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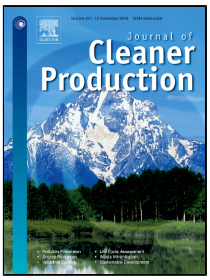

Impacts of Carbon Pricing and Renewable Electricity Subsidy on Direct Cost of Electricity Generation: A Case Study of China's Provincial Power Sector

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PII:	S0959-6526(18)32828-2
DOI:	10.1016/j.jclepro.2018.09.108
Reference:	JCLP 14243
To appear in:	*Journal of Cleaner Production*
Received Date:	18 May 2018
Accepted Date:	12 September 2018

Please cite this article as: Guangzhi Yin, Li Zhou, Maosheng Duan, Weiming He, Peng Zhang, Impacts of Carbon Pricing and Renewable Electricity Subsidy on Direct Cost of Electricity Generation: A Case Study of China's Provincial Power Sector, *Journal of Cleaner Production* (2018), doi: 10.1016/j.jclepro.2018.09.108

Impacts of Carbon Pricing and Renewable Electricity Subsidy on Direct Cost of Electricity Generation: A Case Study of China's Provincial Power Sector

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Abstract:

The power sector contributes 40% of the carbon emission in China, so decreasing the carbon intensity of the power sector is crucial for China to achieve the mitigation target contained in its Nationally Determined Contribution (NDC). Renewable electricity subsidy and carbon pricing are two commonly used mitigation policy instruments in the power sector, but their implementation costs are different. In this article, the Regional Generation Cost Evaluation Model (RGCEM), which is based on an electrical engineering model, Unit Commitment Model, is developed to analyze the emission reduction potential, implementation cost as well as the potential impact on the direct cost of electricity generation of both of the above mentioned policy instruments. Actual power generator data and a typical daily load curve of Guangdong Province, China are used to demonstrate the possible impacts of implementing renewable electricity subsidy and carbon pricing policies. The analysis shows that the emission reduction achieved by carbon price increase of 9.5-11.6 Yuan RMB /tCO_2 is the same as that achieved by 1% increase of share of renewable electricity in the total electricity generation. The stricter the carbon intensity reduction target is, the higher carbon price increases are needed for substituting 1% increase of share of renewable electricity to achieve the same mitigation. The adjustment of mitigation policy portfolio will change the corresponding implementation costs of achieving the specific emission reduction target. It shall however be noted that the spillover effects of renewable electricity subsidy and carbon pricing are different, so implementation cost should not be the sole determinant for choosing mitigation policy instrument in the power sector.

Key Word: Renewable Electricity Subsidy, Carbon Pricing, RGCEM Model, Intensity Reduction Target, Substitution Effect

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