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Cost effectiveness of introducing a new European Evaporative Emissions Test Procedure for petrol vehicles

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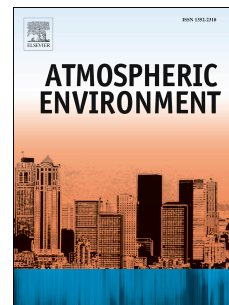
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1 Cost effectiveness of introducing a new European Evaporative Emissions Test 2 Procedure for petrol vehicles

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10

11 Abstract

12 Evaporative emissions of non-methane volatile organic compounds (NMVOCs) arise from
13 the vehicle's fuel system due to changes in ambient and vehicle temperatures, and contribute
14 to urban smog. This paper presents an economic analysis of the societal costs and benefits of
15 implementing a revised European evaporative emission test procedure for petrol vehicles
16 under four scenarios for the period 2015-2040. The paper concludes that the most cost-
17 effective option is the implementation of an aggressive purging strategy over 48 hours and
18 improved canister durability (scenario 2+). The average net benefit of implementing this
19 scenario is €146,709,441 at a 6% discount rate. Per vehicle benefits range from €6-9 but
20 when fuel savings benefits are added, total benefits range from €13-18. This is compared to
21 average additional cost per vehicle of €9.

22 Key words: petrol vehicles, non-methane volatile organic compounds, test procedure, cost
23 effectiveness

24 1. Introduction

25

26 Non-methane volatile organic compounds (NMVOCs) from petrol fuelled vehicles contribute
27 to the formation of ground-level ozone and photochemical oxidants associated with urban
28 smog (Parrish *et al.*, 2009; von Schneidemesser *et al.*, 2010) and pose a threat to human health
29 (Smith *et al.*, 2009; Geiss *et al.*, 2011). Emissions of NMVOCs in the European Union (EU)
30 are decreasing, and fell by 55 per cent in the period 1990-2009. This has been due to the
31 success of European air quality policies limiting air pollutant emissions from road transport
32 (EEA, 2010). However, as much as 17 per cent of the EU urban population still live in areas
33 where the European ozone target value for protecting human health is exceeded (EEA, 2012).

34 NMVOCs emissions originate from fuel escaping from the combustion process during the
35 operation of the vehicle (exhaust emissions). In addition, evaporative losses from the fuel
36 system (i.e. storage tank, carburettor, injection system and fuel pipes) occur immediately after
37 the vehicle is switched off (known as 'hot soaks') and during parking due to changes in
38 diurnal ambient temperatures, and during refuelling (Huang *et al.*, 2011)

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