

# Taxes, Subsidies or Regulation: Why have Britain's carbon emissions from electricity halved?

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## Abstract

We calculate Shapley values to assign the significant reduction in carbon emissions from the British electricity sector to particular policy and other changes. From 2012 to 2018, the price of carbon dioxide rose from £6/tonne to £32/tonne, reducing emissions by 15 million tonnes (mt). Coal capacity fell from 26 GW to 14 GW (largely the result of policies to reduce sulphur emissions), reducing emissions by 28mt. Wind capacity rose from 7 GW to 22 GW, and the capacity of solar PV panels from 1 GW to 13 GW. These subsidised entrants cut emissions by 20mt and 7mt respectively. Demand fell from 319 TWh to 294 TWh, reducing emissions by 19mt. A further 10mt reduction came from the (exogenous) increase in coal prices relative to gas.

Higher carbon prices raised the wholesale price of electricity by £15/MWh. The £9 increase that might have come from closing fossil generation capacity (*ceteris paribus*) was largely offset by reductions due to increased renewable capacity, while the lower level of demand cut the average price by £5/MWh. Combining the impact on wholesale prices and the cost of subsidies, the increase in wind generation raised consumer prices by around £5/MWh, while solar generation had little impact. The estimated resource cost of carbon savings from switching from coal to gas (£14/tonne) was well below that of solar PV (£60/tonne) or wind power (£90/tonne).