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Institutional adaptation to cooling water scarcity in the electricity sector under global warming

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Abstract

This paper studies institutional change as a response to anticipated changes in the natural environment. Power plants occasionally need to be curtailed during heat waves, causing economic losses and putting electricity supply at risk. This problem likely exacerbates due to global warming, so that institutional arrangements for cooling water management may require adaptation. The papers compares different arrangements with a transaction cost analysis. If heat waves only increase in intensity, long-term and site specific temperature caps perform comparatively best. Otherwise, total costs can be reduced by a specific contract between the environmental regulator and electricity producers (the minimum power plant concept), or a dynamic heat load plan. The paper highlights economies of scale in transaction costs, and shows how institutional change can depend on the speed of exogenous changes. The general considerations are illustrated by taking the German Rhine catchment as an example.

Keywords: cascading externalities, electricity, environmental regulation, institutional change, transaction costs, water use conflict

JEL-Classification: D23, Q25, Q41, Q54

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