

# Analytical Annex to the Future Markets Policy consultation of the UK Emissions Trading Scheme (UK ETS)

Annex to the joint consultation of the UK Government, the Scottish Government, the Welsh Government and the Department of Agriculture, Environment and Rural Affairs for Northern Ireland



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*This annex covers proposals made in the UK Emissions Trading Scheme: Future Markets Policy consultation.*

## Analytical annex

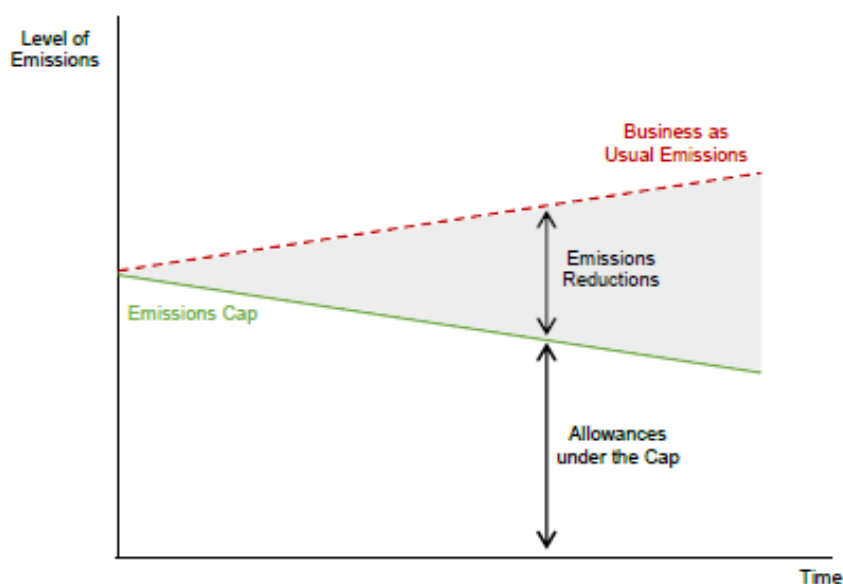
*This annex provides background to the UK Emissions Trading Scheme (UK ETS) market and its current stability mechanisms. It gives an overview of the factors influencing the impacts of the consultation options and considerations. It is not intended to reflect the full evidence base on which decisions will be taken, nor the full evidence base on which proposals have been developed to date. It is not a formal impact assessment. We will seek to gain further evidence to inform decisions from this consultation.*

*In the Authority Response to consultation, the UK ETS Authority, hereafter ‘the Authority’, made up of the UK Government, Scottish Government, Welsh Government and the Department of Agriculture, Environment and Rural Affairs in Northern Ireland will set out impacts of combined proposals, considering the interaction of proposed options and overall scheme impacts. Where we identify specific risks of options, we will set out the actions we will take to appropriately mitigate any such impacts where it is necessary to do so.*

## Section 1: UK ETS overview

The UK Emissions Trading Scheme (UK ETS) works on the principles of cap-and-trade (see Figure 1 below for illustration). A cap is set on the total quantity of UK emissions allowances (UK Allowances or UKAs) permitted in the scheme for surrender against emissions. This cap is reduced over time.

**Figure 1: Illustration of emissions reductions under a cap-and-trade system**



Allowances within the cap are distributed to scheme participants primarily via market auctioning or free allocation. Each allowance under the cap is an allowance to emit one tonne of CO<sub>2</sub> equivalent (CO<sub>2</sub>e). The scheme provides flexibility over how and when its operators reduce emissions through the trading of allowances on secondary markets. See *Primary auctions and the secondary market* for further information on these markets.

The allowance prices that result from auctions and trading create the incentive to reduce emissions.

- Operators whose marginal abatement costs are lower than the prevailing market carbon price can reduce their emissions and thereby reduce the number of allowances they need to purchase. Alternatively, they can earn revenue by selling their allowances.
- Operators whose marginal abatement costs are higher than the market price also benefit as a result of this transfer by purchasing allowances at a lower cost than reducing their emissions.

In theory, trading will occur until operators' marginal cost of abatement is equal to the market price. This facility to trade means emissions are reduced where it is most cost-effective to do so. Also, the reduction in the emissions cap over time creates greater incentives to

decarbonise: the expectation of fewer allowances creating the additional incentive to invest in decarbonation technologies to avoid larger costs in the future.

Additionally, the UK ETS contains provisions to ensure market participants have sufficient flexibility over the timing of abatement, while retaining a clear and consistent incentive to decarbonise. These provisions come in two broad groups:

- Standard approaches carried out by operators and other traders: These include “hedging” or “banking” and also “borrowing” of allowances (see *Banking and Borrowing*). These give participants the capacity to manage the timing of abatement and emissions, and do not alter the total cap over the phase.
- UK ETS provisions over the issuance of allowances: These include the use of unallocated allowances, the flexible share, new entrant provisions and Market Stability Mechanisms. These provisions only change when allowances are issued, and do not alter the total cap over the phase.

This means that annual emissions can fluctuate around the trajectory of the cap.

## Characteristics of the UK ETS

In considering the context in which the UK ETS market operates for the consultation questions, this section sets out characteristics and parameters of the UK ETS.

### Scope/size of market

The UK ETS represents approximately 25% of UK territorial emissions based on the latest 2022 data. The scheme covers the UK’s power sector, energy-intensive industry, and emissions from domestic flights, flights from the UK to the European Economic Area (EEA) and flights from GB to Switzerland.

There were 678 installations and 369 aircraft operators in the UK ETS main scheme in 2022.<sup>1</sup> In addition, the scheme regulates 250 installations under the Hospital and Small Emitter (HSE) opt out, as well as 110 Ultra-Small Emitters (USE).<sup>2</sup> Five UK installations – electricity generators in Northern Ireland – remain in the EU ETS under the terms of the Windsor Framework.

The UK ETS covers carbon dioxide emissions for all activities with the addition of perfluorocarbons for aluminium production and nitrous oxide produced in the production of nitric, adipic, glyoxal and glyoxylic acid.

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<sup>1</sup> Based on operators with recorded 2022 emissions in UK ETS Emissions and Surrenders report published in May 2023: <https://reports.view-emissions-trading-registry.service.gov.uk/ets-reports.html>

<sup>2</sup> See published list Hospital and Small Emitter list here: <https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-a-hospital-or-small-emitter>; See published list of Ultra-Small Emitters here: <https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-an-ultra-small-emitter>

The UK ETS Authority confirmed in its 2023 Authority Response that it had decided to expand the scope of the scheme. This would mean including additional sectors in the UK ETS and capping a greater proportion of UK emissions to further contribute to delivering net zero and UK carbon reduction targets at lowest cost for industry. Subject to further consultation on the details of implementation, the expansion of scope would include:

- Domestic maritime by 2026.
- Energy from waste and waste incineration in 2028 (preceded by a two-year phasing period from 2026-2028).

## Emissions

In 2022, UK ETS-covered emissions amounted to 111 million tonnes of CO<sub>2</sub> equivalent (mtCO<sub>2</sub>e) – of which stationary installations accounted for 103 mtCO<sub>2</sub>e and aircraft operators 8 mtCO<sub>2</sub>e. This represents a year-on-year increase in UK ETS emissions of 3 mtCO<sub>2</sub>e since 2021. This was driven by an increase in aviation activity following the end of the COVID-19 pandemic. This compares to total UK territorial emissions of 417 mtCO<sub>2</sub>e in 2022.

## Cap

In technical terms, the cap refers to the legal limit on the number of UK Allowances that can be created in each year. There is similarly a cap for the trading period. Whilst created as a form of a cap on emissions, these allowances will not automatically be surrendered for the year they are created (see *Banking and Borrowing*).

The annual cap level:

- in 2021 was 156 mtCO<sub>2</sub>e.
- in 2022 cap was 151 mtCO<sub>2</sub>e.
- in 2023 was 147 mtCO<sub>2</sub>e.
- in 2024 will be 92 mtCO<sub>2</sub>e.

In the Authority Response 2023, the UK ETS Authority set out its decision to reduce the annual cap to approximately 49 mtCO<sub>2</sub>e in 2030 which means reducing the overall Phase 1 cap from 1,366 to 936 mtCO<sub>2</sub>e.

