Department for
Business, Energy
& Industrial Strategy

UPDATED SHORT-TERM TRADED CARBON VALUES

Used for UK Public Policy Appraisal

March 2017

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Background

BEIS's short-term traded carbon values for UK public policy appraisal are used for valuing the impact of government policies on emissions in the traded sector, i.e. those sectors covered by the EU Emissions Trading System (EU ETS). Short-term values quoted in this paper correspond to the period up to 2030 and long-term values correspond to the period post-2030.

In 2009, the Department of Energy and Climate Change (DECC) set out a methodology for producing traded sector carbon values to 2050 in the paper 'Carbon Valuation in UK Public Policy Appraisal: A Revised Approach'[1] (July 2009). The paper advocated moving from a social cost of carbon/damage cost approach for valuing carbon to a target consistent resource-cost approach.

In 2012, the hybrid methodology for producing short-term traded carbon values was adopted and involved using a market-based approach using futures prices to produce short-term traded carbon values in the central scenario, and fundamentals-based high and low scenarios for sensitivity purposes[2]. Since 2012, these values have been updated annually using the BEIS Carbon Price Model (BCPM)[3].

These values are being revised again as part of the annual process for updating BEIS's analytical projections and assumptions.

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[1] Available online at:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/41798/120090715105804_e____carbonvaluationinukpolicyappraisal.pdfhttps://www.gov.uk/government/publications/carbon-valuation-in-uk-policy-appraisal-a-revised-approach

[2] 2012 short-term traded carbon values update publication: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/245385/6667-update-short-term-traded-carbon-values-for-uk-publ.pdf

[3] BCPM is an in-house fundamentals-based model for estimating carbon prices. The BCPM estimates EUA prices in the EU ETS in any given year based on the equilibrium between demand for and supply of abatement over a chosen number of future years (the foresight assumption), which can be set to be between 1 year (i.e. no foresight) to 34 years (i.e. perfect foresight to 2050). Demand for abatement depends on the gap between Business As Usual (BAU) emissions and the EU ETS cap, while supply of abatement is given by the marginal abatement cost curves.

Methodology

The 2016 updated short-term traded carbon values are based on the same hybrid methodology as in previous years, but use updated inputs and assumptions, which include:

- Revised Business As Usual (BAU) emissions projections and corresponding Marginal Abatement Cost Curves (MACCs). These have been commissioned from consultants Enerdata and produced using the POLES model, a top-down global sectoral model for the world energy system.[4] These BAU emissions projections and MACCs are consistent with BEIS fossil fuel price assumptions and underlying economic growth projections.[5]
- Updated market prices of EU Allowance (EUA) futures contracts[6]. This includes data on daily settlement prices of EUA futures contracts with maturities up to 2018 traded on the Intercontinental Exchange (ICE) over 3 months between 1 April 2016 and 30 June 2016.
- Re-estimated impact of the Market Stability Reserve (MSR) on the EU ETS cap.

The short-term traded carbon values for UK public policy appraisal are produced for the period up to 2020 under all three scenarios (central, high and low), and are linearly extended beyond 2020 to reach BEIS's long-term carbon values for the period beyond 2030[7]. These long-term carbon values reflect the costs required to limit global temperature increases to 2 degrees centigrade above pre-industrial levels.

Central scenario

Short-term traded values in the central scenario are estimated based on the average daily settlement prices of end year EUA futures contracts of different vintages over a period of 3 months.

The volume of traded futures contracts decreases rapidly the further out the settlement date for contracts. In light of this limited liquidity in the futures market beyond a few years, prices are averaged for those futures with settlement dates up to 2018, where there are

[4] Further information on the POLES model can be found here: http://www.enerdata.net/enerdatauk/solutions/energy-models/poles-model.php
[5] BEIS 2016 fossil fuel price assumptions can be found here: https://www.gov.uk/government/publications/fossil-fuel-price-assumptions-2016
[6] EUAs are the carbon credits or pollution permits traded in the EU ETS.
[7] GUIDANCE ON ESTIMATING CARBON VALUES BEYOND 2050: AN INTERIM APPROACH. Annex 2 (page12): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/48108/1_20100120165619_e___carbonvaluesbeyond2050.pdf

still a reasonable number of futures contracts, and then extrapolated to 2020 using a real discount of 3.8% in line with that used in the BCPM.

