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Evaluation of the UK Emissions Trading Scheme: Phase 1 report - Annex 2

Qualitative research report

A report to the UK ETS Authority prepared by CAG Consultants

December 2023

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Chapter 1: Introduction and Methodology

This chapter explains the purpose of the working paper and describes the methodology for the qualitative research and analysis underlying the findings presented in the paper.

This report presents findings from qualitative research undertaken by CAG Consultants during Phase 1 of the UK Emissions Trading Scheme (ETS) evaluation. CAG Consultants were commissioned by the Department of Energy Security and Net Zero (DESNZ) on behalf of the UK ETS Authority. This is paper is published as Annex 2 to the main Phase 1 evaluation report.

The structure of the paper is as follows:

- Chapter 1: Introduction and methodology
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Summary of methodology

This paper presents findings from a total of 73 in-depth telephone interviews undertaken during June and July 2023 with:

- Representatives from 36 companies with compliance obligations in the UK ETS, referred to as ‘operators and aircraft operators (AOs)’.
- Representatives from 26 companies with trading accounts in the UK ETS registry, referred to as ‘traders’ (a few of which were the trading arms of operators/AOs).
- 9 other stakeholders, including representatives from UK ETS delivery bodies, wider stakeholders and verifiers/compliance consultants.

Sampling of organisations with compliance obligations was targeted primarily at operators and AOs with large emissions, because the behaviour of these operators would be significant for the scheme outcomes, particularly in terms of Greenhouse Gas (GHG) abatement and trading. Sampling details are presented in Appendix 3. A separate quantitative survey by Winning Moves, presented in Annex 1, provided a fuller overview of UK ETS participants as a whole.

The topic guides for the qualitative research were designed to test realist theories about operator/AO abatement behaviour and about the trading behaviour of both operators/AOs and traders. The topic guides also aimed to gather insights on how well UK ETS processes were working, as well as gathering early insights on UK ETS influence/impact on abatement and carbon leakage. An example topic guide is presented in Appendix 3.

Permission was requested for interviews to be recorded and transcribed. Transcripts and notes were analysed using both realist and thematic analysis, as described below.

Thematic analysis

A coding frame was developed, covering the main aspects of the UK ETS process, as well as the main elements of realist theory and potential UK ETS impacts. Transcripts and notes were then coded using a computer-aided qualitative analysis package. Themes were then identified for UK ETS process issues and for potential UK ETS impacts (e.g. carbon leakage).

Realist analysis

Realist methods, developed by Pawson and Tilley[1], are most commonly used to develop an understanding of the behaviours of individuals, but can also be used, as in this evaluation, to describe the behaviours of businesses and other organisations.

To do this, realist approaches involve the development of 'context-mechanism-outcome' configurations (CMOs) which set out theories about causality – what is happening and why. In relation to realism:

- 'Contexts' describe the factors which inform and shape (they may enable or constrain) behaviours.
- 'Mechanisms' describes how contexts are understood to determine behaviours in response to a given intervention.
- 'Outcomes' describe the observed behaviour.

The initial 'candidate' theories about trading behaviour and abatement behaviour in the UK ETS are presented in Appendix 1. These were informed by a literature review and scoping work with UK ETS officials within DESNZ. They are set out as a series of CMO configurations.

During the realist analysis process, each transcript was reviewed and information relating to contexts, mechanisms (thinking and rationale) and outcomes was extracted to inform the development of a set of company-level CMO configurations. Where possible, this was done using excerpts that had been coded against possible 'contexts', 'mechanisms' and 'outcomes'.

For abatement behaviour, company-level CMOs were developed for UK ETS operators/AOs only. For trading behaviours, company-level CMOs were developed for UK ETS operators/AOs and traders. Web research and data base checks were undertaken to check the characteristics

[1] Pawson and Tilley (1997), Realist Evaluation, Sage Publications. https://uk.sagepub.com/en-gb/eur/realistic-evaluation/book205276

of operators and traders. Subsequently, the company-level CMOs for each topic area were reviewed and grouped, according to the level of similarity between their CMOs.

Following this sorting exercise, a set of generalised CMOs were developed to show the main types of identified high-level behaviours for each topic, as described by interviewees. Where clear sub-groups were observed within a CMO group, variants were developed to reflect key differences.

Findings from the realist analysis and thematic analysis are presented in this paper.

Limitations

An important limitation of the findings presented in this paper is that the operator/AO findings are focused on high emitters and do not fully capture the behaviour of smaller emitters in the UK ETS. The sampling was purposively designed to focus on higher emitters, as a small number of large emitters dominate emissions within the scheme.

The purpose of this research was partly to build understanding of complex trading and abatement behaviours. Limitations associated with this were:

- Given the breadth of topics covered within the topic guides, interviewers were instructed to prioritise exploration of trading and abatement behaviour. Findings on process issues were gathered for most, but not all, interviewees because of time constraints.
- There was a limit to the depth with which the research topics could be explored within the scope of a 1-hour interview. The interpretation of some points is therefore uncertain.
- While the interviewers were experienced at undertaking qualitative interviews and had been briefed and trained in relation to the scheme, with access to a trading glossary, they were not specialists in financial markets. The team's understanding of UK ETS trading developed as the interviews progressed, aided by periodic 'downloads' to share insights across the interview team.
- Some operator and trader organisations had multiple people involved with UK ETS activities. Efforts were made to capture information from different individuals where this was important (e.g. involving two people in a phone call; or following up with an email query to someone who was not on the call), but this was not always feasible.
- Some traders were cautious about sharing details of their trading strategies because of commercial sensitivity, despite assurances about confidentiality. Where traders were uncomfortable with being recorded, notes were taken instead. Where traders were not willing to describe their trading rationale in detail, interviewers focused on establishing their basic behaviours and gathering their perceptions on the UK ETS market.

Chapter 2: Feedback on transition from EU ETS to UK ETS

This chapter sets out findings from qualitative research, based on thematic analysis of what worked well, and less well, in the transition from EU ETS to UK ETS in early 2021.

What worked well

Smooth transition, aided by keeping scheme design close to that of the EU ETS

Whilst some interviewees were critical of the transition (specific concerns are identified below), the widely held view was that it had worked well. One of the key reasons for this was reported to be the similarities between the two schemes, in terms of operation and administrative systems.

> *I think choosing to basically clone the EU scheme and duplicate it in the UK, I think that was probably the best thing that could've happened to ease the transition. So, I think my view of it is I think that that transition went as smoothly as it could do. (Heavy industry operator)*

Interviewees also praised the efforts of the regulators and others involved in the transition, commonly suggesting that they had found them to be responsive and helpful.

> *But for the actual introduction of the UK ETS system and in discussions we had, and involvement we were included in, it was really good, to be honest. (Power sector operator)*

The guidance issued in support of the transition was also identified as having been valued and useful.

> *EA were pretty good about sending out lots of documents, I think, from memory. We were getting lots of memorandums, basically, making sure that we knew that it was coming, and being prepared if you needed to be, and so forth. So, I think that worked well. (Trader)*

Some interviewees reported that they had attended stakeholder engagement sessions and found these to be helpful, particularly as a mechanism for disseminating information.

