The impact of the SERC based solar PV outreach training program in Kenya

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Abstract
In this paper it is described how Strathmore Energy Research Centre developed an outreach project funded by USAID, National Science Foundation (NSF) to empower technical institutions to offer solar courses hence creating a pool of qualified technicians spread throughout the geography of the country. Presently the situation is that Kenya has around 1000 solar technicians working in the market with no formal solar PV training or accreditation. The National Industrial Training Authority - NITA, which regulates non-academic skills or craft based training, was helped by this project to develop a PV solar curriculum at three levels (T1/T2/T3) which empowers from craft level technicians to engineers to deal with design, installation and maintenance of PV systems from solar lantern up to utility size level. ERC, the Energy Regulatory Commission for Kenya has supported the initiative as technicians once trained can be accredited by and thus further strength the industry. By June 2016, which is the end of the program, Kenya is to have 1800 accredited technical personnel near almost every major town in the country. The paper describes the positive and negative aspects of this venture.
Key words: Solar Photovoltaic, Capacity building, Technical Training Institutions.

1. Introduction

Kenya ranked seventh globally and second in Africa, best performance on Clean Energy Enabling Framework, largely due to the country's solid policy framework [2]. Although the Kenyan solar PV market is often considered as a successful commercially driven market [5], market spoilage due to poor quality service significantly hindered market growth. In December 2012, the Energy Regulatory Commission (ERC) published the "Energy Solar Photovoltaic System Regulation 2012" [1]. This regulation proposes a path for training and accreditation. There are approximately 800-1,000 solar PV technicians working in the Kenyan market, majority of them did not attend any formal training and certification [7]. The regulations require that only licensed technicians are allowed to design and install solar PV systems. To be licensed, technicians are required to have undertaken a solar training course. The presence of few competent technicians to offer design, installation and maintenance services within the solar PV sector in Kenya presented an opportunity to launch into an outreach program to support the development of the solar PV technology within Kenya. The number of technicians has since increased by a small percentage due to awareness creation and development of the solar curriculum [8].

The problem

In a survey funded by JICA [3] in which 41 higher education institutions participated, it was identified that only 50% offered short courses in Solar PV technology. Of the 368 teaching staff interviewed, only 16% had received prior training in solar PV technology. 52% of the institutes did not have access to adequate training materials while 60% of the respondents felt that they did not have appropriate hands-on training equipment. 20% did not have any hands-on training equipment. This survey clearly uncovered the sorry state of capacity building on solar PV in Kenya and somehow explains the small market penetration.

Scope and objective

There are 34 Technical Training Institutions (TTI) in Kenya and SERC has signed a memorandum of understanding with 18 of them. This paper shares the approach, progress, setback, methodology, and impact so far with the creation of a solar PV capacity building in Kenya. The use of Training of Trainers was the most suitable way to achieve numbers and geographical spread. For that, capacity building and empowerment of technical and vocational institutions to deliver such courses at the institutional level was required.

Strathmore University, through Strathmore energy research center is coordinating a USAID funded NSF project under the Partnership in Enhanced Engagement in Research (PEER) project [6]. The project's objective is to train a minimum of 1000 solar technicians. It was launched in September 2014 and received funding from USAID under the PEER/NSF grant. TTIs were capacitated by having some their teaching staff attending training of trainer sessions and equipped with hands-on training equipment. The memorandum requires that each capacitated institute trains at least 100 technicians in a two years period. These trained technicians are then encouraged to

approach ERC to seek accreditation. These trained/accredited technicians will add to the pool of the technical personnel within the country making it easier for any customers, irrespective of their location, to invest in solar PV installations of any scale with confidence.

The scope of the PEER project was to train at T2 level only. Nonetheless, the German Cooperation Agency – GIZ pick interest and added funds to upgrade the training of trainers to T3 level. GIZ further helped the project by sponsoring SERC and the Kenya Renewable Energy Association (KEREA) to develop a criterion to accredit institutions to carry out PV training. These regulations were gazetted and adopted by NITA.

SERC has designed and patented a specific mobile training kit to serve the purpose of this project (figure 1). At this time, the project has so far trained a total of 300 technicians of which 25 have been accredited.

