Program Review

Each program or service area of Santa Monica College is expected to engage in an ongoing process of self reflection and assessment of program effectiveness. Program review is designed to facilitate and document this process, with program improvement as the intended outcome. Programs and service areas must complete an in-depth report every 6 years; a shorter report covering more limited information is due annually. Certain information included in the annual reports will be automatically aggregated in the 6 year report.

Information submitted in both the 6 year and annual report will be considered by the Program Review Committee. Annual reports will be reviewed by the area vice-presidents and relevant information shared with appropriate planning bodies. Through an annual report to the District Planning and Advisory Committee (DPAC), the Program Review committee forwards information and makes recommendations that are considered in annual institutional planning processes.

Program Information
Program name __Solar Photovoltaic Installation, Sustainable Technologies Program__
Academic year________2012-2013_________________________________
Program contact ___Vicki Drake, Chair, Earth Science Dept___Extension___8652_

Program Type
Check all boxes that apply to your program.

☐ Instructional
☒ Career Technical Education (CTE)
☐ Student or Instructional Support Service
☐ Administrative Service

Review Period
☐ 6 year
☒ Biennial

A. Program Description and Goals
This section addresses the big picture. Prompts should help you describe your program and goals and the relationship to the institutional mission, vision and goals, and how the program is funded.

1. Describe the program and/or service area under review and how the program supports the mission of Santa Monica College.

In 2009, the Earth Science Department partnered with the SMC Center for Environmental Studies to create the Sustainable Technologies Program (STP). The goal of the program is to create a cohesive and robust academic program that builds an academic and industry-based community around emerging environmental fields including renewable energy production, solar installation, energy efficiency and weatherization, water efficiency, resource and recycling management, and green business.

Climate change is widely noted as one of the most pressing environmental problems facing society in the 21st century. The consumption of fossil fuels is a primary contributor to greenhouse gases that accelerate climate change issues. Solar energy is being heralded as one of the most promising solutions to these problems. The core courses in the Sustainable Technologies Program (Solar Photovoltaic Installation) cover the history of energy production and consumption including the growth in dependence on fossil fuels and the realization of the connection between their use and the cause and effects of climate change. It goes further to provide the entire theoretical and practical applications of solar photovoltaic energy as a replacement energy production strategy for residential and commercial electricity utility.
customers, and one that reduces air pollution, finite resource extraction and use, and avoids the planet-wide effects of climate change.

Santa Monica College is committed to academic excellence and educating students to be global citizens; informed, engaged, and productive, with the capability of securing a more sustainable future. The Solar PV courses not only educate students about environmental issues and technological solutions, but also provide them with skills useful worldwide yet aimed at securing a job locally in the emerging green collar economy. Students come to understand their personal contribution to the problem of climate change, and effectively learn strategies to mitigate their impacts. They also learn ways to encourage others to make changes, outlining the environmental, economic, and social justice value of an economy that is reliant on solar energy over other fuels.

2. Identify the overarching goal(s) or charge/responsibilities of the program or service area. If appropriate, include ensuring/monitoring compliance with state, federal or other mandates.

The Sustainable Technologies Program brings together a number of training programs under one umbrella and provides an overarching structure by which students can pursue educational and career opportunities in the various green fields. By including these programs under one umbrella, SMC is recognizing and embracing the interconnectedness of these various fields, and encouraging students to think of green careers as outside the traditional silos of STEM programming. Each of these program tracks will prepare students for immediate employment upon graduation, as well as provide them with the resources and support that they need to transfer to a baccalaureate institution.

As federal and state programs promoting the use of alternative energy sources gain importance in our economic and environmental strategies, solar energy is expected to grow in use for residential, commercial, and utility applications. Job growth is expected to increase in this industry in all three sectors, offering a variety of technical and business career opportunities. The Solar Photovoltaic Installation program is intended to give Santa Monica College students a pathway into this growing field and an opportunity to obtain industry respected credentials.

The course sequence is Introduction to Solar Energy Systems (PV 1), followed by Intermediate Solar Photovoltaic Systems (PV 2), then, Advanced Solar Photovoltaic Systems (PV 3). These three courses offer the industry-preferred classroom training for the North American Board of Certified Energy Practitioners (NABCEP) entry level exam as well as an exposure to the hands-on experience needed for the installer-level certification (NABCEP Installers exam). These courses also form the foundation for developing a fuller CTE program offering in Alternative Energy Technologies should further industry assessment and student interest warrant. One course already developed to support the Photovoltaic Program is Energy Efficiency 1 (EE1), Introduction to Energy Efficiency Auditing. Energy efficiency is often utilized in the solar industry as a first measure for reducing the need for energy prior to sizing the home for solar photovoltaic’s. In fact, State and local rebate programs require that efficiency be addressed at some level, prior to the installation of a solar electric system. For this reason, the Sustainable Technology Program is seeking to add Energy Efficiency as the first supplemental program to address this need.

A growing demand in solar installations performed in the United States, and especially in California, is occurring for solar photovoltaic (PV) system installers. The estimated number of jobs for Installers nationally in 2012 was 65,571, representing an increase of 13,068 more installer positions in 2012 than in 2011 with a potential growth rate of 22% between 2011-2012 (National Solar Jobs Census 2011, The Solar Foundation http://thesolarfoundation.org/research/nationalsolar-jobs-census-2011). Solar PV installation jobs in southern and Central California were expected to grow from 4,570 in 2011 to 6,946 in 2012. This represents a 52% increase (Centers of Excellence, Environmental Scans, February 2012). California’s solar energy market is projected to generate over $8.5 billion through 2015 (Solar Energy Industry Association, 2006), with Los Angeles and San Francisco deemed the areas where demand will be greatest (Occupational Environmental Scan Center for Excellence, December 2007).
3. If applicable, describe how the Institutional Learning Outcomes (ILOs), Supporting Goals, and/or Strategic Initiatives of the institution are integrated into the goals of the program or service area.

Institutional Outcome(s):

Through their experiences at SMC, students will take responsibility for their own impact on the earth by living a sustainable and ethical lifestyle.

- The Solar PV Installation courses incorporate environmental concepts including air quality issues, natural resource depletion and alternative energy solutions that directly connect actions to environmental impact. Most PV and EE courses permit extra credit earned for students who participate on a Sustainable Works Crew, in which personal habits are examined with respect to energy, waste, food, toxins, water, and transportation. In EE1, a required course for the SMC certificates in solar, students carbon footprint is analyzed, and students are encouraged to reduce that footprint by curbing non-renewable energy use.

Through their experiences at SMC, students will acquire the self-confidence and self-discipline to pursue their intellectual curiosities with integrity in both their personal and professional lives.

The Solar PV Installation courses introduce students to the many career opportunities available in the emerging Solar Energy Technology field. It provides them with the basic understanding necessary to confidently pursue entry level career in Solar Installation while pursuing further education necessary to advance. This course provides practical skills that empower and encourage intellectual curiosity, including “soft skills” such as identifying personality types and styles to help in face-to-face interactions, a useful skill in a PV installer’s, or any contractor’s, world.

If your program receives operating funding from any source other than District funds identify the funding source. If applicable, note the start and end dates of the funding (generally a grant), the percentage of the program budget supported by non-District funding, and list any staff positions funded wholly or in part by non-District funds. Do not include awards for non-operational items such as equipment (ex. VTEA) or value added activities (ex Margin of Excellence).

B. Populations Served

In this section you will provide information that describes who your program or service area serves. When comparing data from different periods, use a consistent time frame (ex. Compare one fall term to another fall term). Multi-discipline departments may find it more relevant to answer the following questions for each discipline. Please indicate the number of different disciplines for which information will be provided, and copy, insert and answer one set of questions per discipline.

Set #1

Discipline ___Solar PV Installation_____________________________

1. Describe your students in terms of ethnicity, race, gender, age, residency status, citizenship, educational goal, enrollment status, and full/part-time status. Note any changes in student or enrollment data since the last six-year program review and the possible reasons for the changes.

### 6 yr, annual (first time)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
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<td>29</td>
<td>67</td>
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<td>53.8%</td>
</tr>
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<td>69</td>
<td>685</td>
<td>17740</td>
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<td>92.7%</td>
<td>87.5%</td>
<td>82.9%</td>
<td>73.4%</td>
<td>84.3%</td>
<td>46.2%</td>
</tr>
</tbody>
</table>

The number of women enrolling in the Solar PV Installation courses has increased from the initial 7.3% in 2009-2010 to more than 27% in 2011-2012. While still below the college-wide average, this increase is a welcome change as more active recruiting of women into this program is one of our goals.
In Fall 2009, the majority of the students were white (51%), however, recruitment efforts have resulted in increasing numbers of Asians/PI, Blacks, and Hispanics enrolling into the Solar PV Installation Program. The percentage of White in the program is slightly higher than the college wide, while the percentage of Black is in compliance with the college wide percentages. However, the Hispanic and Asian/PI percentages in the Solar PV Installation Program as significantly lower than the college-wide percentages.