> *I remember participating in a number of stakeholder engagement meetings with BEIS. And they were decently well managed, the information was passed through the associative bodies – Energy UK, IETA, EFET – through the industry. That was good. (Trader)*

Some aspects of the UK ETS were seen as an improvement on the EU ETS

Some processes associated with the UK scheme were seen as improving the scheme, in comparison to the UK ETS. These included:

- An aircraft operator reported that the introduction of a portal (as opposed to the use of an excel spreadsheet) simplified the reporting process.
- The UK ETS operator/AO 'dashboard' was valued by one interviewee who commented that they found it to be effective in communicating issues with the system, such as delays in the issuance of allowances.

What worked less well

Uncertainty about creation of a UK ETS

The delay in the decision as to whether or not the UK would have an ETS or a carbon tax was reported as being generally unhelpful and, for some, a significant challenge and source of material disbenefit.

A challenging timeframe for delivery organisations

Some delivery organisations that were involved in the implementation of the scheme reported that it had been an extremely challenging experience. Suggested lessons from their experience included:

- A perceived 'last-minute' approach was seen as high risk (a view shared by some operator/AO interviewees). It was accepted that the matter was complex, but in practice interviewees reported that it was hugely disruptive and advocated for longer lead-in times.
- Regulators were involved in the policy development process, but some felt that opportunities to improve the efficiency of the scheme (specifically the supporting IT systems) were missed, because insufficient weight was given to their operational experience.
- Discussions regarding a possible scheme, involving delivery bodies and the (then) Department for Business Energy and Industrial Strategy (BEIS), were reported as commencing circa two years before the decision was made to implement the scheme. During this period there was considerable staff turnover at BEIS and this was felt to have impeded progress, particularly in relation to some legal matters. It was suggested that there needed to be better hand-over and knowledge transfer systems in place, to counter this problem.
- Some key types of operator (e.g. small emitters) were reported to have received clarification on scheme detail too late to make informed decisions regarding their participation in the scheme.

A lack of certainty was costly for some types of operator/AO

Operator/AO interviewees noted that a lack of policy certainty was, in general, a problem for business and some complaints were made about the last-minute nature of the introduction of the scheme.

The most specific example of a negative impact came from power sector interviewees, and some interviewees involved in providing services to this sector. This group noted that it was common practice in the power sector to sell electricity 2 to 3 years in advance, and to procure carbon to 'lock in' prices (i.e. to ensure that they could supply, whilst trading at a profit, at the price promised to customers). It was a problem for them that they could not buy UK allowances (UKA) for the five months from the start of the scheme on 1 January 2021 until the first UKA auction on 19 May 2021.

In the absence of policy certainty, power sector interviewees reported that their businesses had been exposed to 'huge' commercial risk as there was no surety about the cost of carbon.

> *They'd sold hundreds of millions of pounds of liabilities forward. Without even knowing the price of power. Because the price of power was a function of whatever the unknown UK ETS price would be. And this risk- Massive. (Power sector operator)*

In the absence of alternatives, operators/AOs reportedly bought EU ETS allowances, seeing this as the best available hedging mechanism.

> *…so it was what we called a 'dirty hedge', if you like. You're hedging your carbon cost to some extent, but EU allowances were not eligible under the EU ETS, so it was a hedge for want of anything better. What should have happened? The honest truth is we should have had a carbon market from 1st January [2021] – not six months later. (Trader)*

Once the UK scheme was introduced, however, the EU ETS allowances needed to be sold and replaced with UK ETS. A reported consequence of this was that those who bought EU ETS lost money on their sale of EU ETS, as the market was aware that the introduction of the UK scheme meant that there would be large scale divestment of EU allowances (EUA). Meanwhile, the price of UK ETS climbed as operators looked to hedge their forward power sales.

> *…there were millions of tons of UK ETS liabilities in the market. And so, moving on one- if you've got your hedged generation, to move from one system to the other, meant that you had to quickly try and cover off your UK ETS exposure. So, you had to go in the market, and try and buy a price which then covers all the EUAs. But remember, you've already bought. So, you're trying to sell the EUAs, and [..] the rest of the market knew that UK generators would be offloading EUAs because they couldn't use them anymore. Whereas they also knew they had to then cover very, very large liabilities, where they didn't have the UK ETS instead. So, spec [speculative] traders obviously came in. (Power sector operator)*
>
> *We'd sensibly been buying our requirements in the EU market, so we had to sell those requirements and then buy the UK requirements. The extreme volatility that we saw as the market opened was absolutely horrendous and it left us as a business exposed to*

> *really quite significant costs and risks. You saw, it opened and the markets didn't trade as one, they traded independently. It means that we've effectively got a spread on and we're exposed to the movements of those two legs. It was pretty horrendous. (Power sector trader)*

One power sector interviewee operator noted that it was inevitable that the transition to a new scheme would pose challenges, but felt that challenges they had faced has been predicted and communicated, but the power sector's concerns had not been listened to.

A number of interviewees stated that they would have liked to have seen the UK ETS allow transfer of EU allowances into the UK scheme. It was noted that a number of operator types, not just in the power sector, had deliberately accumulated EU ETS but had needed to dispose of these as part of their adjustment to the new scheme. Aside from potentially selling at a loss, some interviewees suggested that they had lost money as they had been required to sell an asset that they anticipated was going to increase in value.

> *We don't sell by choice but I have to put in the fact [that] Brexit, and us pulling out of the EU ETS was absolutely appalling for us. Because we had to sell allowances which we knew were going to be increasing in value.* (Power sector operator)

Although aircraft operators also tend to buy allowances far in advance, to cover future sales, fewer transition problems were reported for the aviation sector. This was possibly because they were able to hedge with EUA and then use excess EUA for compliance in their EU ETS operations.

Other concerns

Other reported concerns included:

- A delay in the establishment of an adequate secondary market was reported as meaning that operators/AOs had to buy UKA, which affected their cashflow.

  So, we did for, certainly the first 12 months we had to buy spot. So, we were actually building up the asset in the account and sending cash out the door, which we really don't like. (Industry trader)

- Problems with verification as a result of existing EU ETS verifiers needing to be reaccredited to the UK ETS and some operators needing to find new verifiers.

  So we had to go and search for a new verifier, being accredited in the UK. We had to sign new contracts and run through all those processes internally, to find a verifier and to sign contracts. That was quite a burden on our side. (Aircraft operator)

- Problems with benchmarking owing to a lack of sufficient sites, of a given type or types, in the UK.
- The volume of work that the transition generated, and the ongoing need (for some) to manage participation in two schemes (the UK ETS and EU ETS).
- The move to annual activity level reporting, which was introduced to UK ETS in parallel with its introduction to Phase IV of the EU ETS. This was described as adding a new

level of complexity and an associated need to bring in external support (a new and additional cost).