Figure 1: SERC solar training kits

Overview of solar technicians licensing procedure
Energy Regulatory Commission (ERC) gazetted Solar PV regulations in 2012 for regulating the solar PV sector/market as well as protecting consumers. For solar PV technicians, licensing is done at three levels i.e. basic (T1) level Solar PV system installation work for small systems or single battery DC system of up to 100 Wp, intermediate (T2) level Solar PV system installation work for medium systems or multiple batteries which may include an inverter and advanced (T3) level Solar PV system installation work for advanced, including grid connected and hybrid systems. According to ERC records, in August 2014 64 solar PV technicians were licensed and by November 2015, 300 had been licensed since the regulations were gazetted [4]. The number of licensed technicians per category is shown in the table 1.
Table 1: Number of licensed technicians in Kenya

Level	Number of licensed technicians	
	August 2014	November 2015
Basic (T1) level	2	6
Intermediate (T2) level	21	148
Advanced (T3) level	41	146
Total	**64**	**300**

Ref. ERC solar PV register, Nov 2015.

The analysis of these technicians per location indicates that 42 are based in Nairobi (66%) while the remaining 22 are scattered in 8 different towns across the country (i.e. an average of 2 technicians per location). The number of licensed technicians is therefore too low and their distribution is skewed towards Nairobi and other bigger towns (e.g. Mombasa, Kisumu and Eldoret). This therefore implies that technicians currently installing solar systems in different parts of the country are operating in contravention with the 2012 solar PV regulations. More efforts is therefore required to be put in decentralized training through training institutions and supporting licensing of solar PV technicians in order to improve this situation.

2. Methodology

With the target of building capacity for basic and intermediate solar technical skills (T1/T2) in rural areas, SERC with other stakeholders such as GIZ- Endev and the National Commission for Science, Technology and Innovation

(NACOSTI) designed the ToT curriculum and hands-on mobile training kit. Once this was done, SERC undertook the following activities shown in Figure 3:

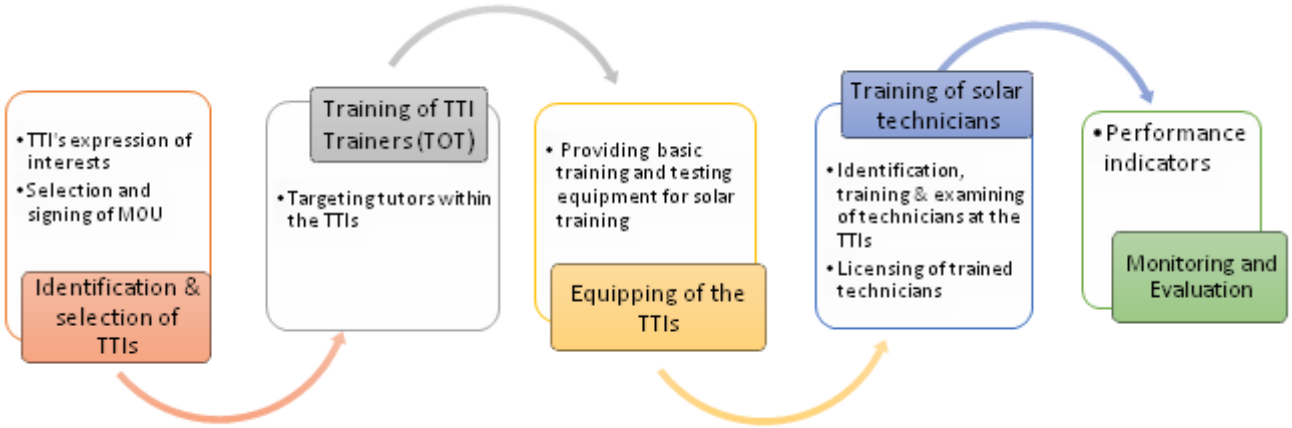

Figure 2: TTI capacity building criteria

The course content for T1/T2 is shown in Annex 2. The duration of the course is five days and most of the theory is covered in the morning sessions and the afternoon session addresses the practical aspect. The course has a e-learning platform which serves the purpose of pre-evaluation of the knowledge level of the candidates. The pre-requisite for this training is that the participant has to have a basic knowledge in electrical wiring. Annex 1 presents the 5 day course details.

As per the MoU SERC is tasked to carry out auditing of the TTI to access the quality of the hands-on training kit assembly, the prowess of the trained teaching staff and finally the number of technicians trained/accredited per institution. Annex 1 gives the details of the selected TTIs presented in figure 3 below.