<table>
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<th>Fall 2012</th>
<th>Total</th>
<th>College-Wide 2011-2012</th>
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</thead>
<tbody>
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<td>6680</td>
</tr>
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<td>7.4%</td>
<td>10.6%</td>
<td>8.4%</td>
<td>17.4%</td>
</tr>
<tr>
<td>Black</td>
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<td>11</td>
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</tr>
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<td>%</td>
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<td>12.1%</td>
<td>7.9%</td>
<td>11.7%</td>
<td>9.8%</td>
<td>9.9%</td>
</tr>
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<td>32.8%</td>
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<td>Native American/ Native Alaskan</td>
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<td>0.3%</td>
</tr>
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</tr>
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<td>3.6%</td>
</tr>
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<td>White</td>
<td>51</td>
<td>114</td>
<td>99</td>
<td>33</td>
<td>297</td>
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</tr>
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<td>10</td>
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<tr>
<td>%</td>
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<td>18.6%</td>
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<table>
<thead>
<tr>
<th>Age Group</th>
<th>2009-2010</th>
<th>2010-2011</th>
<th>2011-2012</th>
<th>Fall 2012</th>
<th>Total</th>
<th>College-Wide 2011-2012</th>
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<tbody>
<tr>
<td>19 &amp; Younger</td>
<td>3</td>
<td>17</td>
<td>74</td>
<td>17</td>
<td>111</td>
<td>11329</td>
</tr>
<tr>
<td>%</td>
<td>3.1%</td>
<td>7.3%</td>
<td>18.9%</td>
<td>18.1%</td>
<td>13.7%</td>
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</tr>
<tr>
<td>20 to 24</td>
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</tr>
<tr>
<td>%</td>
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<td>28.9%</td>
<td>26.6%</td>
<td>25.7%</td>
<td>39.0%</td>
</tr>
<tr>
<td>25 to 29</td>
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<td>33</td>
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<td>5090</td>
</tr>
<tr>
<td>%</td>
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<td>14.2%</td>
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<td>15.7%</td>
<td>13.3%</td>
</tr>
<tr>
<td>30 to 39</td>
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<td>59</td>
<td>48</td>
<td>17</td>
<td>153</td>
<td>5224</td>
</tr>
<tr>
<td>%</td>
<td>30.2%</td>
<td>25.4%</td>
<td>12.3%</td>
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<td>18.8%</td>
<td>13.6%</td>
</tr>
<tr>
<td>40 to 49</td>
<td>14</td>
<td>33</td>
<td>41</td>
<td>12</td>
<td>100</td>
<td>1399</td>
</tr>
<tr>
<td>%</td>
<td>14.6%</td>
<td>14.2%</td>
<td>10.5%</td>
<td>12.8%</td>
<td>12.3%</td>
<td>3.6%</td>
</tr>
<tr>
<td>50 &amp; Older</td>
<td>20</td>
<td>35</td>
<td>48</td>
<td>8</td>
<td>111</td>
<td>372</td>
</tr>
<tr>
<td>%</td>
<td>20.8%</td>
<td>15.1%</td>
<td>12.3%</td>
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<td>1</td>
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<td>1</td>
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</tr>
<tr>
<td>%</td>
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<td>0.4%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>0.1%</td>
<td>0.0%</td>
</tr>
</tbody>
</table>
Students in the Solar PV Installation program are fairly well distributed across all ages, although a slightly larger percentage is in the 20-24 age range. The percentages, however, are not in agreement with the college-wide totals. The Solar PV Installation program have a lower percentage in the under 24 years of age groups than the college-wide, while the college-wide percentages are lower than the Solar PV Installation program in the 25 and older groups.

This is attributed to a large number of employed adults seeking to build their skill set with new technologies for a possible career change to solar installation or a related green economy job. This is reflected in the following data relating career objectives as a larger proportion of the stated educational goal among participants.

<table>
<thead>
<tr>
<th>Ed Goal</th>
<th>2009-2010</th>
<th>2010-2011</th>
<th>2011-2012</th>
<th>Fall 2012</th>
<th>Total</th>
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</thead>
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<tr>
<td>Transfer</td>
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<td>45</td>
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<td>Associate Degree</td>
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<td>10</td>
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<td>14</td>
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<td>2291</td>
</tr>
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<td>%</td>
<td>9.4%</td>
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<td>14.9%</td>
<td>6.8%</td>
<td>6.0%</td>
</tr>
<tr>
<td>Certificate</td>
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<td>18</td>
<td>23</td>
<td>8</td>
<td>58</td>
<td>577</td>
</tr>
<tr>
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<td>9.4%</td>
<td>7.8%</td>
<td>5.9%</td>
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<td>7.1%</td>
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</tr>
<tr>
<td>Career Objective</td>
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<td>52</td>
<td>68</td>
<td>14</td>
<td>157</td>
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<td>4-Yr Student Meeting 4-Yr Requirement</td>
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<td>7</td>
<td>15</td>
<td>2</td>
<td>28</td>
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</tr>
<tr>
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<td>12</td>
<td>13</td>
<td>3</td>
<td>39</td>
<td>2360</td>
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<td>%</td>
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<td>5.2%</td>
<td>3.3%</td>
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</tr>
<tr>
<td>Complete HS Credits/ GED</td>
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<td>0</td>
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<td>0</td>
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</tr>
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<tr>
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<td>0.0%</td>
<td>0.4%</td>
</tr>
<tr>
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<td>1</td>
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<td>19</td>
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</tr>
<tr>
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<td>4.9%</td>
<td>7.4%</td>
<td>5.4%</td>
<td>5.8%</td>
</tr>
</tbody>
</table>

Approximately 52% of the students enrolled in the Solar PV Installation Program, a Career Technical Education program, indicate that they are interested in transferring to a four-year university. While this is a lower percentage than the college-wide totals, it is a good indicator of the ultimate goal for many of our Solar PV students. It is not surprising that almost 20% of the students indicate that enrolling in the Solar PV program meets a career objective, and that this percent is much higher than the college-wide percent. Most non-CTE students enrolled at SMC are not necessarily taking courses for a career objective, especially if they are transfer-oriented.
2. Compare your student population with the college demographic. Are your students different from the college population?

Comparisons with the college demographic, detailed in the previous sections, suggest strong diversity in the program in gender, ethnicity, and especially age, but deviate somewhat from the student-seeking-transfer-degree educational goal, in favor of a career objective or certification goal (useful for future employment).

3. What percentage of students in your program place in basic skills and, if applicable, how does this impact your program goals and/or curriculum?

<table>
<thead>
<tr>
<th></th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
<th>College-Wide Fall 2011</th>
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<td></td>
<td>23</td>
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<tr>
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</tbody>
</table>

Students in Solar Photovoltaic Installation place below the college-wide level in basic skills (math and English) because none of the course offerings have a pre-requisite, and the courses are marketed to Workforce Investment Board offices, veteran affairs offices, and other employment-centered organizations serving a demographic that historically has not been college-focused. The curriculum for this program creates a challenge to offer classes that challenge higher-level degree-seeking students yet offer manageable material for those students still seeking to obtain or improve their basic skills. For instance, while mathematics (including algebra and trigonometric relationships) are included in the contextual classwork, it is not the primary focus and is not required or even essential to passing the course. Those students needing basic skills are encouraged to meet the faculty during office hours, and in some cases class time is utilized to refresh students’ abilities in this area.
C. Program Evaluation

*In this section programs/units are to identify how, what, and when program evaluation takes place and summarize the results from data collected. Please use Section D to address program responses to the findings described in this section.*

Programs/units with multiple disciplines or functions may choose to answer the following questions for each area. Please indicate the number of different disciplines or functions for which information will be provided, and copy, insert and answer one set of questions per discipline, function, or program.
1. Discuss how the program, discipline, support service or function evaluates its effectiveness. Include any changes to the evaluation process since the last six-year program review.

6 yr

The Solar PV Installation program undergoes continual evaluation by the faculty, administrator and department chair involved in this program. As a new CTE program, our initial course offerings were limited to one class - *Introduction to Solar Systems* (PV 1) in Fall 2009. Over the next several years, more courses (*Intermediate Solar PV, Advanced Solar PV*) were added to the schedule, and new courses (in Energy Efficiency, for example) were written and incorporated into the overall program. Meetings are approximately bi-weekly among the full-time faculty and administration, and goal-setting and methodical improvements are made to the curriculum, facilities, industry interaction, and program growth.

The evaluation process has been focused mainly on developing, refining and improving the required lab component of the program. Acquiring tools, equipment, and materials necessary for providing robust and relevant labs to the students, in addition to the actual writing and deployment of labs, generated a steep learning curve for all involved (faculty, students, administrators). This is still an area of development in the Solar PV program. A re-focusing on career planning and certification is also underway following the certificate provider’s (NABCEP’s) changes in their requirements for the (now) three levels or types of skills mastery within the photovoltaic industry. Specifically, a PV Technical Sales and Marketing certificate has been developed, and so the previous need for sales and other customer-focused “soft” skills are finding their way out of the original NABCEP trainings and into the sales-focused training. Curriculum at Santa Monica College has been adapted accordingly.

