

Environmental assessment of photovoltaic energy storage power station

What are the environmental impacts of PV solar power plants?

In this study, the impacts of PV solar power plants on the environment will be investigated. Some of the most significant environmental impacts of PV solar power plants are related to land use, greenhouse gas emissions (GHG), water consumption, hazardous materials, visual impact, and noise [3].

What data is required for a complete analysis of a PV power plant?

The data required for a complete analysis of the PV power plant concerns the raw materials used, the energy consumed, and the emissions generated at each stage of the life cycle studied. This study was based on secondary data, i.e., generic or theoretical data from commercial databases, various study reports, or other published sources.

What is the practical potential of PV power plants?

The practical potential of PV power plants is the amount of solar energy that can be converted into electricity by PV systems under acceptable conditions. This depends on the solar radiation, the area desirable and acceptable for PV installation, and the impact and benefit of PV technology.

Do PV systems have a life cycle assessment?

Numerous studies on the life cycle assessment (LCA) of PV systems have been carried out in the literature [7, 8, 9, 10]. These studies have mainly focused on small (1-100 kWp) and medium-sized (100 kWp-1 MWp) stand-alone PV installations.

How to assess the sustainability of solar PV plants?

The sustainability of solar PV plants should be assessed using a qualitative methodology, dissociated indicators, and potential negative interactions between spheres of influence. Subramaniyan et al. [35] present a method for predicting the degradation rate of PV modules based on physical models and statistical data modeling.

Does expansion of PV capacity have a positive impact on the environment?

CO₂ emissions are at the same level as for concentrated solar power, with a decreasing trend. Pollutant emissions, noise, and water consumption are not major problems compared to other types of power plants. Overall, it can be concluded that the expansion of PV capacity has a very positive impact on the environment.

1. Introduction

This paper presents an original life cycle assessment (LCA) of a concentrating solar power (CSP) plant with thermochemical energy storage (TCES). The studied CSP plant is a hypothetical solar tower pla...

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PV Life Cycle Assessment (LCA) is a structured, comprehensive method of quantifying and assessing material and energy flows and their associated emissions from manufacturing, transport, installation, use and end of life.

To realize the goal of net zero energy building (NZEB), the integration of renewable energy and novel design of buildings is needed. The paths of energy demand reduction and additional energy supply with renewables are separated. In this study, those two are merged into one integration. The concept is based on the combination of photovoltaic, ...

The study quantitatively evaluates the ecological environment effect of large-scale desert photovoltaic development and analyzes the impact of photovoltaic power station ...

Microgrids are designed to utilize renewable energy resources (RER) that are revolutionary choices in reducing the environmental effect while producing electricity. The RER intermittency poses technical and economic challenges for the microgrid systems that can be overcome by utilizing the full potential of hybrid energy storage systems (HESS). A microgrid ...

This work aims to determine the Energy Payback Time (EPBT) of a 33.7 MWp grid-connected photovoltaic (PV) power plant in Zagtoui (Burkina Faso) and assess its environmental impacts using the life cycle assessment tool according to ISO 14040 and 14044 standards. A "cradle to grave" approach was used, considering 1 kWh of electricity produced ...

Photovoltaic power is a rapidly growing component of the renewable energy sector. Photovoltaic power stations (PVPSs) on coastal tidal flats offer benefits, but the lack of information on the effects of PVPSs on benthic ecosystems and sediment carbon storage can hamper the development of eco-friendly renewable energy. We sampled the macrobenthos ...

This is followed by renewable sources, i.e., hydropower, wind power, and solar power, with almost similar requirements with significant variations based on site-specific conditions. Coal requires much less land than any renewable source of energy in an assessment based on direct land requirements only, i.e., power plants and mining activities.

According to a life cycle assessment used to compare Energy Storage Systems (ESSs) of various types reported by Ref. [97], traditional CAES (Compressed Air Energy Storage) and PHS (Pumped Hydro Storage) have the highest Energy Storage On Investment (ESOI) indicators. ESOI refers to the sum of all energy that is stored across the ESS lifespan, divided ...

Photovoltaic-storage integrated systems, which combine distributed photovoltaics with energy storage, play a crucial role in distributed energy systems. Evaluating the health status of photovoltaic-storage ...



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In response to the problem of increasing climate change and energy security, investment in renewable energy sources has increased significantly both in Europe and globally. Wind and solar power plants are expected to be the largest contributors to global decarbonization, ranking first and second in projected capacity by 2050. As all power plants have a certain ...

Using solar photovoltaic power sources has become a discussed topic in the construction and energy industry. The pressing need to reduce reliance on fossil fuels, increasing costs of traditional ...

Design of floating photovoltaic power plant and its environmental effects in different stages: A review ... Design parameters of 10KW floating solar power plant," in . International Advanced Research Journal in ...

The photovoltaic-energy storage-integrated charging station (PV-ES-I CS), as an emerging electric vehicle (EV) charging infrastructure, plays a crucial role in carbon reduction and alleviating ...

The expansion of pumping and storage units on a pre-existing reservoir, namely, a mixed pumped storage power station, is different from a conventional power station in terms of the thermal ...

The characterization of electric vehicles as environmentally friendly means of transportation hinges, on the one hand, upon the manner in which the energy for their charging is generated and, on the other hand, on the recyclability of the materials composing them, with primary emphasis on the recycling of batteries. Given that we are still in the early stages of ...

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The simultaneous escalation in energy consumption and greenhouse gases in the environment drives power generation to pursue a more sustainable path. Solar photovoltaic is one of the technologies identified as a possible source of clean, green, and affordable energy in the future. The vast land area occupied by solar photovoltaics to generate electricity suggests ...

Photovoltaic (PV) solar power plants are a promising technology for generating clean and renewable electricity from solar energy. However, like any other power plant, PV solar power plants can have environmental impacts ...

The objective of this study is to compare the LCA of various tower configuration concentrating solar power (CSP) plants resulting from designing different thermal energy storage capacities. The study uses as base case



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a commercial baseload plant with 17.5 h of storage.

An assessment of floating photovoltaic systems and energy storage methods: A comprehensive review Aydan Garrod, ... like all solar power systems, FPVs are subject to variability and intermittency due to changes in weather, seasons, and time of day. The environmental ... HPP Hydro power plant IPCC Intergovernmental panel on climate change

In stand-alone power systems, technical, economic, and environmental (TEE) assessment of hybrid energy systems under uncertainty is an important issue. This paper focuses on the TEE assessment of a stand-alone hybrid energy system composed of photovoltaic (PV) and diesel generator (DG) with/without battery energy storage (BS) in remote islands in China. ...

This paper takes into account the demand-side satisfaction of the traction power supply station with the photovoltaic-storage integrated energy station, defining demand-side satisfaction (B1) and quantifying it through ...

In this context, VPPs are a significant innovation in the energy sector, as they aggregate distributed energy resources, such as rooftop solar photovoltaics (PVs), and batteries, unifying them into a network that can operate like a single power plant (Wang et al., 2023). Thus, VPPs can generate electricity from renewable sources as well as balance the electricity load, ...

Purpose High concentrated photovoltaic (HCPV) technology transforms solar radiation into electricity at efficiencies far higher than conventional PV cells. The aim of this paper is to evaluate the environmental impact of a commercial HCPV plant located in Morocco by determining the impact of this technology on a wide range of environmental categories. The ...

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