These spread sheets are difficult to understand, some of them with 10,000 lines per page. So, I think, yeah, that's one of the things that [has] come out of it that we're a little bit more dependent on external support because of how technical that element is. (Heavy industry operator)

- The perceived inclusion of an extra step in the approach to emissions reporting (in comparison to Phase III of the EU ETS) was felt to cause an unhelpful delay by one interviewee. In the UK ETS, operators/AOs submit their verified report to the regulator and the regulator then instructs the Registry Administrator to enter the verified emissions figures into the appropriate account in the UK ETS Registry. In contrast, in the EU ETS, operators/AOs submitted their verified report to the regulator and also entered their emissions figure into the EU ETS Union Registry, where it was confirmed by the verifier. The UK ETS process has been designed so that verifiers do not need to interact with the UK ETS Registry, but involvement of the regulator and Registry Administrator was perceived as an 'extra step' by some operators/AOs. This interviewee noted that it created uncertainty because it meant they were unsure of the number of allowances they needed to submit.

  They've added in an extra step which is that the emissions get recorded by the verifier and then passed on to the regulator, and then I understand the regulator then has to tell the UK ETS what the emissions are so they can input them to the system. So that takes quite a lot longer. (Power sector)

- One interviewee felt that an opportunity to simplify the scheme had been missed.

  What I do feel is at its most basic both EU and ETS have become phenomenally complicated, from admin and permitting, a monitoring plan. And I think the UK missed a massive opportunity to simplify that. (Other industry operator)

Some of these points are explored in more detail in Chapter 3 on UK ETS processes.

Chapter 3: Feedback on UK ETS process and design issues

This chapter presents findings on UK ETS compliance processes, based on thematic analysis of qualitative research with operators, regulators, verifiers and other stakeholders. Findings on market processes are presented in Chapter 5.

UK ETS registry – opening accounts and using the registry

The regulators advised that the UK ETS registry portal was designed to be similar to the EU ETS registry but simplified where possible. This is consistent from feedback from users, who commented that some features of the UK ETS registry were easier to use than the EU ETS registry. For example, users could export statements from the UK ETS registry more easily and could more easily transfer and surrender allowances.

> *The actual registry and website is a lot, lot easier with the UK ETS than it was really [with the] EU ETS. To actually find the information that you want, to enter your emissions and surrender allowances is much, much easier to do under the UK system. (Other industry operator)*

However, users reported that registering, or changing, authorised representatives on the system was time-consuming. While there was general acceptance that controls were good for the security of UK ETS registry accounts, many reported that the process of approving or changing authorised users was slow and could be frustrating. While some said that they had got used to the approval system, others reported that there was scope for streamlining the process. Examples of inefficiencies were reported to be that account information had to be re-entered when seeking to make a change, and that primary contacts did not automatically have 'authorised representative' access to the account.

> *Even though [..] we've opened the case from our registry account, we still have to put all the account details, all the representatives [..] We seem to have to do everything from scratch every time we want to make any change. Adding an authorised representative on should be fairly simple once they've had their [criminal record] check, they've sent their passport in and got a signature from us. It should be fairly simple, but it seems to still be a fairly archaic way of doing things. Being able to save progress and things like that would make things a lot smoother. (Power sector trader)*

Operators/AOs based outside the UK had particularly difficulty complying with registry requirements. This particularly affected the aviation and trading sectors, where more companies were based outside the UK. Difficulties arose partly from translation issues and partly from different legal and bureaucratic systems. While 'certified copies' could be submitted for UK documents, the process in some other countries was different. For example, in Germany, non-UK documents had to be translated and then 'notarised' and sometimes approved by a court. This was reported to be time-consuming and expensive, with the process

sometimes having to be repeated when approval delays and repeated queries meant that the documents became out of date (i.e. older than 3 months).

Other than streamlining approval of authorised representatives, other potential improvements to the registry system suggested by users were:

- Making it easier to draw reports from the UK ETS registry into trader systems at the end of a trading day (e.g. trading balance and trade history), as available on the Intercontinental Exchange (ICE) and other systems.
- Possibly presenting historic figures for EU ETS allowance trading within the UK ETS system, rather than data starting in 2021.
- Speeding up or simplifying the process of regulators uploading emissions data (from the permitting, monitoring, reporting and verification (PMRV) system) into the UK registry. It was reported that emissions data did not appear in an operator's UKA registry account until the second or third week of April, by which time they were already being asked to submit allowances for these emissions, in contrast to the EU ETS system where emissions data usually appeared in the registry in early March, well ahead of the surrender date.

There was a range of views about guidance on the registry provided by the regulator (e.g. the EA). On the one hand, many operators/AOs reported that the process was smooth and that the regulator provided helpful support on the registry.

> *…it's been a pretty smooth process. Once we're set up on the portal, everything is within there and it's got all the deadlines and stuff. We've received email updates, and we've got a contact with the Environment Agency, who is being really helpful to answer questions that we've had. (Aircraft operator)*

However, there were reports of operators/AOs finding it difficult to locate the right guidance online, noting continued reliance on EU registry documentation, and having to rely on emails when communicating with the UK Registry.

> *The difficulties to organise all this communication, only through email. So, the only possibility to communicate with the UK Registry was the emails. So, you have to wait your turn after you put a question to sort some items. (Industry trader)*

There was some wider comment from traders and wider stakeholders that ETS trading systems were slow and cumbersome compared to foreign exchange trading systems. These stakeholders envisaged the development of more streamlined, digital registry systems in future.

> *I can tell you that both the EU and the UK, that that's a pretty old-fashioned set up. There are no APIs and straight-through processing, and anything. [..] Like, in FX you book a trade and, literally, one minute later it settles in everyone's accounts. If you book a trade in EUAs or UKAs for that matter, by the time you've actually got them into someone's account, it's at least an hour's work of my back office, for example. (Trader)*

Free allocations

The value of free allowances, in terms of mitigating carbon leakage, is addressed in the chapter on carbon leakage risks. This section focuses on the free allocation process.

As noted in Chapter 2 on the transition to UK ETS, there was some comment that operators should have been allowed to transfer allowances from the EU ETS to the UK ETS at the start of the UK ETS.

Installation operators

For installation operators, there was considerable comment about uncertainties around activity level reporting and finalisation of free allowance allocation, because of delay in approving Activity Level Changes (ALC, see separate section below) and finalising free allowance allocation for the past year. Initial free allocations were made available in the year in which emissions were made, but the final allocation could take several months (even up to 12 months) to be finalised. For example, the sequence of events in 2023 and 2024 would be as follows:

- February 2023 – receive initial free allowances for 2023 (to allow 'borrow-forward')
- April 2023 – deadline for surrender of allowances for 2022 emissions year
- December 2023 – end of 2023 emissions year
- March 2024 – report 2023 emissions, including Activity Level Changes
- April 2024 – deadline for surrender of allowances for 2023 emissions year
- at some future date, receive notification of final free allowances for 2023, after review of any Activity Level Changes by the regulators and approval by the UK ETS Authority
- adjust surrender of allowances, if necessary, when final free allowance notified
- repeat for 2023/2024 and so on

Delays in finalising free allocations were reported to be problematic for operators, as they did not know how many allowances they needed to buy.

