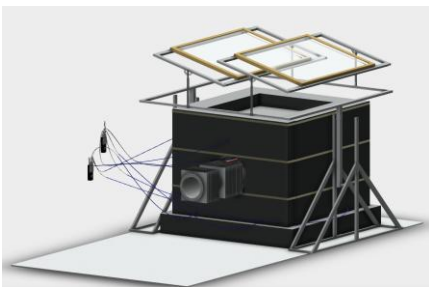
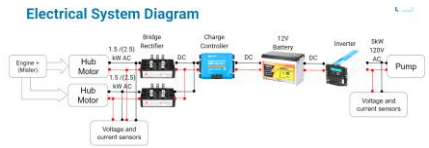
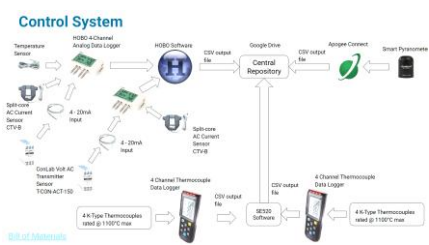
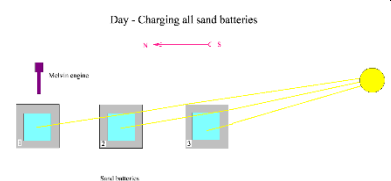
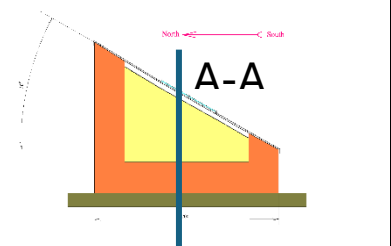
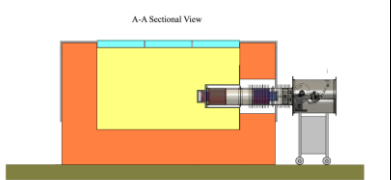


# Fossil-Fuel-Free Irrigation Project Overview

Last update: 5 September 2025

Proof-of-Concept System	Subsystem	Proposed Final System	
  <b>Electrical System Diagram</b>   <b>Control System</b>   <small>Source: Microduino</small>	<ul style="list-style-type: none"><li>1 lens system</li><li>2 Sheet-style Fresnel lenses (30" x 60") on adjustable frame that follows sun daily and allows seasonal orientation.</li><li>Capture area: 2.3 m<sup>2</sup>.</li><li>Focal length: ~31" (787mm).</li></ul> <ul style="list-style-type: none"><li>600mm of rock wool board (ComfortBoard 110) for sides and bottom.</li><li>Double-pane ¼" tempered glass for daytime cover.</li><li>Rock wool for nighttime.</li></ul> <ul style="list-style-type: none"><li>2.3 metric tons of sand.</li><li>1.4 m<sup>3</sup> of sand.</li><li>Need to determine how to efficiently move heat through sand.</li></ul> <ul style="list-style-type: none"><li>1 5-kW "Melvin" Stirling engine.</li><li>High-pressure (40 psi) chamber with misting feature (needs to be perfected).</li></ul> <ul style="list-style-type: none"><li>2 hub motors in Melvin.</li><li>12-volt DC battery to 'clean' output power.</li><li>Inverter to convert to 110V AC power.</li></ul> <ul style="list-style-type: none"><li>Cooling water initially provided by hose from faucet.</li><li>Closed system using air cooling of heated water.</li></ul> <ul style="list-style-type: none"><li>8 Temp sensors in sand, sleeve and on 'cold' end of engine.</li><li>6 voltage &amp; current sensors on hub motors and inverter output</li><li>Pyranometer to measure solar.</li></ul>	<ul style="list-style-type: none"><li>3 separate lens systems</li><li>15 arrays of 16x12 square lenses (830mm x 630mm) on fixed steel cover at permanent 30° angle to horizontal and facing south for each battery.</li><li>Capture area: 8.3 m<sup>2</sup>.</li><li>Focal length: 93.5mm (~3.7").</li></ul> <ul style="list-style-type: none"><li>600mm of rock wool board for sides and bottom.</li><li>Fresnel lenses mounted in steel frame as daytime cover.</li><li>Rock wool for nighttime.</li></ul> <ul style="list-style-type: none"><li>13 metric tons of sand/system.</li><li>7.2 m<sup>3</sup> of sand/system.</li><li>Need to determine how to efficiently move heat through sand.</li></ul> <ul style="list-style-type: none"><li>1 5-kW "Melvin" Stirling engine.</li><li>High-pressure (40 psi) chamber with misting feature (needs to be perfected).</li></ul> <ul style="list-style-type: none"><li>2 hub motors in Melvin.</li><li>12-volt DC battery to 'clean' output power.</li><li>Inverter to convert to 440V AC power.</li></ul> <ul style="list-style-type: none"><li>Cooling water siphoned from pumped irrigation water.</li><li>Open system with new irrigation water providing constant cool water.</li></ul> <ul style="list-style-type: none"><li>Temp sensors in sand, sleeve and on 'cold' end of engine.</li><li>Need to determine other sensor requirements.</li></ul>	 <p>Day - Charging all sand batteries</p>  <p>A-A</p>  <p>A-A Sectional View</p> 