

# Alternative Heat Rejection Methods for Power Plants

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## 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.



## Methods

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.



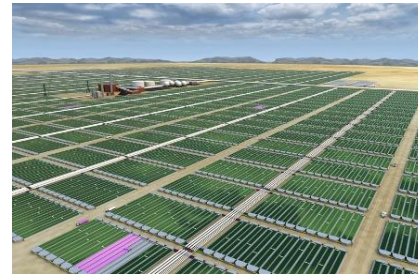
A shallow, extensive canal system provides the condenser discharge water increased contact with the atmospheric air allowing it to cool before reentry to the condenser.



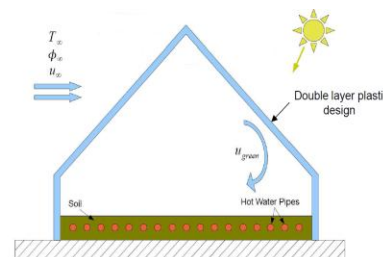
## Methods

An open water algae bioreactor is like a pond with a layer of Thermophillic 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.



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



## 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, Semi-conductor plants, Chemical plants, etc.