## Free Allocation, Industry Cap and the Cross-Sectoral Correction Factor

Free allocation is provided to some operators in the UK ETS to mitigate carbon leakage, the movement of production and associated emissions from one country to another due to different levels of decarbonisation effort through carbon pricing and climate regulation. Mitigating carbon leakage helps support objectives of the UK ETS. In 2022, the proportion of UK ETS emissions covered by free allocation was approximately 36%.

The industry cap sets an upper bound on the free allocation for stationary installations that can be issued each year. Under current scheme rules the industry cap is set at the UK's notional



share of the EU ETS industry cap for Phase IV of the EU ETS. This equated to around 58 million allowances in 2021. In the Authority Response, the Authority agreed to setting the Industry Cap at 40% of the overall cap.

An operator's free allocation entitlement is then calculated via a bottom-up methodology based on risk of carbon leakage, efficiency against a benchmark and historic activity levels.

In terms of specific volumes<sup>3</sup>:

- In 2021, 42 million allowances were allocated for free; 38 million allowances allocated for free to stationary installations and 4 million allowances allocated for free to aircraft operators.
- In 2022, 40 million allowances were allocated for free: 37 million allowances allocated for free to stationary installations and 4 million allowances allocated for free to aircraft operators.
- In 2023, the UK ETS Authority expects to allocate 39 million allowances for free: 35 million allowances allocated for free to stationary installations and 4 million allowances allocated for free to aircraft operators.

If the number of free allowances exceeds the industry cap in a scheme year, and there is no reserve of allowances available to increase free allowances, a cross-sectoral correction factor (CSCF) is applied, which applies an equal percentage reduction to each participant's free allocation. These allowances will be taken from the reserve pot.

## Primary auctions and the secondary market

UK Allowances are sold in fortnightly auctions each year and the revenue from those auctions goes to HM Treasury. These auctions form the primary market.<sup>4</sup> Auction volume for the first three scheme years have been/are:

- 2021: 83 million allowances.
- 2022: 81 million allowances.
- 2023: 79 million allowances.

Approximately 2.8 million UK Allowances will be offered at each 2024 fortnightly auction totalling 69 million in the initial auction calendar.

UK ETS auctioning revenue in 2021 totalled £4.3bn and in 2022 totalled £6.1bn.<sup>5</sup>

UK Allowances that have been released through the primary market or free allocation can subsequently be traded between participants in the secondary market. In the UK ETS secondary market, UK Allowances are often traded through futures contracts. A futures

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<sup>3</sup> Note that free allocation is subject to changes, in particular, as a result of Activity Level Changes in installations.

<sup>4</sup> For further details of how the primary market works: <https://www.gov.uk/government/publications/uk-emissions-trading-scheme-markets/uk-emissions-trading-scheme-markets#uk-etsauctions>

<sup>5</sup> This is from primary auctions.

contract is a legal agreement to buy or sell a particular asset at a predetermined price at a specified time in the future.

Futures are named according to their expiry month. For example, a UKA futures contract that expires in December 2022 would be known as a Dec 22. When a UKA futures contract expires, the contract is settled and delivered by the transfer of UK Allowances from the seller's UK Registry account to the buyer's UK Registry account, and the transfer of the value of the contract from the buyer to the seller.

The volume of traded futures is much higher for the end year futures of the current year. For example, at the end of September 2023 there was Open Interest<sup>6</sup> of 41 million UK Allowances of Dec 23, 7 million of Dec 24, 1 million of Mar 24, a few thousand Dec 25 and nothing in the other contracts (Oct 23, Nov 23, Jan 23, Mar 25, Mar 26).

UK Allowances can also be traded directly between participants Over-the-Counter (i.e. not via an exchange), either as underlying UK Allowances or derivatives (ie. futures contracts)<sup>7</sup>.

### Carbon prices

The carbon markets generally operate on working days. The UKA price often reported for the day is the settlement price<sup>8</sup> of the end year futures contract.

The average UK allowance price in 2021 was £56 per tCO<sub>2</sub>e (the equivalent average EUA price in 2021 was €61 or £52 in sterling). In 2022 it was £79 per tCo<sub>2</sub>e (the equivalent average EUA price in 2022 was €81 or £69 in sterling).<sup>9</sup>

The price in both the primary and secondary markets over 2023 has been very variable, see Figure 2.

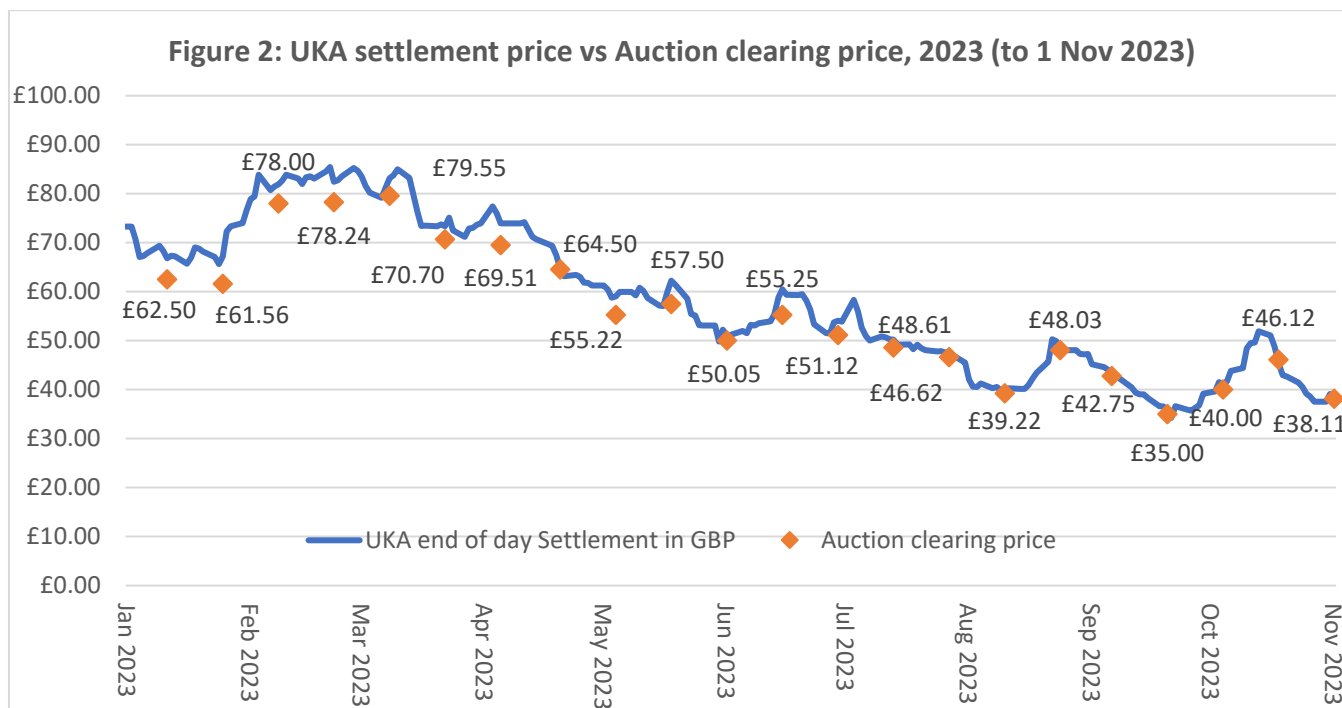
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<sup>6</sup> Open Interest is the total number of outstanding UKA futures contracts that have not been settled.

<sup>7</sup> Derivatives are financial contracts that derive their value from an underlying asset, group of assets or benchmark.

<sup>8</sup> The price which a derivatives contract will reference at the end of each trading day and/or upon its expiration.

<sup>9</sup> These were calculated from the end-year futures published settlement price used in legislation for average prices, i.e. Dec 2021 futures until the end of November 2021, Dec 2022 futures to the end of November 2022 and then Dec 2023 futures.



## The Market and Market Stability Mechanisms in the UK ETS

In order to consider risks to the market, there is first the question about what the purpose of the market is and how it normally functions.

