this information included participant demographics as well as program participation and related training outcomes. These data are collected throughout the participant training period.

⁴ It should be noted that future evaluation activities involving all cohorts will involve collecting these data. In addition, administrative education data will also be collected from the SDP to examine additional outcomes related to SDP3 and SDP4.

Classroom survey data. To obtain information on participants' intermediary outcomes related to program participation (e.g., school engagement, awareness of green jobs), this survey is intended to be implemented at baseline (before training begins) and at the end of training. It should be noted, however, that the first two program cohorts, SDP0 and SDP1, completed only one classroom survey at the end of the program period.

Follow-up survey data. To obtain information on participants' labor market outcomes, pursuit of further training and training-related credentials, a participant follow-up survey was implemented three months following program exit and will be implemented annually thereafter. We will conduct this survey only with students who are no longer in high school.

Exhibit 4 presents the response rates by data collection types for each cohort examined during the current evaluation period:

Exhibit 4. Data Collection by Cohort

Program Participation Summary (as of 2/29/20)			
	SDP0*	SDP1	OppY1
Total program participants	10	18	18
One-time classroom survey	3	18	n/a
Baseline classroom survey	n/a	n/a	18
Program data	7	18	n/a
Follow-up survey	2	4	n/a

*Does not include one student withdrawing after one day of enrollment.

Note: Program exit dates for SDP0 and SDP1 were August 2019; program exit date for OppY1 is May 2020, followed by a 10-week internship.

Qualitative Data

Document review. We gathered and reviewed a variety of program documents to collect relevant data about the BSF program, including:

- Partner/OAC meeting presentations and meeting minutes
- Curriculum development task list and related materials
- DOE application for funding and budget
- Outreach/promotional materials
- Professional development planning notes

Stakeholder interviews. Using semi-structured instruments, we conducted interviews with twelve key program stakeholders to gather information related to the status of the program's implementation to date; the degree to which the program was implemented as planned and adjustments that were made along the way; the number, diversity and strength of relationships that were established; and successes and challenges. During this evaluation period stakeholder interviews were conducted with representatives from almost all key partner organizations.

4. Year 1 Findings

In this section, we provide our findings on implementation progress to date for each of the strategies outlined in the logic model. We also present implementation considerations that outline interesting observations, benefits, challenges, and/or promising practices that relate to specific strategies.

4.1 Program Administration and Management

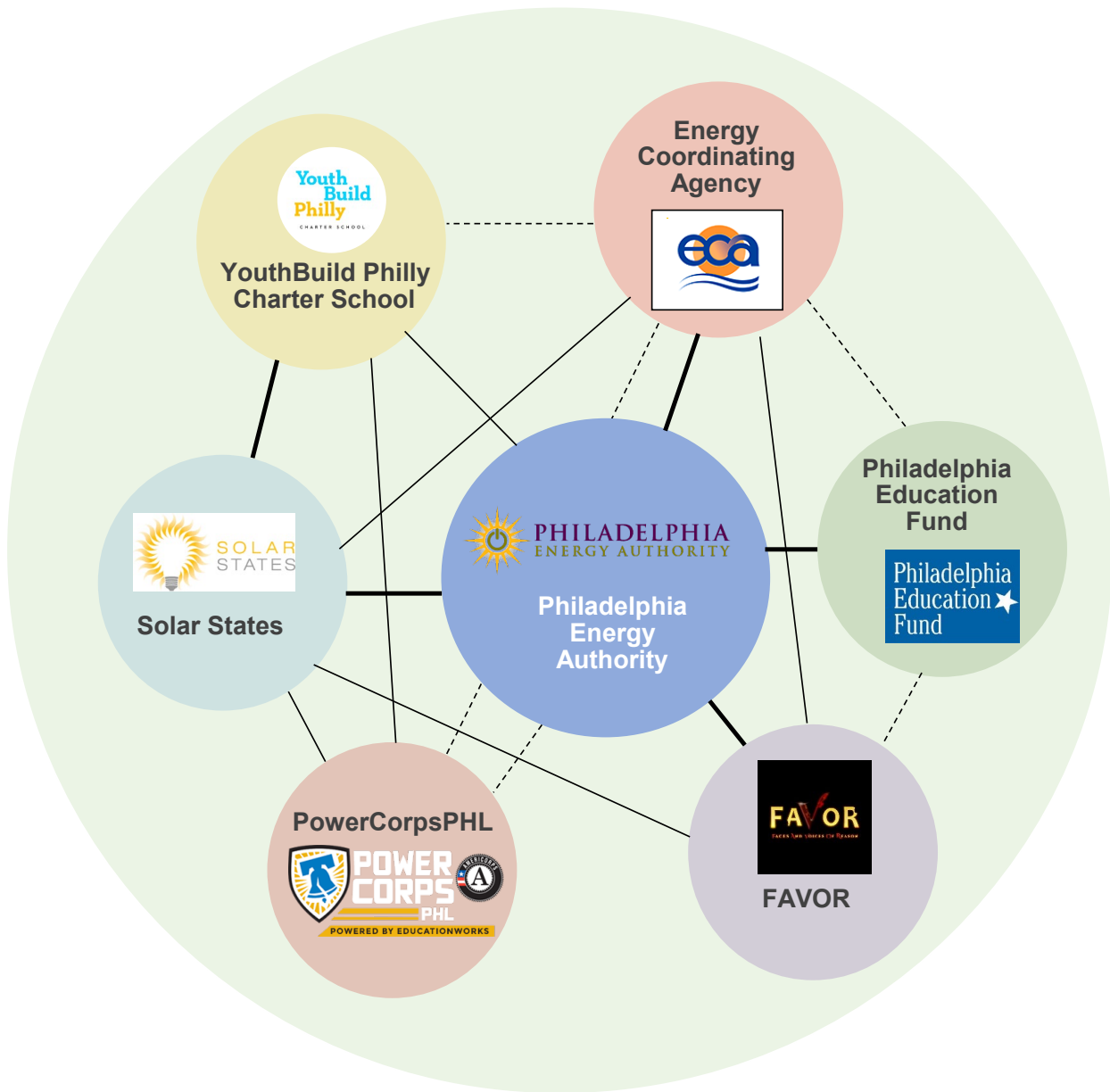
As the lead organization, PEA ensures the timely completion of all milestones and deliverables associated with the award. During the first year of program implementation this activity has involved executing contracts with program partners, identifying additional partners relevant to program implementation, identifying the evaluation contractor, establishing effective communication with all program partners, and coordinating activities among partners.

The following several factors related to the overall organization, administration and management of the program appear to have contributed to successful start-up of the program and strengthened the team's overall partnership structure.

Prior collaboration among partner organizations and PEA. As mentioned above, seven partner/vendor organizations comprise the BSF core team. In addition to the expertise brought to the project by each member of the core team, each organization has collaborated with one or more other organization in the past as shown in Exhibit 5. Therefore, team members were able to build on a well-established foundation, facilitating ongoing collaboration and quick start up to program activities.

Exhibit 5. Past and Current Team Collaboration

Significant prior collaboration ——— Some prior collaboration - - - - - Current collaboration only - - - - -



Shared responsibilities of partner organizations. While each partner organization contributed to the success of implementation based on their respective areas of expertise, multiple partners often contributed to the same tasks (Exhibit 6). In many cases, this “cross-fertilization” strengthens the outcome resulting from these tasks. However, it should be noted that this diversity also brings different approaches for accomplishing the same task, which can sometimes be difficult to reconcile.

Exhibit 6. Shared Responsibilities

Program Management	 Phila. Eng. Authority				
Curriculum Development	 Phila. Ed. Fund	 Solar States	 Energy C. Agency	 Phila. Eng. Authority	
Instructor Development	 Phila. Ed. Fund				
Recruitment and Selection	 Solar States	 Energy C. Agency	 Youth Build	 Power Corps	 Phila. Eng. Authority
Training Delivery	 Solar States	 Energy C. Agency	 Phila. Eng. Authority		
Case Management	 FAVOR	 Phila. Eng. Authority	 Power Corps		
Internship and Job Placement	 Phila. Eng. Authority	 Solar States	 Power Corps.		
Leveraging Resources and Sustainability	 Phila. Eng. Authority	 Power Corps			

Strong commitment to achieving the program goals, objectives, and implementation schedule. An important objective for the first year of program implementation was to achieve the milestones needed to maintain the schedule for training. Among other things, this has required the team's active engagement in iterating several versions of the solar training curriculum, while also training several cohorts of students using earlier iterations. Some partners indicated that the required level of effort far exceeded their expectations,

and in some cases, placed a strain on schedules. Nonetheless, this scheduling did not appear to dampen enthusiasm for the program or partner commitment to achieving program success. In fact, partners expressed their appreciation for PEA’s leadership and commitment to drive excellence in program development and implementation.

