# Chapter 1: Introduction

## 1.1: Background

Solar power is one of the most used renewable source of energy in the world since it is environmental-friendly. According to Akbar Maleki, he states that solar energy is among the most attractive alternatives for the current energy systems due to its availability in various regions, easier predictability compared with wind and its high content (Maleki, 2020). Most people prefer using solar power as their main source of electricity at their homes due to its many advantages. This includes: it’s highly cost-effective and no occurrence of power blackout. However, people tend to oversee the advantages of using solar power that they forget it also has its side of disadvantages. Most people tend to purchase the wrong size and poor quality solar panels from illegitimate companies.

This problem leads people to waste their money in purchasing the wrong size and poor quality solar panels. According to solvoltatics website, it states that low-quality panels and batteries may not be as efficient or long-lasting as higher-quality options, which can lead to increased costs over time (Bailey, 2023). This is because they lack a proper system to advise them the correct size of solar panel they require and also to connect them to the best manufacturers. The wrong size and poor quality solar panels will result in production of little electricity which is insufficient to run homes. This in turn will lead to inefficiency and ineffectiveness of home appliances since they would not reach their optimal performance. This is, indeed, very disadvantageous and frustrating to the consumers.

This is a very major and serious issue to all those who use solar power as the main source of electricity. They include: households, educational institutions, small businesses and big companies which can afford to purchase solar panels. Poor quality solar panels will produce little electricity required to run a company or an education institution such as a university. Thus, will result to consumers opting to use electricity supplied by the Kenya Power and Lighting Company (K.P.L.C.) which is expensive. According to the IESE website, it states that using electricity from the K.P.L.C. is very expensive with high tariffs and connection fees (IESE, 2017). This is after considering that companies and educational institutions will have to purchase large amounts of electricity tokens to ensure that they run smoothly thus minimizing the profits they make which is very discouraging to them.

According to Rosen, J., Smith, A. "Optimal Sizing of Photovoltaic Systems." Journal of Renewable Energy, 2017, 10(2), 123-140, she emphasizes on the importance of accurately sizing solar panel systems to ensure optimal energy production and cost-effectiveness. However, people have come up with solutions like trying to advise consumers on how to install and correctly mount solar panels on their buildings to ensure maximum exposure to sunlight for maximum production of electricity (Bolt, 2023). Nevertheless, this solution has not exactly solved the issue of what sizes of solar panels the household or institution to satisfy their electricity need. To address the problem, this project aims at calculating the correct size of solar panels and batteries and also to connect consumers to legitimate manufacturing companies.

## 1.2: Problem Statement

The problem is that people tend to buy the wrong size of solar panels and batteries to provide the required amount of electricity to their homes. According to Energy Theory website, it confirms that one of the main issues in purchasing solar panels and batteries is that it can be difficult to determine the correct size of solar panels and batteries needed to meet their energy needs (Bolt, 2023). Furthermore, there is also a problem when it comes to connecting customers and solar panel manufacturers to be able to purchase good quality solar panels. People who prefer to use solar power as their main source of electricity are faced with this challenge especially those who live in rural areas. This is due to various factors such as weather conditions, little or no awareness on solar power as a source of electricity.

Most people are unaware or lack enough information regarding solar technology and purchasing of good quality solar panels. They do not know where or which solar manufacturing company produces the best quality solar panels and batteries. This results to them purchasing the wrong size of solar panels and batteries which will produce less electricity required to run their homes. For distribution, customers will end buying low quality solar panels from counterfeit companies thus pouring their money down the drain. Moreover, other people may encounter middlemen who charge them expensive fees to connect them to the best solar manufacturing companies which is very inappropriate. According to the Handwrytten website, it affirms that there is a lack of online marketplaces that connect customers to legitimate solar panel manufacturers (Handwrytten, 2023).

This will result to inefficiency and ineffectiveness of home appliances since they would not reach optimal performance. According to the Anethic website, it states the effects of improper sizing of solar panels which is undersized panels may not generate enough electricity to meet your energy needs, while oversized panels may be unnecessarily expensive and occupy more space than necessary (Anethic, 2023). The consumers will also waste a lot of money purchasing the solar panels due to high charges imposed by middlemen. If the gap is not filled it will result to consumers using electricity supplied by the Kenya Power and Lighting Company (K.P.L.C.). The purchase of electricity from the K.P.L.C. is also very costly thus the customer still loses more money hence cost-ineffective. Lack of a proper system to connect customers to the solar companies and to remove the existence of middlemen and also to calculate for them and advise them one the most appropriate solar panels and batteries to purchase is a key contributing factor to this problem.

## 1.3: General Objective

To create a web-based model to solve the problem of wrong sizing and mismatch of solar panels and batteries and the distribution of solar panels and batteries from the respective companies to the customers.

## 1.4: Specific Objectives

1. To investigate the correct sizing and matching of solar panels and batteries in homes.
2. To evaluate the challenges experienced during sizing and matching process of solar panels and batteries.
3. To design an algorithm to facilitate the sizing and matching of solar panels and batteries.
4. To develop the designed solution.
5. To test the designed solution.