

Water for Energy Production

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Abstract

Purpose of review: Water for energy production is a cross-cutting 21st century grand challenge that requires new knowledge and decision-making for the development and management of water-energy-food infrastructures and governance systems, that will often require trans-boundary planning and cooperation. As this topic involves both public and private interests, developing new water-efficient energy strategies and energy-efficient water strategies could generate significant new business opportunities in arid regions, globally. As rising populations, urbanization, and resource consumption are expected to increase water scarcity, new management strategies on water for energy production are needed, especially including nexus science that addresses uncertainty. Water is essential for the majority of today's current energy production processes, and with the potential for climate impacts to exacerbate water stresses, new systems approaches are needed that aim to develop increasingly water and energy-efficient infrastructure systems and services for cities and communities, globally.

Recent findings: One third of the world's population is expected to live in water-stressed regions within the next decade. Due to the potential for increases in demand and competition for scarce resources, new forms of infrastructure, governance and cooperation will be needed. Water scarcity and limited freshwater supplies will likely create new challenges to energy supply, especially as fossil fuel (including coal, natural gas, and oil) and nuclear energy sources require large withdrawals of freshwater. Water availability and competing demands for water resources can be significant constraints on energy project development.

Summary: With water resources distributed unevenly and often a prerequisite for energy production, plans for energy infrastructure development and operation must determine the available freshwater (surface water and groundwater) to sustain operations. This white paper aims to highlight key challenges and opportunities, using an interdisciplinary and systems-oriented lens to sustainably manage water for energy systems.