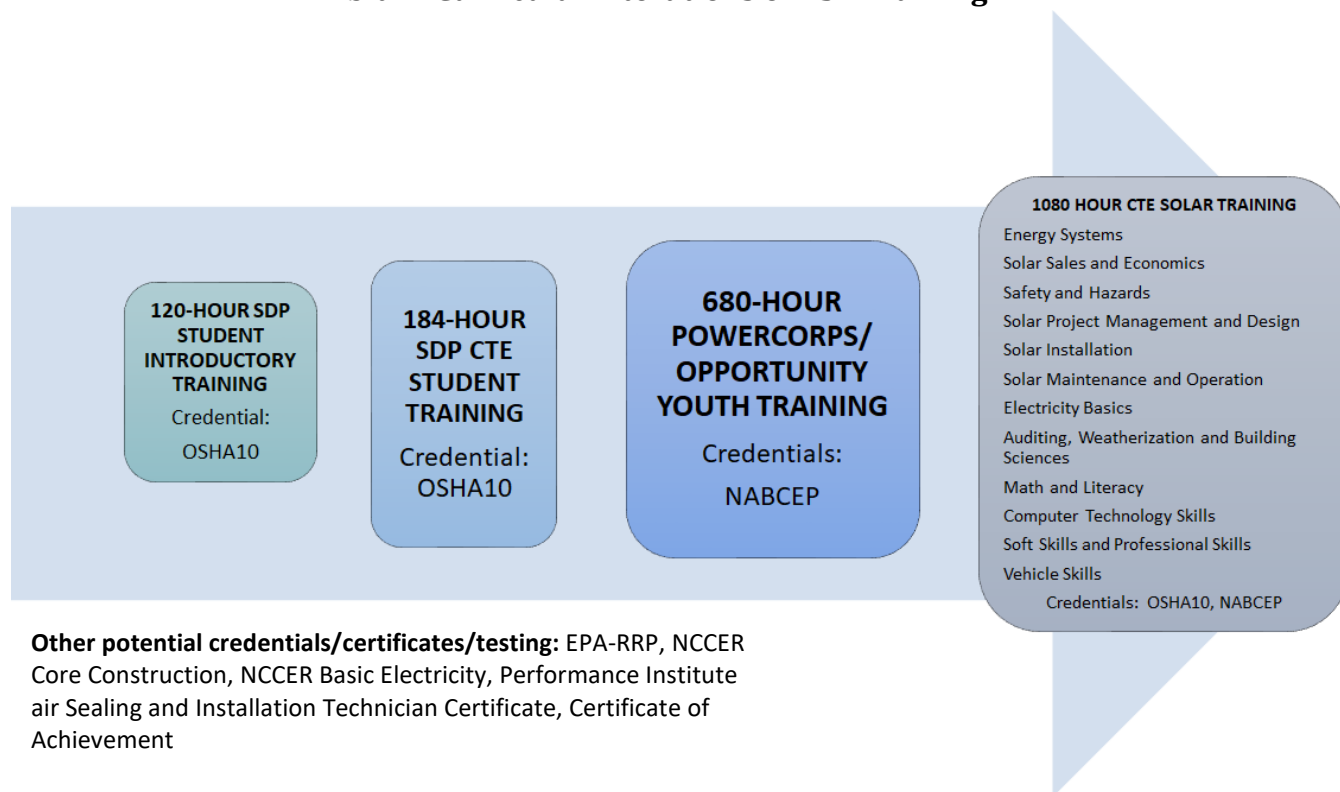
Communication. PEA program staff have successfully used the following methods to continuously engage the team and keep them updated on the status of implementation:

- Monthly in-person partner meetings for the purpose of status updates and planning
- Regular email communications among all partners
- Impromptu phone meetings involving one or more partners to troubleshoot/plan specific issues as needed between monthly meetings
- Written meeting minutes

4.2 Curriculum Development

A significant task thus far has been the development of the solar training curriculum. As shown in Exhibit 7, the team has iterated several versions to support the eight cohorts of training starting with the existing 120-hour *Find Your Power* curriculum.

Exhibit 7. Curriculum Iterations of BSF Training



This work has involved steadily building the curriculum to satisfy the PDE requirements

for high school-based CTE programs including 1,080 hours of training conducted over three academic years. Once approved, the program will support training for two cohorts of CTE students (CTE classes of 2023 and 2024) beginning with SDP3 in August 2020. Between 10th through 12th grades, participants will receive extensive instruction in solar installation, design, and sales, as well as energy efficiency, electrical basics and construction safety. Participants will be connected to opportunities for paid summer internships and opportunities for employment or further training upon graduation in occupations such as PV Installer, PV Sales, Retrofit Installer Technician, and Energy Auditor.

Progress Towards Implementation

As shown in Exhibit 5 above, the following program partners have had primary responsibility for developing the BSF curriculum: ECA, Solar States, and PEF in close consultation with the SDP. Both ECA and Solar States have a long history of developing and providing similar training. In addition, they have both provided solar training to youth and adult populations using other established curricula. PEF staff have expertise in curriculum development related to STEM programming and provide input on evidenced-based program strategies and components, as well as guidance and direction on development of the PDE CTE application.

In addition, the team relied heavily on input from the OAC, identified early in the program period and convened quarterly. The OAC is comprised of subject matter experts from ECA, Solar States, SDP, YBP, and PEA and other industry, employer, and education (secondary and post-secondary) organizational representatives.⁵ The OAC has been instrumental in articulating specific learning objectives associated with the program. The resulting Secondary Competency Task List (Task List) submitted as part of the PDE CTE application process, measures the technical competency of a student in a specific POS and reflects requirements for credential obtainment and school district standards. The Task List also provides the foundation for developing the curriculum, lesson plans and syllabi.

In addition to convening the OAC, the team engaged in numerous additional activities under the leadership of PEA. This included reviewing previous training program outcomes and labor market data and assessing gaps between the earlier iterations of the curriculum and the Task List. To fill identified gaps, the team conducted an extensive literature review and interviewed experts to identify additional existing curricula and evidenced-based strategies. Relatedly, the team has also been developing syllabi and replicable lesson plans.

To date, the program has met all its contracted milestone requirements and is on track for continuing to do so. Significantly, the PDE has reviewed and provided initial approval of the Task List and have been provided with a new Classification of Instructional Program

⁵ Appendix B provides a full list of OAC member organizations.

(CIP) code for “Solar Energy Technology/Technician”. At the time of this reporting, the team is currently in the process of finalizing the 1,080-hour CTE solar training curriculum and developing lesson plans and syllabi, before obtaining final and formal PDE approval to offer the CTE solar training program starting in Fall 2020.

As this process has evolved, the following challenges, lessons learned, and best practices were observed by members of the team:

- The BSF team is interested in developing an innovative and unique solar training model that both addresses local workforce demand and provides training for disadvantaged populations. As such, the team did not simply replicate a generic training model, but rather iterated a curriculum previously implemented within the city of Philadelphia. This approach can be challenging because there is little to help guide the process and provide a frame of reference for a reasonable level of effort required to expand the program and complete curriculum development tasks. To increase the depth of the program through multiple iterations of the curriculum, team members noted a need for extensive dives into the literature and existing national curricula, in addition to expert consultation, to identify appropriate best practices.
- By systematically documenting their training experiences (e.g., what works, what doesn’t work) after each class, the team has developed a tool for continuous improvement. This process will result in a growing body of knowledge that helps inform and improve each subsequent round of curriculum development and will aid in replicating the program in the future.
- The diversity of expertise brought by the curriculum development team members also brought a diversity of approaches for accomplishing a common task. This has required that team members find common ground by combining both the hands-on experience and knowledge of skilled trainers with recommended best practices and methods known to education experts. In addition, the diversity of OAC members has also required significant effort to align various perspectives when developing the Task List.
- Implementation of the expanded 1,080-hour solar power CTE training at the SDP’s Frankford High School requires that the team ensure that required pre-requisites for the training – most notably in math – aligns with student high school course completion, especially among students with individualized educational plans (IEPs).
- Relatedly, is the challenge associated with credential attainment. While the curriculum is designed to provide instruction relevant to several credentials, it is unclear if the timing will allow students to take all exams prior to graduating from high school. More specifically, students must be at least age 18 or older to sit for the North American Board of Certified Energy Practitioners® (NABCEP®) Associate level exam, likely limiting some students from taking the exam prior to graduation.

4.3 Training Delivery

In addition to curriculum development, the BSF program will involve providing internships and training to eight cohorts of Philadelphia students. In this section, we discuss the program's key strategies associated with these efforts and present preliminary findings on the three cohorts of students that have begun (and in some cases completed) their BSF training by March 31, 2020 (Exhibit 8).

