

Article

The Influence of Photovoltaic Self-Consumption on Water Treatment Energy Costs: The Case of the Region of Valencia

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Abstract: Energy consumption is one of the principal components of the operative costs incurred by providers of water services, both financial and environmental. Fortunately, in recent years solar panel technology has improved substantially, and photovoltaic self-consumption has become a tool that can reduce the costs of water reuse and other water services. Regions with a scarcity of water resources make a considerable use of non-conventional sources, consuming a significant amount of energy, which has a high financial and environmental cost and compromises the sustainability of the water supply. This research analyses the possibility of replacing part of this energy with self-consumption through photovoltaic panels based on data obtained for the Region of Valencia in order to analyse the impact of energy substitution on energy costs. Performing a Cost–Benefit Analysis, self-consumption projects require an electricity market price of between 0.14 and 0.18 EUR/kWh, so in financial terms it is not a particularly attractive alternative. However, the avoided greenhouse gas emissions have a high value, and including them in the calculations, the price needed to be in feasible amounts of 0.04–0.10 EUR/kWh for a small installation and 0.02–0.08 EUR/kWh for a large one. In other words, photovoltaic self-consumption is still today an alternative with financial difficulties, but the associated environmental benefit justifies public intervention as it is a beneficial energy alternative in a context of high greenhouse gas emissions.



Citation: García-López, M.; Montano, B.; Melgarejo, J. The Influence of Photovoltaic Self-Consumption on Water Treatment Energy Costs: The Case of the Region of Valencia. *Sustainability* **2023**, *15*, 11508. <https://doi.org/10.3390/su151511508>

Academic Editor: Seung-Hoon Yoo

Received: 29 June 2023

Revised: 20 July 2023

Accepted: 24 July 2023

Published: 25 July 2023



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Keywords: energy cost; photovoltaic self-consumption; wastewater treatment; electricity prices; photovoltaic energy

1. Introduction

The climate conditions of our planet are becoming increasingly adverse. And there is no doubt that the pollution that we have generated over the years is significantly affecting our way of life and how the different economic activities of our society are carried out. Therefore, one of the key concepts on which the way in which we address this situation should be based is the circular economy. The fundamental pillar of the circular economy consists of minimising the generation of waste through the constant reuse of materials or products. Fossil fuels form part of a linear economy as they are extracted, used to generate energy and give rise to one or several waste products that affect the natural environment. However, renewable energies are more consistent with the circular economy concept as they generate much less pollution and their materials can be reused [1]. In addition, renewable energies, particularly in the case of photovoltaic solar panels, represent a strong economic stimulus, thanks to the generation of business and, therefore, employment. This is highly relevant in a context such as the current situation, where the pandemic has a strong economic impact [2].

In the past, all of these advantages were offset by two strong disadvantages: the low level of efficiency of the solar panels and the high cost generated by their installation and maintenance. However, the technology has improved over time [3], reducing their cost and improving their efficiency significantly [4,5], which explains the recent increase in the