

# Prosumer Community: A Risk Aversion Energy Sharing Model

Shichang Cui, Yan-Wu Wang, Chaojie Li, Jiang-Wen Xiao

**Abstract—** Household photovoltaic (HPV) prosumers and the community photovoltaic (CPV) system have been growing rapidly with the development of the sustainable technology. The uncertainties of these distributed renewable energy resources bring a significant challenge to the design of power market mechanism and the energy dispatch of the power system for promoting energy efficiency. It is essential to develop a novel efficient energy management strategy for addressing this challenge from the perspective of community prosumers. Accordingly, a risk aversion energy sharing model based on a devised local energy market is presented. A stochastic game is established to minimize prosumers' energy costs and the weighted conditional value-at-risk (CVaR) of energy sharing loss of uncertain CPV through optimal energy sharing profiles. The household loads and HPV outputs are considered as stochastic parameters in the game model. Moreover, a sample weighted average approximation (SWAA) method is proposed for a better estimation of the stochastic game while the SWAA equilibrium is obtained by a relaxation method based algorithm with theoretical proof. In addition, the blockchain technology is introduced as a distributed and secure way to facilitate the energy sharing model. The case studies show the efficiency of the proposed energy sharing model and the algorithm.

**For the published version of record document, go to:**  
<http://dx.doi.org/10.1109/TSTE.2019.2909301>