# THE DETERMINANTS OF ACCEPTABILITY OF SOLAR POWER SYSTEMS: A SURVEY OF POWER CONSUMERS IN SOUTHERN SRI LANKA

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## 1. Introduction

Currently majority of Sri Lankan population rely on grid connected electricity supply to fulfill their basic needs of energy. In view of reducing the electricity bill they limit their electricity consumption for several activities such as lighting, operating instruments etc. and usually they depend on wood fuel, L P Gas and other low quality fuels for cooking and other heating purposes. Such practices reduce quality of life and degrade the environment. As a solution for these problems, renewable energy sources like solar can be introduced as substitutes. Even though adequate solar resources are available in the country and the applications of solar technologies are feasible to use, power consumers have been reluctant to accept solar power systems to recover their day today needs yet. Solar Photovoltaic installations are at present becoming more financially attractive than earlier. It is now appropriate to make comprehensive evaluation of the acceptability of solar power. Promoting the development of economically viable new renewable energy sources are a key strategy under the national energy policy. The development framework of the government of Sri Lanka requires 20% of electricity generation from new renewable energies by 2020. An innovative environment of energy industry will encourage people to use new and renewable energy. Today solar power systems are becoming more popular in developed countries as well as developing countries. Understanding the present situations the solar power systems are developed with new technologies for affordable prices.

Therefore, this paper attempts to explore the determinants of public acceptance of solar power systems in Sri Lanka.

## 2. Research Problem

In Sri Lanka hydro power generation reached its maximum potential during Last two decades. As a solution to full fill increasing national electricity demand, more thermal power plants are being introduced. It is unfavourable for the growth of national economy because of continues harmful effect on environment and wastage of foreign exchange by importing fossil fuels. Solar energy contributes very small share of national power and energy supply is one of the major challenges of solar energy strategies for sustainable development. However potential of solar energy is substantial. Adequate solar resources are available and applications of solar power systems are feasible in Sri Lanka. Solar power systems have not been popular up to an expected level that it can be reached as other countries in the world, Because the consumer acceptance of solar power systems influenced by several other factors.

## 3. Research Objective

The main purpose of this paper is to explore the factors which influence consumers' acceptability of solar power systems in Sri Lanka. As an ancillary objective this paper also examines the most significant factors and insignificant factors for the acceptability of solar power systems.

## 4. Methodology and structure of the model

Factors which influence consumer acceptance of solar power were determined by comparing it with traditional grid connected power system. Based on the theoretical and empirical review nine influential factors were selected for designing the questionnaire. This study is mainly based on the primary data and both survey and interview methods are adopted for respondents in southern province. The survey results are subjected to analysis by using a psychological theory developed by Ajzen (1996) named as Theory of planned behaviour. The sample survey is conducted using Likert scale questionnaire which designed based on the nine dimensions used as the proxies for the determinants. Out of 150 questionnaires the respondents were 132 which is satisfactory number for the analysis. The survey was administrated by the

investigator himself among 132 respondents. Moreover, 18 solar power users were interviewed which was designed based on the same influencing factors. Analytical technique consisted with descriptive method and Binomial logistic regression model for deep analysis of hypotheses. Nine independent variables were considered that correspond to nine hypotheses. Using statistical output, validity of the proposed factors was analyzed and the final result was suggested by comparing the opinion and the experiences of power consumers who already users of solar systems.

## 5. Key Findings

Nine factors which influence consumers' acceptability of solar power systems have been identified. These factors were categorized in to four groups according to their effectiveness and assumed directions. First, three significant factors were identified as positive high influential factors: (1) improved quality of life, (2) increased durability and, (3) strong government commitment. Improvements of each of these three factors are more sensitive to increase the acceptability of solar power. Second, other two significant factors were identified as negative high influential factors (major barriers): (1) high initial cost and, (2) the uncertainty of reliability of solar energy as continues power supply on demand. Reductions of each of these two factors are more sensitive to increase the acceptability of solar power. Third, other two less significant factors were identified as positive low influential factors: (1) less additional monthly expenses and, (2) local solar market maturity. Improvements of each of these two factors are less sensitive to increase acceptability of solar power. Fourth, remaining two insignificant factors were identified as positive factors: (1) good assessment of others (family members, friends, neighbours, etc.), (2) popularity of solar power. However these two factors can be considered as influential factors. Findings of the survey regarding above nine influential factors were compared with the results obtained from responses and experiences of solar power users and further validation of factors was obtained. Also the socio-economic impact of solar energy found to be favourable.

## 6. Conclusions

The consumer's acceptability of solar power systems is found satisfactory but the public awareness regarding solar power is not so satisfactory. It is found that, five factors which highly

influence consumers' acceptance of solar power are more sensitive with consumers' acceptability. Hence small variation of these factors would affect consumers' acceptance significantly. Three most influencing positive factors should be improved. For this, public awareness regarding the improvement of quality of life using solar power and durability of solar systems should be upgraded. Strong government commitments should be established to promote solar power usage. Also two most influencing negative factors (barriers) should be eliminated. "High initial cost" and "the uncertainty of reliability of solar energy as a power supply on demand" were identified as two main barriers. These barriers can be mitigated by introducing attractive and favourable incentive schemes or energy policies such as feed-in tariff, by adopting new and efficient solar technologies and, by improving public awareness regarding existing solar policies, new solar technologies and advantages in using solar power. Other less influencing positive factors such as favorable local solar market maturity, less monthly additional expenses, good assessment of others and the popularity of solar power should be improved. To achieve this, it is important to organize demonstration and training programmes, workshops and exhibitions to assess solar power installations. This study predicted five key influential factors and other less influential factors providing a basis for future scholarly research and policy implications.

## 7. Policy Recommendations

It is important formulate policies to improve positively affected factors and eliminate negatively affected factors (barriers), to populate more solar power system installations across the country as suggested in the survey.

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