Exhibit 8. Bright Solar Futures Training Cohorts to Date

Cohort	Program Type	Intended Participants	Training Dates	Number of hours
SDP0	Summer internships	Returning trainees from <i>Find your Power</i> (n=7)	Summer 2019	120
SDP1	Summer class	SDP CTE class of 2019; open to all Philadelphia high school students (n=18)	Summer 2019	120
OppY1	Power Corp training	Opportunity Youth from Power Corps (n=18)	January to July 2020; Monday – Friday	680

Instructor Development. To ensure that training is effectively delivered in a way that is accessible to youth, PEF has been charged with providing instructor professional development using strategies and tactics designed to enhance teaching effectiveness. Professional development activities have included a workshop on lesson planning and classroom management, as well as class observations and coaching involving feedback on instruction.

As described above with regard to curriculum development, at times the expertise of seasoned trainers can be at odds with the best practices encouraged by PEF. While both recognize the value provided by the other, this separation could prevent the full value of professional development from being fully realized.

Related to this issue is an articulated concern about recruiting an appropriate candidate to serve as the school-based instructor for the SDP CTE Solar Energy program, scheduled to be implemented at Frankford High School beginning September 2020. Mostly notably, it was thought that it may be difficult to recruit a candidate that both possesses the required knowledge and skills and will also accept the likely salary differential between teacher and industry. Alternatively, after obtaining the appropriate certifications to serve as the teacher, the candidate could choose to work elsewhere. The team has considered the use of solar professionals as guest speakers for gaps in instruction related to some components of the curriculum. In addition, PEF will continue to offer professional development workshops for BSF teachers.

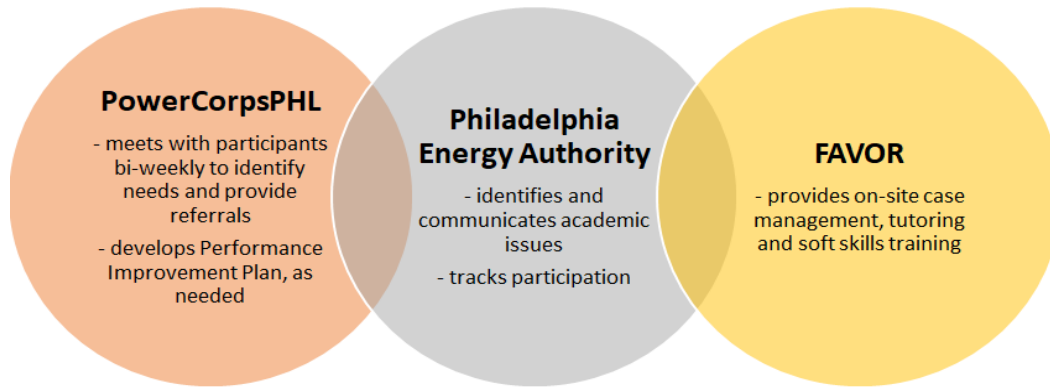
Student Recruitment and Selection. The BSF program was designed to target SDP CTE students and OppY, providing training to approximately 105 students across the eight cohorts. It was intended that OppY candidates would be referred by YBP, a national non-profit whose local chapter runs a charter school with a specialty area in construction-related trades. In addition, the program seeks to diversify the solar industry with more people of color and women. Program developments related to recruiting and selecting students include:

- The PC-PHL program helps prepare OppY with the prerequisite requirements for enrollment in the BSF program and increase their likelihood of success in the program. Youth from PC-PHL and YBP become aware of the program through fellowship fairs and other outreach activities such as on-site visits with local employers. Interested students engage in an application and interview process.
- In 9th grade, SDP students begin the process of selecting which CTE program they will pursue for the remainder of their secondary education. To recruit students for the SDP CTE solar program starting August 2020, the BSF team has conducted two information sessions led by a BSF instructor from Solar States. In addition, for interested students, a field trip was conducted to visit Solar States' office to provide students with a better understanding of the work and environment.
- Field trips and job shadowing were identified as a useful mechanism to help students gain a better sense of the work environment and work activities. However, it was suggested that it is important to also inform students about the local job market and that employment in the solar industry will likely involve travel due to accommodate contractual work or relocation. This is discussed in more detail below under "Internship and Job Placement".

Targeted Case Management. Case management is an important function designed to reduce attrition and help participants successfully complete course requirements. At the start of each training cohort, each participant's academic and soft skills are assessed and a support plan is put in place. Case management includes academic tutoring and connecting participants to support services to address barriers to participation (e.g., child care, housing, food, legal aid, health care and, in some cases, public transportation passes).

Exhibit 9 illustrates organizationally how the program supports participants where PEA coordinates with PC-PHL for PC-PHL students (including OppY) and with FAVOR for SDP students, respectively. As mentioned above, the case management function offered to PC-PHL participants is an extension of the PC-PHL fellowship program overall and reflects a leveraged program resource. Academic support is generally provided as needed by instructors in the form of one-to-one tutoring.

Exhibit 9. Case Management Organization



The diversity of participants among the BSF cohorts bring their own unique set of challenges that might be addressed through case management. For instance, in some ways OppY1 participants may be better prepared than other cohorts to participate in the BSF training – in general, they are older (all adults), have all completed prior job readiness training, and are paid wages while participating in the program. In this regard, staff indicated that these students should be held more accountable for their behavior (e.g., missing class) and that having greater expectations of them is appropriate. On the other hand, OppY1 participants may experience more adjustment issues when starting the BSF program; the experience requires greater independence and the single-instructor classroom format sharply contrasts with the hands-on, on-site work associated with PC-PHL’s service-oriented foundations program. Since case management services are provided by PC-PHL for OppY1, communication between the BSF training and PC-PHL is especially important.

As discussed above, the program could face some additional challenges as it seeks to accommodate SDP CTE students entering the program with IEPs and/or struggling with content. However, FAVOR will continue to provide these students with case management services to help address these issues.

Internship and Job Placement Coordination. The program will offer participants the opportunity for paid internships in addition to classroom time. PEA will convene the intern hosts and arrange for the internships. To date, the program placed 10 individuals in paid internships with five employer partners during the summer and fall of 2019. For those individuals completing training and no longer in high school, PEA will also assist with job placement in either the solar industry or other industries using similar skill-sets or the pursuit of further-related training. As discussed in Section 2.2 above, the City of Philadelphia has engaged in several initiatives spurring demand for skilled workers in the solar industry. Further, program partners are well positioned to leverage their long-standing relationships to identify internship and employment incentives for program graduates.

According to the Bureau of Labor Statistics (BLS), there were 9,700 Solar Photovoltaic (PV) Installation jobs nationwide in 2018. BLS estimated that between 2018 and 2028, these jobs would increase by 6,100 (63%), much faster than the average for all occupations, which is expected to grow by 5%⁶. In addition, Projections Managing Partnership (PMP), which serves as a consortium of state and local projections, estimated an even greater increase in these jobs. PMP's *Projections Central: State Occupational Projections* reported 11,300 installers nationwide in 2016 based on the numbers reported from 12 states; the national estimate more than doubles (104%), reaching 23,100 by 2026⁷.

BLS expects a greater demand for PV installers as the cost of PV panels and shingles continues to fall, which would encourage more residential households to take advantage of these systems. In addition, the increasing popularity of solar leasing plans is expected to create additional demand, as customers no longer bear the upfront costs of installation. Since the long-term demand for PV panels is also dependent on government incentives, states and localities that provide incentives to reduce the cost of PV systems should experience greater demand for workers⁸.

Despite this demand nationally, some program partners are concerned that local or regional employers in the solar industry may not have the consistent demand for skilled labor to absorb all BSF program graduates over time. One partner cited the “solar coaster” nature of the industry where demand can vary dramatically over time. Another noted that participants may need to be willing to travel or relocate to accommodate employer requirements.

As shown in Exhibit 10, PMP projects high job growth for solar installers in several east coast states including Florida, New Jersey, North Carolina, Vermont and Massachusetts. The number of installers in those states was 3,950 in 2016 and is projected to increase by 80% to 7,100 by 2026⁹. Most relevant to the BSF program, over the same time period, job growth for installers in neighboring New Jersey and New York, is anticipated to double (101% and 105%, respectively) resulting in a total of 3,550 jobs by 2026.

⁶ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Solar Photovoltaic Installers, on the Internet at <https://www.bls.gov/ooh/construction-and-extraction/solar-photovoltaic-installers.htm> (accessed March 04, 2020).

⁷ Projections Managing Partnership, *Long Term Occupational Projections (2016-2026)* on the internet at <http://www.projectionscentral.com/Projections/LongTerm> (accessed March 04, 2020). The projection was performed in July 2019.

⁸ Bureau of Labor Statistics, U.S. Department of Labor, *Occupational Outlook Handbook*, Solar Photovoltaic Installers, on the Internet at <https://www.bls.gov/ooh/construction-and-extraction/solar-photovoltaic-installers.htm> (accessed March 04, 2020).