2. Describe how the program, discipline, support service, function, administrative unit or service area engages all unit members in the self evaluation dialogue.

6 yr

Meetings every two weeks in addition to the daily flow of emails keep administration and faculty engaged in healthy criticism and continuous evaluation of the program. Furthermore, the Industry Advisory Board, comprising experts and employers in the solar PV industry as well as non-profits focused on employment (veterans) and non-profit work (Grid Alternatives) meet quarterly to review program progress and provide suggestions for improvement. The most recent recommendation include an enhanced focus on internships (with job creation or placement in mind) and more opportunity for qualifying experience for the NABCEP installer’s level exam.

3. Describe how and when the program, discipline support service or function assesses outcomes, sets and measures goals and objectives (annual or long range), and determines areas to target for improvement. Describe how the program uses Student Learning Outcomes (SLOs), Service Unit Outcomes (SUOs) or Unit Outcomes (UOs) assessment data to inform program planning and decision making.

6 yr

Student Learning Outcomes (SLOs) are created for each course in the series developed for Solar Photovoltaics (Introductory, Intermediate, and Advanced) and these outcomes are aligned with the job task analysis elements developed by NABCEP. NABCEP tasks are prioritized as critical, important, and useful, and so courses are designed to meet SLOs while also meeting all critical and important job task analysis elements as well as most useful elements. For future changes and additions to curriculum, job tasks are reviewed or incorporated to ensure alignment between educational learning outcomes and industry job knowledge and skill expectations.

4. What have your SLO/SUO/UO assessments revealed or confirmed since your last report?
6 yr, annual
SLO assessment is ongoing. This is the first Program Review for the Solar PV Installation program and we will be using the assessments of our SLOs to improve our Solar PV curriculum and lab exercises. Preliminary comparisons between established and actual student learning outcomes suggest a strong mastery of industry knowledge but a difficulty in keeping course content current and relevant in the face of rapidly improving technology and more rapid deployment of solar PV technology in all sectors (residential, commercial, and utility). A proposed addition of a PV Technical Sales and Marketing course (in development) and a proposed Commercial Building Science efficiency class are two possible modifications to the program that will help students with a desired career or sector focus.

In fact, our Industry Advisory Board’s input helped us identify the trends in the industry ahead of the labor and industry aggregated data publication, allowing us to find early curriculum development funding (through NSF) and enhance our faculty pool to stay relevant to participating students.

5. What has available data from TIMS reports and/or the Institutional Research website revealed or confirmed since the last six-year program review report? Include the following indicators, as appropriate: success, retention, number of AA degrees or certificates awarded, completion rates etc. Note trends, differences in performance by group (ethnicity, gender, age) or enrollment type (day/evening, on-ground/on-line). Please include relevant examples either in this section or as an appendix to this report.

6 yr, annual
This is the first Program Review for the Solar PV Installation Program.

The first and second courses in Solar PV Installation Program (PV1 and PV 2) run sequentially in eight-week sessions – the third course, PV 3, is only offered in a 16-week format. PV 1 and PV 2 are three-unit courses, while PV 3 is a four-unit course. All the lecture sections in this program are offered weekdays in the late afternoon or evening, with labs scheduled for all day sessions on alternating Fridays or Saturdays. There is no online or hybrid component at this time – all the classes are offered as ‘on-ground’.

<table>
<thead>
<tr>
<th>Successful Course Completion Rates by Gender: PV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>Female</td>
</tr>
<tr>
<td>Male</td>
</tr>
<tr>
<td>PV</td>
</tr>
<tr>
<td>College-Wide</td>
</tr>
</tbody>
</table>

In Fall 2009, the completion rate for males as 52.2% and 33.3% for females. The female completion rate increased to 64.7% in Fall 2010, but dropped to 55% in Fall 2011. The completion rate for males has increased steadily since Fall 2009, with a 55.8% completion rate in Fall 2010 up to 60% by Fall 2011.
Course Completion Rates by Ethnicity indicate that among the reporting students, White and Hispanic students have the highest completion rates starting in Fall 2009. Asian/PI and Black have the highest drop-off in completion rates – starting with high completion rates in Fall 2009, but dropping by Fall 2011.

<table>
<thead>
<tr>
<th>Successful Course Completion Rates by Ethnicity: PV</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asian/PI</td>
<td>--</td>
<td>--</td>
<td>100.0%</td>
<td>73.3%</td>
<td>50.0%</td>
</tr>
<tr>
<td>Black</td>
<td>--</td>
<td>--</td>
<td>56.7%</td>
<td>30.4%</td>
<td>38.9%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>--</td>
<td>--</td>
<td>33.3%</td>
<td>53.8%</td>
<td>70.6%</td>
</tr>
<tr>
<td>Native Am</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Other</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>White</td>
<td>--</td>
<td>--</td>
<td>60.0%</td>
<td>69.8%</td>
<td>67.5%</td>
</tr>
<tr>
<td>Multi-Races</td>
<td>--</td>
<td>--</td>
<td>--</td>
<td>33.3%</td>
<td>75.0%</td>
</tr>
<tr>
<td>Unreported</td>
<td>--</td>
<td>--</td>
<td>0%</td>
<td>50.0%</td>
<td>16.7%</td>
</tr>
<tr>
<td>PV</td>
<td>--</td>
<td>--</td>
<td>50.0%</td>
<td>57.1%</td>
<td>59.2%</td>
</tr>
<tr>
<td>College-Wide</td>
<td>64.3%</td>
<td>65.1%</td>
<td>66.7%</td>
<td>68.2%</td>
<td>68.8%</td>
</tr>
</tbody>
</table>

The Successful Course Completion Rates by Age Group data indicate that students across a broad spectrum of ages are successfully completing the courses as of Fall 2011. Those percentages did drop for the 25-29 and 50 or Older age group in Fall 2010, however, completion rates for the age groups between 20-24 as well as 30-49 showed an increase in completion rates in Fall 2010. Completion rates for younger students (under 29) increased in Fall 2011, while the rates for students over 30 dropped.

<table>
<thead>
<tr>
<th>Successful Course Completion Rates by Age Group: PV</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>19 or Younger</td>
<td>--</td>
<td>--</td>
<td>0%</td>
<td>33.3%</td>
<td>47.4%</td>
</tr>
<tr>
<td>20 to 24</td>
<td>--</td>
<td>--</td>
<td>16.7%</td>
<td>33.3%</td>
<td>54.3%</td>
</tr>
<tr>
<td>25 to 29</td>
<td>--</td>
<td>--</td>
<td>50.0%</td>
<td>11.1%</td>
<td>57.9%</td>
</tr>
<tr>
<td>30 to 39</td>
<td>--</td>
<td>--</td>
<td>62.5%</td>
<td>72.7%</td>
<td>68.4%</td>
</tr>
<tr>
<td>40 to 49</td>
<td>--</td>
<td>--</td>
<td>50.0%</td>
<td>92.3%</td>
<td>73.3%</td>
</tr>
<tr>
<td>50 or Older</td>
<td>--</td>
<td>--</td>
<td>100%</td>
<td>71.4%</td>
<td>61.5%</td>
</tr>
<tr>
<td>PV</td>
<td>--</td>
<td>--</td>
<td>50.0%</td>
<td>57.1%</td>
<td>59.2%</td>
</tr>
<tr>
<td>College-Wide</td>
<td>64.3%</td>
<td>65.1%</td>
<td>66.7%</td>
<td>68.2%</td>
<td>68.8%</td>
</tr>
</tbody>
</table>

The Course Retention Rates have steadily increased from Fall 2009 to Fall 2011.

<table>
<thead>
<tr>
<th>Course Retention Rates: PV</th>
<th>Fall 2007</th>
<th>Fall 2008</th>
<th>Fall 2009</th>
<th>Fall 2010</th>
<th>Fall 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>PV</td>
<td>--</td>
<td>--</td>
<td>69.2%</td>
<td>80.4%</td>
<td>85.0%</td>
</tr>
<tr>
<td>Dept</td>
<td>--</td>
<td>--</td>
<td>69.2%</td>
<td>80.4%</td>
<td>91.2%</td>
</tr>
<tr>
<td>College-Wide</td>
<td>81.3%</td>
<td>81.63%</td>
<td>83.3%</td>
<td>84.3%</td>
<td>85.2%</td>
</tr>
</tbody>
</table>
The first course in Solar PV Installation, PV 1, was offered in Fall 2009. PV 2 was offered in Spring 2010 with PV 3 added to the course offerings in Fall 2010. To receive a 19-unit Certificate, students needed to complete all three PV classes, one Energy Efficiency class (first offered in Fall 2010) and two additional academic classes – Environmental Studies (Environmental 7/Geography 7), and Introduction to GIS (Geography 20/GIS 20) or CAD.