### Normal market function

The UK ETS marketplace provides participants with benefits in the form of gains from trade. Operators covered by the traded sector: energy-intensive industry, the power sector and aviation, engage with the markets either directly or through intermediaries. Financial intermediaries also provide important liquidity to the scheme.

As stated earlier, in theory trading will occur until participants' marginal cost of abatement is equal to the market price. This facility to trade means emissions are reduced where it is most cost-effective to do so. In short, to plan effective, efficient decarbonisation investment, participants want some future price certainty of UK Allowances. Because market participants have information about the supply of allowances and general size and participation in the UK ETS, they also have some understanding of the price they will pay for allowances in future years.

Some volatility is an inherent and positive attribute of market systems. However, gains participants make from emissions trading also rely on stable markets that can instil short and long-term confidence for market participants. Therefore, market functioning needs to strike a balance between evolving price discovery and stable price signals. In particular, shocks to demand and price caused by sudden unexpected events can result in participants losing price certainty and confidence. The scheme's underlying cap-and-trade approach is not expected to

be adjusted routinely or frequently and therefore if there is an issue that needs more immediate attention than a cap review would take, that is where Market Stability Mechanisms apply.

In general, the market is expected to operate without intervention, supporting price discovery and liquidity. Market Stability Mechanisms are needed for circumstances where the current cap and market rules have not been functioning effectively. Market Stability Mechanisms in the UK ETS are designed as their name suggests – to stabilise the market when needed.

## Cost-effective abatement and price certainty

The UK ETS Authority wants a functioning market for its participants to decarbonise the UK sectors covered and move towards a net-zero economy. The Authority wants operators to have increased certainty of price because it means cost-effective abatement will take place. Possible causes of poor price certainty are:

- Poor liquidity.
- High volatility.
- Lack of information about the market.
- Lack of confidence in the market.

Therefore, these causes need to be considered and the risk of them occurring should be minimised. The costs of not doing so are:

- Operators have insufficient information (for example, about price) to decarbonise cost-effectively.
- Operators lose confidence in the market functioning.
- Operators lose confidence in the Authority.

## Liquidity and volatility

Liquidity refers to the efficiency or ease with which an asset or security can be converted into ready cash without affecting its market price. For the UK ETS this means that liquidity refers to how easily UK Allowances can be bought and sold quickly at low transaction cost, and at a price close to the observed price. Traders want liquidity in a market because it means buying and selling is smooth and efficient. In a liquid market the price is little affected by individual trades, meaning there is reduced volatility and increased certainty. Liquidity, as defined here, is not a discrete state, rather it is comparative. This means that a market is generally compared to other markets, or other timepoints, when assessing whether it is liquid. For the UK ETS, this could mean comparing with the EU ETS.

Volatility is often discussed alongside liquidity. Volatility means liability to change rapidly and unpredictably. The term “price volatility” is used to describe price fluctuations of a commodity (e.g. the day-to-day percentage difference in the price). The degree of variation, not the level of

prices, defines a volatile market. Volatility is somewhat related to liquidity but is specifically about price change.

As stated above, the UK ETS Authority wants a functioning market for its participants to decarbonise the UK. It wants emitters to have increased certainty of price because it means cost-effective abatement will take place. Therefore, the Authority favours a liquid market and low volatility because these increase price certainty for the operators who trade in that market.

### **Evaluation report on price certainty, liquidity and volatility<sup>10</sup>**

Research to evaluate the UK ETS is being carried out by CAG Consultants, in conjunction with University College London, Winning Moves and Cambridge Econometrics resulting in an end-year report.

A review of economics literature was undertaken as part of this work to investigate the market quality characteristics of emission allowances. It found that volatility in market prices is not necessarily bad: in an efficient market, prices would be expected to vary in response to new information. However, volatility can be disadvantageous for price discovery if it is driven by 'noise'<sup>11</sup> rather than new information. The review concluded with a list of suggested market quality proxies that could be employed in evaluating the quality of the trading process on the market. The market quality proxies recommended in the literature review were implemented in secondary market data analysis. This analysis focused on trading price and volume data available from the Intercontinental Exchange (ICE). This related to UKA derivatives and focused on December futures contracts because these were the most liquid products. It also looked at EUA derivatives for comparisons with the EU ETS market.

The analysis explored UK ETS market quality using a set of proxies for both liquidity and the price discovery process. Regarding price discovery, the analysis examined price volatility and its components, the degree of price efficiency, and variations in price discovery over a typical trading day. The analysis also examined the relationship between various quality proxies for liquidity and price discovery and compared liquidity in auction and non-auction weeks. In terms of liquidity, the analysis explored bid-ask spread dynamics and low-frequency liquidity measures.

Most of the analysis was undertaken for the period from 1 December 2021 to 15 September 2023. The initial period of trading from 19 May 2021 to 30 November 2021 was excluded as the UK ETS trading system was still being established during this period. But market proxies that required use of bid-ask spread<sup>12</sup> data could only be calculated for the period from 28 July to 15 September 2023, because these data were only held on the ICE platform for a limited time. Some of the findings are therefore tentative until confirmed by analysis over a longer time period. Where data permitted, market proxies were calculated for ICE trading in December

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<sup>10</sup> "Evaluation of UK Emissions Trading Scheme: Phase 1 Report"<https://www.gov.uk/government/publications/evaluation-of-the-uk-emissions-trading-scheme-phase-1>

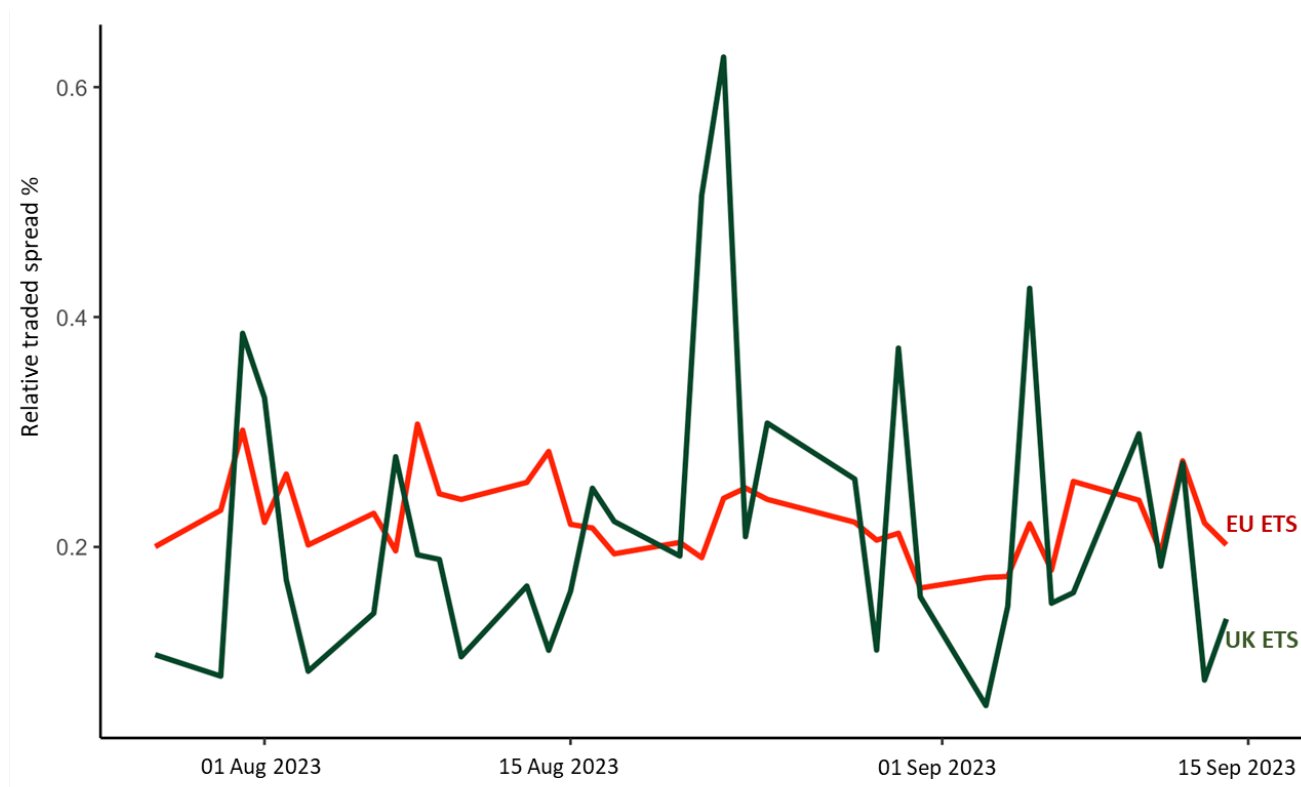
<sup>11</sup> 'Noise' is activity that confuses or misrepresents genuine underlying trends.

