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Determinants of Residential Rooftop Solar : A Review-Based Paper

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ABSTRACT

Sustainable development has been an inevitable for the world as non-renewable sources of energy are depletable and exhaustible and polluting the environment as well. Renewable sources are inexhaustible and environment friendly and relatively less polluted and economically affordable as well such as solar, wind, hydropower. Solar electricity generation through rooftop solar utilizing solar photovoltaic is better option for energy transition at residential sector as this technology is economically viable for small scale power generation at home therefore government disburses subsidy to residential sector to make it more attractive despite all this the adoption of rooftop solar in residential sector is determined by some other determinants. This paper made an attempt to identify the determinants of adoption of residential rooftop solar. The results of the study shows that the high upfront cost of rooftop solar is the major economic determinant of adoption of the residential rooftop solar.

Keywords: *Residential Rooftop Solar (RRS), Solar Irradiance, Peer Effect*

Rapid growth of population, industrialization and modernization paves the way for high energy demand but the supply of the energy cannot satisfy that demand as the sources of energy are non-renewable all these paves the way for diversification of energy sources such as renewable sources (Nurwidiana Nurwidiana, 2021).United Nations has introduces SDGs (Sustainable Development Goals) for all its member countries among all theses 17 goals the 7th goal is concerned with clean and affordable energy access to everyone (Tracking SDG7: The Energy Progress Report , 2022). Energy transition can be foster by participation of residential sector in rooftop solar adoption (Tobias Kraschewski, 2023).Domestic sector has been accounted for 30% of green-house gas emission therefore it is necessary to increase the share of renewable sources in energy generation ,here energy implies electricity which can be generated from solar energy by various solar electricity generation technologies (Takahiko Kiso, 2012).The adoption of RRS is influenced by the technological acceptance of the society (Nurwidiana Nurwidiana, 2021).Rooftop solar does not only provide affordable and uninterrupted electricity but it also enables consumers to sale the excess electricity to power grid and they get compensation on it (Nurwidiana Nurwidiana, 2021).Adoption of rooftop solar has been hindered by certain economic, social, psychological, technical and other factors which should be addressed through policy design (Tobias Kraschewski, 2023).

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Solar energy is most suitable energy source for tropical and subtropical regions such as India, China, United State, Australia (Padmanathan K., 2019).

Objectives of the Study

- To identify the economic, social and technical determinants of residential rooftop solar (RRS).
- To understand people's perception towards rooftop solar.
- To provide a comprehensive review on RRS adoption.
- To understand the technological acceptance mechanism of RRS.

RESEARCH METHODOLOGY

In present study existing literature were reviewed. Review method has been employed for this paper. All research articles that were reviewed in this study are qualitative and quantitative, thus the determinants can be deeply understood as both methods were utilized for the research in those papers. In several studies ABM (Agent Based Model) was used mostly to understand the determinants of residential rooftop solar.

ECONOMIC DETERMINANTS OF RRS

The initial high investment, LCOE (Levelized Cost of Electricity) are the major determinants that influences the adoption of rooftop solar at residential sector as the low- income group of people cannot afford the high initial investment on rooftop solar though it will beneficial for them and subsidised (Mark M. Akrofi, 2023). Home ownership is necessary in several countries to adopt the rooftop solar at home, those who are lived in rental homes are not eligible for the subsidised rooftop solar adoption (Yu-Jui Chang, 2023).As economics deals with inflation and other monetary aspects time value of money is the important determinants that affect the investment on rooftop solar system at domestic sector (Dusgun Agdas, 2023).The rates of loan for RRS is one of the major economic determinants of RRS (Pasapong Gamonwet, 2023).

Local solar rooftop installing companies and government are the key driver to speed up the adoption of RRS, moreover the price of electricity and payback period of the system are crucial factors for the same (Nurwidiana Nurwidiana, 2021).The FiT (Feed in Tariff) scheme in Hong Kong is not sufficient for the promotion of RRS as the high initial investment is the barrier for low and middle income households (Jinqing Peng, 2013).

SOCIAL DETERMINANTS OF RRS

(Eric O'Shaughnessy, 2023) noted that peer effect is positively associated with high income group for adoption of rooftop solar whereas the same effect is negatively associated with low-income group. Socio-economic factor such as population density is found more influencing the adoption of rooftop solar for households in China (Kewei Xu, 2023). The lack of proper information and awareness were the were the factors that slower the pace of rooftop solar at in rural areas (Weidong Wang, 2023). (Nurwidiana Nurwidiana, 2021)noted that the environmental awareness is a one determinate that is non- monetary but affects a lot to the uptake of rooftop solar at residential sector.

Other determinants of RRS

Apart from economic and social determinants there are several determinants that determine the success of rooftop solar such as technical (power factor), meteorological (solar irradiance), psychological (Jordi Olivella, 2021).

CONCLUSION

On the basis of review of existing literature, it can be concluded that the adoption of rooftop solar at residential sector is determined by various determinants i.e., economic, social and other but RRS is more sensitive for economic determinants therefore the government should take several initiatives (subsidies, tax concession, tax rebates) in order to give a pace to energy transition in residential segment.

The government support is required in all segments not only for residential segment in order to achieve the renewable targets. In several countries the governments have been started FiT scheme but peoples' responses towards this particular scheme is not as much expected and some reluctance from distribution companies (Discom) are there as their revenue will get affected from RRS adoption therefore all these issues are yet to be addressed in order to achieve Net Zero Emission (NEZ) in the world.

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Conflict of Interest

The author declared no conflict of interest.

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