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Internalizing the external costs of biogas supply chains in the Italian energy sector

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ABSTRACT:

In Italy biogas support schemes are being revised to include subsidies for the production of biomethane. Energy policies should foster environmentally optimal solutions, especially because social acceptance issues often arise in the case of biogas. In this paper we use the external cost methodology to quantify the environmental impact of airborne emissions associated with biogas-based energy vectors and their corresponding fossil substitutes. These are evaluated at supply chain level and incorporated in a spatially explicit optimization model. The method is applied to northern Italy to compare the potential impact of alternative policy options. It is found that, while the external costs of biogas-based pathways are always lower than corresponding fossil fuel based pathways, the differences are generally so small that policies based on internalization of external costs alone would not lead to further development of biogas-based technologies. For all utilization pathways, consideration of local externalities leads to a less favourable evaluation of biogas-based technologies, which results in external costs even higher than the substituted fossil fuel if biogas is allocated to local heating.

Keywords: External costs, biomethane, biogas supply chain, CHP, BeWhere model, Environmental impact

1 INTRODUCTION

Growing concerns about climate change made the reduction of CO₂ and equivalents a major motive for enhancing the use of biomass for power generation, since it is generally considered to be carbon neutral [1]. Combustion is the most commonly used technology for solid biomass rich in

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