<sup>12</sup> The difference between the highest price that a buyer is willing to pay for an asset and the lowest price that a seller is willing to accept.

futures for both the UK ETS and EU ETS, to allow comparison of liquidity and price discovery in these two markets. This analysis did not include trading in EU ETS futures on other exchanges (e.g. European Energy Exchange (EEX) which is a central European electric power and related commodities exchange).

Detailed analysis of liquidity was possible for both the UK ETS and EU ETS. This analysis focused on the mean and median relative traded spread which represents the cost of doing a complete trade (i.e. buying and then selling, or vice versa) relative to the market price. These are robust measures of shorter-term liquidity, within the trading day, which can be calculated for both the UK ETS and EU ETS. This dataset showed that the mean relative traded spread was actually slightly lower (i.e. liquidity was slightly higher) for the UK ETS than the EU ETS over July to September 2023. The median relative traded spread for the UK ETS was noticeably lower, although there was considerably more variation in the spread within the UK ETS than the EU ETS. Further analysis of this metric over longer time periods would be required to provide a fuller interpretation.

**Figure 3: Liquidity as measured by relative traded spread (28 July to 15 September 2023)**

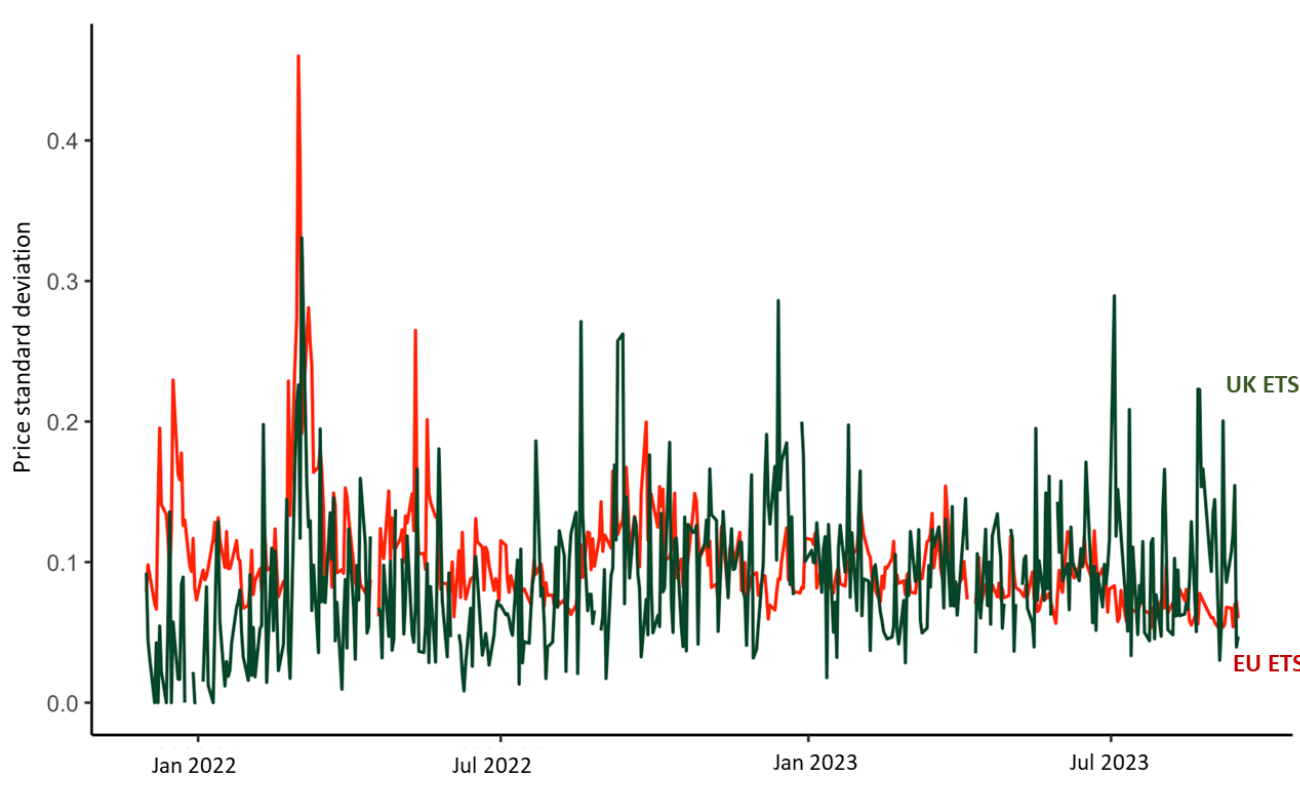


Source: secondary market data analysis, based on ICE data for December futures. The relative traded spread is the difference between the best price of buyer-initiated trades and the best price of seller-initiated trades, divided by the average of these two prices (in %). Spread measures are calculated for 5-minute trading intervals and then averaged for each trading day.

Secondary market analysis was also carried out on price volatility. This analysis found that (on average from 1 Dec 2022 to 15 Sept 2023), overall price volatility in the UK ETS was comparable to the average for the EU ETS over this period. However, the average volatility of

the two markets differed over time: the EU ETS secondary market experienced more significant spikes in 2022, particularly at the end of February 2022 when the Ukraine war began, but the price volatility in the UK ETS secondary market was higher and more variable than the EU ETS during 2023.

**Figure 4: Daily volatility of 1-minute returns (December 2021 to September 2023)**



Source: secondary market data analysis, based on ICE data for December futures.

Overall, this suggests that liquidity and volatility in the UK ETS are not that different from the EU ETS, although these results rely on a currently, small amount of data. More detailed information and results from this work are published in the full Evaluation report.<sup>13</sup>

In terms of market functioning, this means that any impact on price certainty, liquidity and volatility should be considered when looking at changing the Market Stability Mechanisms that apply. In practice, Market Stability Mechanisms are unlikely to have a significant impact on risks to liquidity or volatility in themselves as they have little effect on the supply in the long term and do not change those participating in the market.

<sup>13</sup> Evaluation of the UK Emissions Trading Scheme: Phase 1 report  
<https://www.gov.uk/government/publications/evaluation-of-the-uk-emissions-trading-scheme-phase-1>

## Existing markets policy

The UK ETS already includes some features that aim to address unusual circumstances that threaten the normal market function. These are generally designed to operate when the price drops below or rises above a pre-defined specific amount.

### **Auction Reserve Price**

Any bids in primary auctions below the Auction Reserve Price (ARP) are not accepted, providing a minimum price in auctions. The ARP was introduced on the launch of the UK ETS as a transitional mechanism to ensure a minimum level of ambition and price continuity during the initial years of the UK ETS. Currently the ARP is £22.

Allowances in a primary auction are unsold if supply is greater than demand or if the clearing price<sup>14</sup> would be significantly below the price on the secondary market<sup>15</sup>. Any allowances that do not clear in a primary auction are then added to the next four auctions, unless the total for those auctions exceeds 125% of the original size of the auction. In cases where it is exceeded, the allowances are added to the reserve (which is the Market Stability Mechanisms account).

Therefore, if demand is reduced because participants would only bid below the ARP this means that the ARP can result in allowances being moved to later auctions or placed in the reserve.

### **Cost Containment Mechanism**

A Cost Containment Mechanism (CCM) was introduced with the launch of the UK ETS. This currently means that if prices in the UK ETS exceed three times the average UK ETS price over the previous two years for six consecutive months, Authority intervention can be considered.<sup>16</sup> However, for the first two years, to address concerns around the reactivity of the UK ETS in managing high price spikes, the CCM had lower price and time triggers. It was planned to mirror the design features of the EU ETS mechanism in the longer term to best facilitate any linking agreement and to provide continuity for industry (see *The Future of Carbon Pricing* consultation)<sup>17</sup>.

