Current status of solar home systems in Bangladesh

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Abstract: Since early 1990s more than four-million solar home systems (SHS) have been installed in Bangladesh and the number is still increasing [1-7]. This is mainly because SHS take full advantage of the clean and abundant solar energy. SHS are especially welcomed in the remote and least developed areas where the national grid does not reach and will not be covered in the future. Some studies show that users have benefited from having SHS in several ways, such as improved economy, education and health conditions [8] although a recent survey showed that many people merely use the SHS collected electricity for showing off their personal status or pure entertainment purpose e.g. charging mobile phones rather than economy development [5]. Nevertheless, both governments and organizations are still investing and promoting SHS as a main solution for off-grid electrification [2].

However, SHS are not 100% environmentally and economically sustainable because they use batteries to store the energy collected by photovoltaic solar panels for night usages [9]. Batteries normally have short life time e.g. 5 years and our studies show that it is too costly for many users to replace the batteries once coming to the end of their lives. More importantly, they are not disposable and potentially hazardous to the environment. In addition to that, SHS generate power only when sun shines (day time) and the battery can store limited amount of energy, thus provide electricity for limited amount of time (typically only up to 5 hours each day). In this paper we present our recent studies on the status of the SHS deployed in the past 10-15 years in the hilly areas of Bangladesh. We investigated current conditions of SHS, users' income, electricity usage pattern, and costs of installing and maintaining SHS in 12 villages in Rangamati and Bandarban districts. The results show that SHS users are currently experiencing what we call "the post SHS crisis", which means most current SHS users have never replaced the batteries since their SHS have been installed due to the high cost. Therefore, they still have no electricity for nights or even daytime when there is not enough solar energy. Accordingly, there is a desperate demand for new technologies to solve this crisis and offer more sustainable power for users. In the end, we will review some reported solutions and propose a novel solution.

Keywords: *Solar Home Systems, Sustainable Energy, Off-grid Energy*

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REFERENCES

[1] Khan J., and Arsalan M. H., Solar power technologies for sustainable electricity generation- A review, Renewable and Sustainable Energy Reviews, 55 (2016), 414-425.
[2] Kannan N., Vakeesan D., Solar energy for future world: A review, Renewable and Sustainable Energy Reviews, 62 (2016) 1092-1105.
[3] Barrie J., Cruickshank H. J., Shedding light on the last mile: A study on the diffusion of Pay As You Go Solar Home Systems in Central East Africa, Energy Policy, 107 (2017) 425-436.
[4] Sansaniwal S. K., Sharma V., Mathur J. Energy and exergy analyses of various typical solar energy applications: a comprehensive review, Renewable and Sustainable Energy Reviews, 82 (2018) 1576-1601.
[5] Holtorf H., Urmee T., Calais M. Pryor T., A model to evaluate the success of Solar Home Systems, Renewable and Sustainable Energy Reviews, 50 (2015), 245-255.
[6] Modi A., Buhler F., Andreasen J. G., Haglind F., A review of solar energy based heat and power generation systems, Renewable and Sustainable Energy Reviews, 67 (2017), 1047-1064.
[7] Zubi G., Spertino F., Carvalho M., Adhikari R. S., Khatib T., Development and assessment of a solar home system to cover cooking and lighting needs in developing regions as a better alternative for existing practices, Solar Energy, 155 (2017), 7-17.
[8] Zubi G. Fracastoro G. V., Lujano-Rojas J. M., El Bakari K., Andrews D., The unlocked potential of solar home systems; an effective way to overcome domestic energy poverty in developing regions, 132 (2019), 1425-1435.
[9] Diouf B., and Avis C. The potential of Li-ion batteries in ECOWAS solar home systems, Journal of Energy Storage, 22 (2019), 295-301.