

## Design of Transformerless Electric Energy Router in Smart Home

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**Abstract :** A single-phase transformerless electric energy router (TL-EER) is proposed for renewable energy management and power quality improvement in smart homes. The proposed TL-EER only contains four semiconductor switching devices, which reduces costs greatly compared to traditional electric energy routers. TL-EER functions as intelligent systems that optimize the flow and distribution of energy within a grid, enabling seamless interaction between generation, storage, and consumption. In addition, TL-EER operates in multiple modes and could be converted to diverse topologies by changing the states of relays. As for power quality, voltage and current compensating methods are adapted. Thus, high-quality electrical energy could be transferred to the load, and the grid-side power factor could be improved. Finally, laboratory prototypes are established to validate the effectiveness of the system.

**Keywords :** transformerless, electric energy router (EER), power flow, power quality, power factor

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