⁹ According to recent PMP's short-term projection of installers performed from a different set of 12 states in March 2020, the number of installers in 2019 (7,420) is projected to grow to 8,600 (8,590) by 2021. Among New England states included in the projection, including New York, Vermont, Massachusetts, and Maine, the number of SV installers is projected to increase from 1,520 in 2019 to 1,690 in 2021 (a 11% increase).

Exhibit 10. Solar Installer Job Projections, 2016-2026

Area Name	Base (2016)	Projection (2026)	Change	Percent Change	Average Annual Openings
United States	11,300	23,100	11,800	104%	3,000
California	4,900	11,300	6,400	131%	1,480
Florida	990	1,920	930	94%	250
New Jersey	920	1,850	930	101%	240
New York	830	1,700	870	105%	220
North Carolina	500	690	190	38%	80
Vermont	410	560	150	37%	70
Massachusetts	300	390	90	30%	50
Hawaii	190	370	180	95%	50
Missouri	140	200	60	43%	20
New Mexico	100	220	120	120%	30
Ohio	60	130	70	117%	20
Indiana	50	50	0	0.00%	10

Data Source: Projections Managing Partnership, *Long Term Occupational Projections (2016-2026)* on the internet at <http://www.projectionscentral.com/Projections/LongTerm> (accessed March 04, 2020).

As a result, graduates wanting to apply their new skills specifically to the solar industry may need to consider relocating to regions anticipating higher demand for these occupations. As such, the BSF team is beginning to engage employers outside the City of Philadelphia to serve as internship hosts and is considering field trips to NJ employers to build these relationships.

In addition, the program has appropriately begun to explore occupations with transferable skills and establish partnerships with local employers seeking those skills. According to O*NET, an online occupational search tool sponsored by the U.S. Department of Labor, tasks and skills relevant to those performed by PV installers are relevant to a range of other occupations, including electricians, plumbers and roofers.¹⁰

BSF Program Findings. In this section, we describe program findings reflecting data collected, to date, on three cohorts of students: SDP0, SDP1, and OppY1¹¹. The following discussion reflects program participation data and data collected via classroom surveys and a follow-up survey. As discussed above, classroom survey data were collected for SDP0 and SDP1 at one point of time at the conclusion of training. However, classroom data collected for OppY1 reflects participants' baseline status and will be collected again at the end training. Since this data is intended to be part of a pre-post comparison, we do not discuss its content as findings below. However, we do provide exhibits reflecting these responses in Appendix C. Additional exhibits reflecting other data content that are

¹⁰ <https://www.onetonline.org/link/summary/47-2231.00>

¹¹ It should be noted that data was not collected for the SDP2 due to the timing of SDP permissions.

described but not shown in exhibits below, may also be found in Appendix C.

In this section we describe findings related to the following categories of information:

- Enrollment and characteristics of program participants
- Training outcomes
- Labor market/training related outcomes
- Other program outcomes
- Participant feedback

Enrollment and Program Participant Characteristics

- Exhibit 11, summarizes the actual participation for SDP0, SDP1, SDP2 and OppY1 and expected participation for SDP3, OppY2, SDP4 and OppY3. As shown, the PEA program is on track for reaching or exceeding its training goals of 105 student participants.

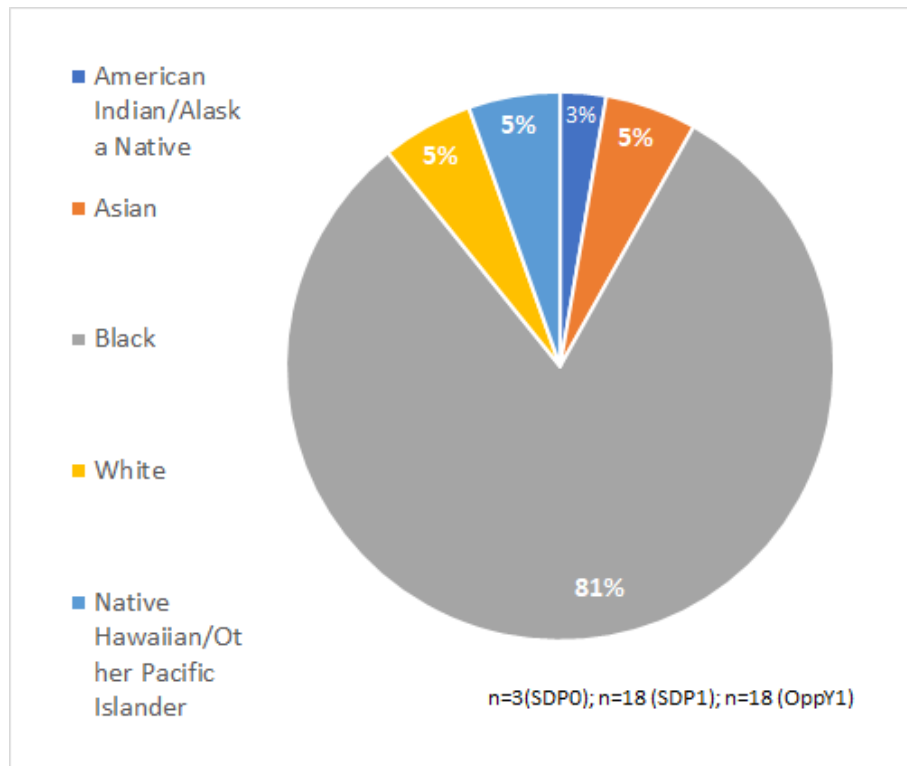
Exhibit 11. Enrolled Students

BSF Participants	
Past and Current Cohorts	
SDP0	10
SDP1	19
SDP2	18
OppY1	19
Future Cohorts	
SDP3	15
OppY2	15
SDP4	15
OppY3	15
TOTAL	126

Note: While we have noted the number of enrolled students for SDP2 in this table, the SDP2 cohort will not be included in the analysis of other training outcomes due to the timing of SDP permissions.

- As shown in Exhibit 12, most (81%) of all SDP0, SDP1, and OppY1 participants identified their race as Black, while White, Asian, and Native Hawaiian/Other and Pacific Islander students were equally represented (5% each) . A greater proportion of students in OppY1 identified as Black compared to those in SDP1 (94% vs. 75%).
- Regardless of race, about 18% of all SDP0, SP1, and OppY youth identified as being of Hispanic or Latino ethnicity.
- About 10% of participants across all programs identified as female.

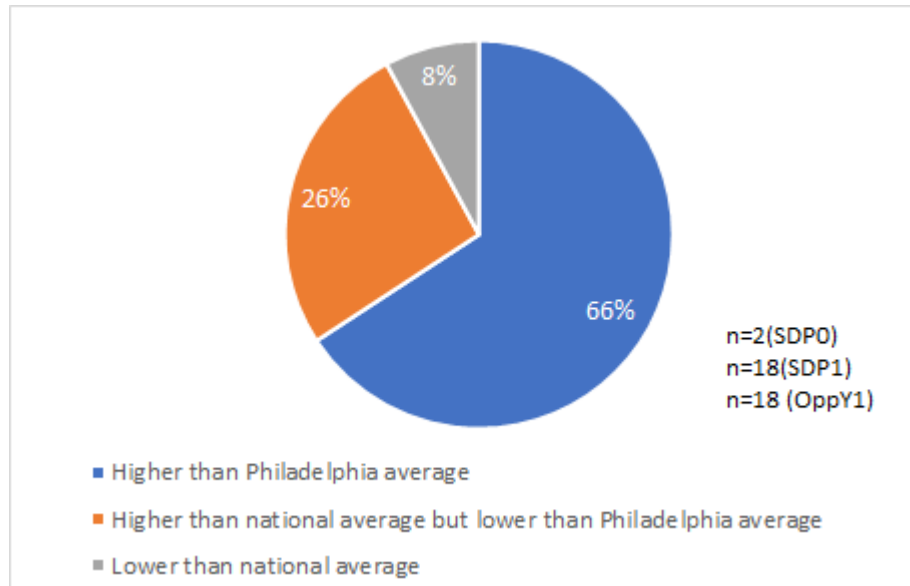
Exhibit 12: SDP0, SDP1, and OppY1 Participant Race



- According to the U.S. Census Bureau's 2013-2017 American Community Survey estimates, the percent of people living below that poverty level in the United States as 15%; in the City of Philadelphia the percent was 26%.¹² Among the 38 SDP0, SDP1, and OppY1 participants who provided resident zip codes, 92% live in zip codes where the percent of individuals living below the poverty level were higher than the national average; 66% live in zip codes where this percent exceeds the Philadelphia average (Exhibit 13).