The actual number of students completing all the coursework and receiving the 19-unit certificate is low. Many students found that taking the three PV classes was sufficient for their needs in either career advancement or new employment, and some even found employment on the strength of, or even the current participation in, just one PV or EE class. If taking the NABCEP Entry Level exam was their goal – and not an SMC certificate, they may have chosen to forego the SMC certificate and pursue the industry certificate, in which case job experience becomes the priority.

A modification in program development made in 2012 was the decision to offer an orientation session two weeks prior to start of term. This change has already demonstrated an increase in student commitment to the SMC certificate through the building of an identifiable cohort of students on track with both the PV1 and PV2 courses and the EE1 and EE2 (Residential Building Science) courses, now offered as a departmental certificate and targeted to students seeking rapid immersion into the green economy, and what we hope will be higher completion rates of not only certificates and job placement, but also possibly in completion of Associate of Science degrees in Photovoltaic Installation.

6. If applicable, discuss any other information or sources your program used this year to assess effectiveness (such as surveys, CalPASS, job placement, transfer rates, observed trends, tutoring usage, etc.), what the information has revealed or confirmed, and how it factored into program planning and decision making. Please include relevant information/examples from these additional sources either in this section or as an appendix to this report.

6 yr, annual
At this time, the Sustainable Technologies Program has not used other information or sources. However, anecdotal evidence suggests that some students that have ended their involvement prematurely have actually secured employment, and in some cases, landed positions significantly higher in placement than entry-level. One student, a vice president of operations in construction, and let go during his attendance in the course, found a more lucrative position out-of-state in Hawaii with an all-solar contracting firm. A woman in the program parlayed a previous business degree with her PV1,2, and 3 academic experience into a Finance Manager position in a local solar firm, and yet another was hired by another local solar firm and moved quickly from installer, to crew lead, and now manages the inspection side of the business.
Program faculty and staff are currently developing surveys to more accurately capture these success stories that otherwise do not appear in summary data of the program.

7. If applicable, discuss achievement rates on state licensure exams.

<table>
<thead>
<tr>
<th>PV 3 Completion</th>
<th>Exam Date</th>
<th>Test type</th>
<th>Score</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2011</td>
<td>6/25/2011</td>
<td>Paper</td>
<td>63</td>
<td>Fail</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>6/25/2011</td>
<td>Paper</td>
<td>85</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>6/25/2011</td>
<td>Paper</td>
<td>76</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pass Rate</td>
<td>80.00%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exam Date</th>
<th>Test type</th>
<th>Score</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>51</td>
<td>Fail</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>71</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>89</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>38</td>
<td>Fail</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>89</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>75</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>80</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>38</td>
<td>Fail</td>
</tr>
<tr>
<td>Fall 2010</td>
<td>Paper</td>
<td>77</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>55</td>
<td>Fail</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>72</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>80</td>
<td>Pass</td>
</tr>
<tr>
<td>Spring 2011</td>
<td>Paper</td>
<td>68</td>
<td>Pass</td>
</tr>
<tr>
<td>Fall 2011</td>
<td>Paper</td>
<td>83</td>
<td>Pass</td>
</tr>
<tr>
<td></td>
<td>Pass Rate</td>
<td>73.33%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Pass Rate</td>
<td>73.33%</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Test type</th>
<th>Score</th>
<th>Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer 2012</td>
<td>CBT</td>
<td>57</td>
<td>Fail</td>
</tr>
<tr>
<td>Summer 2012</td>
<td>CBT</td>
<td>63</td>
<td>Fail</td>
</tr>
<tr>
<td>Summer 2012</td>
<td>BT</td>
<td>43</td>
<td>Fail</td>
</tr>
</tbody>
</table>
Students completing the three PV course sequence are qualified to sit for the NABCEP Entry Level Exam. Our pass rates for the first two NABCEP exams were very good (80% in June 2011 and 73% in December 2011). For these semesters, PV 3, the course designed as a preparatory for the exam, ran in a 16-week format. However, students who completed the Summer 2012 session of PV 3, which ran in an 8-week format, were not as successful in passing the NABCEP (45% pass rate). We are looking into the reasons for the low passing rate, which may be a function of PV3 duration, instructor, exam methodology (CBT versus paper), and whether these factors can be controlled in the future. Still, the aggregate passing rate is 67%, and our understanding is that the NABCEP national average is on the order of 60%. We are striving to keep our passage rate significantly above the national average.

8. Career Technical Education (CTE) programs are required to have active industry advisory boards which meet at least once a year. (Attach minutes from each meeting since the last program review report). List advisory board membership, how often it meets, and indicate involvement with the program. Please attach minutes from the most recent advisory board meeting as an appendix to this report.

6 yr, annual
The Industry Advisory Board meets at least once each semester and once during the summer. Advisory Board members are directly involved with the Solar Industry either as employers, owners, or installers. We also have representation from local government (Santa Monica City). See the roster below for name, company and title. In the future we may consider inviting members with specific skills such as solar sales, solar design, or solar program administration in order to create new courses or certificate tracks. As we expand our Solar PV program into a broader Sustainable Technologies Program we may also consider adding advisory board members with specific track expertise such as Energy Efficiency, Green Building, Water Efficiency, Business Consulting, or a broader understanding of Renewable Energies (including wind, solar thermal, biofuels, and ocean wave and current technology). In many cases the Advisory Board has provided detailed feedback for curriculum development including a bulleted list of math skills used on solar installation job site. They have also provided detailed information on equipment and tools needed in the development of a Solar PV installer lab. The Advisory Board identified Energy Efficiency as an important component of the Solar PV Installation curriculum.

Industry Advisory Board Members:
Brian Hurd, President, Hands on Solar, Santa Monica College Consultant
Rod Bergen, Professional Engineer UCLA instructor
Solar Trade Advisory Board Recommendations

Consider offering group industry tracks, or compressed contract education offerings based on the same curriculum.

Consider students that are in career transition from another technical field or military service and may have existing knowledge.

Partner with Workforce Investment Boards and Veterans groups to be the “qualified institution” for accessing additional training dollars.

Bring the current community education course offering in Energy Efficiency over to the for-credit side through the curriculum approval process.

Consider making Energy Efficiency a prerequisite.

Encourage students to utilize the SMC Math Lab and/or take the non-credit Math course.

Consider expanding the program to address the program administration aspect of the solar industry.

Consider expanding the program to provide a concentration on Operations and Maintenance of solar systems.

Consider developing a Math course specific to energy and solar (Energy Math).

Consider making Math a prerequisite and utilizing the existing placement test to determine eligibility.

Create a subcommittee to investigate the math content and requirement.


6 yr, annual
In response to our IAB recommendations we have implemented the following:

1. Developed Contextualized Math Modules for use in the Solar PV program that can be adapted to any other CTE program. Faculty is working with IT and Design Technology to provide an interactive modules that can be transformed into “Apps” for download.

2. Developed, and are currently offering, two courses In Energy Efficiency. A third Energy Efficiency course is being written for approval, along with developing a new 18-unit Certificate in Energy Auditing.

3. A new Solar PV course, **PV Technical Sales and Design**, is being written to be offered initially for non-credit through Community Ed, and then as a new for-credit class for spring 2014.

---

### D. Program Improvement

*In this section, please document what you did last year as a result of what you described in Section C and what you are planning to do for the coming year.*

#### Part 1: Looking back

*In this section, please summarize your response to last year’s planning efforts.*

1. Note the status of the previous year’s objectives.

   [This relates to an automated response feature expected with the future online submission. If your program set specific objectives for the previous year, please summarize them and indicate whether each objective has been completed, is still in progress, or has been eliminated. Add comments if you feel further explanations are needed. *If your program did not set yearly objectives, you may omit this item for the 2012-2013 review.*]

2. List accomplishments, achievements, activities, initiatives undertaken, and any other positives the program wishes to note and document.

   **6 yr, annual**

   One of the accomplishments from last year was the development of a 12-unit Departmental Solar PV Certificate. Discussions with industry and students indicated that a 12-unit Certificate consisting of PV 1, PV 2, EE1, and EE2, would be valuable for our Solar PV students. Students can now be prepared to take the NABCEP entry-level exam after completing the 12-unit series of courses.

   Another accomplishment was to establish a cohort model for the students enrolled in the Solar PV classes. At the program orientation, students were encouraged to sign up for all four of the courses in the 12-unit Certificate. The overlapping percentage of students between the two classes rose sharply as a result, helping to establish an identifiable group that can move together through the program and support one another towards completion.

3. Summarize how the program or service area addressed the recommendations for program strengthening from the executive summary of the previous six-year program review.

   **6 yr** This is the first Program Review for the Sustainable Technologies Program.
4. Describe any changes or activities your program or service area has made that are not addressed in the objectives, identify the factors that triggered the changes, and indicate the expected or anticipated outcomes.

6 yr, annual
No objectives were set since this is the first Program Review for the Solar PV Program in the STP.

