Project Description

The Redhawk Power Station is comprised of two 2x1 combined cycle natural gas-fired units to produce a total of 1,060 MW of electrical power. Critical to the planning and permitting of this facility was the source and utilization of water and the environmental impact of the station with respect to liquid emissions.

Based upon these issues, Redhawk was designed to use reclaimed municipal effluent from the nearby Palo Verde Nuclear Generating Station for its process water requirements. What is unique about this source of water is that it’s supplied by several neighboring City of Phoenix municipal treatment facilities with their associated seasonable variability. The plant would also be designed to utilize well water as a contingency and achieve in either case, high-quality water for continuous reuse throughout the plant.

The Client’s Needs

The second critical aspect is the permitted requirement as a Zero Liquid Discharge facility. As regulated, no aqueous waste can be discharged from site operations into the environment. The wastewater treatment system must be designed to remove contaminants and recycle high-quality water back into the process.

This closed loop integration of the overall water cycle must be achieved over the complete range of feed water conditions as well as support plant operations. The treatment system must produce of high-purity water, maintain cooling tower conditions for high availability, and comply with the Zero Liquid Discharge mandate.
Project & Technology Solutions

The Zero Liquid Discharge (ZLD) System had to reclaim water resources and reject waste properly as an integrated component of the power station. APS selected Veolia Water Technologies to design and build a process system utilizing HPD® evaporation and crystallization technologies, which were the key elements in the overall design.

The evaporator was designed to receive 450 gpm of high-salinity blowdown from the cooling towers. The compressor-driven HPD evaporator pre-concentrates the brine and produces high-purity distillate for recycling to the cooling tower and service water system.

Concentrate from the evaporator is advanced to a forced circulation crystallizer where the salts that form the impurities are crystallized and sent to a centrifuge for dewatering. The HPD crystallizer is also compressor driven and produces distillate that is combined with that of the evaporator for recycle.

The Results

The turnkey project was efficiently completed and the wastewater treatment plant commissioned by Veolia Water Technologies in the promised time frame.

Since the commissioning of the integrated ZLD system in 2002, the Redhawk Power Station has successfully accomplished the goal of effectively recycling the waste created by cooling tower blowdown and producing high-quality water while adhering to the Zero Liquid Discharge mandate.

Turnkey Scope of Supply

Veolia was the sole point of responsibility in providing a design-build solution for the complete wastewater portion of the plant which included:

- All major process equipment
- Mechanical erection
- Buildings
- Utility piping and valves
- Electrical hardware and cabling
- Overall control system
- Insulation and painting
- Structural support and access steel
- Training of staff, commissioning and start-up support