> *I think the timing of the validation from the UK ETS system, so we effectively will pull together our [emissions and activity level] data for the end of March, put that into the [PMRV] system, so we have a rough idea of what our allowances are going to be and then we don't get a validation from the UK ETS system probably nearly 12 months after. It then means that we're not 100% sure exactly when we're going to get the balance of the allowances lined out. So we think we know what we're going to get but it's not until towards the end of the cycle that we get it. And clearly then, that can cause a little bit of concern from our side. (Heavy industry operator)*

Compliance consultants reported some teething problems in the allocation of allowances in the UK ETS, with some installation operators being asked by the regulator to adjust their reporting of activity levels in the initial years of the scheme. In some instances, this had implications for

the free allocation that operators had already received, with some allowances being clawed back. However, the consultants reported that the system had improved since 2021.

There was support for the 'borrow-forward' option, through which the initial allocation of allowances for the current year was made before surrender of UKA compliance requirements for the previous year. Several operators/AOs reported that they had used this system at some point in the past, finding that it offered flexibility. There was some indication of operators being less confident to use this mechanism if they expected UKA prices to go up, as borrowing forward could create more problems for their organisation in the following year.

> *Clearly, the fact that the UK ETS, as the EU ETS before it was designed, the free allocation arrives prior to compliance of the previous year, and that does provide a helpful flexibility, I would say, in terms of options for businesses. [..] I think it's a deliberate design, and what you will see lots of companies will use that borrow-forward option. (Heavy industry operator)*

There were a few other comments about free allocation processes for installation operators:

- regulators commented on the challenge of developing a consistent approach to free allocation, which required liaison between different regulators on tricky issues such as free allocation for gas flaring activities (where there was a perceived risk that gas could be flared in order to obtain free allowances).
- compliance consultants commented on the strange situation that a single installation could be producing some types of products that were on the carbon leakage list (and hence qualified for higher free allocations) and others that were not on the list (and therefore received a lower level of free allocation (usually 30%).

Aircraft operators

There were additional comments about free allocations in the aviation sector. In particular, some aircraft operators expressed dissatisfaction with the benchmarking process which used 2010 and/or 2014 data. Some felt that the benchmark should have been updated (e.g. to 2019) to allow the allocation of free allowances to be adjusted for growth or decline in the activity of different aircraft operators since 2010/2014.

> *…the way that the allowances are apportioned to airlines is based on a 2010 benchmark, which is now 13 years out of date. So some of the airlines that used to exist, that got those allowances, don't exist anymore. So those allowances from the aviation market have disappeared. But the activity has not, and that's one of the things. (Aircraft operator)*

Aircraft operators commented that the provisions for growth-related adjustments were much less satisfactory for aircraft operators than for installation operators.

> *Everybody else [i.e. installation operators]] can just go through and say, "We have a significant increase in capacity, and therefore we're putting in a request for more allowances." Airlines don't have that. You have to show something like, I think it was*

> *18% growth year on year, over a four-year period. Nobody achieves that. (Aircraft operator)*

Some aircraft operators also commented that many AOs also made voluntary offsets for their carbon emissions, which meant that they were paying for emissions twice, both via UK ETS and voluntary offset schemes.

However, the UK ETS Authority announced in July 2023 that free allocations for aircraft operators would be phased out by 2026. Some aircraft operators were reported by regulators to have challenged this decision. In interview, some aircraft operators expressed concern that this would impact negatively on their profitability, but others reported that this would create a more level playing field for aircraft operators, removing the perceived unfairness associated with the 2010 benchmark.

> *in a few years there will be no free allocation anymore, so then we don't have to talk about it. I mean that would massively impact our [P&L [profit and loss position], I mean the cost increase will be really significant for the aviation sector, and it really hurts. That's what I can tell you. There will be just a big disadvantage, but- yes, when there's no free allocation anymore, then there will be no unfairness. (Aircraft operator)*

Permitting process for installation operators

Installation operators were required to obtain GHG permits. Many of them reported that it was reasonably straightforward to apply for GHG emissions permits and that regulator responses were fairly quick. Some installation operators reported that they had multiple permits for different pollutants (e.g. the Monitoring Certification Scheme (MCERTs) for NOx as well as UK ETS for GHG).

> *To be fair, they are normally very quick. They are quicker when presented with a problem where we're not in compliance than they would be if it was just a query. But that's the nature of the beast. But they are pretty good. (Other industry operator)*

However, some experienced stakeholders reported inconsistencies depending on which individual you were dealing with at the regulator. This suggested a lack of consistent interpretation of permitting requirements across the regulator(s).

> *Certain clients, we can submit two or three at once and they're pretty much carbon copies of the permit. Obviously, address is different, that kind of thing, but then you'll get a list of questions for one and a list of questions for the other and they don't match. Or one will sail through and then the other one, there'll be hold ups and stuff. (Compliance consultant)*

Installation operators reported that the process of notifying the regulator of changes, and applying for associated permit changes, could be quite cumbersome. One suggested that reducing the level of detail provided in the permit and monitoring plan could help to reduce the need to make minor changes to permits. It was suggested that detail could be put in internal procedures instead, which could be shared with the verifier.

> *I would have thought for a stable [product] site I should probably only have to apply to change my permit every three to five years, something like that. The way it's administered at the moment I almost have to end up doing it every year, for some trivial reason I've never thought of. [..] It just elongates the process and makes life more burdensome for both operators, verifiers and the EA. And it comes back to that basic problem of too much detail in the permit to start with. The monitoring plan should not in that level of detail be anywhere near the permit. (Heavy industry operator)*

The burden for installation operators associated with permit variations was reported to constrain some apparent 'simplifications' of UK ETS processes.

> *So there was a provision in UK ETS to be able to have a minor source that you could- It amounted to less than 10 tonnes. And then you wouldn't have to have a full monitoring plan for it. Great. Good idea. Except that I then had to apply to modify my permit to include it. So you've created more admin to get the simplification than it was worth me to have the simplification in the first place. It's just crazy. (Heavy industry operator))*

Permit variations also created a workload within the regulators, which could lead to delay in permit variations being processed.

> *There can sometimes be a bit of a lag through the Environment Agency when you put in a variation to your site permit. And we've done quite a few, as things change. There can be a bit of a lag in getting that permit back. (Other industry operator)*

Scottish and Welsh regulator were reported to have started charging for permit variations. This tended to result in permit variations being 'bunched' up together and could mean that longstanding variation requirements get forgotten along the way, if personnel changed within the organisation.

> *…since clients have started having to pay for variations in Scotland and Wales, we've had some of them where smaller issues, ones that you just submit a notification for, have stacked up. [..] You know, they'd submitted notifications maybe two years ago, the agency has come back and said, 'Vary a permit at your next significant permit variation.' [..] so we'll send a notification in [..] and then two, three years down the line, someone else will be doing a permit variation and the notification will still be sat there, still be on file, but there's no flag against it saying, 'This needs to be included.' (Compliance consultant)*

There was some suggestion that some of the regulators had decided against receiving certain types of notifications, possibly in order to reduce the workload on the regulator.

> *So, for instance, getting some sort of agreement about what you put in as a notification and then them having to respond to it, and every time you do that, your permit is then hanging in the balance. So if something else comes along and they haven't processed it and released it back, you have then got this bottleneck, and that is exactly what was happening to us. [..] I think that was due to shortages and workload at the regulator. So they have now effectively decided that they don't want notifications for certain things. (Offshore oil operator)*

Monitoring and reporting process

The 'Permitting, Monitoring, Reporting and Verification' (PMRV) system used by the UK in the EU ETS and the first two years of the UK ETS was called the 'Emissions Trading Scheme Workflow Automation Project' (ETSWAP). At the time of the qualitative research, the ETSWAP system was reported by regulators to be nearing the end of its useful life, so regulators and operators were transitioning to a new PMRV system called 'Manage your Emissions Trading System' (METS).

