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(57) Abstract :
ABSTRACT DEVELOPMENT OF AUTONOMOUS SMART GRID SOLAR PANEL NETWORKS FOR IMPROVED RELIABILITY The development of autonomous smart grid solar panel networks has the potential to enhance the reliability and quality of the energy they produce. Autonomous smart grid networks, which can be composed of stand-alone photovoltaic (PV) systems connected to the power grid, are capable of continuously managing solar production in order to match changing demand. This is typically accomplished by using advanced algorithms to control the grid-bound solar energy, including multiple solar panel sources and converters. The benefits of autonomous smart grid solar panel networks are numerous. They are capable of achieving greater levels of energy reliability and system stability while lowering the total costs associated with electric infrastructure and energy production. Autonomous smart grid networks can also offer improved reliability when it comes to shade-related outages. By storing excess energy when solar panels are partially or fully shaded, peak solar production can be maintained during periods of reduced direct sunlight. Furthermore, the development of autonomous smart grid solar panel networks allows for more granular control over grid-connected solar energy. This facilitates a move from traditional, centralized production models to more distributed and flexible architectures, thereby enabling the wide-scale adoption of renewable energy sources by leveraging real-time solar and electric grid data. Additionally, this increased data availability and control makes it easier to identify and diagnose potential failure points within the solar energy network. In addition, an autonomous smart grid solar panel network may result in fewer maintenance requirements for the system as a whole. This is an important factor for operators, who are largely responsible for overseeing system performance and ensuring operational reliability. Overall, autonomous smart grid solar panel networks offer numerous potential benefits to the energy system. These benefits include improved energy reliability, greater stability and lower costs for electric infrastructure and energy production, as well as increased data availability and control, fewer maintenance requirements, and a move to distributed renewable energy sources. Taken together, these advantages have the potential to create greater efficiency within the energy system.

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