

Design of a Solar-Powered Portable Phone Charger for Everyday Use

Natruell Smith, Writing for Engineers, Professor Weyn, 4/25

Introduction

Purpose: There is limited access to phone charging and explain the goal of design a portable, solar-powered solution to address it

Background: Phone are essential, but battery life often ends during long days or outdoor activities.

Problem Statement: There is a need for a portable charger, sustainable charging solution, that doesn't rely on a power outlet or batteries.

Objective: Design a compact, solar-powered phone charger that can store energy and charge a phone through their charging ports.

Design Requirements

Portability: Must fit in a backpack or pocket

Charging Capability: Must provide at least on full phone charge

Durability: Must withstand outdoor use

Sustainability: Powered only by solar energy

Safety: Prevent overheating or overcharging

Design Description

Components: Small solar panel, rechargeable battery, charge controller module, USB output port, and an outside case

How it works: Sunlight charges the battery (solar panel), the charge controller manages energy flow and battery protection, and user plugs in their phone with a cord to take the portable power.

Design Evaluation

The solar-powered portable phone charger meets its main goal of providing a sustainable and portable way to charge devices without using traditional power sources. It is affordable, easy to carry, and uses a charge controller to keep the battery safe and efficient. However, there are some limitations. Charging can be slow, especially in low sunlight, and the device depends on good weather to work well. Some parts may also be fragile without a strong case. In the future, the design could be improved by adding a larger solar panel, a more durable casing, a battery indicator, or even wireless charging features to make it more user-friendly and reliable.

Testing Plan

Test 1: Charging speed in full daylight vs partial daylight

Test 2: Battery capacity, can it fully charge a phone?

Test 3: Heat test, does the case stay cool in direct sun exposure

Test 4: Durability, how well does the case hold up?

Conclusion

The solar-powered portable phone charger offers an effective and eco-friendly solution for charging mobile devices without relying on electrical outlets. Designed with affordability, portability, and sustainability the charger uses solar energy to store power in a rechargeable battery, making it ideal for students, travelers, and outdoor use. While the design has some limitations, such as slower charging in low sunlight and the need for a protective casing, it could successfully demonstrate the potential of small-scale renewable energy technology. With future improvements, this charger could become a reliable and convenient tool for everyday use.