¹² Source: 2013-2017 American Community Survey 5-Year Estimates
(https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml)

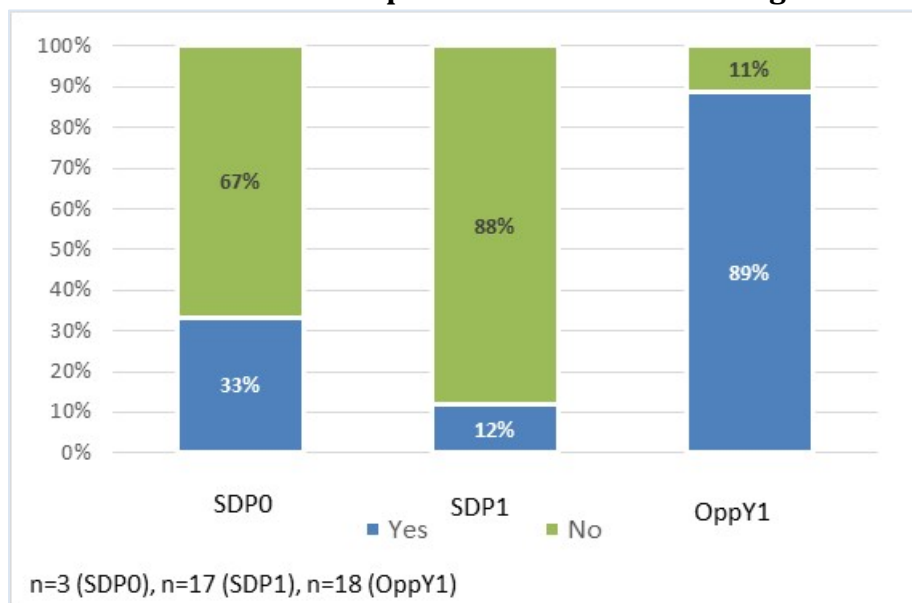
Exhibit 13: Poverty Levels of Residences of SDP0, SDP1, and OppY1 Participants



- Among responding SDP0 and SDP1 participants, over one-half (57%) had completed either 11th or 12th grade. Over three-quarters (76%) of responding SDP0 and SDP1 students reported they will be returning to high school; among those, 43% reported that they will be participating in a CTE program.
- Among all responding SDP0, SDP1, and OppY1 participants, one-half (50%) participated in some type of skills training prior to the BSF program, such as welding, CAD certification, or workforce safety (Exhibit 14). However, this varied across cohorts. About 89% of OppY1 youth participated in prior training compared to 12% of responding SDP1 participants¹³. The high prior training rate among OppY1 participants may reflect both their participation in the PC-PHL Foundations Program and that they are no longer in high school, providing greater opportunity for other training.

¹³ A comparison to SDP0 participants is not made due low reporting of this information among this cohort.

Exhibit 14. Completed Prior Skills Training



■ **Training Outcomes**

- Almost all (89%) of SDP0 and SP1 program participants completed the BSF program (Exhibit 15).
- About three-quarters (76%) of SDP0 and SDP1 participants earned some type of credential, license or certificate as a result of participating in the BSF training (Exhibit 16). Notably, all SDP1 participants earned OSHA10 certification.

Exhibit 15. Internship/Training Completion

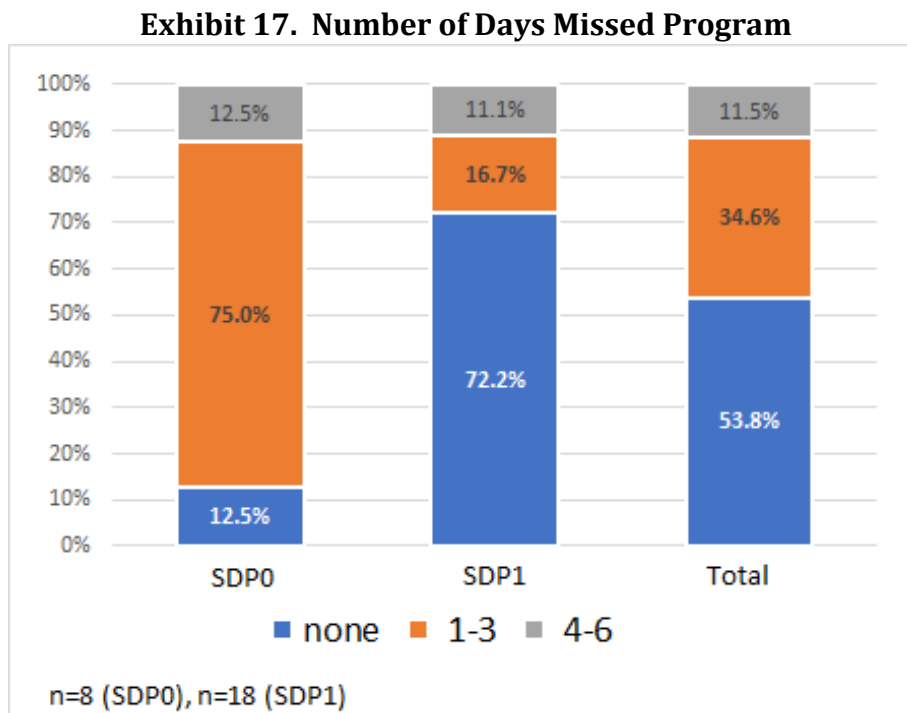
	SDP0		SDP1		Total	
	n	Percent	n	Percent	n	Percent
Yes	7	70%	18	100%	25	89%
No	3	30%	0	0%	3	11%
TOTAL	10	100%	18	100%	28	100%

Exhibit 16. Obtained Other Related Credential, License, or Certificate

	SDP0		SDP1		Total	
	n	Percent	n	Percent	n	Percent
Yes	1	N/A	18	100%	19	76%
No	6	N/A	0	0%	6	24%
TOTAL	7	N/A	18	100%	25	100%

Note: the BSF program was not designed with the intent that students would earn a credential, license, or certificate for the SDP0 cohort.

- Overall, over one-half (54%) of SDP0 and SDP1 participants attended every program day (Exhibit 17). Complete attendance was reported by 72% of SDP1 participants; in contrast, just one of the eight SDP0 participants for whom this information is available had complete attendance.



■ *Labor market/Other training Related Outcomes*

In this section, we describe responses to a follow-up survey implemented to participants three-months post program exit. Only those individuals that were identified as not returning to high school were eligible to complete the survey. The number of eligible participants and the number of participants that responded is found in Exhibit 18.

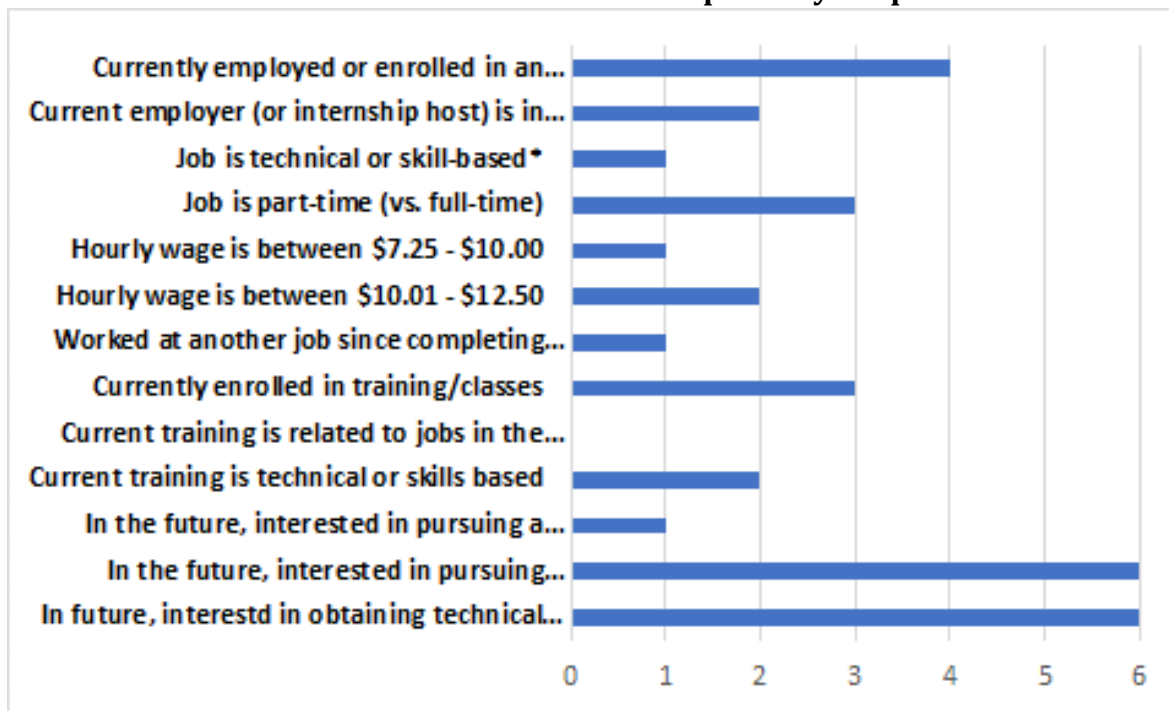
Exhibit 18. Follow-Up Survey Participants

	Eligible	Responded
SDP0	2	2
SDP1	5	4
TOTAL	7	6

Due to the small number of respondents (6), counts – rather than percentages – are used to describe survey responses. These responses are summarized in Exhibit 19. Of interest, while only one individual expressed certainty that they were interested in pursuing a career in the solar industry, all respondents indicated that they were interested in either obtaining technical or skills-based employment or future training. In addition, four

individuals reported that they were employed or in an internship at the time of data collection.

