Water Management in Thermoelectric Power Generation

Crosscutting Research Division

Strategic Center for Coal

Barbara Carney
Barbara.Carney@netl.doe.gov
Area of Interest 1
Subtopic 1-A “Utilization of Low Grade Heat within Existing Power Generation System”

Projects started October, 2014
Forward Osmosis (FO) Process Utilizing Low Grade Heat: Applications in Power Plants  Carnegie Mellon University

Recirculated Water or Wastewater

Membrane

Waste Heat Input

Draw Solution

Draw Solute Recovery

Drinking Water

Brine

Establish rigorous models of the temperature and heat duty of the draw solute recovery system integrated with power plant waste heat to determine FO feasibility.
The COHO (CO$_2$-- H$_2$O) – Utilizing Low-Grade Heat and CO$_2$ at Power Plants for Water Treatment - Porifera

Waste heat used to treat degraded water and capture CO$_2$ from flue gas.

Osmotic pressure drives water across membrane

Draw solution removes CO$_2$ from flue gas (miscible)

SPS=switchable polarity solvent water miscibility (60 wt%) to immiscibility (>2000 ppm)

CO$_2$ released with heat (immiscible)
Simultaneous Waste Heat and Water Recovery from Power Plant Flue Gases

Institute of Gas Technology

Transport Membrane Condenser (TMC)

*Media & Process Technology* ceramic nanoporous membrane to remove waste heat and water from flue gas.
Development of a Field Demonstration for Cost-Effective Low-Grade Heat Recovery and Use Technology Designed to Improve Efficiency and Reduce Water Usage Rates for a Coal-Fired Power Plant

Southern Company Services, Inc., Electric Power Research Institute, URS Group

Develop system-level concept that integrates and utilizes waste heat and improves heat transfer.

Addresses the viability of deploying innovative conversion concepts to large-scale power generation systems.

Addresses innovative concepts for utilization of low-grade heat, including facilitation of water treatment, bottoming cycles, and low-cost refrigeration.

Reduces water intake relative to current power practices.

Develops a cost-benefit analysis for large-scale power generation.

A technology recommendation will be made and costs will be developed for a field test of a combined heat-recovery/use process at a Southern Company facility.
Water-Energy Management Research and Development

Area of Interest 1


Subtopic 1-B “Low Cost Treatment of Produced Waters”

concentrated brine solution, total dissolved solids level of up to 320,000 parts per million (ppm), 180,000 ppm as an average

Projects started October, 2014 and January 1, 2015