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Indicators for suitability and feasibility assessment of flexible energy resources

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Abstract-

Recommender systems play a critical role in optimizing building energy consumption by providing personalized advice based on data analytics and user preferences. However, the literature highlights the need for systems that can justify their recommendations, as many of these systems use non-transparent machine-learning techniques. This research introduces two distinct types of indicators with three main goals: to identify patterns of flexible consumption behavior using transparent and straightforward methods suitable for remote decision support systems, thereby eliminating the need for extensive databases; to evaluate the feasibility of installing solar panels on building facades, rooftops, and structures using high-resolution 3D models; and to enhance understanding through a quantitative assessment of the feasibility and suitability of integrating renewable energy sources, particularly photovoltaic systems. Flexible prosumers are scored by assessing their energy consumption level, consistency, and variability through the Flexible Consumption Indicators. Topology Indicators perform a quantitative assessment of the feasibility of support surfaces for installing photovoltaic panels, taking into account rooftop pitch angles, orientations, and surrounding and internal structures, identifying those areas exposed to sufficient levels of irradiation. This study, which uses actual consumption profiles and similar households' buildings 3D models, demonstrates how the proposed indicators can aid identifying users with flexible consumption profiles that reside in buildings compatible with renewable energy sources, aiding in decision-making process within the energy transition.

Index Terms- Indicators; Demand side management; Solar energy; Decision support systems; Building topology

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