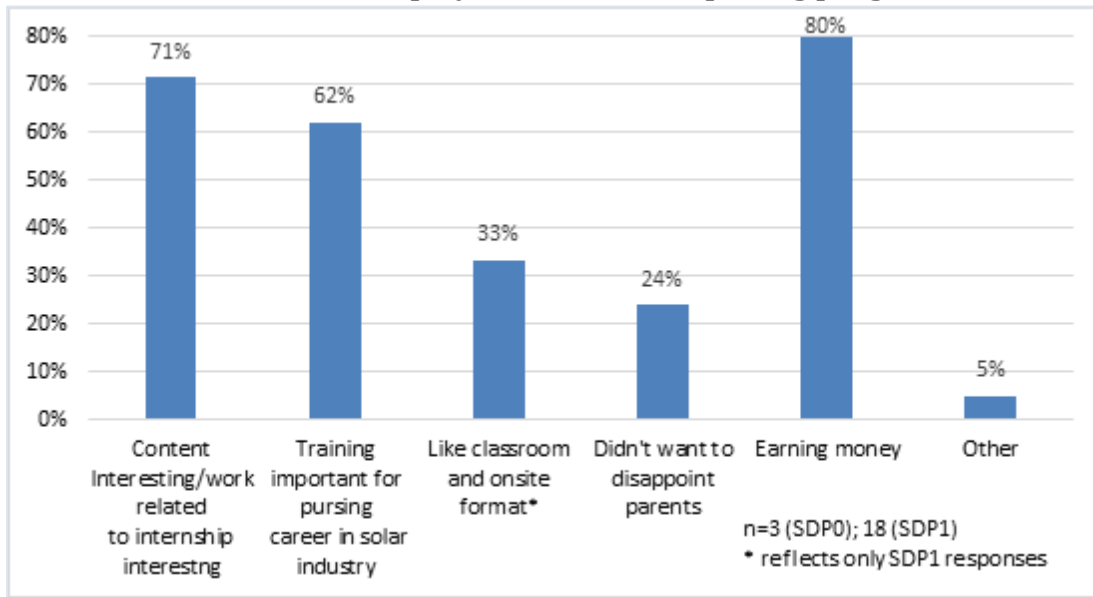
Exhibit 19. Three-month Follow-Up Survey Responses



■ **Other Program Outcomes**

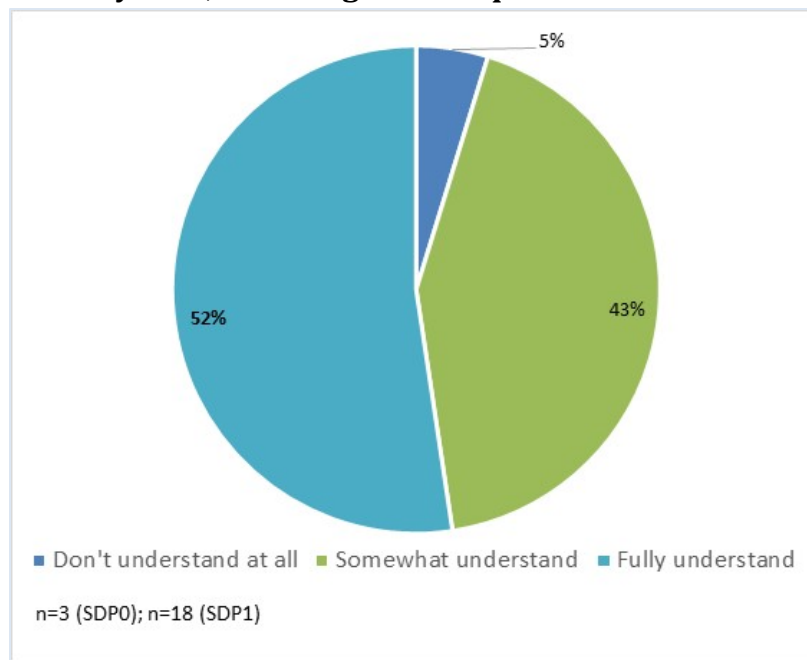
- As seen in Exhibit 20, among those responding to the classroom survey, SDP0 and SDP1 participants were most likely to indicate that they completed the BSF program because they liked the idea of earning money (80%), they found the content (related to training or internship) was interesting (71%), or they felt training was important for pursuing a career in the solar industry (62%).

Exhibit 20. What played a role in completing program?



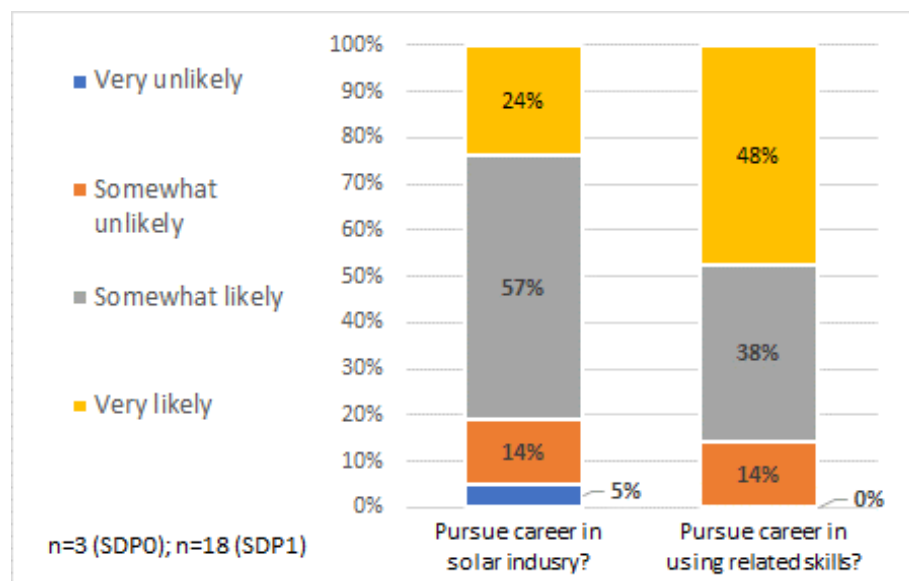
- Participants most often indicated that they either fully understand (52%) or somewhat understand (43%) the job opportunities in the solar industry field as a result of participating in the BSF program (Exhibit 21).

Exhibit 21. As a result of participating in BSF, how much do you feel you understand about job opportunities in the solar industry field, including skills required?



- As seen in Exhibit 22, almost one-quarter (24%) of SDP0 and SDP1 students responding to the classroom survey indicated that they were very likely to pursue a career in the solar industry based on what they learned from the BSF training; for careers using skills related to what they learned through the program, this percentage increased to almost one-half (48%). Only a very few responding participants thought it was unlikely that they would pursue a solar career (5%) or a career using related skills (0%).

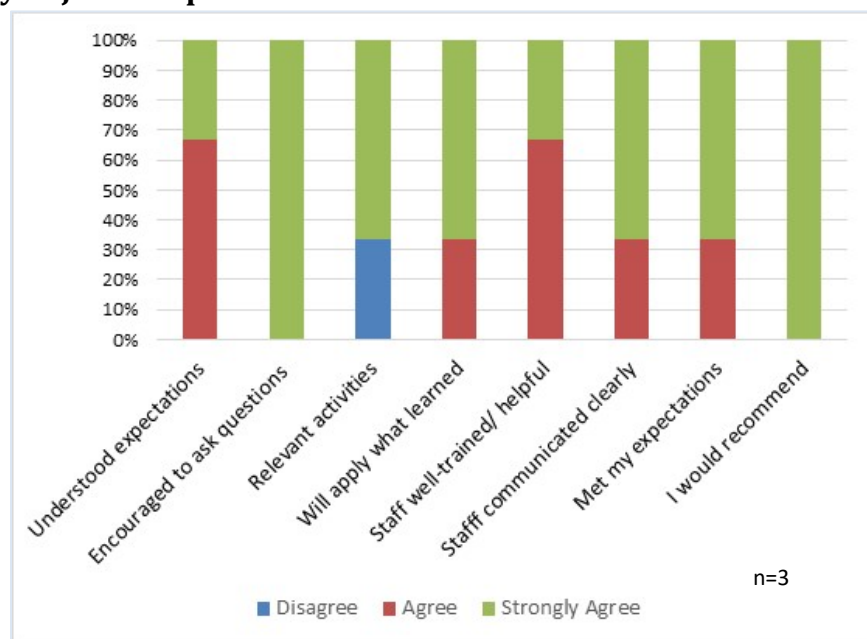
Exhibit 22. How likely are you to choose a career in the solar industry? How likely are you to choose a career using the types of skills described/taught through the BSF program?



