



Department for
Business, Energy
& Industrial Strategy

UPDATED SHORT-TERM TRADED CARBON VALUES

Used for UK Public Policy Appraisal

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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 purposes². Since 2012, these values have been updated annually using the DECC Carbon Price Model (DCPM). This was later renamed the BEIS Carbon Price Model (BCPM) following the creation of the department in 2016³.

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

¹ Available online

at:https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/41798/1_20090715105804_e_carbonvaluationinukpolicyappraisal.pdf<https://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 EU Allowance 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 33 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 2017 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 of the world energy system⁴. These BAU emissions projections and MACCs are consistent with the 2017 BEIS fossil fuel price assumptions and underlying economic growth projections⁵.
- Updated market prices of EU allowances (EUA) futures contracts. 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 2017 and 30 June 2017.
- Re-estimated impact of the Market Stability Reserve⁶ (MSR) on the EU ETS cap based on the assumption of an increase in the withdrawal rate from 12% to 24% in the years 2019-23.

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 2030⁷. These long-term carbon values reflect the costs required to limit global temperature increases to 2 degrees centigrade above pre-industrial levels.

⁴ Further information on the POLES model can be found here:

<http://www.enerdata.net/enerdatauk/solutions/energy-models/poles-model.php>

⁵ BEIS 2017 fossil fuel price assumptions can be found here:

<https://www.gov.uk/government/publications/fossil-fuel-price-assumptions-2017>

⁶ The Market Stability Reserve (MSR) is a carbon market reform aimed at providing price stability for installations covered under the EU ETS scheme. The MSR will work by reducing new supply entering the market, via government auctions, until the calculated surplus falls below an upper threshold, and will be returned to the market once the calculated surplus falls below a lower boundary.

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

NOTE: On 23 June 2016, the EU referendum took place and the people of the United Kingdom voted to leave the European Union. Until the date of exit, the UK remains a full member of the European Union and all the rights and obligations of EU membership remain in force. While exit negotiations remain in progress, the update to the short term traded carbon values are produced on that basis and consequently, include no explicit assumptions about post EU exit impacts on emissions projections and demand for EUAs.

Consequently, care should be taken in considering whether these values are appropriate for use in analysis.

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 2017 and 2018 vintages, averaged 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 still a reasonable number of futures contracts, and then extrapolated to 2020 using a real discount rate of 3.8% in line with that used in the BCPM. These are then linearly extended beyond 2020 to reach BEIS's long-term carbon values for the period beyond 2030⁸.

High scenario

Short-term traded carbon values in the high scenario up to 2020 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 foresight⁹ of 10 years is chosen, as opposed to 6 years' foresight that was used for the central scenario assumption in the BCPM. With longer perfect foresight, market participants have a longer view of the market, including future

⁸ 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

⁹ Foresight is the number of years into the future over which market participants assess the degree of scarcity in the market

caps and the abatement needed to reduce emissions. This increases the carbon price in the short-term as more abatement is required over a longer time horizon.

- The discount rate reflects the expected annual increase in carbon prices over time. A discount rate of 8% in real terms is used instead of 3.8% as in the central trajectory. The rationale behind the use of the 8% discount rate is to capture a risk premium which is not included in the 3.8% rate and this higher rate assumes that market participants take long-term information into account in current pricing. Given the future under-supply of allowances relative to the current state of the EU ETS, the higher discount rate results in a higher price trajectory in the near-term.

Note that the foresight and discount rate assumptions are consistent with the recommendations made by an external peer reviewer in 2014¹⁰.

From 2021 onwards, the high trajectory is extended to reach BEIS's long-term carbon values for the period to 2030¹¹.

Low scenario

Short-term traded carbon values under this scenario are also fundamentals-based up to 2020 and have been derived using the BCPM 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 up to 2020 i.e. the cost of abatement needed to meet the cap (which is zero up to 2020). This reflects a situation of continued oversupply of allowances in the market driven by depressed economic activity in recent years.

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

¹⁰ Foresight and Cost of Carry assumptions in the BCPM:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/359708/Peer_review_William_Blyth.pdf

¹¹ 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

From 2021 onwards, the low trajectory is extended to reach BEIS's long-term carbon values for the period to 2030 with a -50% sensitivity in line with government guidance on long term carbon valuation¹².

2017 updated short-term traded carbon values

BEIS's 2017 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 2016 values is provided in the subsequent section.

Table 1: BEIS updated short-term traded sector carbon values for policy appraisal in real 2017 terms, £/tCO₂e