To date the CCM has triggered twice, once in December 2021 and once in January 2022. On both occasions the Authority decided to take no action.<sup>18</sup>

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<sup>14</sup> The auction clearing price is the price of the bid at which the sum of the volumes bid matches or exceeds the volume of allowances auctioned.

<sup>15</sup> In which case the auction clearing price becomes the price of the lowest bid that is not significantly below the prevailing secondary market price. The auction platform provider determines what is significant.

<sup>16</sup> In the event of the Authority not reaching an agreed position, HM Treasury would make a decision.

<sup>17</sup> This is available:

[https://assets.publishing.service.gov.uk/media/5d22f7d7ed915d0bc6a0a18f/THE\\_FUTURE\\_OF\\_UK\\_CARBO\\_N\\_PRICING\\_-\\_04072019.pdf](https://assets.publishing.service.gov.uk/media/5d22f7d7ed915d0bc6a0a18f/THE_FUTURE_OF_UK_CARBO_N_PRICING_-_04072019.pdf)

<sup>18</sup> <https://www.gov.uk/government/publications/uk-emissions-trading-scheme-ets-authority-cost-containment-mechanism-decisions>



## Banking and Borrowing

The UK ETS has “banking” and “borrowing” similar to the EU ETS rules on banking and borrowing. Banking means that allowances would remain valid indefinitely, participants can “bank” allowances without limitation: in some cases for hedging<sup>19</sup>. Borrowing means that participants entitled to free allocation can also “borrow” allowances by using in-year free allocation to comply with the previous years’ compliance obligation.

## Reserve Pot

The Authority announced that, in order to provide long term market resilience, it would put aside 29.5 million allowances<sup>20</sup> of the cap for future market management for the remainder of Phase 1 (i.e. until 2030). This is equivalent to over 3% of the overall cap. This reserve has multiple uses: for mitigation of a CSCF and for when Market Stability Mechanisms are triggered requiring additional allowances.

## Risks under consideration

The consultation sets out the risks to the market which were identified by the Authority. This annex summarises them below. In the next section, this annex reviews the options sets for addressing them, specifically identifying the impacts from the Market Stability Mechanisms' considered.

### Risk 1: risk of demand shift with long-term impacts

As stated in the Consultation, the effective functioning of the UK ETS market<sup>21</sup> is supported by a degree of surplus<sup>22</sup> in the scheme. This surplus supports liquidity and price discovery in the market (see *Liquidity and volatility*). This risk investigates the scenarios where, as a result of market demand shift, the surplus is either too great or too little to support decarbonisation in line with the Authority’s aims. Market Stability Mechanisms to address this risk would be centred around the amount of surplus either directly or indirectly. This will be considered in cases where the circumstances were longer-term than a shock, but not a permanent change to the scheme design which would be better addressed by a more fundamental review of the scheme and its cap.

### Risk 2: risk of sudden, significant and sustained price decrease

This risk would occur when the market function was affected. Examples include a sudden selling of a large number of allowances and associated price drop. A sudden selling of

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<sup>19</sup> To hedge is to take an offsetting position in an asset or investment (e.g. UK Allowances) that reduces the price risk of an existing position (e.g. in energy). A hedge is therefore a trade that is made with the purpose of reducing the risk of adverse price movements in another asset.

<sup>20</sup> This figure is presented to the nearest 0.5 million throughout this document.

<sup>21</sup> Technically speaking, it is the imbalance or tension between supply and demand that results in a carbon price in a market.

<sup>22</sup> Surplus is defined as the volume of allowances present in the scheme in excess of the volume of allowances required for annual compliance; effectively supply minus demand.

allowances might occur because of the sudden exit of a participant from the scheme or the consequence of economic shocks or other factors (e.g. in March 2020 when covid was prevalent and the EU ETS price dropped). Addressing this risk requires defining what “sudden, significant and sustained” is in terms of time frame and price. In general, this risk is about events that need a short-term adjustment through Market Stability Mechanisms to address the effect rather than a change to the scheme design, such as a change to the cap. These events are usually considered within a year and shorter term than for the risk above.

### **Risk 3: risk of sudden, significant and sustained price increase**

This risk is the counterpart of Risk 2 and would, similarly, occur when the market function was affected. Examples include a sudden buying of a large number of allowances resulting in a price rise. A sudden buying of allowances might occur with a delay to a decarbonisation project or a change to the energy market resulting in a greater use of fossil fuels and need for carbon allowances. Addressing this risk requires defining what “sudden, significant and sustained” is in terms of time frame and price. In general, this risk is about events that need adjustment through a Market Stability Mechanism to address the effect rather than a change to the scheme design, such as a change to the cap. These events are usually considered within a year.

## Section 2: Counterfactual and Options

This section looks at the current arrangements and compares it with each of the options considered in the consultation. It sets out a qualitative assessment of the possible impact of changes. Note that Market Stability Mechanisms generally only apply when the market is no longer functioning as expected or within a pre-defined “normal range”. Therefore, impacts generally only occur outside normal functioning. More quantitative analysis of the approach will be developed for the Authority Response.

### Counterfactual – Do nothing

To consider the options for changing Market Stability Mechanisms in the Scheme, and the impacts of moving to them, a position with which to compare them is required. This is a default “do nothing” or “counterfactual” scenario.

For this consultation, the counterfactual is to continue only with the mechanisms currently in place with the parameters that they currently have.

- The Auction Reserve Price set at £22.
- The Cost Containment Mechanism set at its current parameters.
- Arrangements for Banking and Borrowing.
- No other Market Stability Mechanisms.
- The reserve as set out in the Authority Response (29.5 million allowances for whole phase).

### Options

The options under consideration are broad and the consultation is structured to hear from participants on the potential risks to the scheme. Each of the circumstances is taken in turn.

#### Option set 1 (Risk 1: demand shift with long-term impacts)

This category is about considering appropriate measures and triggers to adjust supply and therefore change the size of the surplus. This category considers the scenarios where the number of allowances in circulation<sup>23</sup> or the average price of an allowance falls outside of a pre-defined range which is considered necessary to support decarbonisation in line with the Authority’s aims. This range is usually considered over a compliance period, i.e. a year. This

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<sup>23</sup> The total number of allowances in circulation (TNAC) is generally of the form of the number of allowances auctioned plus free allocation minus the number of allowances surrendered. There are some differences between definitions and these are usually based on when to consider the events of the scheme year to take place (e.g. surrender of allowances can occur up to four months beyond the scheme year in question).

category is about effects that are long-term but not permanent as these would be better addressed by changing the cap. The consultation aims to gather responses which help to translate mitigation of this risk into an appropriate measure or measures with effective parameters.

### **Considering a Supply Adjustment Mechanism**

A Supply Adjustment Mechanism (SAM) adjusts the number of allowances to be auctioned in certain years if predefined quantity or price triggers are activated.

- A quantity-triggered SAM is triggered if some measure of volumes, such as the total number of allowances in circulation (TNAC), crosses pre-defined thresholds. When these thresholds are crossed, the Authority can release or withdraw a limited number of allowances from the reserve and auction those allowances.
- A price-triggered SAM is triggered if allowance prices cross pre-defined (probably annual) price thresholds. When these thresholds are crossed, the Authority can release or withdraw a limited number of allowances from the reserve and auction those allowances.

As stated earlier, the market will generally have surplus (allowances in circulation) as part of its normal running. These are allowances that are hedged or banked by participants. Therefore, any trigger or consequent adjustment should only occur in excess surplus or scarcity, to take into account this element of usual operation.

In terms of the trigger mechanism, a year is often the time frame for consideration because it is a full compliance period. For a quantity-triggered SAM this will reflect the complete supply and demand of allowances for verified emissions. For a price-triggered SAM some average annual price could reflect the prices across that year.<sup>24</sup> However, in the case of a price-triggered SAM there might be a case for a faster adjustment mechanism (although that scenario is also addressed in *Option set 3: responding to sudden, significant and sustained price increases* later).

