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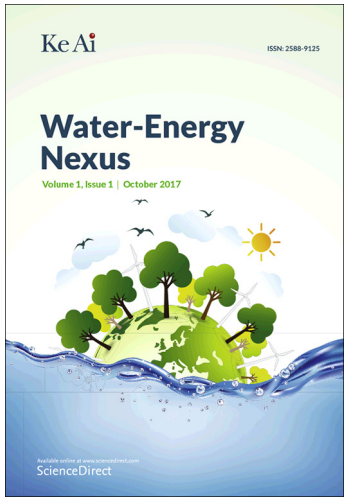

Cooling Water Use in Thermoelectric Power Generation and its Associated Challenges for Addressing Water-Energy Nexus

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Abstract

Thermoelectric power plants traditionally have required huge volumes of water to condense steam from the turbine exhaust. The complex interdependency between water and energy poses new challenges for policy makers to achieve a safe, secure and sustainable supply of water and energy in the future. Cooling systems are the most water-intensive part of the thermoelectric generation process, presenting significant opportunities to reduce the withdrawal and consumptive use of fresh water. Reuse of impaired water for cooling can reduce freshwater withdrawal and decrease water contamination and withdrawal-related impacts on aquatic life and the environment. Here we focus on challenges and opportunities for improving water efficiency in the cooling systems of thermoelectric power plants. First, we present the types of cooling systems in a thermoelectric power plant. Then, we illustrate the key criteria for feed water quality for cooling systems. We use this information to determine appropriate design and operation guidelines for cooling systems. In order to facilitate the use of impaired water in cooling systems, we suggest the key technical issues and available water technologies for brackish water desalination.

Keywords: water consumption; water withdrawal; energy-efficient technology; zero liquid discharge; fit-for-purpose use.