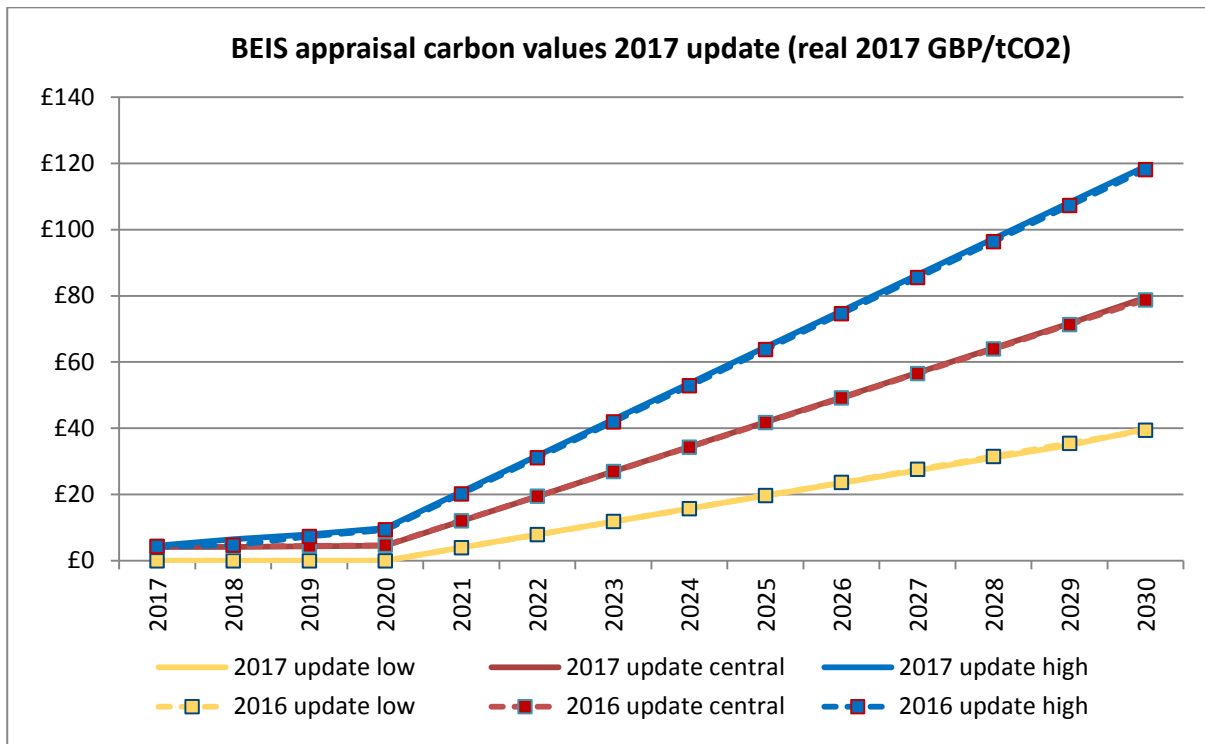
Year	Low	Central	High
2017	0.00	4.13	4.79
2018	0.00	4.19	6.51
2019	0.00	4.37	7.92
2020	0.00	4.56	9.83
2021	3.97	12.05	20.76
2022	7.91	19.53	31.69
2023	11.83	26.99	42.63
2024	15.73	34.45	53.56
2025	19.60	41.90	64.49
2026	23.46	49.34	75.42
2027	27.29	56.77	86.35
2028	31.12	64.20	97.28
2029	34.93	71.62	108.21
2030	39.72	79.43	119.15

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.

¹² 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

Comparison with 2016 short-term traded carbon values

The chart overleaf provides a comparison of the updated 2017 values with those published in 2016. The reasons for the differences between each scenario are explained in the following paragraphs.



Central scenario

The updated values in the central series, estimated up to 2020 based on market data for futures prices, are marginally lower compared with last year's values. This is driven by a fall in the market price of EU allowances compared to last year. The 2016 update showed average futures prices were €5.81/t for 2017 delivery, whilst in this year's update, the average 2017 futures price was €4.81/t, a 17% decrease. However this has been largely offset by the impact of the depreciation of the GBP since last year and resulting in marginally lower values this year.

High scenario

Updated carbon values in the high scenario are outputs of the fundamentals-based BCPM modelling up to 2020 and are slightly higher than those from last year. These series represent the state of the world in which strong economic growth and a low price of coal relative to gas drive an increase in BAU emissions; the need to contain emissions within the EU ETS cap then increases the demand for allowances and consequently, drives a

higher carbon price. Market participants in this state of the world take a longer view on fundamentals (2030 GHG target, MSR etc.), which prompts them to undertake early action to invest in carbon abatement technologies.

The key assumptions underpinning the high series are:

- i. High BAU scenario (based on high economic growth and a low price of coal relative to gas) and corresponding MACCs.
- ii. Length of perfect foresight window of 10 years. This foresight window is consistent with the peer review recommendations in 2014.
- iii. The discount rate of 8% in real terms (appropriate for the high series since a higher discount rate would produce higher prices up to 2030 in comparison with a 3.8% discount rate as in the central series). The discount rate of 8% in real terms is consistent with the peer review recommendations in 2014.
- iv. EU ETS cap that is consistent with a 43% EU GHG emissions reduction target and MSR.

The slight increase we have witnessed in the high price scenario projection up to 2020 is due to the fact that we have applied an 8% discount rate to the futures prices to be consistent with the 8% discount rate we apply to the BCPM fundamentals price in the high series. The modelling assumption in the 2016 carbon price update project was a 3.8% discount rate, so the higher discount rate applied this year has the effect of raising carbon prices, all other things being equal.

Low scenario

Updated carbon values in the low scenario up to 2020 use entirely fundamentals-based modelling (BCPM) and are the same as those from last year. The price of allowances is zero up to 2020 in this scenario, as it was in the 2016 update. This scenario represents a pessimistic view of the future where there is a continued chronic oversupply of allowances in the carbon market relative to demand that drives low prices.

The key assumptions underpinning the low series are:

- i. Low BAU scenario (based on low economic growth and a high price of coal relative to gas) and corresponding MACCs.

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- ii. Perfect foresight window of 6 years (appropriate for the low series since this would produce lower prices than longer perfect foresight).
 - iii. Discount rate of 3.8% in real terms (agreed following consultation with an external peer reviewer). Note that a higher discount rate would not change the result.
 - iv. EU ETS cap that is consistent with a 43% EU GHG emissions reduction target and introduction of the MSR (Market Stability Reserve).

For 2020 onwards, the low carbon values for appraisal in this year's update remain essentially the same. There is a negligible difference from the 2016 low series for appraisal due to the incorporation of the updated 2017 GDP Deflator.