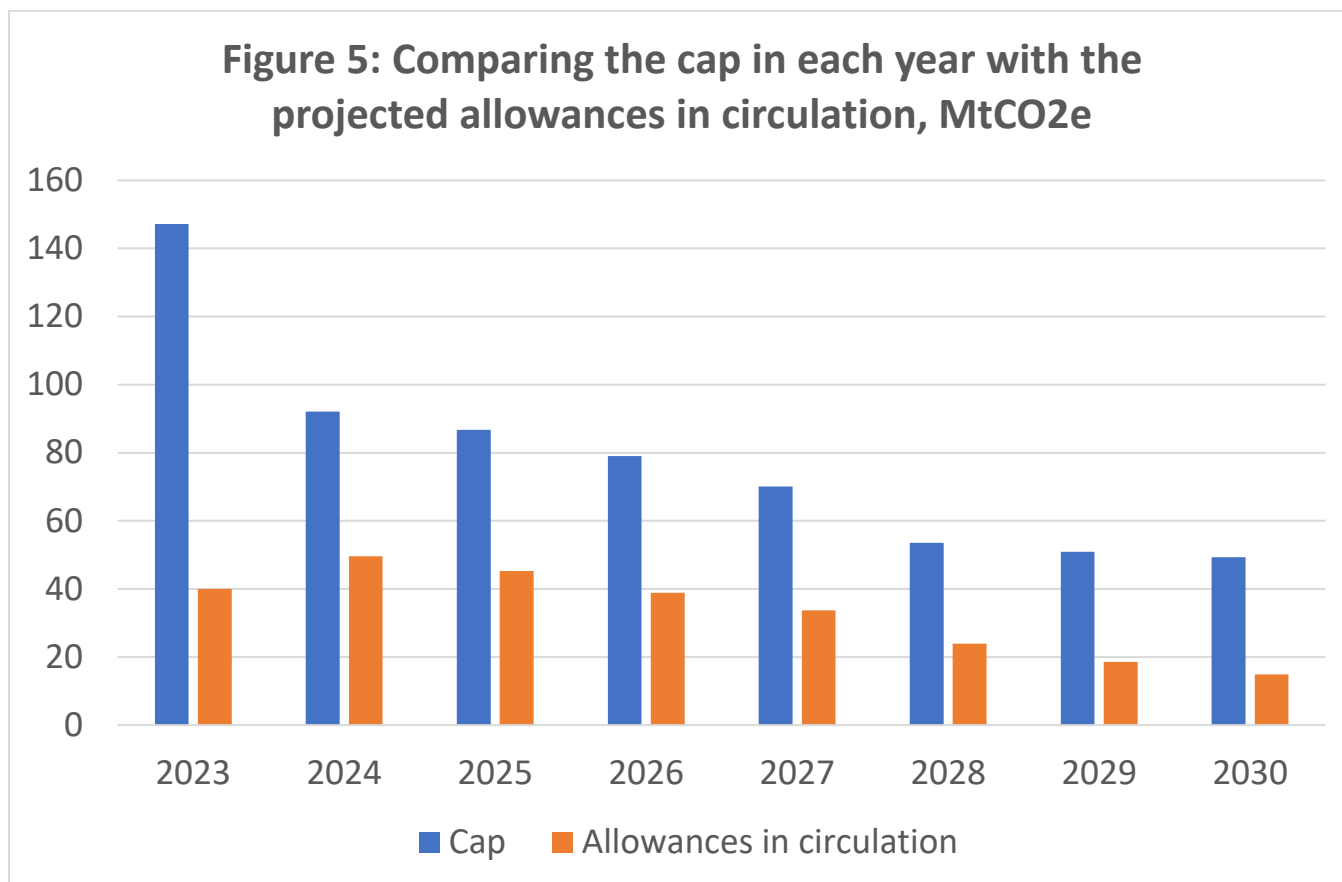
One other aspect to a SAM is that when it triggers to add allowances back into the market for auctioning, these will come from the reserve. Therefore, there will be a maximum total volume the SAM can put into auctioning – the size of the reserve. Also, as this is not the only measure to access the reserve (the CCM and mitigation of a CSCF both do so), the actual number of allowances added could be very limited.

Figure 5 shows projected allowances in circulation under the Net Zero consistent cap. These figures are indicative and come from the DESNZ Carbon Market Model which has outputs that include emissions.<sup>25</sup>

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<sup>24</sup> Although, with banking and borrowing, some allowances will have been obtained through free allocation or purchase in previous years.

<sup>25</sup> The model is a fundamentals-based model which determines the required emissions reduction needed to meet the cap on an annual basis. This model uses marginal abatement cost curves (MACCs) to then determine the



*Note: Allowances in circulation are modelled here as cap minus emissions for that year.*

As noted earlier, the total number of allowances in circulation can be calculated in different ways. If it is assumed that surrender of allowances happens at the end of the year (rather than at the end of the following April) then the number of allowances in circulation in the UK ETS is (auctions + free allocation – emissions/surrendered allowances):

- 18 million at the end of 2021
- 29 million at the end of 2022

A SAM is different from a CCM as it is designed as a longer-term, pre-designed and automated adjustment which the market participants can price in (see *Reviewing the Cost Containment Mechanism* for more on “pricing in”). A CCM instead responds to short-term shocks and, crucially, is discretionary in order to have an effect rather than for the market participants to already have priced it in. A SAM is also different from an ARP as the ARP results in allowances being “rolled forward” initially into future auctions and only if the market continues to remain at a low price will allowances be moved to the reserve.

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cost of the last marginal reduction of GHGs and the resulting cost at which firms will choose to abate emissions. This determines the equilibrium value of a UK ETS allowance in the model. Abatement activities below this cost level are acted upon, and any unabated emissions would purchase allowances to comply with the UK ETS.

The impact of introducing a SAM where the counterfactual has none may be an adjustment to the annual cap (but not the trading period cap) in the next year whenever it triggers by changing the volume of allowances being auctioned without adjusting other pots within the annual cap. A SAM is automatic rather than discretionary, so the market participants are informed about the effect and is therefore able to “price-in” the SAM operation. This is because the SAM acts after information about the year in question is known. This may lead to increased effects:

- If the SAM will remove allowances, reducing the size of the surplus, market participants will know in advance and may decide to bank more allowances before scarcity rises. The impact will be even greater scarcity and may drive the price up.
- If the SAM will add allowances to increase the size of the surplus, market participants will know in advance and may decide to buy fewer allowances before scarcity drops. The impact will be greater supply and this may drive the price down.

An impact of the SAM is that it will confirm to the market participants the quantity levels or price levels that the Authority considers to be acceptable market norms. This provides additional certainty that the market will function within those trigger levels. However, this means that the market participants will have less certainty about the longer term (beyond the next year) than before because the SAM is operating and adding extra complexity about the future.<sup>26</sup>

## Option set 2 (Risk 2: responding to sudden, significant and sustained price decreases)

This category is about considering appropriate measures to address sudden, significant and sustained price decreases. What is appropriate depends upon what is determined to be meant by “sudden”, “significant” and “sustained”. The risk is about effects that are not permanent as these would be better addressed by changing the cap. The consultation aims to gather responses which can be used to help translate mitigation of this risk into an appropriate measure or measures with effective parameters.

On initial consideration, one possible reaction to a sudden, sustained price decrease would be to apply only a SAM. This mechanism was discussed earlier (see *Considering a Supply Adjustment Mechanism*). A SAM is less appropriate to cover this option because it is generally a longer-term measure and therefore not suited for addressing a sudden change.