> *ETSWAP is, at this point, it's starting to crumble. It's just really not realistic to stay on ETSWAP any longer. (Regulator)*

Introduction of the new system was originally planned for the 2022 compliance year, but at the time of the research this had been pushed back into 2023. This section presents feedback on each system in turn, as well as some more general feedback.

Overview of monitoring and reporting process

Regulators and operators reported that monitoring and reporting processes worked well overall, with operators generally complying with procedures that were established under the EU ETS. These procedures had largely continued into the initial stages of the UK ETS.

> *I think the rules and the compliance cycle is quite well established. So most operators know what they're doing. The compliance is generally quite high. And the compliance cycle, which is the various dates through the year that sites are required to take certain actions in accordance with their permit and monitoring plan, I think it's quite well established. (Regulator)*

Feedback on past system (ETSWAP)

Operators/AOs who had been in the UK/EU ETS for some time were used to the ETSWAP system and generally reported that they liked the system. Those who were part of the EU ETS as well as UK ETS (e.g. aircraft operators) tended to report that ETSWAP allowed easier data entry than EU systems. However, UK systems were reported to be less user-friendly in terms of sharing information on allowances allocated to operators, as mentioned in the UK Registry section above.

> *…in terms of the reporting, we use ETSWAP to do our reporting in the UK, compared to paper-based, spreadsheet analysis that you send into the EU. Its miles ahead, the UK, in that regard. [..] For reporting, we [UK] have this great system where we put all the data in and that's great. But, actually, the UK government dissemination of information, it's just spreadsheets on a webpage. In the EU, they have the dissemination of information on a huge database that is easily accessible and people can get into, but for the reporting they use spreadsheets. So [why not] use the best of both worlds? (Aircraft operator)*

Organisations who regularly used ETSWAP, such as verification and compliance consultants, said that they had learnt how to use the system. But organisations who only interacted with the

reporting system once a year tended to find it complicated to use. Some brought in compliance consultants to reduce their need to interact with the system. The system was reported to be complex because it aimed to cover every possible operator situation, but the regulators had made efforts to make the system easier to complete, such as highlighting cells that required entries.

> *…they've [regulators] always got to have a form that everybody can fill in. And so one of the things that gets me is, I only need about three pages, and there's hundreds of pages of documents. And whilst, you know, it covers every eventuality – [..] they have made it better, to be fair. It does light up the bits that you need to fill in. But I think the number of tabs on it is up to J, H, I, or something like that. (Other industry operator)*

Feedback on past system (aviation-specific issues)

There was some indication that monitoring and reporting was easier for aircraft operators, because flight data could be imported from central sources. While installation operators had to submit a permit application as their first step in the UK ETS process, the regulators monitored EUROCONTROL flight data and alerted aircraft operators when they were close to the threshold for UK ETS. Operators reported that they could import flight information directly from the ETS Support Facility, which made data entry easier than for EU ETS, which still used a spreadsheet-based system. The aviation 'small emitters tool' was also reported to be easy to use. Verifiers also commented that they could access data on the portal in a convenient way during verification.

> *I believe that the process of adhering to the UK ETS regulation in terms of [..] reporting, etc, it's much more efficient than the EU ETS [..] because the UK ETS, everything is on a portal. Basically, you have the list of flights you imported there, you have everything. It's very easy, whereas the EU ETS is still everything on an Excel format. (Aircraft operator)*

There was reported to be some extra burden for aircraft operators because they had to be part of both UK ETS and EU ETS (and, for some, also the Swiss ETS). Because UK ETS aviation reporting was relatively straightforward, this added a modest amount of additional time: for example, one aircraft operator reported that reporting in two systems added about 15% to their reporting time. They commented that the additional burden may increase if UK ETS diverges significantly from the EU ETS.

Reporting of Sustainable Aviation Fuel use (SAF) was flagged by verifiers as an area for improvement. The regulators had trialled systems for SAF reporting but verifiers commented that these were not yet fully developed. For example, they suggested that a more standard format was required for the Product Transfer Document (PTD) and commented that letters obtained from fuel providers might not be sufficiently robust proof (because they could be forged). They feared that aircraft operators would only pay for SAF, which is more expensive than aviation kerosene, if they could reliably report it within the UK ETS and EU ETS.

> *So I think it would be great if they can actually, again, now that we have just accomplished a second year, to do a reassessment of all the documents that are*

> *actually available, and potentially come out with some clear guidance, or some clear requests, especially when it comes to proving the sustainability of the SAF. I mean, they are aware that the proof of sustainability can be very challenging to be collected from the fuel provider, so this is why they eventually accepted what they call the PTD. Nevertheless, there is no official format for the PTD, and the type of information can differ from each fuel provider. (Verifier)*

Feedback on new system (METS)

The regulator's intention was that METS should retain good aspects of ETSWAP but have a simpler user interface, with stronger security and General Data Protection Regulation (GDPR) compliant processes. The system had been trialled with some operators during 2023 and improvements were still being made by the system developers at the time of the research. While there were some teething problems, the intention was that the system should eventually be better than ETSWAP.

The delay in introducing METS had caused some uncertainty, and some extra work in preparing for a transition that did not happen in 2022, but there was some acceptance that delay was sensible.

> *I think the only thing with that, uncertainty wise, probably more so for us than clients, was this new system was due to come out and we were getting towards the busy point of the reporting year and we hadn't heard anything about it. So, there was a bit more uncertainty for us, as well. [..] It was probably a relief that it got delayed, because we were going to be getting to grips with a new system as we hit the busy period of the year. (Compliance consultant)*

The METS system uses the gov.uk system and is browser-based. The regulators explained that this means that data had to be entered and presented over multiple pages, compared to single tables in ETSWAP. With the new system, users had to click backwards and forwards between different pages, while with ETSWAP they could scroll around a large data table presented on a page.

Regulators anticipated that use of 2-factor authentication (2FA) in the METS system may be challenging for those who only interact with the system once a year, if they have forgotten the process or no longer have access to the device used for authentication.

> *I can see situations in the future where those users, who maybe only log in once a year to make a submission, haven't touched their 2FA in a year and have no idea what it is, or maybe they've changed their phone, or something like that, they may have to go through the whole process again. (Regulator)*

Operators and consultants who were used to using ETSWAP tended to find the change to METS difficult at first, at least in part because it involved change to well-established procedures. Regulators reported that the new system may be more acceptable to operators who were not familiar with ETSWAP. Some frequent users reported that they were getting used to the new system.

> *We've been trialling the new METS system this last month so that's been quite interesting to see the changes there because ETSWAP was always quite [good]… it's quite a shock to the system when you're new to it. And it wasn't the easiest to navigate but this new METS system it looks promising. It'll be interesting to see how it reacts to the different tasks that we have to do. (Compliance consultant)*

At the time of the qualitative research, the linkage between METS and UK ETS registry had yet to be tested, as this aspect of METS would only be required during the verification process.

