

Toward sustainable electricity generation mix: an econometric analysis of the substitutability of nuclear energy and hydropower for fossil fuels in Canada.

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ABSTRACT

The dominance of fossil fuels in electricity generation fuel mix continues to undermine the importance of electricity as a critical factor for sustainable economic development. As with most economies of the world, the Canadian fuel mix for electricity generation is dominated by fossil fuels. This scenario creates both environmental and resource sustainability challenges. There are questions marks over the potentials of nonfossil energy sources to address these challenges and ensure a more sustainable electricity generation. This study aims to examine the potentials of nuclear energy and hydropower to substitute the fossil fuels of coal and natural gas in electricity generation for Canada. A trans-log production function was estimated with the ridge regression method to obtain the parameter estimates. The empirical findings show that, with the exception of coal input, all energy inputs have positive output elasticities, which indicate that an increase in the energy inputs will increase output in Canada. The results further provide evidence of positive elasticity of substitution between the non-fossil energy sources and the fossil fuels which give credence to the hypothesis that clean energy sources such as nuclear energy and hydropower have the potential to substitute for the fossil fuels of coal and natural gas the electricity generation process for Canada. The estimates show that the smallest substitution occurs between coal and gas, which is an additional evidence that clean energy has higher chances of substituting fossil fuels. Policies that promote the adoption of more renewable and clean energy sources are recommended in the body of the paper.

KEYWORDS:

[Interfuel substitution](#) ; [electricity](#) ; [nuclear energy](#) ; [hydropower](#) ; [ridge regression](#) ; [Canada](#)

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