High scenario

Short-term traded carbon values in the high scenario are entirely fundamentals-based and have been derived using the BCPM under a certain set of assumptions that produce high prices. For instance:

- BAU emissions projections and corresponding MACCs that are produced using assumptions about (a) high economic growth and (b) low prices of coal relative to gas, which lead to greater demand for coal and higher emissions.
- A length of perfect foresight[8] of 10 years is chosen, as opposed to 6 years' foresight that was used for the central trajectory. With longer perfect foresight, market participants have a longer view of the market, including future caps and the abatement needed to reduce emissions. This increases the carbon price as more abatement is required over a longer time horizon.
- A discount rate of 8% in real terms is used instead of 3.8% in the central trajectory. With a higher discount rate, greater abatement can be achieved in future at the same price (i.e. future costs are more heavily discounted). As a result, carbon values under the 8% discount rate assumption are lower than they would be with 3.8% assumption.

Note that the foresight and discount rate assumptions are consistent with the recommendations made by an external peer reviewer in 2014[9].

Low scenario

Short-term traded carbon values under this scenario are also fundamentals-based and have been derived using the BCPM Carbon Price Model under a certain set of assumptions that produce low prices. For instance:

- BAU emissions projections and corresponding MACCs are produced using assumptions about (a) low economic growth and (b) high prices of coal relative to gas, which lead to lower demand for coal and lower emissions.
- Carbon prices are entirely driven by market fundamentals, i.e. the cost of abatement needed to meet the cap, which is zero for early years. This represents a situation of continued oversupply of allowances in the market driven by depressed economic activity.

[8] Foresight is the number of years into the future over which market participants assess the degree of scarcity in the market

[9] Foresight and Cost of Carry assumptions in the DCPM: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/359708/Peer_review_William_Blyth.pdf

- No changes are made to the length of perfect foresight or discount rate compared with the central scenario.

2016 updated short-term traded carbon values

BEIS's 2016 updated short-term traded values are shown below in Table 1. Further detail on the underlying assumptions and an explanation of the reasons for the differences with the 2015 values is provided in the subsequent section.

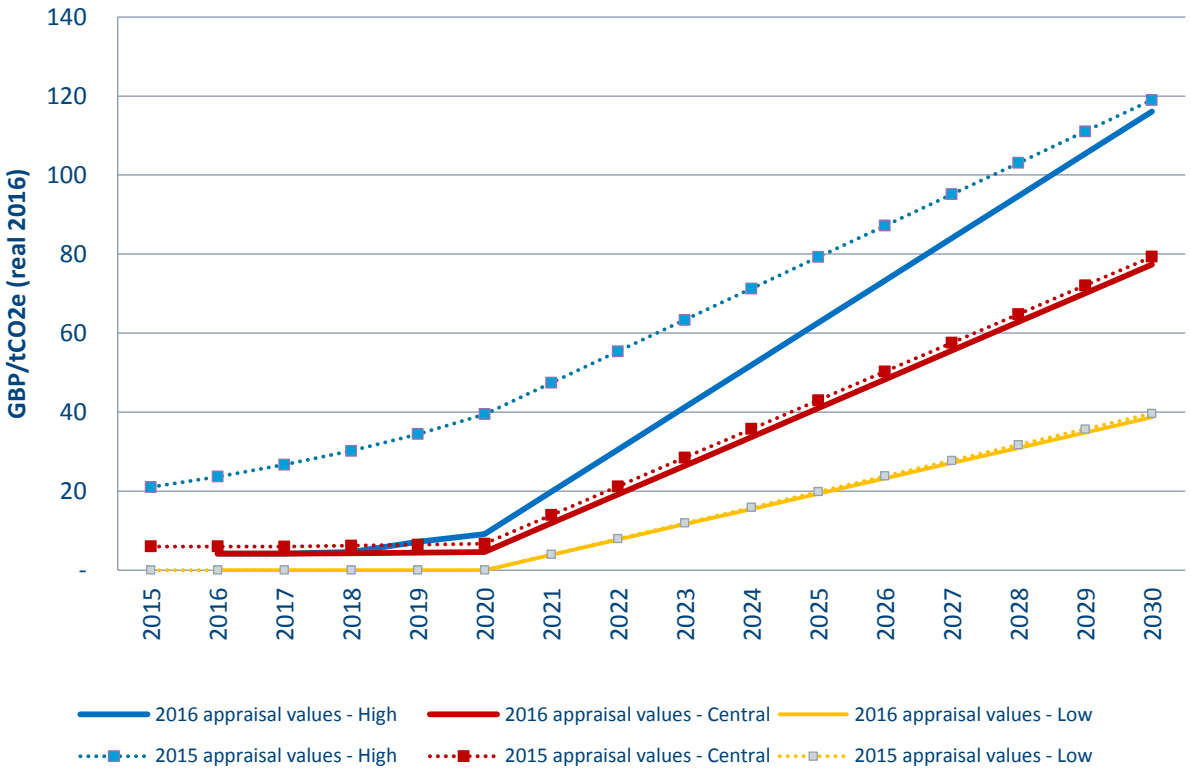
Table 1: BEIS updated short-term traded sector carbon values for policy appraisal in real 2016 terms, £/tCO2e