5. If your program received one time funding of any kind, indicate the source, how the funds were spent and the impact on the program (benefits or challenges).

6 yr, annual
A Margin of Excellence grant in the amount of $5000.00 was awarded to the STP in 2010. The funds were used to purchase lab tables for the Solar PV lab room to replace the broken and mismatched tables provided by the college.

A small grant in the amount of $7,500 was obtained to facilitate developing the Solar PV Technical Sales and Design course. The funds came from the US Department of Energy (DOE) Sunshot program to continue solar PV training in California and Hawaii community colleges. The Sunshot program has agreed to fund the development of college-level PV Sales and Marketing courses to help expand these skills, leading to increased demand for solar installation services.

6. Describe any grants, VTEA, or other funding received since the last review [in the past year] and how it was used to improve the program.

6 yr, annual
The Solar PV Installation program received funding from VTEA/Perkins in 2012-2013, as well as in prior years. The bulk of our proposal was for equipment. This equipment was used to create a high functioning, state-of-the-art Solar PV and Energy Efficiency laboratory. The courses have a significant lab requirement and currently our professors are developing lab exercises in effort to meet the course objectives. One of the larger expenses was for Solar/Mock Roof trainers. Due to liability issues that restrict our students from going on a roof, this is the primary method of giving our students the hands-on experience they need to fill high-demand high-paying jobs in Solar PV and Energy Efficiency fields.

Most of the tools purchased were to be provided to each of our students during class hours, as opposed to some programs require students to bring their own tools. However, many job sites do not always require employees to bring their own work supplies, and we feel that it is important to provide our students quality tools instead of asking them to purchase something that may or may not be needed in the workplace upon completion. In this way, we are meeting the goals of the Perkins grant by supporting underserved populations like lower income students and not penalizing students who cannot afford the tools by excluding them from this hands-on learning experience.

7. If applicable, note external factors that impacted the program (e.g., licensure requirements, state or federal requirements, CCCO mandates, regulations, etc.), and any changes the program made as a result.

6 yr, annual modified/no change box
NO changes
8. Describe faculty engagement in activities, training, or professional development to remain current with industry trends.

6 yr, annual
Faculty have participated in a variety of workshops, seminars and conferences related to Renewable Energies, including attending workshops in Colorado, and Costa Rica. Additionally, the faculty have attended numerous “Train-the-Trainer” workshops locally.

Stuart Cooley, now Professor, Renewable Energies, and the first full-time hire for the Sustainable Technologies Program, has been active in augmenting his decades of experience in the energy efficiency realm and in the solar promotion program of the City of Santa Monica, with considerable training and professional development through seminars, webinars, off-site trainings with the Department of Energy (DOE), National Science Foundation (NSF), and internationally with GREEN (the Global Renewable Energy Education Network). Foremost among these are the NSF-sponsored Sustainable Energy Education and Training (SEET) Technology Workshop in Colorado in which Prof. Cooley received two weeks of sustained training specifically for educators from experts in their respective fields in Renewable Energy. Cooley also attended a four-day long exposure to international renewable energy development with GREEN in Costa Rica, a program we hope to extend to SMC students in coming years. The trip included introduction to utilities in Costa Rica that generate wind, geothermal, hydroelectric, and solar energy, and included other disciplines such as botany, land management, and ecology.

Cooley is also being stretched in his teaching abilities and grant-writing through a five-day Science Education for New Civic Engagements and Responsibilities (SENCER) workshop in Santa Clara, and Mentor-Connect, an NSF-sponsored program to assist community colleges in securing NSF funding for undergraduate education. His attendance at DOE’s Solar Instructor Training Network (SITN) train-the-trainer events led to his completion of the NABCEP Entry Level Exam. He has also volunteered for solar industry externships and has worked on-site with a local solar contractor.

Other adjunct faculty have also attended the Costa Rica workshop (Ralph Krongold), and Department of Energy Train-the-Trainer events (Ralph Krongold, Michael Burns).

9. Describe departmental efforts to improve the teaching and learning environment.

6 yr
Stuart Cooley, full-time faculty in the program was selected as a faculty leader in the new Teaching and Learning Center (TLC) in the process of development at SMC. He is applying his experience, especially in the area of contextual-based basic skills training, to real-world examples as a new way to engage students in the learning of those skills. He will be developing examples that largely draw on the same basic skills needed for photovoltaic installation and energy efficiency to develop examples, and intends to utilize those materials in the program to improve understanding and enhance learning.

The newly implemented cohort model has created an internal support structure for the students and has strengthened the program performance overall. This, combined with the new 12-unit department certificate should allow students to achieve success and encourage them to persist in the program.

10. If there is a tutoring component or other learning support service associated with the program, describe the relationship between the service(s) and the instructional program. If applicable, discuss any data you have compiled regarding student participation and the impact on student success.

6 yr
Though Solar PV courses are identified with Science, Technology, Engineering, and Math (STEM) training at SMC, the supplemental instruction and tutoring available through the recently acquired SMC/UCLA Science and Research Initiative (SRI) are NOT currently available to student in the Solar PV Installer Program. In future years of this five-year grant-funded program, it is hoped that some supplemental instruction will be made available within the PV classes.
Part 2: Moving forward

In this section, please indicate what your plans are for the coming year(s).

11. Discuss and summarize conclusions drawn from data, assessments (SLO, SUO, UO), or other indicators identified in Section C and indicate any responses or programmatic changes planned for the coming year(s).

Looking at the data from the Pass/Fail rate for the NABCEP Entry Level exam, it appears the first two groups of students who took the exam were very successful, while the last group was less than successful. While there is probably no one reason for this drop in the Pass rate, one suggestion is that the students from Summer 2012 took the final PV 3 class in an 8-week format which seems to have been too compressed. In the future, the PV 3 class will only be offered during the fall or spring semesters as a full 16-week course.

Other conclusions drawn from the data involve gender and ethnic success rates. The data show that females are becoming more successful, and we are enrolling more women into the Solar PV Installation program; however, our percentages of women in this program are still low. The addition of the Solar PV Technical Sales and Design course may be one of the opportunities needed to encourage more women into the program.

The ethnic success rates are improving for the Hispanic students, but not for the Black or Asian/PI. Those are two ethnic groups where more support is needed to assure success. While the data does not indicate why the Black or Asian/PI students are not successful, it may well be that some of them are unprepared for the math component of the Solar PV program. The newly created Math Modules will be of great assistance by providing the contextualized math used in the Solar PV Installation courses in a self-paced, interactive format.

12. List the objectives or target goals your program or service area has identified for the coming year. Indicate the number of objectives identified. __4____ Use the comments section to indicate the reason for the objective (assessment results, changes in data, changes in external factors, etc.). Indicate how each objective or goal links to the division goals. Boxes for reporting three objectives have been included here. Please copy and insert boxes if additional objectives are proposed.

<table>
<thead>
<tr>
<th>Objective 1: First is the continued development of a Solar Photovoltaic Lab. This includes safety equipment for more in-the-field opportunities, more examples of AC modules and micro-inverters, and state-of-the-art PV field testing equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Area/Discipline/Function Responsible: Faculty</td>
</tr>
<tr>
<td>Assessment Data and Other Observations:</td>
</tr>
<tr>
<td>X SLO Assessment Data and/or SUO Assessment Data and/or UO Assessment Data</td>
</tr>
<tr>
<td>□ Program Review Committee Recommendation</td>
</tr>
<tr>
<td>□ SMC Strategic Initiative (indicate specific initiatives in the comments section below)</td>
</tr>
<tr>
<td><strong>Other Factors (briefly describe below):</strong></td>
</tr>
<tr>
<td>------------------------------------------------</td>
</tr>
<tr>
<td><strong>Timeline to accomplish the objective:</strong> Continual – purchasing equipment, and updating labs is an ongoing process.</td>
</tr>
<tr>
<td><strong>Describe how objective will be assessed/measured:</strong> Assessment of this objective will be in the successful completion of the Solar PV Installation courses by students, as well as an increased Pass Rate for the NABCEP Entry Level Exam.</td>
</tr>
<tr>
<td><strong>Comments:</strong> Students need specific skills in using tools, construction site familiarity, bending conduit, basic safety, compass reading, reading spec sheets, math and overall English reading and writing skills. Math, safety and hands-on experience were identified by our board as important exit skills for our program graduates. Extensive discussion of how our program can support students obtaining NABCEP certification also contributed to the development of the program. The value of partnering with four-year institutions has also been discussed and is being explored by the program chair and support staff. New acquisitions in lab equipment will favor diversity of vendor/manufacturer and less duplication of lab set-ups. While this complicates the role of the instructor in managing a variety of activities simultaneously, it broadens the students’ exposure to all the various equipment or tools they may encounter in the field.</td>
</tr>
</tbody>
</table>
Objective 2: Formalize and build upon an established relationship with Grid Alternatives, a non-profit that allows our students to obtain real-world installation experience in solar installation. GRID Alternatives is a non-profit company whose mission is to bring affordable solar energy to low-income households in California. Its core program is the Solar Affordable Housing Program, where they train and lead community volunteers and job trainees from all walks of life to install solar electric systems.