Regulators reported that they were improving the system in response to feedback from frequent users (e.g. compliance consultants).

> *…we do get comments back from particularly agents, saying, "I quite liked this on ETSWAP and it's not quite the same in METS. Can we do X, Y, Z around it?" They are probably the people who have been most proactive in working with the government on its user acceptance testing for METS and trying to provide that feedback. (Regulator)*

Mechanics of moving data from ETSWAP to METS

Some operators/AOs expressed frustration that there was no automatic process for transferring documents and data from ETSWAP to METS. Instead, the onus was on them to save historic documents and transfer details of all permits from ETSWAP to METS, rather than this being done automatically. A regulator commented that it was a legal requirement for UK ETS operators/AOs to keep all records for 10 years but pointed out that ETSWAP had previously acted as a document store. METS does not fulfil this role so the transition effectively creates a new requirement for operators/AOs to keep a separate record of their UK ETS documents. Operators/AOs reported that the transfer was burdensome, particularly for operators with large numbers of small sites, whether they were in the main or were HSE installations . This contributed to some operators/AOs having a negative view of the transfer to the new system, particularly if they perceived ETSWAP to be fit for purpose and could not see the rationale for the new system.

> *But the absolute biggest waste of time was moving from the ETSWAP system, which is working, to the new portal that was going to be in, in September last year. They told us, "We are responsible for retaining all the documents from it." So, they've not even bothered ensuring continuity. So, having us then spend all the time manually downloading every single document [..] So, we've had seven sites waste at least two days each. (Other industry operator)*

Other detailed points on reporting

Specific points raised by operators/AOs included:

- **Resistance to measures that would improve the accuracy of their Greenhouse Gas emission reporting**. Operators had the choice of using different 'tiers' of accuracy for their reports. Improvement recommendations, made by the regulators and/or verifiers, sometimes encouraged them to move up to a higher 'tier' of accuracy. Some installation operators reported that it was too costly or too much hassle to undertake the

procedures (e.g. gas chromatography) or install the equipment (e.g. gas meters) required to do this.

The second thing is trying to prove tiers every year, that you meet the highest tier possible. We are, as an industry, resisting installing gas meters on natural gas, to hit the top tier, on grounds of unreasonable cost. (Other industry operator)

- **Disproportionate effort involved in reporting on 'de minimis' sources.** Some installation operators commented that significant time was required to report on small sources of emissions (e.g. use of bottled gas), and have these emissions verified, when they represented a very small proportion of their overall emissions. They suggested that a 'de minimis' rule could be introduced. Other comments suggested that such a change had been considered by the regulator, but that installation operators needed to change their permit to adopt this approach (see permitting section above).

  I think probably our biggest bugbear in terms of the monitoring is the fact that we seem to spend an inordinate amount of time trying to get to little, tiny bits of data on a few bottles of gases that we buy, for it to be verified. Compared to huge, huge amounts of natural gas and it's less than… I think for us, bottled gases is something like… I think it's less than something like 0.1, 0.2% of our overall total emissions. And it seems really crazy that things like that cannot somehow have some kind of de minimis exemption. (Other industry operator)

- **No notification of improvement requirements.** There was comment that the report issued by the regulator did not actively flag improvement requirements. While these were issued on the system (i.e. ETSWAP), the operator/AO did not always know that they were there.

Verification

Overview

Verifiers review the emissions reports prepared and submitted by operators/AOs, on an annual basis. They analyse the data provided to check for mistakes and compare the procedure to the monitoring plan to make sure the emissions report is compliant. In the past, verifiers had to make a physical site visit to each installation or aircraft operator each year, but verifiers can now apply to the regulator to undertake a virtual site visit if this appears to be appropriate. When the review is complete, the verifier submits a verification report via the PMRV platform (i.e. ETSWAP or METS). Verifiers do not provide consultancy or advice to operators, although some 'compliance specialist' firms provide advice to some clients while offering verification services to others.

There was comment from both regulators and operators that communication with verifiers generally worked well, with verifiers identifying compliance issues that need to be addressed. Verification was particularly straightforward for aircraft operators because EUROCONTROL provided a reliable, central source of reliable flight data.

> *…we did it for the first time in January and February. [..] It went well and we were able to work quite closely with our verifier, in terms of getting things backwards and forwards through the [ETSWAP] portal. (Aircraft operator)*

Interviewees did not mention difficulties in finding verifiers, although some commented that it was unhelpful that their EU ETS verifiers had to be re-accredited under the UK ETS, as noted in Chapter 2 on the Transition from EU ETS to UK ETS. Changing verifiers could add to the time involved in verification because of the need for the new verifier to understand a given company's operations.

Operators mentioned that the process of reporting activity levels for 'activity level reporting' added another element to verification (see Activity Level Change section below).

Specific issues raised about the verification process are outlined below.

Disproportionate burden of verifying small details

A few installation operators commented that verification of minor details in emissions reports could be disproportionate to their impact on emissions. They felt that time spent on these aspects of verification could be better spent addressing GHG emissions in a more meaningful way.

> *I think the [..] third party verification process [..] is quite, quite a burden. I think we understand that we have to do it but the level of rigour and detail that some of them are going into doesn't really add that much value [..] and then ultimately the impact on CO2 emissions is very, very small. And the amount of effort that we have to put in at this side I think is disproportionate because we could be working on other more important environmental related issues than just really digging into the numbers. (Heavy industry operator)*

Installation operators also pointed out that the verification process for Hospital and Small Emitter sites was as rigorous as main scheme verification, despite the lower levels of emissions involved. For operators with large numbers of sites, this was reported to add to the implementation burden of the UK ETS.

> *…the cost of the verification and the audit, for the hospital and small emitter scheme stuff, which is what a large number of our [product sites] are, the level of scrutiny is exactly the same, it doesn't matter which bit you're in. So yes, that would be my thing. UK ETS allowances cost is one cost, and then there's this massive slew of stuff underneath it, which nobody ever seems to pay any attention to. That's the unseen cost. (Heavy industry operator)*

Other detailed comments on verification

- Verifiers flagged a few areas where they felt UK ETS rules were not entirely clear and where more guidance was needed. These included some aspects of the new Activity Level Change procedures, use of biomass fuels, the circumstances under which virtual

site visits could be substituted for physical site visits and the provision of energy efficiency information by operators/AOs.

- Slight inconsistencies between regulators were reported by operators and verifiers. For example, when the devolved administration delayed implementation of changes that had been implemented by the Environment Agency, this caused some uncertainty for installation operators that had multiple sites across different administrations.
- Similarly, some operators/AOs mentioned that different verifiers sometimes interpreted UK ETS rules in slightly different ways.
- Verifiers reported that it was problematic for them if regulators published new guidance while verification was underway (e.g. between December/January and March the following year).
- Some installation operators perceived that an extra step had been introduced into approval of emissions figures. As noted above, in the UK ETS, operators/AOs submit their verified report to the regulator and the regulator then instructs the Registry Administrator to enter the verified emissions figures into the appropriate account in the UK ETS Registry. In contrast, in the EU ETS, operators/AOs submitted their verified report to the regulator and also entered their emissions figure into the EU ETS Union Registry, where it was confirmed by the verifier. The UK ETS process has been designed so that verifiers do not need to interact with the UK ETS Registry, but involvement of the regulator and Registry Administrator was perceived as an 'extra step' by some operators/AOs.
- There were some comments from installation operators about regulator delays in processing permit variations which then resulted in issues being picked up during the verification process. They felt that they were being taken to task for shortfalls in the regulator response. This was particularly reported for one of the smaller devolved administrations which may have fewer resources to manage UK ETS.
- Verifiers commented that some operators/AOs, particularly small aircraft operators, were not fully aware of their responsibilities under UK ETS.

