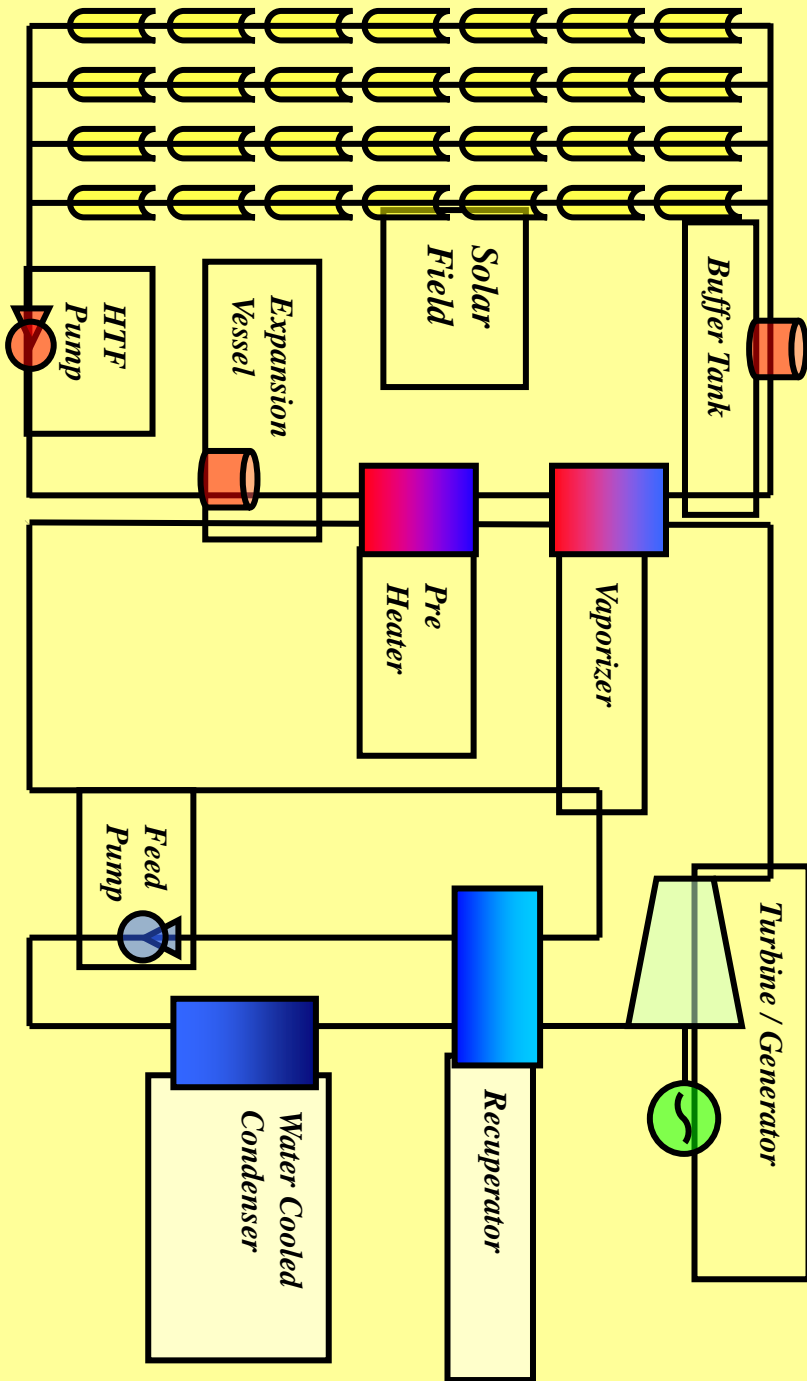


## Solar Thermal Power Plant Tour

This is a visual tour and a description of the major components in a 1 MW (million Watts) solar thermal power plant that uses the heat from the sun to boil and vaporize an organic liquid. The liquid boils at a much lower temperature than water (see center pages) and the vapor is used to power a turbine and an electric generator.



Cactus Moon Education, LLC.  
Understanding Green Technologies





**Aerial View of the Power Plant:**

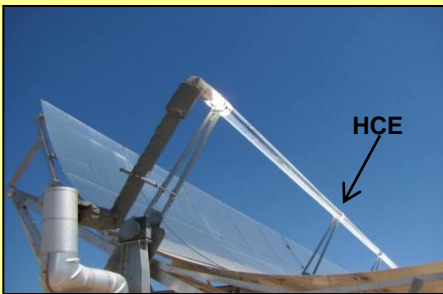
The **Solar Field** consists of 6 rows of parabolic shaped mirrors each ¼ mile long oriented in a North/South direction.

The **Power Block Skid** and the other pieces of equipment are located at the north end of the mirrors, and to the East is the evaporation pond where excess water from the cooling system is removed from the site by natural evaporation.



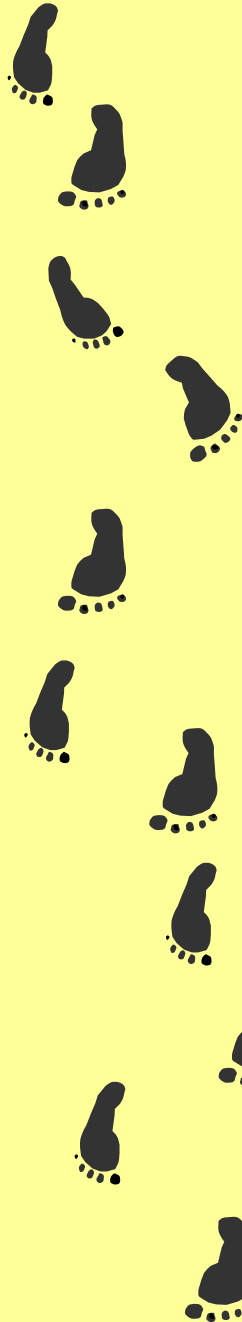
**Solar Field :**  
The **Solar Field** covers a total area of 110,000 square feet.