■ **Participant Feedback.**

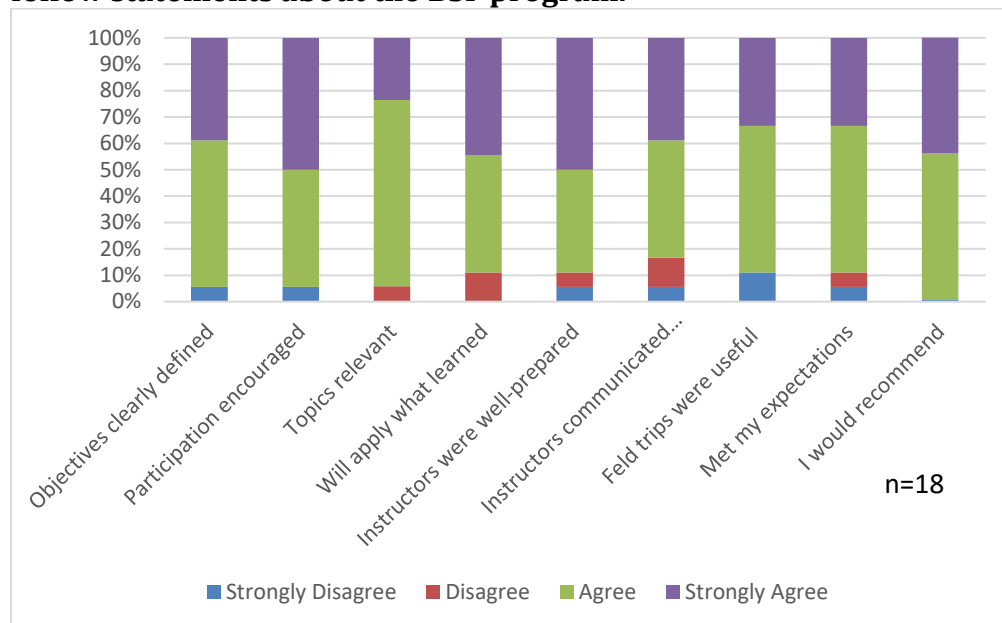
- With one exception, responding SDP0 participants indicated agreement or strong agreement with several measures of participant satisfaction (Exhibit 23). This includes understanding program expectations, being encouraged to participate and ask questions, feeling that they will apply what they learned, that the staff were well-trained, prepared, and communicated information clearly, that the program met their expectations and that they would recommend the program to others.

Exhibit 23. Please tell us how much you agree with the follow statements about the BSF internship program that you just completed.



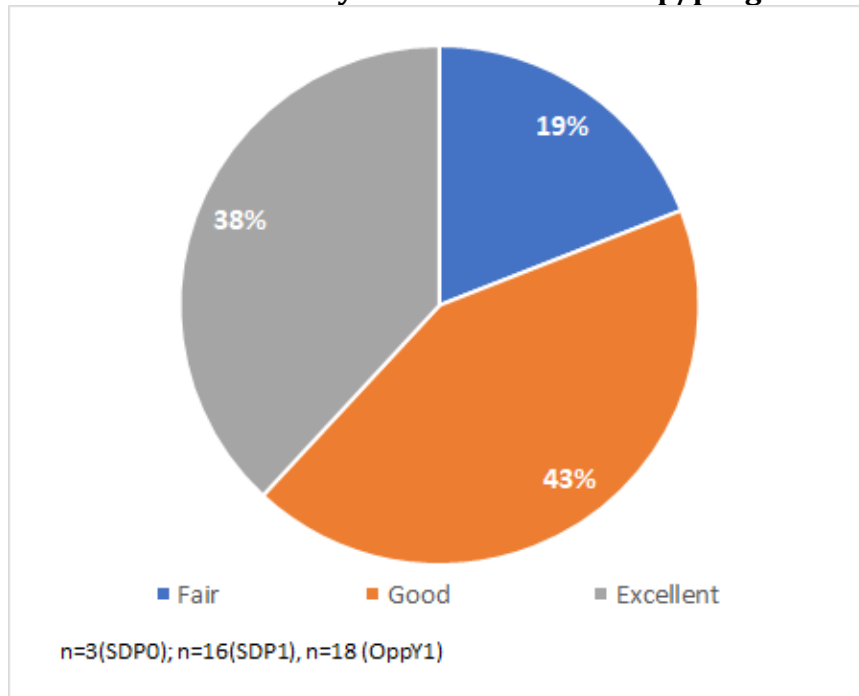
- The majority of SDP1 participants either strongly agreed or agreed with most measures of program satisfaction (Exhibit 24). Where this was not the case, between 6 and 17 percent of participants disagreed or strongly disagreed with these measures.

Exhibit 24. Please tell us how much you agree with the follow statements about the BSF program.



- As shown in Exhibit 25, 38% of responding SDP0 and SDP1 participants rated their training as excellent overall, while 43% and 19% provided ratings of good, and fair, respectively.

Exhibit 25. How would you rate the internship/program overall?



4.4 Leveraging Resources and Sustainability

PEA's plan for sustaining the program has been an integral component of program design since its inception. This includes accessing Perkins funding and funding from PhillyWorks (Philadelphia's workforce development agency), and foundations, as well as leveraging resources from the program's significant network of program partners. In addition to financial sustainability, long-term sustainability of the program will require ongoing support from program partners to ensure continued industry relevance of program curriculum and creating pathways for additional training and credentials through articulation agreements with post-secondary institutions. Given PEA's strong reputation within the City of Philadelphia for executing clean energy initiatives and support within City government, it is well-positioned to continue to generate this support.

To date, significant developments related to these strategies include:

- As mentioned above, the team learned that a state-wide approach must be used to gain PDE approval as a CTE POS, enabling all PA school districts to access Perkins

funding. The BSF team will help to facilitate this process.

- The OAC will continue to advise the BSF CTE training program. In addition, an articulation agreement for the SDP program will be in place by August 2020.
- The program actively seeks to leverage additional support (both financial and in-kind contributions) from its wide network of related industry partners. These types of contributions will be used for expenses that are not being covered by DOE funding, such as the development of the solar lab that will house the program at Frankford High School.

5. Recommendations

As mentioned above, evaluation findings during the first year of program implementation are primarily intended to be formative. That is, the findings reflect the program during its planning and early implementation phase. Therefore, these formative findings are intended to provide insights and guide the recommendations that may help to make program strategies more likely to result in the outputs and outcomes outlined in the program logic model.

Recommendation: Streamline meetings/communications practices

During the initial stages of program implementation, having all members of the BSF team involved in all planning and development activities likely has significant benefits. In fact, program staff have been successful at developing a strong core team committed to achieving the program's objectives. This has also resulted in developing program approaches that have been vetted and benefited from input from a diverse range of program stakeholders.

However, as partner roles become more specific and "global" issues decline, we recommend more targeted communication processes, to lessen the burden and avoid "burnout" of program partners. This may include targeted meetings and emails that include only those on a need-to-know basis.

Recommendation: Continue to manage expectations and increase transparency when recruiting

As future cohorts are recruited to enroll in the BSF program, we encourage a "no surprises" policy that provides students with as much and clear information as needed for them to decide if enrolling in the program is right for them. The team should continue efforts to inform prospective students about the work environment and/or job requirements, thus reducing the likelihood that a student would withdraw from the program once enrolled because of a misunderstanding. PEA should continue or consider including job shadowing, on-site visits, in-person student testimonials, employer descriptions, and

videos as part of their recruiting activities.

Also important is to ensure prospective students understand what their options may be for employment and career pathways after completing the program, including potential work locations. This may include employment and training that is either directly related to the BSF program or uses program-related skills that can be transferred to other occupations. Using infographics and other easily digestible formats in handouts may help students understand the options available to them as a result of participating in the BSF program. Career pathway graphics for relevant occupations will provide students with clarification on the careers that they can pursue, either directly related to training or in related occupations and the training/credentials needed to get there. They also serve as easy-to-reference guides that demonstrate how a student can translate the skills gained through the BSF program into a well-paying job. These graphics may help students develop short- and long-term plans and can also serve as tools for program recruitment, employer engagement, and case management.

Recommendation: Increase efforts to expand participation of young women.

