World Academy of Science, Engineering and Technology
International Journal of Energy and Power Engineering
Vol:16, No:09, 2022

# Distributed Energy Resources in Low-Income Communities: a Public Policy Proposal

**Authors :** Rodrigo Calili, Anna Carolina Sermarini, João Henrique Azevedo, Vanessa Cardoso de Albuquerque, Felipe Gonçalves, Gilberto Jannuzzi

**Abstract :** The diffusion of Distributed Energy Resources (DER) has caused structural changes in the relationship between consumers and electrical systems. The Photovoltaic Distributed Generation (PVDG), in particular, is an essential strategy for achieving the 2030 Agenda goals, especially SDG 7 and SDG 13. However, it is observed that most projects involving this technology in Brazil are restricted to the wealthiest classes of society, not yet reaching the low-income population, aligned with theories of energy justice. Considering the research for energy equality, one of the policies adopted by governments is the social electricity tariff (SET), which provides discounts on energy tariffs/bills. However, just granting this benefit may not be effective, and it is possible to merge it with DER technologies, such as the PVDG. Thus, this work aims to evaluate the economic viability of the policy to replace the social electricity tariff (the current policy aimed at the low-income population in Brazil) by PVDG projects. To this end, a proprietary methodology was developed that included: mapping the stakeholders, identifying critical variables, simulating policy options, and carrying out an analysis in the Brazilian context. The simulation answered two key questions: in which municipalities low-income consumers would have lower bills with PVDG compared to SET; which consumers in a given city would have increased subsidies, which are now provided for solar energy in Brazil and for the social tariff. An economic model was created for verifying the feasibility of the proposed policy in each municipality in the country, considering geographic issues (tariff of a particular distribution utility, radiation from a specific location, etc.). To validate these results, four sensitivity analyzes were performed: variation of the simultaneity factor between generation and consumption, variation of the tariff readjustment rate, zeroing CAPEX, and exemption from state tax. The behind-the-meter modality of generation proved to be more promising than the construction of a shared plant. However, although the behind-the-meter modality presents better results than the shared plant, there is a greater complexity in adopting this modality due to issues related to the infrastructure of the most vulnerable communities (e.g., precarious electrical networks, need to reinforce roofs). Considering the shared power plant modality, many opportunities are still envisaged since the risk of investing in such a policy can be mitigated. Furthermore, this modality can be an alternative due to the mitigation of the risk of default, as it allows greater control of users and facilitates the process of operation and maintenance. Finally, it was also found, that in some regions of Brazil, the continuity of the SET presents more economic benefits than its replacement by PVDG. However, the proposed policy offers many opportunities. For future works, the model may include other parameters, such as cost with low-income populations' engagement, and business risk. In addition, other renewable sources of distributed generation can be studied for this purpose.

**Keywords :** low income, subsidy policy, distributed energy resources, energy justice
**Conference Title :** ICEP 2022 : International Conference on Energy Planning
**Conference Location :** San Francisco, United States
**Conference Dates :** September 27-28, 2022