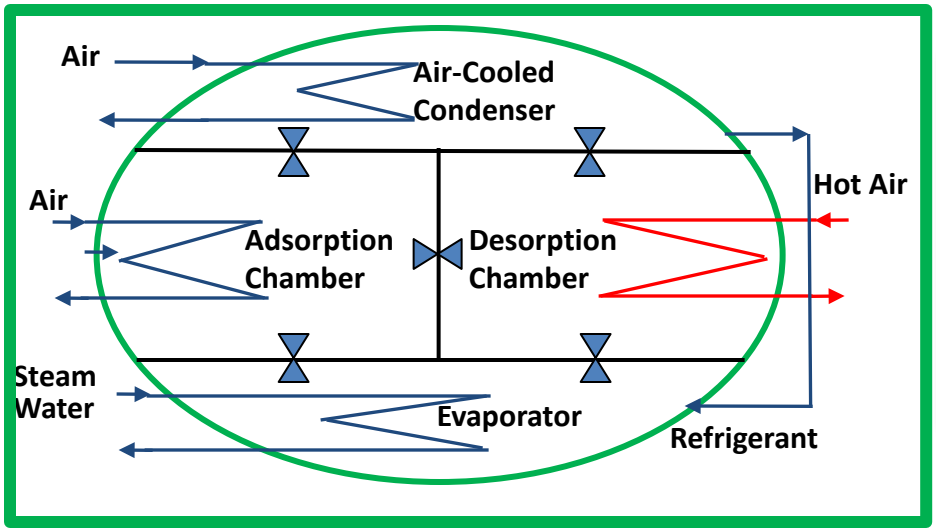
# Project 1: Waste Heat/Solar Driven Green Adsorption Chillers for Steam Condensation (Collaboration with Allcomp)

**Schematic Illustration of a Typical Adsorption Chiller**




## Key Potential Benefits

- Dry cooling system
  - **Near Zero** water use and consumption
- Reduced condensation temperature
  - As low as **35 ℃**
  - Potential for annual power production increase by up to 5%
- Full power production even on the hottest days compared to air cooled condensers.