Increasing efforts to encourage participation by young women relates to the program's long-term goals of diversifying the solar workforce to include female participation. As mentioned above, females represented just 10% of participants among SDP0, SDP1, and OppY1 participants that reported this information. To help increase representation of females, PEA may want to consider efforts to reduce female barriers to participation in non-traditional occupations (NTOs).¹⁴ This includes such things as trying to make sure the marketing and occupation materials presented to potential students do not communicate biases associated with the training occupations' characteristics (e.g., long working hours, extended periods of travel, and low pay). The program should also be mindful of such things as threats to stereotypes and lack of self-efficacy which are often associated with female persistence in NTOs. Providing additional support through such things as case management or mentoring, may help to reduce the internalized stereotypes young women may have about their ability to be successful in both completing the BSF training and a career in the solar industry.

Targeted recruitment practices and materials are designed to correct inaccurate perceptions related to work in the solar industry and may help to mitigate the inhibitions young women may feel about participation. This may include such things as using images of women in the work environment and female testimonials. In addition, recruitment efforts should highlight the positive outcomes of program participation that are especially relevant to women when compared to more commonly recommended training options (e.g., cosmetology, child care). This includes economic self-sufficiency, higher wages,

¹⁴ NTOs are defined by the U.S. Department of Labor as occupations in which the representation of one gender is less than 25%. <http://uhcc.hawaii.edu/nontrad/index.php>

improved benefits, broader job opportunities and advancement potential, and job satisfaction. Additionally, once enrolled in the program, the use of female mentors to prevent isolation and supportive services offered through case management, may increase retention as well as longer-term program outcomes.

Recommendation: Closely coordinate implementation of the CTE Solar Program at Frankford High School with the SDP.

- ***Professional Development.*** The type of professional development that may be useful to the CTE instructor hired by the SDP will likely depend on the background and experience of the hired instructor. An instructor recruited from industry brings extensive hands-on knowledge and experience to their classrooms but may have limited professional experience in classroom instruction. Providing professional development opportunities for instructors to grow their pedagogy knowledge and skills may help increase confidence and create more engaging classroom environments for students. Akin to the objectives for professional development that PEF has already conducted, the existing professional development workshops could be utilized within the context of the SPD CTE program.

However, professional development will also benefit the instructor that possesses education credentials but is new or relatively new to the solar industry's skilled-based training. Professional development in this case would more appropriately be provided by industry experts, such as BSF's existing trainers from Solar States or ECA. This professional development could target specific aspects of the curriculum for which additional training is needed. Other professional development options include teacher mentoring or work groups that facilitate the sharing of best practices.

- ***Use Subject Matter Experts for Targeted Lessons.*** Related to "Professional Development" discussed above, we recommend that the program identify specific lessons that would be more effectively taught by specific industry subject matter experts (SMEs). This strategy may be particularly useful should the instructor be recruited from outside the solar industry. This process may also have the added benefit of creating additional connections with industry leaders and establishing a pipeline of potential internship hosts and employers. To encourage retention of young women in the program, female SMEs should be used, as possible.
- ***Troubleshooting Curriculum Implementation.*** PEA should set up processes to monitor curriculum implementation and quickly troubleshoot any issues as it arises. This might include things such as restructuring lesson plan sequences to accommodate academic pre-requisites or finding workarounds to other SDP site-specific challenges.

- ***Case Management.*** Setting up a process to monitor student progress and provide support will help to ensure student retention and program success. While program staff can draw on its experience with prior and current CTE students, implementation of highly-sequenced 1,080-hour curriculum, may create additional academic challenges for students, especially within the context of additional school-based accommodations that may need to be made (e.g., student IEPs). Case management activities may include the following:
 - Working with the SDP and the instructor, the program may be able to help identify and link participants to tutoring as the need arises and other wraparound support services that may be needed.
 - Providing additional supportive services to females participating in the program to troubleshoot issues and help them find ways in which they feel more comfortable and confident exploring NTO options.
 - Providing information to students about employment and/or future training options after completing the program, resulting in a written plan that evolves over the course of program participation.

Recommendation: Continue to Leverage Resources and Pursue Sustainability

While these activities will continue through the program’s entire period of performance, its importance is significant. Most notably, program staff should continue efforts in the following areas:

- ***Help to Facilitate the Process for the POS Designation from the PDE.*** Establishing the program as a CTE POS will result in the articulation of a consistent program design, supporting statewide program replication and access to Perkins funding.
- ***Explore Funding Opportunities to Support OppY.*** With significant input from PC-PHL, the program should explore funding from a variety of sources, including federal agencies that support workforce training, private foundations, and the public workforce system.
- ***Leverage Community Resources and Sponsorships to Provide Supportive Services.*** While often one of the more important components of training programs, supportive services often lack the necessary resources to be effective. Program staff should work to strengthen ties with local social service agencies that could offer these services, formalizing a Memorandum of Understanding that clearly outline the services and organizations that can provide participants with these services.

- ***Establish Articulation Agreements with Post-Secondary Institutions.*** Continue to work with the CCP to create career pathways for youth in either solar training or related skills training. These opportunities can be introduced to youth while recruiting and through meetings with case managers to help students reach their long-term goals.
- ***Engage the Resources Available through Public Workforce System.*** PhillyWorks can help to link students completing the program to a broad range of employment and training opportunities throughout the Philadelphia metropolitan area. Students can gain access and respond to job openings, post resumes, participate in job preparedness workshops, attend job fairs and workshops, and learn about additional tuition-free training and career coaching possibilities.

6. Conclusion

The program brings a range of solid knowledge and expertise to the table through its key partners and the OAC. Blending both evidenced-based practices from the educational field with the expertise of skilled trainers, industry experts and employers, the diversity in subject matter experts is likely effective in developing a comprehensive curriculum, despite some challenges in aligning individual opinions and approaches. Further, the program’s “leave no stone unturned” approach to develop an innovative and highly tailored program based on evidenced-based practices, should increase the likelihood of positive program outcomes.

During the first year of program implementation, the BSF team has rallied to complete numerous activities to support the program’s key strategies, including the following:

- Facilitating collaboration among a wide range of program partners,
- Iterating several expansions of the training curriculum,
- Recruiting, engaging and retaining early program participants,
- Placing students in internships and implemented pilot and expanded training,
- Receiving early stage approval from the Pennsylvania Department of Education (PDE) on a Career and Technical Energy (CTE) curriculum for solar energy training,
- Identifying the School District of Philadelphia (SDP) high school to implement the CTE program, and
- Leveraging resources to enhance the program through commitments from community partners.

Much has been learned from the progress the BSF team has made thus far. Aligned with the formative nature of the current study, the following recommendations represent opportunities the team has to maximize program outcomes during the remaining two years of the program. With the exception of one recommendation – streamlining and adapting meetings and communications practices that are aligned with program needs, as it evolves

– all of the recommendations are more closely related to training activities, than management or administration. In some cases, the recommendations may add to the team’s “toolbox” or enhance existing program practices. In other cases, the recommendations bring attention to the importance of activities in which the team may already be engaged, highlighting the need to remain vigilant about implementation.

Manage expectations and increase transparency when recruiting to help reduce student attrition and help increase the likelihood that students will pursue longer-term outcomes, such as enrolling in further related training or pursuing quality jobs in related industries. Of particular importance are issues related to work environment, job requirements, and labor market characteristics.

Increase efforts to expand participation of young women by tailoring marketing and occupational materials, case management support and mentoring. These efforts are designed to reduce long-standing biases and stereotypes about female participation in NTOs and to increase the self-efficacy of young women entering the program.

Closely coordinate implementation of the CTE Solar Program at Frankford High School with the SDP to troubleshoot any potential issues that could arise when implementing the program in a new environment. This may include activities already planned or those that are new, such as *continuing professional development and using subject matter experts* to enhance or expand the range of industry expertise brought the program; developing a process to *troubleshoot the implementation of the curriculum*, if needed, so that lesson plans may be quickly adapted or sequences changes, if needed; and providing *case management* to stay abreast of student progress and provide additional support as need. In addition, to supporting the overall success of the program, these recommendations may more specifically encourage student retention, credential attainment, and pursuit of employment or further related training upon graduation.

Continue to Leverage Resources and Pursue Sustainability to help ensure program activities will be maintained beyond the current funding period. While program funding covers the upfront costs of program and curriculum development and implementation of training for initial cohorts, achieving the programs longer-terms goals of filling the shortage of workers in the solar industry and providing quality jobs for a diverse workforce, will require positioning the program for continued support beyond the life the current funding. Important activities include *helping to facilitate the process to obtain the POS designation from the PDE* so that the program may be easily adopted by school districts state-wide; *exploring funding opportunities to support program implementation with Opportunity Youth*; *leveraging community resources and sponsorships to provide supportive services* to help enhance program completion; *establishing articulation agreements with post-secondary institutions* to help create career pathways within the solar and related industries; and *engaging the resources available through the public workforce system* to provide additional sources of program funding and to create additional connections to local employers and workforce needs.