Each row of mirrors is 1,193 feet long and rotates on its North/South axis to track the sun as it travels across the sky from East to West each day



**Heat Collection Elements:**  
A **Heat Collection Element (HCE)** is a coated steel tube surrounded by a glass sleeve. The **HCEs** are located at the focal line of the mirrors.. The mirrors concentrate the sun's energy 70 times onto the **HCEs**.

The **HCEs** carry the mineral oil which gets heated to a temperature of 572° F by the time it leaves the solar field.



**Cooling Tower:**

The heat from the organic liquid vapor is transferred to the water in the **Condenser** and this water needs to be cooled down so that it can return to the **Condenser** again and cool more vapor. In the **Cooling Tower**,

water is exposed to the atmosphere, where the surrounding air takes away some of the heat. The cooled water can be re-circulated back to the **Condenser**.



**Transformer:**

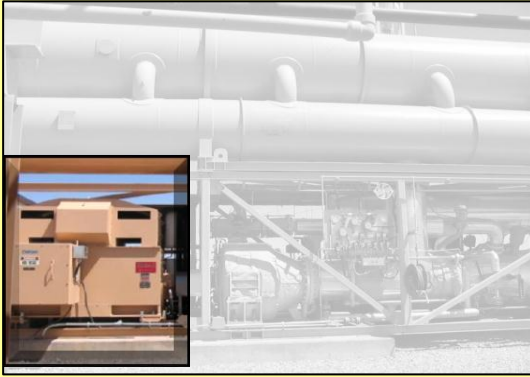
The **Transformer** steps up the voltage of the electricity generated by the Generator so that it matches the voltage of the electricity in the local electrical **Power Grid**.



**Power Grid:**

Once in the **Power Grid** the solar electricity generated from this parabolic trough solar power plant mixes with

electricity generated from nuclear power plants, coal fired power plants and natural gas fired power plants.



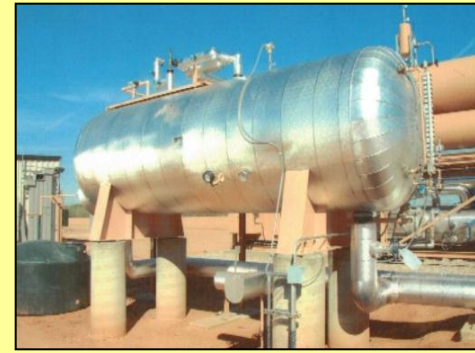
**Generator:**  
The **Generator** is the machine that converts rotational energy into electrical energy.

The **Generator** generates 1.37 MW (or 1,370kW) of electrical power. The pumps and other electrical equipment at the power plant consume 370 kW of power leaving 1,000 kW (1 MW) to be sent into the electrical power grid.



**Condenser:**  
After the organic liquid vapor has powered the **Turbine**, it exits the **Turbine** and enters the **Condenser** where cold water helps another heat exchanger cool the vapor back to a liquid.

The liquid is pumped around back to the **Vaporizer** where it is heated and vaporized and once more powers the **Turbine**.



**Expansion Vessel:**  
This is an important piece of equipment that prevents the pressure of the mineral oil in the solar field from becoming too high.



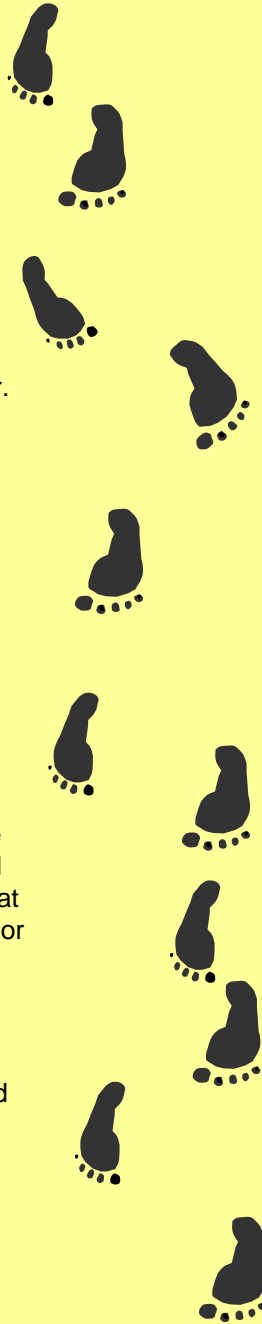
**Vaporizer :**  
A Heat Exchanger in the **Vaporizer** transfers the heat from the mineral oil to the organic liquid.

The liquid boils and the **vapor** enters the **Turbine** at a pressure of 323 PSIA.



**Turbine :**  
When the high pressure vapor hits the Turbine blades it causes the Turbine blades to move and rotate the Turbine shaft.

The Turbine shaft is connected to the Generator and so when the Turbine shaft rotates, so does the Generator.



# How it Works

## THREE PROCESS LOOPS