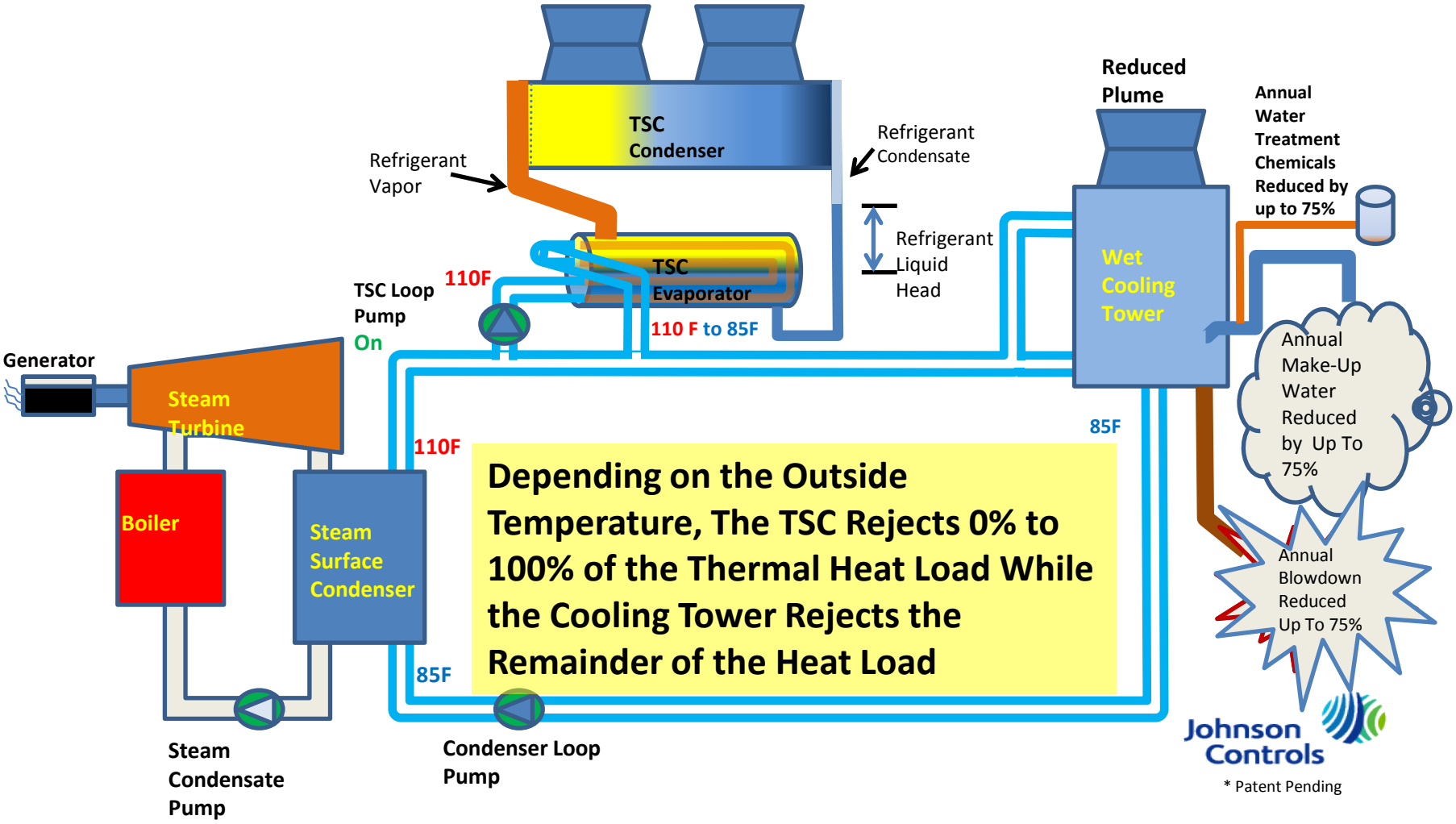
**Phase 1 Project Scope**

- Explore best power plant system level approaches to utilize waste heat or solar heat for desorption
- Perform system integration energy and mass flow balance analysis for a 500 MW coal-fired power plant
- Perform technical and economic feasibility study(EPRI Patent Pending)

# Project 2

## Feasibility Study of Using Thermosyphon Coolers to Reduce Cooling Tower Water Consumption (Collaboration with Johnson Controls Inc.

### Power Plant Heat Rejection System Incorporating Thermosyphon Cooler (TSC) Technology*



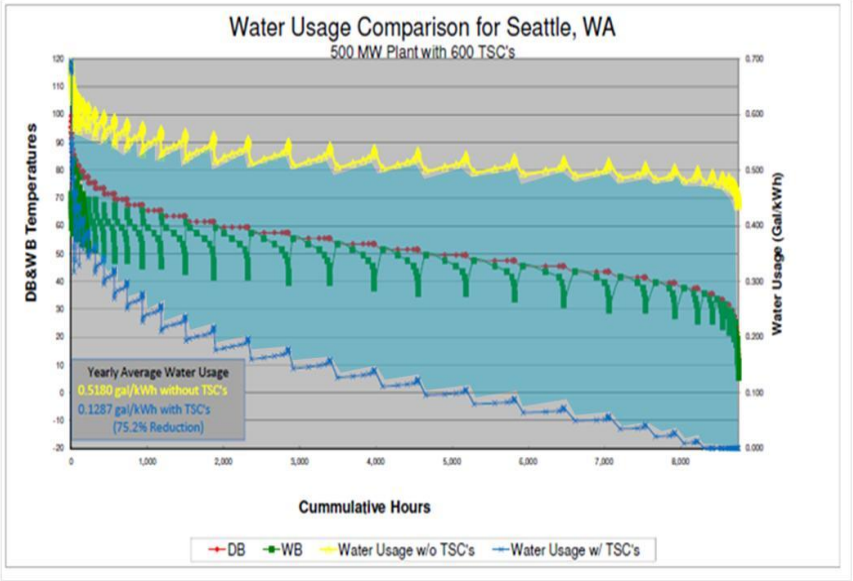
# More about Project 2

**Key Potential Benefits**

- Potential annual water savings up to 75%
- Compared to ACC, full plant output is available on the hottest days
- Ease of retrofitting
- No increase in surface area exposed to primary steam
- Reduced operating concerns in sub freezing weather
- Broad application (hybrid, new, and existing cooling systems) existing cooling systems)

