This paper presents a model predictive controller developed in order to minimize the cost of grid energy consumption and maximize the amount of energy consumed from a local photovoltaic (PV) installation. The usage of as much locally produced renewable energy sources (RES) as possible, diminishes the effects of their large penetration in the distribution grid and reduces overloading the grid capacity, which is an increasing problem for the power system. The controller uses 24 hour prediction data for the ambient temperature, the solar irradiance, and for the PV output power. Simulation results of a thermostatic controller, a MPC with grid price optimization, and the proposed MPC are presented and discussed.