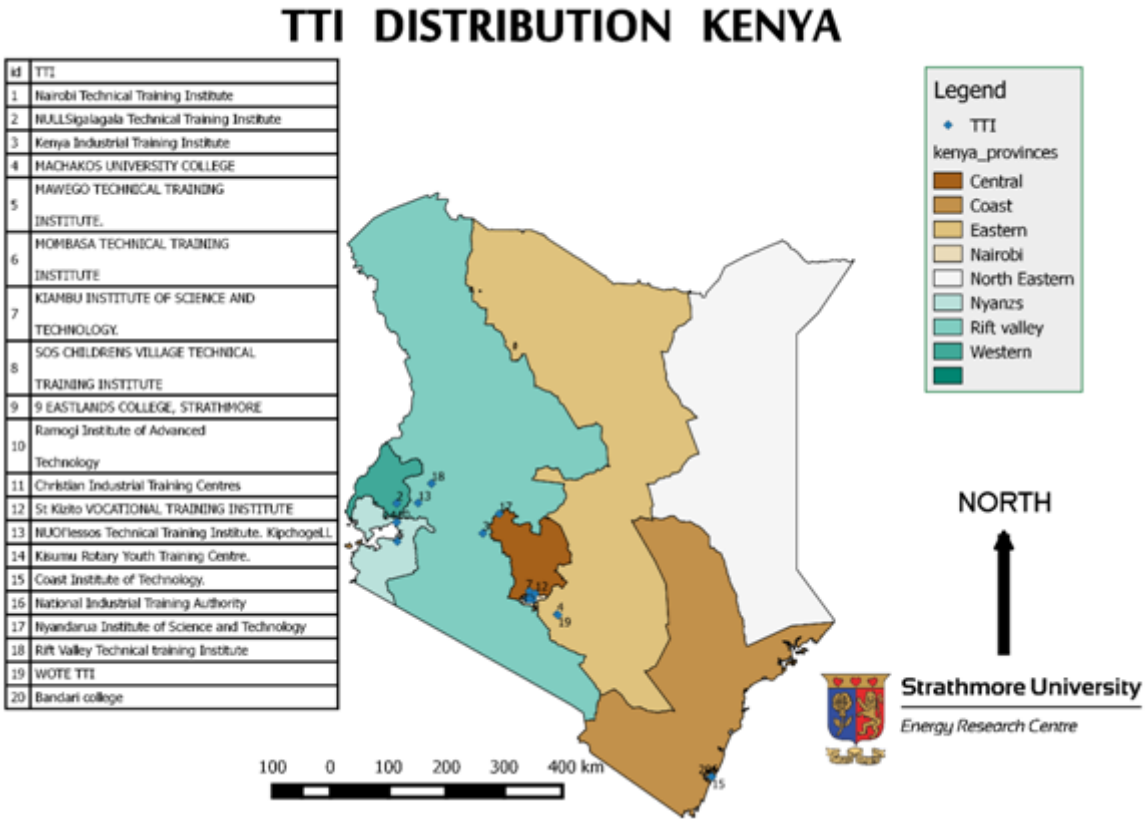

Figure 3: Regional distribution of the selected TTIs in Kenya.

3. Results

The impact of the project is presented in two categories, namely qualitative and quantitative. Five parameters

have been considered:
1. The level of responsiveness measured by the speed of signing the MOU, the support received by the project coordinators at the institution and the financial support to the design and completion of the training kits.
2. Participation and preparation of the TTIS by availing two technicians for the training of trainers and the absorption of the course materials and content.
3. The fabrication of the training kits according to SERC design, which has to be done by the beneficiaries TTIs in their workshops.
4. The number of technicians trained in respect to the assigned target and finally
5. The number of licensed technicians per institution.