Area/Discipline/Function Responsible: Faculty

Assessment Data and Other Observations:

- SLO Assessment Data and/or
- SUO Assessment Data and/or
- UO Assessment Data
- TIMS Report Data
- Institutional Research Data
- Other data or observed trends
  (briefly describe in the comments field below)

External Factors:

- Program Review Committee Commendation
- Program Review Committee Recommendation
- Program Review Recommendation for Institutional Support
- SMC Strategic Initiative
  (indicate specific initiatives in the comments section below)
- SMC Master Plan for Education Objective #___
- X Advisory Board Recommendation (for CTE only)
- Other Factors (briefly describe below):

Timeline to accomplish the objective: Continual – starting Spring 2013. The need for students to have industry experience is ongoing.

Describe how objective will be assessed/measured: The expectation is that a student looking to gain industry experience for the goal of an installer’s level certification by NABCEP (the certifying agency) can stay with Grid Alternatives as a continuing volunteer for some or all of the hours necessary for attainment of the installer’s level certification. This requires advancement to “Team Leader” status with Grid Alternatives, and their arrangement with NABCEP for qualifying time on the job(s).

A student with strong personal initiative can volunteer for Grid Alternatives outside the SMC arrangement, and with this addition to their required lab hours, they can accelerate their earning of hours of experience needed for the installer’s level exam.

Comments: Graduates should have installed at least three different (manufacturers’) systems under a variety of circumstances according to our Industry Advisory Board.

Objective 3: Create a PV Sales class and related certificate.

Area/Discipline/Function Responsible: Faculty

Assessment Data and Other Observations:

- SLO Assessment Data and/or
- SUO Assessment Data and/or
- UO Assessment Data
- TIMS Report Data
- Institutional Research Data
- Other data or observed trends
  (briefly describe in the comments field below)

External Factors:

- Program Review Committee Commendation
- Program Review Committee Recommendation
- Program Review Recommendation for Institutional Support
- SMC Strategic Initiative
- SMC Master Plan for
- X Advisory Board Recommendation
Objective 4: Increase Retention Rates of Solar PV students with more Completers.

Area/Discipline/Function Responsible: Faculty

Assessment Data and Other Observations:

<table>
<thead>
<tr>
<th>X  SLO Assessment Data and/or</th>
<th>☐ TIMS Report Data</th>
<th>☐ Other data or observed trends (briefly describe in the comments field below)</th>
</tr>
</thead>
<tbody>
<tr>
<td>☐ SUO Assessment Data and/or</td>
<td>□ Institutional Research Data</td>
<td></td>
</tr>
<tr>
<td>☐ UO Assessment Data</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

External Factors:

<table>
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<th>☐ Program Review Recommendation for Institutional Support</th>
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<tbody>
<tr>
<td>☐ SMC Strategic Initiative (indicate specific initiatives in the comments section below)</td>
<td>☐ SMC Master Plan for Education Objective #___</td>
<td>X Advisory Board Recommendation (for CTE only)</td>
</tr>
</tbody>
</table>

☐ Other Factors (briefly describe below):

Timeline to accomplish the objective: Approximately one year beginning Spring 2013. A cohort model was used in spring 2013 to build cohesion and student support systems within the Solar PV Program, as students signed up for Solar PV and Energy Efficiency courses with the 12-unit departmental certificate as a one-semester goal. Encouraging retention and persistence through this cohort model will improve our overall completer rates. We estimate that it will take at least one year to see improved retention and completer rates.

Describe how objective will be assessed/measured:
By the end of Spring 2014, we expect to see higher numbers of graduates, certificate holders and completers.

Comments:
E. Curriculum Review

The Program Review annual report will note whether course outlines are up to date.

1. Discuss how the department reviews, revises, and creates new curriculum. Include the following information:
   - The process by which department members participate in the review and revision of curriculum.
   - How program goals and SLOS are integrated into course design and curriculum planning.
   - The relationship of program courses to other college programs (cross-listing, overlapping content,
   - The rationale for any changes to pre-requisites, co-requisites and advisories.
   - How the department ensures course syllabi are aligned with the course outline of record.

   6 yr
   This is the first Program Review for the Solar PV Installation Program within the Sustainable
   Technologies Program: Curriculum Review is not required

2. Discuss the role of the advisory board and other industry bodies or input in updating curriculum to meet industry standards and the needs of students.

   6 yr
   Our Industry Advisory Board plays a crucial role in shaping the direction of our course offerings to meet the ever-changing and growing Green Economy job sectors. Their input helps us to provide relevant curriculum to our students. By keeping us abreast of changes and advances in solar technology, our IAB validates our curriculum and assures us that our students will have the skill sets sought by industry.

F. Community Engagement

1. List the engagement of program members in institutional efforts such as committees and presentations, and departmental activities.

   6 yr, annual
   Stuart Cooley, full-time faculty member, presents to other classes on energy (e.g., Interior Architecture 39), serves on the TLC Committee, and is active in the SMC/UCLA STEM program. The Sustainable Technologies Program participates in STEM Day, VIP Welcome Day, the Latino/a conference, and other institutional outreach days. The STP is covered in all of the institutional presentations given by the Director of Sustainability, highlighting the program opportunities to the SMC community. The STP program faculty and admin participate in the CTE committee, BSI initiative, and are represented on several committees campus-wide, including the SMC Sustainability Energy Subcommittee and the Environmental Affairs Committee.

   By virtue of the partnership with the Center for Environmental and Urban Studies the Sustainable Technologies Program is highlighted in the following presentations and events:

   Presentations:
   - VIP Welcome Day presentation and resource fair
   - Latino/a conference presentations and green tours
   - Young Collegians and Connect for Success workshops for summer program
   - STEM Day, STEM new student orientation
   - CSEA new employee orientations
   - Academic Senate new faculty orientations
   - FA professional development workshops
   - Associated Student retreat
   - Get involved presentations to variety of classes (approximately 5-7 per semester)
   - Management Association annual updates
   - Board of Trustees Annual Report
   - STP new student orientation (RRM and PV / EE)
- Green campus tours provided to a variety of groups, including academic departments (approximately 10 per semester)
- SMC Environmental Lecture Series
- Flex Day workshops

**Annual events:**
- Sustainability Week
- Earth Week

2. If applicable, discuss the engagement of program members with the local community, industry, professional groups, etc.)

6 yr, annual
Stuart Cooley is active in participation in local CALSEIA meetings and presents solar to the community (e.g. at Pluralistic (elementary) School #1 in Santa Monica. In addition to the campus wide events and committees, Genevieve Bertone, program administrator, sits on the Solar Santa Monica Advisory Board. The developing partnership with Grid Alternatives takes the program and its students into the community to install solar on affordable housing.

3. Discuss the relationship among and between full and part-time faculty, involvement of part-time faculty in departmental activities, and part-time faculty access to resources and support.

6 yr
All faculty (full and part-time) are involved in curriculum decisions and are encouraged to participate at all levels of departmental activities. A “Solar Photovoltaic Handbook” was prepared and distributed to all Solar PV faculty. The 3-ring notebook contains copies of the original 19-unit Solar PV Application, approved course outlines, sample syllabi, a Lab Exercise Template (attached to this report), sample Solar PV labs, inventory and supply logs and Purchase Requisitions for equipment.

Additionally, as chair of the department, I hold orientations at the beginning of the semester for new part-time instructors outlining typical administrative duties such as roster management, textbook requisitions, media center services, and so forth.

**G. Future Trends, Program Planning, Conclusions and Recommendations**

The following items are intended to help programs identify, track, and document unit planning and actions and to assist the institution in broad planning efforts.

1. Present any conclusions and recommendations resulting from the self evaluation process.

6 yr, annual
We are preparing for workforce of the future. We seek to provide state-of-the-art knowledge and experience to our students. By that, we mean a process of learning and access to tools and materials that represent the state-of-the-art (i.e., the best practices) for the solar installation industry. This process along with other has made it clear that more hands on experience is needed. The Grid Alternatives experience is an excellent opportunity for our students to acquire the necessary experience in the field and move to the advanced level certification, while learning industry standards currently used and found widespread within the industry.
There are other options for companies we may use for internship opportunities. The lead faculty will be exploring other internship opportunities with industry installation companies with a strong local presence, with an ancillary goal of filling some of the potential employment slots with our program completers.

In addition to increased field experience, it is also clear that there is an interest in the business side of solar. Therefore, we are currently developing a PV 4 sales class and related certificate. This will be for students interested in working in the office of a solar company or starting a company of their own.

We are currently developing an employer survey to see what the job potential is for this track and to also ensure that the existing curriculum is serving employer needs.

Finally, we want to continue to build on the cohort model and increase retention rates and NABCEP pass rates.

