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Customer Background

A small town in the Colca Canyons of Peru wants to develop a spa for hikers and tourists to stop and relax along their journey. This project the team to design a pumping system requires to source this water to the spa from a hot spring in the canyon below.

Problem Statement

The aim of the project is to create a water lifting system that can move hot spring water to a man-made spa at a height of 250 meters. Renewable energy sources will power the system as well as wind power. To assess the functional performance of the full-scale design, a scaled-down prototype is being built.

Requirements

Design Requirements	Design Targets
Water needs to be pumped from a geothermal/hot spring to an elevated spa	Elevation: 150m
System needs to run fully on renewable energy	Power: 1500W
Water needs to be pumped at a steady rate	Flow rate: 5-10 GPM
Design needs to be able to communicate electronically	Distance: 200 meter communication

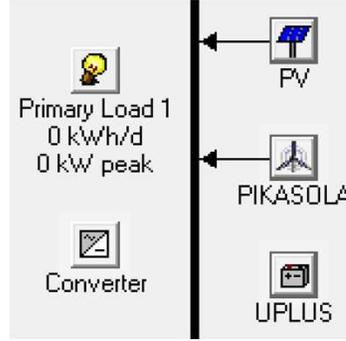
Experimentation and Concepts

Power Calculations:

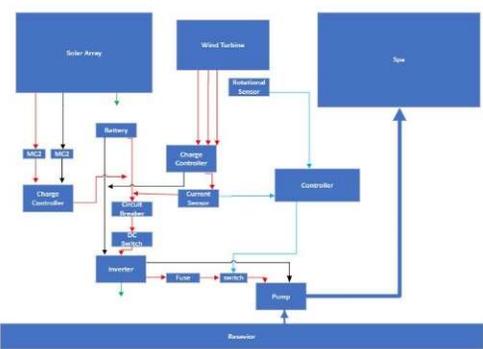
$$Power = \left(\frac{10 \text{ gpm} \cdot 500 \text{ ft} \cdot 1 \text{ lb/ft}^3}{3960 \cdot 0.50} \right) \cdot 745.7 = 2.5 \text{ HP or } 1850 \text{ Watts}$$

$$Solar \text{ Power} = 1850 \text{ Watts} - 440 \text{ Watts} = 1410 \text{ Watts}$$

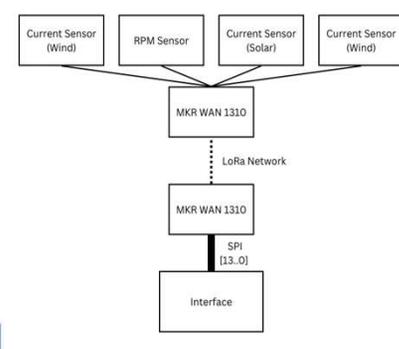
Homer Simulation:



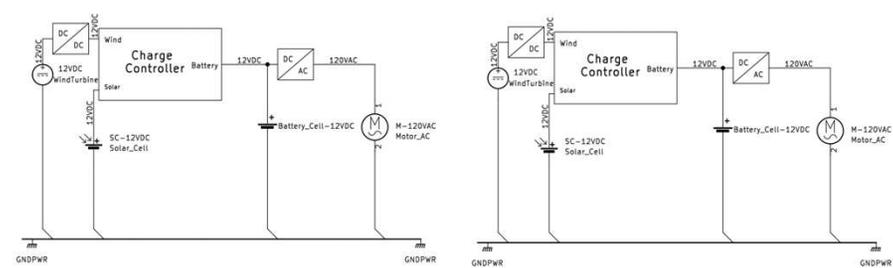
Final Design



Block Diagram of Full System



Block Diagram of Digital System



Electrical Schematic of Full-scale System and Scaled-down System

Testing

Solar Panels:

