Evaluation of Solar Water Heating Systems in Brazilian Low-Income Households

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In Brazil, the electric matrix is essentially renewable and many actions have been made for the development and utilization of solar energy applied to water heating. This is a viable alternative to electric water heating, which is responsible for 24% of total energy consumption of residential sector. Since 2000, the minimum standards of reliability, durability and performance of equipment used in Solar Water Heating Systems (SWHS) have been secured through a routine check by testing reference laboratories. However, there was a need for the solar sector to better understand the efficiency of existing installations. In this sense, National Electricity Conservation Program (Procel) finished, in 2010, a large national level pioneering study in order to evaluate in the sites the real situation of the SWHS installations.

From the social perspective, benefits can be perceived by the households. Reducing the electricity bill would result in good savings in the family budget, which would impact more effectively in lower social classes. In this case, the average reduction of energy consumption is about 35%. Consequently Procel decided to conduct a research in these sites of low-income households located in Rio de Janeiro and São Paulo states. Based on statistical treatment of data for definition of samples, the technical evaluations were conducted by approximately 50 researchers in 154 SWHS installations of nearly 4,000 households. The purpose of this evaluation process was to check material issues of quality and maintenance of equipment as well as behavior and satisfaction of the residents. For this reason, a methodology of work was developed, including not only training activities for the researchers, but also developing of didactic material and database, and interviews.

According to the results, there was about 84% of satisfaction level among low-income residents with SWHS. In addition, around 94% of the residents noticed the energy savings related to the technology. However, the researchers realized that households need to have continuous assistance so the information related to equipment maintenance and good practice in the use of hot water may not be wasted over time.

Moreover, the problems of maintenance and the lack of knowledge of the SWHS proved to be occurring in all the inspected sites. For instance, about 66% of the residents do not clean the solar collectors glasses. Another critical point indicates that about 55% of the mixers show leaking problems. This suggests that researchers have to figure out better technological solutions.

In addition, the results also suggest not only the creation of measurement and verification programs for evaluating the benefits generated by the use of SWHS, but also the diffusion of technology programs, and training of skilled labor, involving design, implementation, and maintenance.

To summarize, the goal of this poster is to present the results of this work. Hopefully, in a near future, the collected data will help Procel in the improvement of energy supply as well as motivating new actions to boost public policies in all the places where the use of SWHS is being provided.