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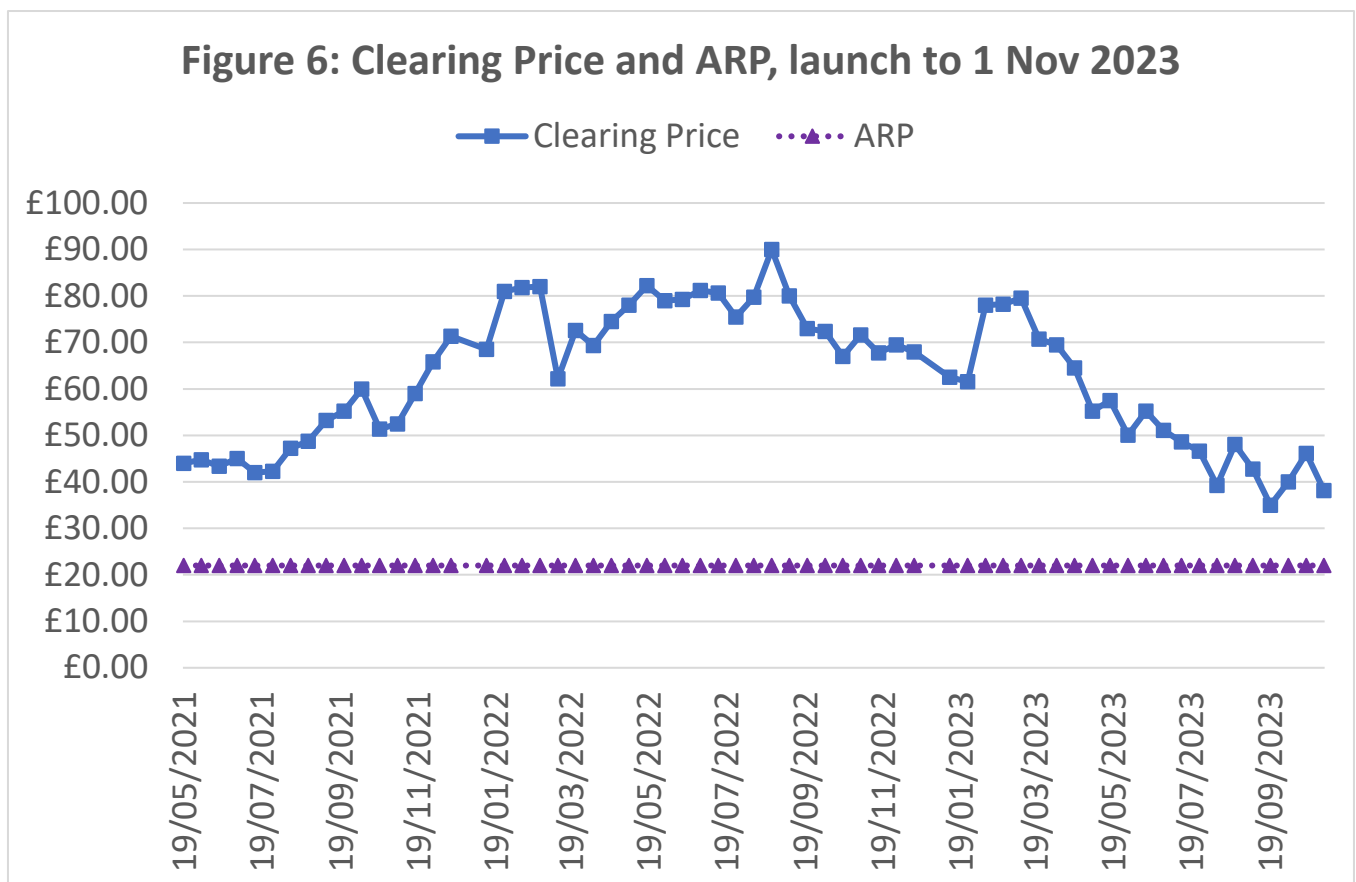
<sup>26</sup> The operation of a SAM in removing or adding allowances will have an impact on supply which will change the market parameters, that is, the supply in the future and therefore the price. While the market participants understand all the initial elements of the system, such as the supply of allowances and the range of behaviour, and demand, of other participants, multiple iterations mean a much larger uncertainty range as future supply for each year depends on each previous year and the price in turn depends on a series of uncertainty behaviour/demand ranges.

## Reviewing the Auction Reserve Price

This section of the consultation considers the existing Auction Reserve Price (ARP) and its use in mitigating the risk. It reviews changing the level and explores whether the design should be changed (e.g. should it remain static or evolve over time).

The higher the ARP is set, the greater the effect, or likelihood of an effect, on market participants' behaviour. Similarly, if the ARP is no longer static but made dynamic (i.e. by adjusting it on an annual basis to reflect previous average prices or some inflation measure), the impact on the UK ETS will depend on exactly how it is altered.

The current ARP, £22, has always been lower than the auction clearing price. For most of the life span of the UK ETS the clearing price has been several times the ARP (see figure 6).



In terms of impact overall, this means a change to the ARP could influence market participants' behaviour even if the ARP was not triggered. This is because market participants will put their range of bids to the auction platform with an understanding of the ARP and therefore ensure that the minimum bid they give is at or above it.<sup>27</sup> Having the ARP close to where the primary auction mechanics (stated in legislation) are setting the clearance price means that participants may consider adjusting their range at the cheaper end of their range of bids to address this, perhaps by not placing allowance bids where they would bid below this ARP. There would be a

<sup>27</sup> For further details of how the primary market works: <https://www.gov.uk/government/publications/uk-emissions-trading-scheme-markets/uk-emissions-trading-scheme-markets#uk-etsauctions>

further effect if the ARP triggered, but the counterfactual ARP (£22) would not have done, because it was set higher and the impact would depend on how many times it triggered and whether allowances were removed from the market.

## **Alternatives to the ARP**

There are other approaches to a “lower bound” in Emission Trading Schemes both in practice and in theory. Some work on a minimum price, others on reviewing large supply or surplus. The impact on the scheme from moving to, or adding, one of these other measures depends not just on the measure but on the specific way in which it is implemented. For example, permanent removal of allowances would affect the cap, but moving allowances between auctions within a year, or several years in the same Phase, would not as the total volume for the year, or Phase, would remain the same.

### **Price floor (absolute)**

An absolute price floor would keep prices across the markets above a certain price level. For example, this could work by the Authority buying up allowances at a fixed rate for a period of time. If prices drop below the agreed level, the price floor is triggered and the Authority can intervene and buy back a portion of allowances until the price is restored to a value above the floor price.

The effects of a price floor compared to the current ARP would depend on how it was operated. It could affect the overall cap / ambition of the scheme if triggered. Incorporating a price floor could reduce market supply and the effect of requiring the Authority to buy allowances would have fiscal implications. Finally, the price floor, like other measures, could influence market participants’ behaviour even if it were not reached.

### **Price floor (temporary)**

A temporary price floor similarly would keep prices across the market above a certain price level, but for a limited time period (e.g. a month).

The impact of a temporary price floor would be milder than an absolute price floor because of the comparative short-term effect.

## **Emissions Containment Reserve**

The Emissions Containment Reserve (ECR) is a policy mechanism designed to automatically reduce the allowance supply when the price of allowances falls below a trigger price. The volume of allowances removed from supply by the ECR is not intended to be available for future sale and therefore allowances are effectively being removed from the overall cap. Whilst the ECR does not direct control allowance price, instead it aims to impact price indirectly by altering the supply/demand balance – a decrease in supply (without a change in demand) is likely to result in an increase in price and prevent any further price decrease.

The impact of moving to an ECR from the counterfactual ARP (£22), or to have as well as an ARP, would include the potential to change the allowance cap to be tighter if there was a



period of low prices. Removed allowances could either go into the reserve or reduce the overall trading period cap in the traded sector unless they were re-introduced at a later point. The effect is this would likely raise the cost of allowances in the longer term because of scarcity. There might also be an impact on market participants behaviour from the presence of the ECR even if it did not trigger.

### **Reverse Cost Containment Mechanism**

This would work in a similar way to the Cost Containment Mechanism, but for low prices. This means that if prices in a UK ETS were below some fraction of the average UK ETS price over the previous reference period for a number of consecutive months, the Authority could intervene in the market.

The impact of this measure would depend on what parameters were used for the reverse CCM, whether it triggered and also whether the Authority intervened. As for other measures, a reverse CCM could influence market participants behaviour even if it were not triggered.

### **Option set 3 (Risk 3: responding to sudden, significant and sustained price increases)**

This category is about considering appropriate measures to address sudden and sustained price increases. What is appropriate, as for price decreases, depends upon what is determined to be meant by “sudden”, “significant” and “sustained”. The risk is again about effects that are not permanent as these would be better addressed by changing the cap. The consultation aims to gather responses which will be used to help translate mitigation of this risk into an appropriate measure or measures with effective parameters.

