

## The Heating Prosumer: Optimal Simultaneous Use of Heat-Pumps and Solar Panels

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**Abstract :** This paper analyses the consequences of a heat pump on the optimal behavior of a prosumer. A theoretical microeconomic model is developed for household heating and electricity consumption to analyze the profitability of installing a solar PV system with a heat pump, battery storage, and grid use. The aim is to present the optimal scenario of investment in renewable energy equipment to cover domestic and heating needs. Simulation data of a French house of 170m<sup>2</sup> in Chambéry are used in this paper. The house is divided into 5 zones with 3 heated zones of 89.4 m<sup>2</sup> occupied by two people. The analysis is based on hourly data for one year, from 00:00 01/01/2021 to 23:00 31/12/2021. Results indicate that without taking the cost of materials and no financial aid, the most profitable scenario for a household is when he owns solar panels, a heat pump, and battery storage. However, with the costs and financial aid of the French government for energy renovation, the net economic surplus change and the profitability during 20 years are important when the household decides to add a heat pump to existing solar panels. In this scenario, the household can realize 35.84% as a surplus change improvement, but this cannot cover all installation costs. The household can get benefits and cover all installation costs after exploiting financial support in the case of adopting a heat pump. The investment in a battery is still not profitable because of its high cost and the lack of financial aid. Some public policy recommendations are proposed, especially for solar panels and battery storage.

**Keywords :** household's heating, prosumer, electricity consumption, renewable energy, welfare gain, comfort, solar PV, heat pumps, storage

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