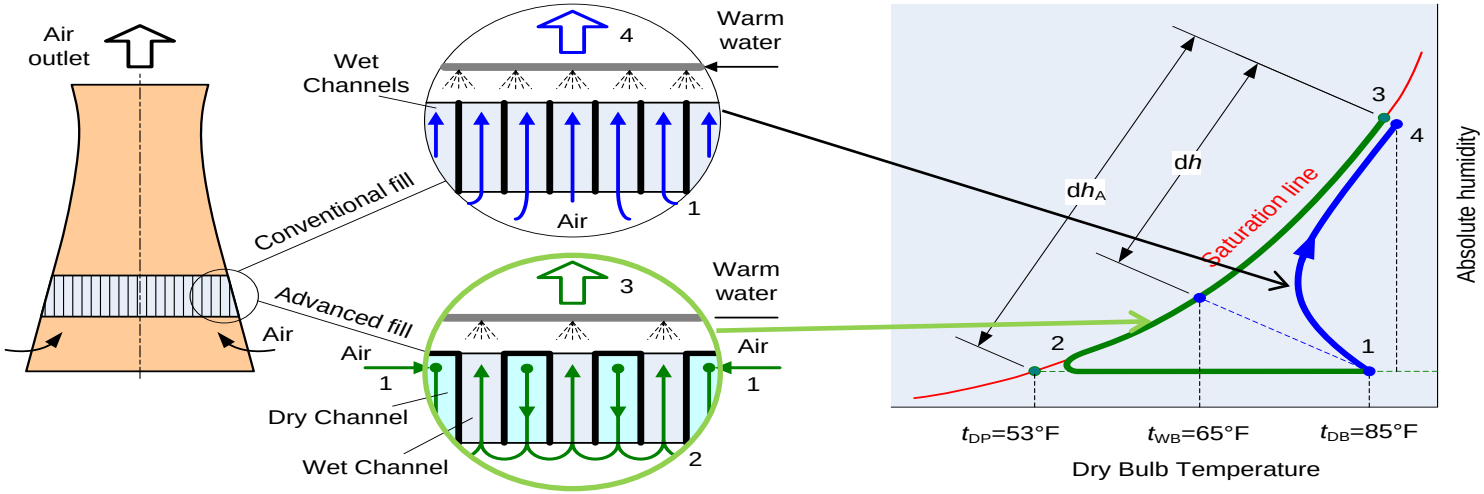
**Project Scope**

- Perform a thorough feasibility evaluation of a hybrid, wet/dry heat rejection system comprising recently developed, patent pending, thermosyphon coolers (TSC).
- Make comparisons in multiple climatic locations, to standard cooling tower systems, all dry systems using ACC's, hybrid systems using parallel ACC's, and air coolers replacing the thermosyphon coolers.
- Determine the most effective means to configure and apply the thermosyphon coolers .



# Project 3 : Advanced M-Cycle Dew Point Cooling Tower Fill (Collaboration with Gas Technology Institute)

For additional information on this project, please click here.




**Project Scope**

- Develop an advanced fill
- Perform CFD and other types of energy, mass, and momentum balance modeling
- Evaluate performance and annual water savings for several typical climates using simulation models
- Perform prototype testing in lab cooling towers
- Perform technical and economic feasibility evaluation

**Key Potential Benefits**

- Potential for less cooling water consumption by up to 20%
- Lower cooling tower exit water temperature resulting in increased power production
- Ease of retrofitting
- Broad applications

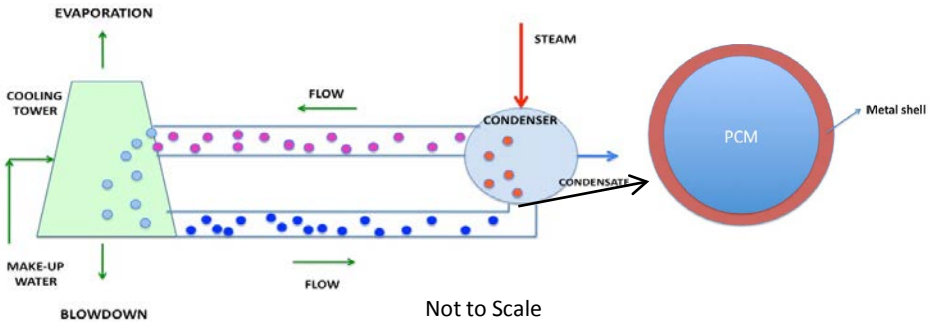
# **Project 4** selected by EPRI Breakthrough Technology Program

Multi-functional Nanoparticles for Reducing Cooling Tower Evaporative Loss (Collaboration with Argonne National Lab)

## Project Scope

- Develop multi-functional nanoparticles with ceramic/metal shells and phase change material cores
- Measure nano-fluid thermo-physical properties
- Perform prototype testing in scaled down water cooled condenser and cooling tower systems
- Assess potential environmental impacts due to nanoparticle loss to ambient air and water source.
- Perform technical and economic feasibility evaluation

**Phase Change Material (PCM) Core/Ceramic or Metal Shell Nano-particles added into the coolant.**




Not to Scale

## Key Potential Benefits

- Up to 20% less evaporative loss potential
- Less drift loss
- Enhanced thermo-physical properties of coolant
- Inexpensive materials
- Ease of retrofitting
- Broad application (hybrid/new/existing cooling systems)