Solar Photovoltaic Training in Suva, Fiji
A VOCTEC Case Study

The Pacific Island nations face a number of barriers to clean energy development including limited financial resources, inadequate local human capacity to support the clean energy systems, high turnover of trained persons within the population, and a lack of the standardized training for technicians, operators, and engineers. The Vocational Training and Education for Clean Energy (VOCTEC) program, under the leadership of Arizona State University (ASU), received a 2-year associate award in 2012 from the United States Agency for International Development (USAID) towards delivering long term vocational education and training that will strengthen local capacity (both men and women) to design, install, operate, maintain, and repair solar photovoltaic (PV) energy equipment.

Fiji serves as a regional hub for renewable energy practitioners and aid organizations and has reasonable access to the other Pacific Island Nations. In collaboration with the University of the South Pacific (USP) in Suva, Fiji with campuses throughout the region, ASU faculty and the USP counterpart delivered the first photovoltaic (PV) educator training workshop at the USP Laucala Campus, from February 4 to 15, 2013. The objective of this two-week training workshop was to enable the training participants to conduct future PV technician trainings in their respective countries and communities.

To make the program sustainable, the trainers were selected based on specific criteria: 1) have post-secondary education in electronics, electrical engineering, or other related technology fields; 2) are affiliated with institutional stakeholders in the training industry; and 3) have prior technical vocational teaching experience. Sixteen participants from four Pacific Island nations (i.e., Fiji, Solomon Island, Tonga, and Vanuatu) were
selected for the program. Background information on the trainers was collected in the beginning to make the training program fit their needs, background, and different learning styles and experiences.

The participants engaged in the two-week workshop curriculum, which comprised an array of modules on non-technical (e.g., gender inclusion, entrepreneurship), technical and advanced technical topics, and hands-on laboratory exercises. These learning activities were designed to help the participants learn how to: 1) present and demonstrate PV instructional material and hands-on exercises; 2) promote inclusion and formulate teaching strategies to train solar PV technicians; 3) use common PV solar components and test equipment; and 4) use and access the VOCTEC Virtual Learning Environment (VLE), which is an electronic platform created for additional resources and back up support from ASU and to facilitate discussions among the alumni of the training.

To design, develop, and deliver these learning materials, a combination of expertise in different areas of solar PV was required. Faculty and staff from ASU in collaboration with the counterparts from the USP were involved at different levels. For curriculum development, for example, the subject matter experts (SME) provided the initial content materials to the instructional designer to design and develop training materials. Each learning module was developed based on specific set of learning objectives, which also drove the creation of the assessments. Alignment of curriculum and assessments with learning objectives allows to more accurately measuring the level of trainee’s understanding and acquisition of knowledge. This process of curriculum development, including the assessments and discussion items, was done iteratively with the respective SMEs (e.g., assessment and evaluation SME, PV solar SME) and a team of reviewers who provided content specific reviews and feedback to ensure that the instruction material met the standards of quality. Although all the course material was saved on electronic flash drives and sent to the trainers; it was also uploaded on the VLE for the trainers to access whenever needed. Additionally, many logistical arrangements were needed, such as lodging, printing, and shipping of the material and solar modules and accessories.

Even though, at the end the training was delivered on time and all the material and items were ready when needed; the team had to deal with some unexpected challenges that happened along the way since this was the first PV training workshop that the VOCTEC program delivered in the Pacific Islands. Some of the challenges included: last minute decision to locally print material, limited internet connection in Fiji, cancelation of the on-site lodging for security reasons, refusal of payment by credit
cards by some vendors, problems of international shipping and custom issues. However, because of the collaboration among all the team members at ASU and USP, these challenges were overcome and did not cause any delays in the delivery of the training, or compromised the quality of the training. Overall, the training was effective and the data from different assessments revealed that it led to positive results.

To assess the training effectiveness on participants’ attitudes, learning, and behavior, 10 different assessment instruments were administered at various intervals during the workshop. The reaction (attitude) assessment measured the participants’ perception of and satisfaction with the design of the training program and delivery of the content. The learning assessments were administered to measure the extent to which the participants’ acquired new knowledge and skills as a result of the training. The behavior evaluation measured the participants’ ability to apply the newly learned knowledge and skills in real-life settings following the training. Results from the assessments and evaluations data analysis reflect a very high degree of participant satisfaction with the training workshop. The attendees showed almost total satisfaction with the training course, structure/organization of the course, and instructors. The participants’ average scores were either greater than 4.6 on a 5-point scale or greater than 2.9 on a 3-point scale, showing that they were well satisfied with the training.

In terms of learning, the non-technical, technical, and advanced technical content areas were each assessed separately. In cases where pre and post-knowledge levels were measured relative to the training event, i.e., with the non-technical and advanced technical content areas, the result showed positive increase in knowledge from before the training to after the training. Overall, all post training measures of understanding and remembering information showed high marks, exceeding an average score of 86 percent in all content areas. The performance measures on the team executed hands-on exercises were also positive. All teams received a high score on the hands-on exercises and participants were highly engaged in the learning process.

With respect to behavior, participants’ perceived preparedness and confidence to fulfill the objectives of the educator training program were also in the affirmative. Across all represented groups, and for most questions, the average response score was 2.75 on a 3-point scale where 2 represented “somewhat prepared or confident” and 3 represented “very prepared or confident”. The highest rating of preparedness was given to using inclusive teaching practices, fostering a sense of community in the classroom, and helping students make connections to the teaching material (Average score = 2.94). The confidence and preparedness findings gain further credibility given the performance of the group on the assessment tests given during the workshop. The participants’ confidence was also bolstered by the extensive teaching background of most of the
participants. Further, a significant number of attendees had prior trainings in solar PV area, which also helped them to better understand the course modules. The participants from all four Pacific Islands nations expressed a commitment to deliver at least one PV technician training within this year. The results of the various assessments showed that the overall objective of the training was fulfilled.

Based on the feedback collected from the training and to address the participants’ comments, knowing that they will be delivering the technician training, the ASU team took the initiative to:

- Review and improve existing assessment materials to ensure suitability for upcoming technician level trainings. This modified material was also sent to the trainers in the Pacific Islands for their review and approval.
- Communicate clearly to trainees the reasons and guidelines for conducting assessments and clearly define the thresholds for passing the training class.
- Provide instructors in the partner institutions with easy-to-use, value-added tools and processes to conduct and evaluate assessments and communicate required information back to ASU/VOCTEC.

In summary, the training in Fiji was effective and led to promising results. Many lessons were learned throughout the training process. Currently, these lessons are being applied to improve the preparation and delivery of other similar projects. Some of the lessons learned from the Fiji training are:

- Detailed planning (schedule, dependencies, deliverables etc.) and development of the assessment parts for any project need to be done in a timely fashion to allow sufficient time for reviews and quality control processes.
- Assessments are important part of the training program, and the assessment procedure would be well planned and effectively executed. Strong communication between the subject matter experts, evaluation expert and personnel on the ground is necessary.
- Logistics planning must consider the challenges of working in developing countries, where culture and business approach might be different than in the home country. Adequate backup plans are necessary, and sufficient financial resources must be earmarked and made available for smooth implementation of the training program.