As more Universities offer degrees in sustainability and renewable energy, SMC should explore articulation agreements that encourage SMC CTE students to pursue further education while working in the field. This will increase their chances of getting a high-growth, high demand career.

These companies include Solar City, Verengo Solar, Solartronics, and Fire Energy, and others. We have had students from our program go to work for each of these companies, making access and potential cooperation easier.

CURRENT TRENDS, PLANNING, RECOMMENDATIONS

2. Identify any issues or needs impacting program effectiveness or efficiency for which institutional support or resources will be requested in the coming year. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request support or resources through established channels and processes].

PROGRAM CHALLENGES:

(1) Adequate storage: We need space for the very large pieces of equipment necessary for the program and area in the parking lot to perform lab exercises. Although the storage space issue has been somewhat ameliorated by allowing the PV program access to space used by Facilities, this is a temporary measure. Finding adequate funding for shelving and bins for organizing equipment was another challenge. We were able to secure monies and, as a result, shelves and bins were installed over the winter 2011 intersession. The tools, equipment and other supplies are now out of their packing boxes and stored in labeled bins. The next step is to organize the equipment into specific lab exercises, thus enabling the instructors to deliver their labs to the students in an effective, timely manner.

(2) Organizing lab materials: Currently our materials are so unorganized that our faculty does not know what materials are available or if there are sufficient supplies to cover each student. This makes lesson planning very challenging. Furthermore, many times our faculty forgo lab exercises all together because the difficulty of getting materials in and out in a timely manner. Our instructors have taken inventories, but with all the materials still in original packing boxes, it makes the whole process of lab planning very difficult. Our VTEA monies will not pay for shelving – the VTEA believes that type of material should be supplied by the institution.
(3) Weekly teaching hours put CTE and Transfer classes in completion: As noted, in the program review above, the STP program faculty, administrators and Industry Advisory Board are interested in offering more classes and growing the sustainable technologies program. However, the Earth Science department is limited in the number of WTH provided. Not only does this make it difficult to offer the entire sequence in a timely manner, it also is a disadvantage for growing institutional support for the program as faculty are reluctant to give up transfer courses for CTE.

3. If applicable, list additional capital resources (facilities, technology, equipment) that are needed to support the program as it currently exists. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

6 yr, annual
Continued administrative support to purchase and replace the high quality equipment, tools and materials necessary to sustain the Solar PV Installation program. VTEA/Perkins funds are designed to grow and expand CTE programs. We use those funds to purchase new equipment to support new courses in Solar PV. The funds are not to be used for maintaining programs – such as replacing equipment and tools that are worn out or broken.

4. If applicable, list additional human resources (staffing, professional development, staff training) needed to support the program as it currently exists. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

6 yr, annual
Qualified and trained lab technicians would be a great asset for the class room and lab sessions. It is very difficult to monitor 30-35 students who are working on a variety of lab exercises both inside and outside the classroom. Having a lab technician would greatly benefit the overall safety of the lab classes, as well as providing another resource for students who are working through their assigned tasks.

Full time administrative support at the Center for Environmental and Urban Studies would allow us to extend program reach, efficiency and effectiveness. Currently, the CEUS only has part time staff and is unable to support program growth such as assisting with internships, facilitating cohort building activities, and providing program outreach and tracking.

FUTURE TRENDS, PLANNING, RECOMMENDATIONS

5. Projecting toward the future, what trends could potentially impact the program? What changes does program planning for these changes?

6 yr annual
The solar industry is a nascent industry in an historic sense. Solar photovoltaic technology will likely dominate the renewable energy sector of energy production as developing nations transition away from fossil fuel mining, production, and use, and move towards a distributed generation (DG) networked system that includes geo-energy for heating and cooling, wind energy, small hydro, as well as solar and is networked with energy storage elements such as home and car battery, ultracapacitor and flywheel systems serving an electric transportation fleet of vehicles. Furthermore the construction industry will
adapt to green building and sustainable practices as a functioning norm, rather than a marginalized specialty. It is clear that an energy and environmental literacy will be required of all educated persons, and that this education will require technical knowledge and facility, and a respect and understanding for science and technology in addition to basic skills in math and English.

Since many of these basic skills are not present in some (nor required of all) community college students, it is also a challenge set forth for the program to be able to educate all students regardless of their basic language and math abilities, technical skill level, or capacity for physical work. The program, while training students for a useful, marketable skill in the job world, it is equally compelling as a technical basis for encouragement of further studies in the math and sciences to prepare students for transfer to a four year degree in sustainable technologies related fields as diverse as global politics, environmental philosophy, medical sciences, or electrical or mechanical engineering.

The Sustainable Technologies Program brings together a number of training programs under one umbrella and provides an overarching structure by which students can pursue educational and career opportunities in the various green fields (see attached Career Pathways Model). By including these programs under one umbrella, SMC is recognizing and embracing the interconnectedness of these various fields, and encouraging students to think of green careers as outside the traditional silos of STEM programming. Each of these program tracks will prepare students for immediate employment upon graduation, as well as provide them with the resources and support that they need to transfer to a baccalaureate institution. For entry-level work, there are nine tracks in the Sustainable Technologies Initiative:

1. Recycling and Resource Management (EXISTING, SUSTAINABILITY PROGRAM)
2. Photovoltaic Installation, Design and Sales (EXISTING, RENEWABLE ENERGY PROGRAM)
3. Energy Efficiency Auditor (IN DEVELOPMENT)
4. Wind Energy Technician (Solar Thermal Energy Technician, RENEWABLE ENERGY PROGRAM)
5. Geothermal Energy Technician, RENEWABLE ENERGY PROGRAM
6. Sustainable Building Consultant (PLANNED for SUSTAINABILITY PROGRAM)
7. Business Applications – Entrepreneurship and Logistics (PLANNED for SUSTAINABILITY PROGRAM)
8. Landscape (Water) Efficiency Technician (PLANNED for SUSTAINABILITY PROGRAM)

The first two tracks are in place. The third, Energy Efficiency Auditor, is in the process of being developed, which we expect to complete by the spring of 2014. The fourth, Wind Energy Technician, will adapt curriculum from CREATE and other sources for launching within the next year. The fourth track, along with the to-be-developed fifth and sixth tracks (Solar Thermal Energy Technician and Geothermal Energy Technician) and the existing tracks two and three (Photovoltaic Installation- Design and Sales, and Energy Efficiency Auditor), comprise the new Renewable Energies Program, and requires a substantially larger investment in equipment and curriculum materials, which has delayed its launch and for which we are now seeking funding. (Tracks seven, eight, and nine round out the Sustainability Initiative’s long-range goals, and are planned for development and implementation at some time in the future.)

6. If applicable, list additional capital resources (facilities, technology, equipment) that will be needed to support proposed changes. [This information will be reviewed and considered in institutional planning]
processes but does not supplant the need to request resources through established channels and processes].

6 yr, annual

EQUIPMENT ACQUISITION specific to the Renewable Energy curriculum for hands-on training and educational exploration is also key to the expansion of the Sustainable Technologies Program. Some of the equipment that will need to be acquired in the near future includes:

- Solar PV Trainer
- Solar Hot Water System Trainer
- Wind Powered Generator
- Geothermal trainer
- Biodiesel Demonstrator
- Weatherization Technician
- Solar Stirling Engine Technology
- Wind Powered Generator - Cutaway

7. If applicable, list additional human resources (staffing, professional development, staff training) that will be needed to support proposed changes. [This information will be reviewed and considered in institutional planning processes but does not supplant the need to request resources through established channels and processes].

6 yr, annual Qualified lab technicians, full-time administrative support at the Center for Environmental Studies, Supplemental Instruction and tutoring support.

8. If applicable, note particular challenges the program faces including those relating to categorical funding, budget, and staffing.

6 yr, annual

Santa Monica College is known as a transfer institution with a commitment to sustainable and ethical living which fits perfectly within the Sustainable Technologies Program offerings. Receiving institutional support, (i.e categorical funding, staffing and budget), in addition to outside funding from grants (such as VTEA Perkins) will be essential to meet SMC’s stated goals of producing global citizens who live sustainable and ethical lives.

9. Please use this field to share any information the program feels is not covered under any other questions.

6 yr, annual

As a final note, Energy efficiency and renewable energy (i.e., Solar Photovoltaic) are the “twin pillars” of sustainable energy policy. Both resources must be developed aggressively if the state and country are to stabilize and reduce carbon dioxide emissions in the next century. Efficiency is essential to slowing the energy demand growth so that rising clean energy supplies can address the current depletion of resources. However, these are not traditional career technical, blue collar, careers; this field demands a workforce that can understand and manipulate math and science concepts in an environment that is regularly impacted by ever changing and evolving technology. The Sustainable Technologies Program incorporates the principles of traditional career technical education programming, such as applied learning designed to support entry level work, with the cornerstones of a quality transfer program, specifically strong foundations in math, English, and critical thinking, thus recognizing the changing
nature of technology driven career technical fields. The overall merit for the STP is the college’s focus on advanced technological education as part of a much larger career path, and not a terminal degree. Students who pursue coursework through the Sustainable Technologies Program will complete their studies with the skills that they need to enter the workforce or continue their education. Our hope is that the students in the Sustainable Technologies Program will move beyond entry-level employment in the energy field and encourage and support students as they move up the educational and career ladder. While some students may choose traditional blue collar jobs, such as installers or repairmen, our programs will prepare them for career advancement when they choose to do so, by integrating math and science concepts and promoting additional education.