Year	Low	Central	High
2016	0.00	4.18	4.18
2017	0.00	4.22	4.22
2018	0.00	4.25	4.61
2019	0.00	4.41	7.22
2020	0.00	4.58	9.14
2021	3.87	11.86	19.83
2022	7.74	19.14	30.52
2023	11.61	26.42	41.21
2024	15.47	33.70	51.90
2025	19.34	40.98	62.60
2026	23.21	48.25	73.29
2027	27.08	55.53	83.98
2028	30.95	62.81	94.67
2029	34.82	70.09	105.36
2030	38.68	77.37	116.05

Please note that these values are based on a specific set of assumptions with respect to the move from the end of Phase III of the EU ETS (ending 2020) to a fully functioning and comprehensive global carbon market in 2030. Consequently these values should not be considered as "forecasts" of future prices and BEIS accepts no responsibility for any outcomes arising from the use of these figures.

Comparison with 2015 short-term traded carbon values

The chart below provides a comparison of the updated 2016 values with those published in 2015. The reasons for the differences between each scenario are explained in the following paragraphs.



Central scenario

Short-term traded carbon values for policy appraisal in the central trajectory are produced using the same methodological approach as in 2015. The 2016 updated carbon values in the central scenario are lower as compared to the 2015 values, which is driven by:

- the expectation of increased EUA auction volumes in 2017 in comparison with 2016. EU ETS auction volumes are affected by the backloading policy that reduced auctions in 2014-2016; as a result auction volumes in 2017 are significantly higher than in 2016. This has affected the EUA futures curve as market participants are now pricing the expectation of higher auction volumes.
- power sector installations have sold some of the allowances that they originally bought for hedging, thus exacerbating oversupply.

High scenario

Updated carbon values in the high scenario are outputs of the fundamentals-based BCPM and are considerably lower than those from last year. This is largely driven by the assumptions about the foresight (10 years in contrast with 16 years used in the 2015 carbon price update) and the discount rate (8% in contrast with 3.8% in the 2015 carbon price update). Both assumptions lie within the sensitivity range previously recommended by the external peer reviewers (footnote 9).

The high series represents a state of the world in which strong economic growth and the low price of coal relative to gas drive an increase in BAU emissions and a subsequent increase in demand for allowances which drives the ETS price up. Market participants in this state of the world take a longer view on fundamentals (including future emissions reduction targets), which prompts them to undertake early action to abate carbon.

Low scenario

The updated values in the low scenario up to 2020 are based on the estimates from the BCPM and are the same as those from last year. The price of allowances up to 2020 is zero in this scenario. This represents a pessimistic view of the future with continued chronic oversupply of allowances in the carbon market and, consequently, low demand that drives low prices.

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