Kalina (K-Cycle)

The California or Nevada Facility is based upon the use of binary geothermal power. Binary cycle generation is different from dry steam or flash technologies as the vapor or liquid from the geothermal reservoir never comes into direct contact with the blades of the turbine generator.

This method is used for liquid dominated geothermal resources of generally low and medium temperatures, ranging from approximately 200 to 420 degrees F. In the binary system, hot geothermal fluid is pumped or flows under pressure to the surface into heat exchangers and is typically returned to the reservoir through a re-injection system. The hot geothermal fluid is used as a source to heat another “working fluid” within a closed power plant cycle. The closed cycle includes evaporators, turbine-generators, condensers and pumps. The primary advantage of the binary thermal conversion method is its ability to efficiently convert more commonly found low and medium temperature liquid dominated resources into power through the use of working fluids that have low boiling temperatures. It also has the advantage of producing zero emissions, which neither dry steam nor flash cycles can claim.

The Kalina (K-Cycle) technology for thermal conversion represents the most significant improvement in thermal power plant design since the advent of the Rankine Cycle in the mid 1800’s. It does not alter any of the principal components of the thermal power cycle. Russian-born scientist Alex Kalina realized that the most important step was to change the working fluid. Traditionally, pure organic fluids such as iso-pentane and iso-butane have been used for the working fluid in binary geothermal power plants. These single-component fluids are inherently inefficient. Kalina's insight was to use ammonia-water mixtures as the working fluid. The use of ammonia-water reduces available work losses in heat transfer processes within the power plant. The result is a 20 to 40 percent greater thermal efficiency, increased electrical output and improved power plant specific cost. With its improvements in efficiency, productivity and cost, the Kalina Cycle is the successor to the Rankine cycle in binary geothermal applications.

The Kalina Cycle technology also offers significant operational safety and environmental impact advantages over the Rankine Cycle for binary geothermal applications. Ammonia is not an explosion hazard and is environmentally benign. Because of its proven applicability as a safe and efficient industrial heat transfer fluid for over 150 years, proper care and handling procedures for ammonia are well known.