Alternative Heat Rejection Methods for Power Plants
Faculty: Drs. Eckhard Groll and Suresh Garimella  Students: Robert Leffler and Craig Bradshaw

Objective
• Identify and evaluate heat rejection processes that provide power plants with viable alternatives to cooling towers, lakes, and rivers.
• Determine feasibility of design in regards to cost requirements, land requirements, and environmental factors.

Methods
Solar chimney with a plate fin heat exchanger at the base of the collector.

A spray pond using evaporation and convection to reject heat to the atmosphere.

Low pressure spray nozzles are positioned over the pond in an array.

A shallow, extensive canal system provides the condenser discharge water increased contact with the atmospheric air allowing it to cool before reentry to the condenser.

Wintertime greenhouse heating can be achieved by pumping hot condenser discharge water through pipes in the floor of the greenhouse.

Methods
An open water algae bioreactor is a like a pond with a layer of Thermophyllic algae growing on the surface. The algae is periodically harvested for biodiesel production.

The pond is heated by the condenser discharge water up to a temperature of 75°C.

Impact
Direct Impact:
• Closed loop heat rejection to the atmosphere.
• Electricity production from plant waste heat in solar chimney.
• Algae bio-fuel production in algae bioreactor pond.
• Winter time greenhouse heating by process waste heat.
• Lower impact on ecosystem of lakes and rivers.
• Less costly than cooling towers

Broader Impact:
• Alternative methods of heat rejection not limited to the power generation industry.
• Petroleum refineries, Food processing plants, Semiconductor plants, Chemical plants, etc.