Suggestions to improve verification

The main change implied by the comments above was that verification requirements might be made less rigorous, and hence less burdensome, for sources and sites involving small levels of GHG emissions.

A further suggestion was that a 'change log' might be introduced for emissions reports, to track verification comments and changes made in response to them.

Finally, a compliance company suggested that regulators could bring in extra resourcing around the verification period, if they don't do this already, to help turn round queries quickly during this period.

> *If they could just set some deadlines to say, "Our aim is to get back to you within two weeks of any correspondence, or, if you have a minor query, you can pick up the*

> *phone," something, that would be great. [..] I suppose it gets more critical when you get into verification. Verification starts in November and usually finishes mid-March, I should imagine, for some people. We try and do it a bit earlier, but when you're going through that final verification you might need to… Something might get found. You might need to put a notification in. [..] The verifier might want to see the evidence of that and see what the response is, so maybe having extra resources at those times of the year could help. (Compliance consultant)*

Processing of Activity Level Changes

Overview

Reporting of Activity Level Changes was introduced to the UK ETS, in parallel of introduction of this process into Phase IV of the EU ETS. It was new to operators and verifiers in 2021 but would have applied even if the UK had remained part of the EU ETS. Reporting of Activity Level Changes was introduced to support a new rule about free allocation adjustments: free allocations are now adjusted up or down if installation's recent activity level (averaged over the past two years) increases or decreases by more than 15%. In earlier Phases of the EU ETS, free allocations were only adjusted if production levels increased or decreased by more than 50%.

Operators and regulators commented that activity level reporting (to enable identification of Activity Level Changes) had created additional requirements for installation operators and made their reporting processes more burdensome for them. Activity level reporting and Activity Level Changes did not apply to aircraft operators.

Regulator comments on ALC process

The regulators commented that the process for approving and implementing ALC was complex: the regulators reviewed activity level assessments and their implications for free allocations, and then passed their recommendations on to the UK ETS Authority on a quarterly basis. The UK ETS Authority then took the final decision on ALCs and free allocation adjustments. Updated allocation tables were uploaded into the registry and adjustments were made to the allocation of allowances where needed (e.g. through the registry administrator issuing more allowances or the operator returning allowances).

Regulators reported that they reviewed over and under allocation of allowances when all submissions had been received (i.e. on 31 March 2023 for 2022 emissions). The rationale was that this was fairer than reviewing under/over allocation for submissions on a first-come, first-served basis. The regulators and UK ETS Authority undertook the review and approval of ALC changes in quarterly batches to help manage the workload. While the process was reviewed after the first year of ALCs, this was still felt to be the best approach.

There was comment from one of the smaller regulators that they were capacity constrained, so the time taken up by the new ALC process had reduced the time they had available to spend

reviewing other elements of the UK ETS process (e.g. annual emission reports, site inspections and compliance reviews).

> *It's a really significant time or resource-constraint for the team at [regulator], and obviously it's quite new, so it's really something that dominates a lot of the year. Which means we're not doing work we would historically have been doing as much as we would like to, around maybe annual emission report reviews or site inspections and compliance reviews, that sort of stuff. We still do those things as well, but not to the capacity we would have before, just because ALCs just take so much time. (Regulator)*

A further comment from a regulator was that the ALC process involved use of templates and tools that were developed by the EU Commission. They were concerned that the UK needed ongoing access to the latest version of these tools or needed to develop its own version of these tools.

> *…use of European Union tools [is] particularly predominant in the ALC process. ALC reports are based on Commission templates, which have been adapted to UK templates, but they're fundamentally European templates [..] And we use the same tools as we would in the EU Commission to process. The notable one is the UBA tool [Umweltbundsamt - a EU Commission tool], which is basically an Excel tool that runs on a bunch of scripts to check the template data, check that the templates haven't been edited in any way, that everything is accurate. It's a bit of a cumbersome tool but it is really useful and important to the process of reviewing ALC reports. And we have no ownership over this tool. And I'm constantly concerned that we'll lose access to current versions. And it does get updated reasonably frequently, as bugs are discovered or things are improved or what have. I do get anxious that we're eventually just not going to be able to use the most current versions of the tool and, as such, will be running templates that have bugs in them. (Regulator)*

Regulators also commented that there were few experts in the UK to consult about how best to implement the new ALC process, because the UK ETS Authority was relatively inexperienced. In contrast, the EU Commission had longer experience and more embedded knowledge and would have been a helpful sounding board on how to implement the ALC process.

Installation operator comments on ALC workload

Installation operators also commented that the ALC process was time-consuming and added another strand to UK ETS reporting, in parallel with emissions reporting. There was some comment that the complexity of ALC spreadsheets had made some operators more dependent on external consultants.

> *And at the same time as implementing the activity level benchmarking process, which was monitoring and reporting of our emissions calculations, but the free allocation piece, that actually is as big a piece of calculation work, if not bigger, than the actual CO2 calculations for our site. So yes, there was a lot of work all came at the same time, which was difficult to manage. (Heavy industry operator)*

> *My understanding is with the activity level reporting, that wasn't necessarily done every year, I think in [Phase III of] the EU scheme. So, changing that so that it's done on an annual basis, it has meant that we need to have a consultant more involved with that, because it can be quite technical to make sure that we get the data correct for that. These spread sheets are difficult to understand, some of them with 10,000 lines per page. So, I think, yeah, that's one of the things that we've come out of it that we're a little bit more dependent on external support because of how technical that element is. (Heavy industry operator)*

However, some installation operators commented that they would have had to get to grips with ALC even if the UK had remained in the EU ETS, and that the process would get easier as they got used to it.

Comments on ALC delays

Installation operators commented that long time lags in approval of ALCs meant that they faced uncertainties about potential increases or decreases in their free allocation of allowances. While each installation operator would have calculated ALC adjustments when submitting their report in March, and had these signed off by their verifier, it could take many months for these adjustments to be approved by the regulator and UK ETS Authority.

> *…[the] annual activity submission for each site looks back at the last two years, and your activity data versus your baseline. We have triggered the -15% change on a couple of occasions recently, so that means we've ultimately lost allowances. But there is a whole lag in that process. For example, we've submitted that activity data with external verification by the end of March. But for example, last year, we didn't hear back from the Environment Agency until about, I don't know, November or December, in terms of the output of that review. Which then confirms the level of allocation that we've then lost. That was all a bit frustrating with that lag in that process, to be honest. (Other industry operator)*

Delayed ALC approvals meant that installation operators faced uncertainties about how many allowances they would need, including whether they needed to return surplus allowances. It could also lead to them having to purchase allowances at a sub-optimal time, when prices were higher.

