

Quantifying the UK's Future Thermal Electricity Generation Water Use: Regional Analysis

Authors : Daniel Murrant, Andrew Quinn, Lee Chapman

Abstract : A growing population has led to increasing global water and energy demand. This demand, combined with the effects of climate change and an increasing need to maintain and protect the natural environment, represents a potentially severe threat to many national infrastructure systems. This has resulted in a considerable quantity of published material on the interdependencies that exist between the supply of water and the thermal generation of electricity, often known as the water-energy nexus. Focusing specifically on the UK, there is a growing concern that the future availability of water may at times constrain thermal electricity generation, and therefore hinder the UK in meeting its increasing demand for a secure, and affordable supply of low carbon electricity. To provide further information on the threat the water-energy nexus may pose to the UK's energy system, this paper models the regional water demand of UK thermal electricity generation in 2030 and 2050. It uses the strategically important Energy Systems Modelling Environment model developed by the Energy Technologies Institute. Unlike previous research, this paper was able to use abstraction and consumption factors specific to UK power stations. It finds that by 2050 the South East, Yorkshire and Humber, the West Midlands and North West regions are those with the greatest freshwater demand and therefore most likely to suffer from a lack of resource. However, it finds that by 2050 it is the East, South West and East Midlands regions with the greatest total water (fresh, estuarine and seawater) demand and the most likely to be constrained by environmental standards.

Keywords : climate change, power station cooling, UK water-energy nexus, water abstraction, water resources

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