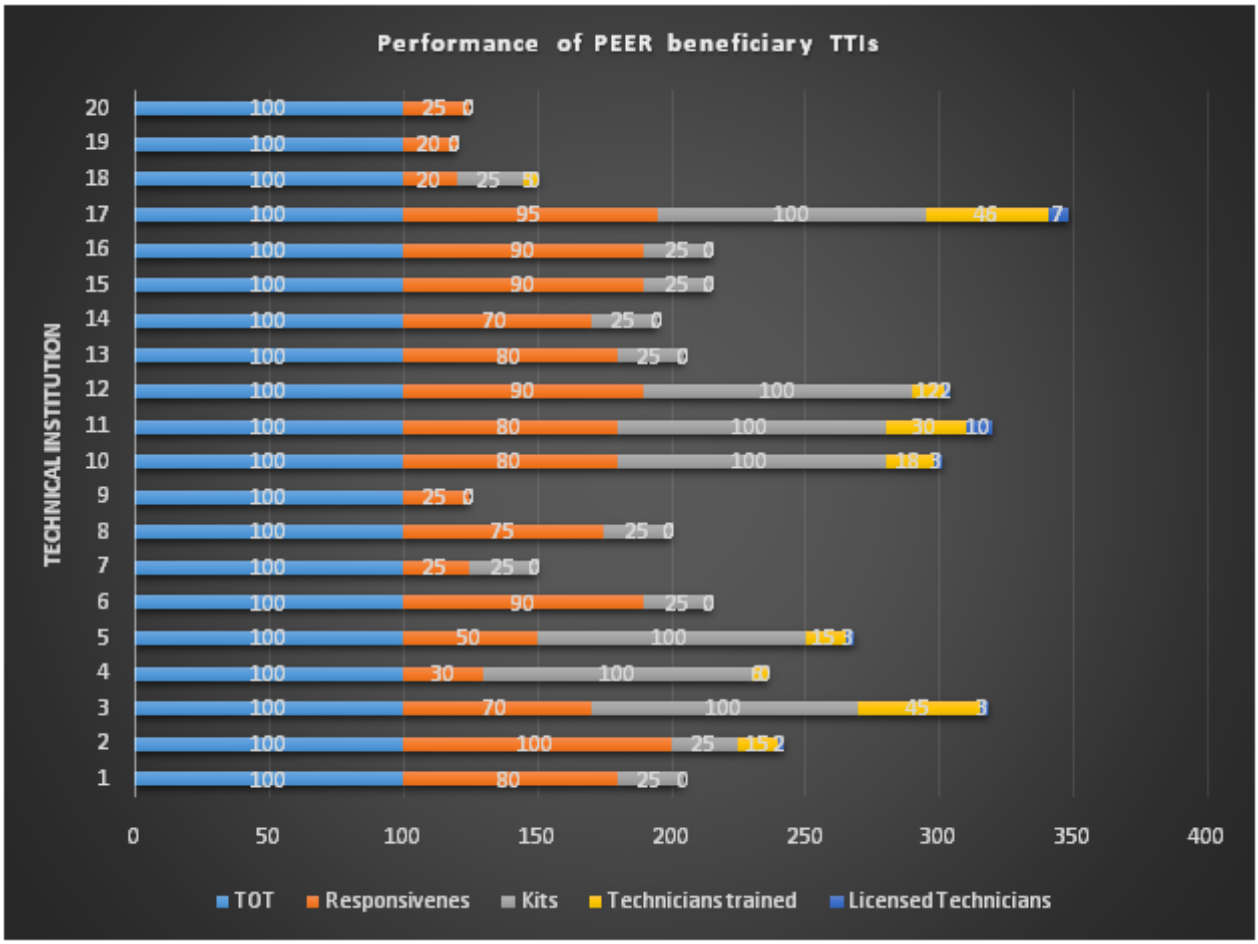

Figure 4 presents the performance per institution in each aspect of the analysis and annex 1 presents the details of the TTIs. It is worth noting that private institutions have performed better than public due of various reasons such as budget constraint and delays due to bureaucracy.

25% of the selected beneficiary institutions are Private and have trained 32% of the total technicians trained under the project. The project has trained a total of 38 women technicians, 36 are now seeking licensing and 2 are part of the 9 licensed female technicians in the whole country. The female licensed technicians only account for 3% of the licensed technicians in Kenya (ERC, 2015).

Qualitatively, the project has created a lot of impact through empowering Institutions to run the solar PV courses, building capacity of the youth through the institutions, creating awareness and supporting the regulations within the solar sector, empowering women, creating confidence in the end users about the solar PV technology and supporting the development of the solar PV technology within Kenya.

4. Conclusion

The project has a target of training, through the TTIs, a minimum of 1000 technicians by the 30th September 2016. So far 36% has been trained within 60% of the project period. This nonetheless is not cause for concern as most of the initial period was dedicated to empowering the institutions. We therefore expect much great speed of training in the last months of the project. The impact within the country is much more than the quantitative figures may suggest

SERC has recognized also that supporting the technicians to get licensed and accredited requires attention as many may fear taking the exams. Another issue is that the institutions have to ensure gender balance by training

female technicians. Large numbers of licensed technicians are anticipated with regards to the impact by the project which is in line with Kenya's vision 2030.

It was noted that awareness creation of the solar PV regulations was achieved through the partnership with other stakeholders such as GIZ EnDev Kenya, ERC, NACOSTI, KEREA, TTIs, and the county governments. The awareness focused on the content and importance of complying with the regulations and the penalties for non-compliance. Many players in the market did not know that they were required to have a trained and licensed technician as a member of staff in order to carry out their business. This awareness is anticipated to increase demand for solar technician training services in the relevant areas. Finally we envision that this project should continue on a second stage to cover the other TTIs which did not benefit from this phase.

5. References

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