One possible reaction to a sudden, sustained price increase would be to apply only a SAM. This mechanism was discussed earlier (see *Considering a Supply Adjustment Mechanism*). However, a SAM generally refers to a longer timeframe. All approaches will be considered alongside their interactions.

### **Reviewing the Cost Containment Mechanism**

One response to addressing this risk is to review the current elements of the Cost Containment Mechanism. These elements include:

- the trigger multiplier
- the number of trigger period
- the reference period

There is also the issue of whether to incorporate automatic action, or whether this would continue to be at the discretion of the Authority.<sup>28</sup>

Table 1: Previous and current CCM thresholds

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<sup>28</sup> HM Treasury has the authority to authorise the increase in supply to auctions if the CCM is triggered.

Scheme Year	Previous period ending before trigger period	Multiplier applied to previous period average	Recent period - where price is compared to trigger price
First year	Two years	2.0	Three months
Second year	Two years	2.5	Three months
Third year onwards	Two years	3.0	Six months

Changing the multiplier, timeframe of observation and historical reference period would change the sensitivity and reactivity of the mechanism. The impact compared to the counterfactual would depend on the changes made, whether it was more or less likely to trigger; although whilst the measure is discretionary the market can not automatically “price in” the effect (see below).

If the measure remained discretionary, the impact, compared to the present approach, would also depend on whether and what action was taken. This is because anything that the market participants know - such as what would happen if the CCM was triggered - is already something they take into account when valuing trades (ie. “priced in”). Therefore, if they knew the number of allowances that would be added (for example) they would be more likely to be able to immediately include that in their calculations when they believed that the CCM would trigger. If there is not a predefined action, they can not price it in. Therefore, to make a change to the market, the CCM has the advantage of being a response that it not already priced in and therefore should adjust the market.

Any change to the existing approach might result in a change to market participants behaviour even if the resulting CCM never triggered.

### Alternatives to the Cost Containment Mechanism

As for the ARP and the “lower bound”, there are other approaches to an “upper bound” in Emission Trading Schemes that could be implemented.

### Cost Containment Reserve

A Cost Containment Reserve has a pre-determined trigger price and, if it is reached at auction, a pre-determined volume of allowances is released into the market to reduce prices. This is effectively a simplified, automated version of the CCM.

When compared to the counterfactual of a CCM, market participants would have full knowledge of the effect and outcome of the CCR compared to the uncertainty currently existing and therefore would have “priced-in” the outcome which is not the case with the current discretionary approach with the CCM.

## Price Ceiling

A price ceiling sets an absolute limit on how high the price of an allowance can rise. If this price rises above a pre-determined level, the Authority could supply allowances, offered at the price ceiling value, until prices drop below that level. Depending on the number of allowances, this may require the ability to breach a previously agreed cap. Finally, the price ceiling, like other measures such as a price floor, could influence market participants behaviour even if it were not reached.

The effects of a price ceiling compared to the current CCM counterfactual would depend on how it was operated. In particular, it could affect the overall cap and therefore the ambition of the scheme if triggered. Incorporating a price ceiling would increase market supply, and the effect of requiring the Authority to sell additional allowances, would have fiscal implications. Finally, if the cap could be breached there would be implications for meeting carbon budgets.

## Related areas

Because all the Market Stability Mechanisms interact the reserve, the size and possible replenishment of this is also considered in the consultation. In the case of multiple measures triggering, the pot could quickly empty completely (or fill, although the effect of the decreasing cap makes that less likely). This is also one of the reasons that there is considerable overlap between the options.

## Interdependency

There is overlap between the options under consideration, see Table 2.

Table 2: Interdependency

Combination	Effects	Interaction
Quantity-triggered SAM and ARP	<p>The SAM is likely to be designed to reflect an average number of allowances in circulation in a year. It is likely to react in the longer term, depending on its design.</p> <p>The ARP price applies to all primary auctions.</p>	<p>A quantity-triggered SAM is likely to trigger alongside low prices (because low prices are generally seen in periods of high surplus). If so, it would remove allowances from the market, placing them in the reserve. This would have the likely effect of raising the price.</p>
Price-triggered SAM and ARP	<p>The SAM is likely to be designed to reflect an average price, perhaps on the secondary market. It is likely to react in the longer term, depending on its design.</p>	<p>A price-triggered SAM might interact with an ARP on its lower price bounds in the sense that when the price is at, or more likely near, the ARP, then it will add allowances to the reserve from the market. This</p>

Combination	Effects	Interaction
	<p>The ARP price applies to all primary auctions.</p>	<p>would have the effect of making allowances scarcer and likely raising the price away from the ARP.</p>
<p>Quantity-triggered SAM and CCM</p>	<p>The SAM is likely to be designed to reflect an average number of allowances in circulation in a year. It is likely to react in the longer term, depending on its design.</p>	<p>Circumstances leading to a triggering of the quantity-triggered SAM (at the low surplus trigger) might include the effects from a high price shock triggering the CCM.</p>
	<p>The CCM reacts to high prices on the secondary markets comparing the average over each month with a multiple of a historical average.</p>	<p>Both measures would look to take allowances from the reserve to increase supply and therefore reduce the price.</p>
<p>Price-triggered SAM and CCM</p>	<p>The SAM is likely to be designed to reflect an average price, perhaps on the secondary market. It is likely to react in the longer term, depending on its design.</p>	<p>When the price is high enough to have triggered the CCM process it is likely to also trigger the SAM unless it was a short-lived shock.</p>
	<p>The CCM reacts to high prices on the secondary markets comparing the average over each month with a multiple of a historical average.</p>	<p>Both measures would look to take allowances from the reserve to increase market supply and therefore reduce the price.</p>
<p>CSCF and MSMs</p>	<p>If the number of allowances allocated for free in a scheme year is higher than the industry cap, and there is no reserve of allowances available to increase free allowances, a CSCF is applied, which applies an equal percentage reduction to each participant's free allocation. Mitigation of this uses allowances from the reserve.</p>	<p>Whilst the triggers for both are separate, because both use the reserve, if allowances are needed for both then a decision will be needed on what takes precedence.</p>
	<p>ARP can add to the reserve, CCM can remove allowances from the reserve and a SAM can do either.</p>	

The impact of changing the scheme compared to not changing it will depend on the combination of changes away from the counterfactual rather than each element being valued independently.

### **The reserve**

There are options around changing the reserve.

- Changes to size.
- Changes to structure.

The impact of these compared to the counterfactual will depend on the precise differences, for example whether the size of the reserve changes and when. The impact will also depend on where allowances would come from or might otherwise be allocated. How reallocation is carried out might affect the allowance cap – and therefore emissions – for specific years, or financial transfers between business and Government for specific years. Deletion would likely result in a reduction in emissions and an increase in the carbon price.

## Section 3: Societal impacts

This section summarises the potential costs and benefits to society associated with the Market Stability Mechanisms options outlined above compared to the counterfactual.

### Emissions reductions and carbon prices

The primary benefit of an ETS is the benefit to society of emissions reductions (abatement) that are achieved as a result of the policy. As these Market Stability Mechanisms would all take place when the market was functioning outside its usual parameters, any impact would only happen in those circumstances and there is no specific expected long-term or permanent difference in impacts.

Market Stability Mechanisms are designed to stabilise the market and deal with shocks. This means that they should improve confidence for participants to effectively decarbonise and therefore stabilise the market price and reduce the possibility of it being significantly higher or lower than any participant's projections.

### Compliance costs

Compliance costs reflect the costs incurred by operators to purchase the allowances necessary to meet their obligations under the UK ETS. In general, higher carbon prices will tend to increase compliance costs, while reductions in participants' emissions will tend to reduce them. Compliance costs constitute a social transfer from participants to government (i.e. auction revenue).

The effect on compliance costs will depend on which changes are made but, as for emissions reductions, there is no specific expected long-term or permanent difference.

### Administrative costs

These will depend on which changes are made. Whilst changes might incur initial costs, they may be more or less costly in the longer term, depending on the details.

### Wider economic impacts and economic transfers

The effect on wider economic impacts will depend on which changes are made but, as for emissions reductions and compliance costs, there is no specific expected long-term or permanent difference.

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