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| **Abstract:** |  |
| Abstract— The research work reports on the design, simulation, and implementation of a smart net-metering system for distributed photovoltaic (PV) and grid-connected customers. This paper presents a comprehensive study on the development and deployment of a smart net-metering system for distributed PV systems and grid-connected customers. This work aims to demonstrate the bidirectional flow of electricity for net-metered customers. Next, the paper delves into the design aspects of the proposed smart net-metering system. It discusses the architecture and components required for the seamless integration with distributed PV systems and the grid. The design incorporates advanced metering technologies, communication protocols, and intelligent algorithms to enable real-time monitoring, control, and data exchange between PV systems, customers, and the utility. The simulation and modeling of the smart net-metering system are done using MATLAB and Proteus. Various scenarios are simulated to assess the system’s performance, including energy generation, consumption, and bi-directional power flow with the grid. The results of the simulations provide valuable insights into system behavior and performance under different conditions. The implementation phase is then presented, showcasing the practical deployment of the designed smart net-metering system. The experimental hardware outlines the installation process and integration with the existing infrastructure. The experimental results show real time outcomes of the system on the LCD screen. | |