H. Executive Summary

These fields to be filled out by the Program Review committee. Reports will be sent to the program and will be available on-line to populate relevant fields in the annual report and the next 6 year report.

Can this be done automatically?

Narrative

Commendations

Recommendations for Program Strengthening

Recommendations for Institutional Support

Resources, note on appendices etc.
DATA
Institutional Research website
CalPASS
Chancellor's Office Data mart
TIMS reports
SLO Assessment Data
ISIS data
Placement data

RESOURCES
Program Review website
Institutional Effectiveness website
Curriculum website
Mission, Vision, Goals
ILOs
Strategic Initiatives
Definitions for course and program SLOs & SUOs
VTEA Core indicators
CPEC- Transfer data
IPEDS- Federal data
Clearing House data
ATTACHMENTS

Industry Advisory Board Meeting Minutes, September 20, 2012

Lab Exercise Template

Sustainable Technologies Career Pathways Model
1. STP Faculty Update
   a. New adjunct faculty: Edward Ruiz from East Los Angeles Occupational Center
   b. Mike Burns no longer available - working for Martifer Solar
   c. Rod Bergen not available for the 8-week teaching patterns, and PV 3 not taught this fall

2. Fall 2012 Schedule update
   a. Moved to cohort model by offering PV 1 in the first 8 weeks and PV 2 in the second 8 weeks (of a 16 week semester). Students will be attending classes on either a MW or TuTh schedule all semester.
   b. One of the first 8-week PV 1 classes cancelled due to low enrollment
   c. Second 8-week PV 2
      i. MW class is almost full, while the TuTh class has low enrollment

3. Spring 2013 schedule
   a. Continue with cohort model with one PV 1 class offered in the first 8 weeks, and one PV 2 class offered in the second 8 weeks.
   b. Energy Efficiency 1 and Energy Efficiency 2 will be offered in 8 week sessions, as well, fostering the cohort model with the PV class.
   c. Encourage students enrolled in PV 1 and PV 2 to enroll in EE1 and EE 2 (and vice versa).
   d. Possible offering of PV 3 if sufficient demand

4. Curriculum Review
   a. Faculty stipends approved for PV faculty and Math faculty to work collaboratively on developing three contextualized math modules for the PV and Energy Efficiency courses during Fall 2012 semester.
   b. Work on math modules will continue into Spring 2013, with three more math modules completed by the end of the Spring 2013 semester.
   c. Discussions on the new proposed 12-unit Departmental (“Industry”) Certificate in Solar PV.
      i. New certificate composed of four classes: PV 1, PV 2, EE1, and EE 2.
      ii. Completion of the first two PV classes will prepare students to sit for the Entry Level NABCEP exam
   d. Expand PV 3 in conjunction with practical hands-on experience with Grid Alternatives.
      i. Grid Alternatives contacted and current Fall 2012 PV students will have a field trip to Grid Alternatives in October
ii. Partnering with Grid Alternatives allows PV 3 students to accumulate required hours and experience to sit for the NABCEP Professional Installers exam.

1. Need to determine number of hours/hands-on experience required and how students can acquire the hours within a one-year period (starting in a fall semester and completing the following spring, for example).

2. Determine if an SMC waiver is necessary for students, in addition to the Grid Alternatives own waiver

e. New curriculum for Solar PV program

i. Consider expanding curriculum to create a PV 4: Technical Sales and Design course.

ii. Employer Survey to be completed spring 2013 to ascertain necessity and demand for such a course and possible new certificate.

1. Survey will encompass potential employers/solar providers within and outside of Los Angeles County

2. Survey will be developed and administered by SMC Institutional Research.

3. Need list of names of providers for survey

iii. Possible new 12-unit certificate to be developed for Technical Sales and Design.

1. Need to determine classes to include for a Technical Sales and Design certificate.

2. Discussion on specific topics that need to be included in course:

   a. Understanding contracts and contract law; more electric code; module format for classes; Sales Rights Act;

5. Program Needs

a. Number one priority: knowing our students and knowing our potential employers.

   i. Work with employers

      1. Students hired contingent upon finishing education/certificate

      2. Costs of education covered by employer

      3. Employer receives educated and trained employee – loyalty

b. Develop stronger outreach program with Vets, CalSeia, Community Solar Initiatives, Solar Santa Monica, ABC (Association of Builders and Contractors), Grid Alternatives, and other organizations.

   i. Use of Craig’s list and other online tools for marketing program

   ii. Stuart to contact Vets program at SMC

   iii. Promote the tax advantages of hiring a vet

   iv. Partnership with program at Fremont High

   v. Family Readiness Center

   vi. Connect to TREE – service for returning vets

      1. Cannot self-promote, but can make information available to vets

      2. Stuart can give a short primer “Solar Primer for Vets” as an introduction to Solar energy

c. Field trips for students

   i. Helio Power agreed to discuss setting up a field trip opportunity.

   ii. Contact local utilities for possible field trip opportunities

d. Guest Speakers for classes

   i. Joel Davidson, Rod Bergen volunteered their expertise as guest speakers

   ii. Scott Gordon, Helio Power
e. Discussion on the changing focus of Solar PV
   i. More leasing of panels, less buying by residents
      1. Larger systems with private financing
   ii. Fewer installation jobs may be available in future
   iii. Industry changing from a ‘one-stop-shop’ (where one company does everything) to ‘contracts’, where different companies involved in the solar purchase (one for selling, one for installing, one for financing, etc.)
   iv. Looking to ‘asset management of existing solar panels’ from just a ‘pure Sales and Marketing’ in the future
   v. Rule of thumb: 1 Administrator/Manager can generate jobs for six salespersons and 1 salesperson generates jobs for six workers/installers
f. Discussion on Farmer’s Field and need for workers from local sources – not outsourcing
   i. Trained sales personnel
g. U.S. Green Building Council
   i. Works with community colleges
   ii. LEED certification
h. Future discussions with SMC Business Department
   i. “Greening” of a business certificate or individual courses

6. Future meetings –
   a. Holidays coming up – next meeting in late January/early February.
      i. Lunch hour (11:00-1:00 pm) is the best time for IAB members
      ii. Genevieve will send out email invitations to next IAB meeting

7. Attending:

   SMC:  Vicki Drake, Chair, Earth Science Department
         Stuart Cooley, Faculty, STP, Earth Science Department
         Rod Bergen, Faculty, STP, Earth Science Department

   Scott Gordon, Helio Power;
   Jesse Medina, Hire-A-Vet
   Michael Ware, EcoMotion
   Benita Duran, Los Angeles Neighborhood Land Trust
   Brenda Ramirez, SB WIB
   Joel Davidson, Solutions
TITLE/NAME OF LAB: (Indicate if this lab is for PV 1, PV 2, PV 3 or Energy Efficiency in addition to the 'title')

TEACHING OBJECTIVES/FEATURES OF THE LAB: (What are the main concepts being presented in this lab? How are these concepts related to the lecture topics?)

STUDENT OBJECTIVES/OUTCOMES: (What will the students learn as a result of this lab? How will this lab demonstrate student competency in subject matter being presented?)

TEACHING THE LAB: (How will the lab concepts be presented? What presentation media will be used (lectures, demonstrations, video, etc.)? Provide a detailed 'step-by-step' lesson, if necessary.)

TIME REQUIRED FOR STUDENTS TO COMPLETE THE LAB: (Include any setup, demonstration, teaching, and clean-up time)

EQUIPMENT NEEDS:

SUPPLIES:

SUPPLIER: (If new supplies/equipment are needed, please include part number where possible)

TOOLS: (Drills, hammers, screwdrivers, pliers, etc.)
SMC SUSTAINABLE TECHNOLOGIES PROGRAM: CAREER PATHWAY MODEL

Secondary STEM Education Programs

SMC Earth Sciences Sustainable Technologies Program

Geospatial and Design Technologies: GIS, Remote Sensing, GPS, CAD

Math/Physics Course for Energy and Water efficiency

Landscape Efficiency Technician

Photovoltaic Installation, Design, Sales

Renewable Energies Technician

Energy Efficiency Auditor

Sustainable Business Consultant

Logistics

Geospatial and Design Technologies:
GIS, Remote Sensing, GPS, CAD

Environmental Health Science

Urban Planning

Architecture

Environmental Geography/Geology

Engineering (PE, CE, EE)

Advanced degrees (B.A., B.S. / M.A., M.S.)

Workforce