Potential perverse incentives associated with ALCs

There was also some indication that – in certain circumstances - ALCs might provide perverse incentives for installation operators to run certain processes unnecessarily, to avoid reaching the 15% threshold at which they would begin to lose free allowances. The threshold was reported to apply in absolute terms, irrespective of their production level.

> *But, for our [plant], it sort of almost gets to the point where because it's heat and fuel, it gets to the point where we're going to lose allowances if we don't use a certain amount of gas, and it's not product related. So, to a certain extent, you could argue that if we were low on our use of natural gas, that we could say, "Oh, just leave the [process] running to make sure that we don't lose our free allocation,"[..] because I understand it*

> *has to be an absolute reduction, but when you want to keep your free allocation (Heavy industry operator)*

There was no indication that any installation operators had run equipment simply to avoid hitting the ALC threshold, resulting in unnecessary emissions, but simply an observation that there might – in some circumstances - be an incentive for them to do this.

Accuracy and consistency of activity level reporting

There was some comment that activity level reporting had become much more important because it was now a key factor in the allocation of free allowances. There was some comment from regulators that all parties were going up a learning curve in terms of the accuracy and consistency of activity level monitoring, which now required a level of accuracy similar to emissions monitoring.

> *They have a monitoring plan that is very similar, it's a very similar thing, it's a monitoring plan for how much stuff they produce and how much heat they use and things like that. And because the rules are new and complicated, I'm not sure how consistently well they're being applied. Scotland may well be doing something slightly different from what England is doing. And how accurate is that information that we're actually getting back anyway? And we are obviously issuing free allowances, which is essentially free money, based on this data. Is it as accurate as it should be? (Regulator)*

Negative effect of two-year timeframe for ALC adjustments

As noted in the free allocation section above, the two-year timeframe for ALC adjustments was reported to adversely affect the profitability of restarting or increasing production for plants that had been through a period of lower production.

> *…probably one of our bugbears is the delay the dynamic allocation system introduces in terms of having to hand stuff back, and then if you increase production, there's a long delay in actually getting more allowances, free allowances to cover what you've done, and you have to take the financial pain in the interim, which potentially could really hammer the profitability of the business. (Other industry operator)*

The qualitative research identified two cases where installation operators had closed a plant or production line because of market conditions (including the effects of COVID-19). These plants/lines remained closed and - in both cases - the installation operators commented that the prospect of operating the plant (or production line) for the first year or two without free allowances was a barrier to restarting production.

Enforcement

Insights on enforcement were gathered from the regulators and verifiers/compliance consultants, but not from operators, because of the constraints of interview length.

Installation operators

The regulators reported good compliance rates for installation operators, with most installation operators registering for the scheme and surrendering the correct number of allowances. Good levels of engagement and compliance with the scheme had been established during the EU ETS and carried over into the UK ETS. Small numbers of installations were reported to surrender insufficient allowances or fail to surrender, with the latter mainly involving installation operators that were in administration.

Historically, under the EU ETS, penalties were reported to relate mainly to high-level issues such as operating without a permit and failing to monitor and report correct emissions. Enforcement of lower-level issues under the EU ETS, such as compliance with permit conditions or monitoring plans, was reported to be discretionary and somewhat variable, depending on regulator workloads. At the time of this research, few mandatory penalties had been issued within the UK ETS and the regulator had not yet published its Enforcement and Sanctions policy with regard to discretionary sanctions.

Compliance consultants reported that delays in enforcement action, whether relating to the EU ETS or UK ETS, could cause unexpected shocks for operators.

> *So, that was October 2019 and then we got a notice of intent to impose a civil penalty November '22. So, it took 3 years for them to issue a penalty notice. [..] the client came back and said, "Three years is an awfully long time to not penalise us and then suddenly decide [to do so]…" (Compliance consultant)*

Aircraft operators

Regulators reported that engagement with aircraft operators based outside the UK was more problematic, with some smaller non-UK operators not having registered for UK ETS despite being covered by the scheme. The number of aircraft operators covered by UK ETS was reported to be around 400, significantly higher than the 150 administered by the UK under the EU ETS. The increase resulted from UK regulators having to regulate aircraft operators registered or resident outside the UK that had previously been administered by other EEA States for the purposes of EU ETS. The regulators' approach was to encourage compliance rather than move straight to enforcement.

A further enforcement issue facing regulators was the challenge of recovering debt or enforcing penalties in other jurisdictions. Again, this particularly applied to small aircraft operators that were based outside the UK.

Enforcement – HSE and USE installations

Feedback on enforcement for Hospital and Small Emitters (HSE) installations is based on interviews with regulators, as qualitative interviews were not targeted at HSE operators.

Operators of the HSE installations do not have to buy and surrender allowances. They report allowances on an annual basis and only have to pay for emissions (in the form of a 'civil penalty' or fine) if these exceed their agreed emissions target. Targets are defined in absolute

terms, with no adjustment for activity levels, and are set to decline over time. A number of HSE operators were reported to have exceeded their targets in recent years, either because of tightening targets or because of increased levels of operator activity.

Regulators reported that the term 'civil penalty' could be misleading for instances where HSE operators had exceeded their emissions targets. For example, a hospital that built a new energy efficient building might exceed their target because their absolute level of emissions had increased. To reduce the risk of reputational damage, the UK ETS regulators do not publish lists of organisations incurring these civil penalties.

> *…every year we get concerns from people who are maybe not that involved in ETS, saying, "Why is this hospital getting such a significant penalty, what did they do wrong? Have they had a big pollution [incident] or something?" And it's not really how it works, but that is the language used. (Regulator)*

Although such an operator could in theory ask for a permit variation and increase their target, regulators commented that this might involve more time and effort than simply paying the penalty for excess emissions until targets were reviewed in 2025.

Qualitative research did not aim to undertake research about Ultra Small Emitters (USE) installations. USE operators do not need to report emissions provided they remained below the USE threshold (2,500t CO2e per annum in specified scheme years). There was some qualitative evidence from regulators that there was a risk of USE operator contacts becoming out of date because there was no annual reporting process. There was a related risk that some USE operators might forget to inform the regulator if they exceeded the USE threshold.

Specific features applying to aircraft operators

There were two additional issues that were specific to aircraft operators: issues around use of Sustainable Aviation Fuels (SAF); and issues around interactions between UK ETS and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Use of Sustainable Aviation Fuel

Use of Sustainable Aviation Fuel (SAF) was relatively new within the EU ETS and UK ETS, so systems for monitoring, reporting and verification were still being refined. The Environment Agency set up a pilot on how to monitor, report and verify use of Sustainable Aviation Fuels. Some aircraft operators and a verifier reported in interview that this was well received, commenting that the UK ETS regulator had tackled issues around SAF reporting effectively and proactively.

> *The first year, they had actually no clue, so they asked all the operators, "You can submit all the documentation that you have related to SAF." As a verifier, we were instructed to not verify actually the SAF, to consider the SAF as just regular Jet A-1 kerosene. So they collected all of this information, and they tried to understand what kind of documents they have access to, and [..] had a chat with the operators, I guess*

> *also with the fuel providers, to have a clear understanding, and they eventually came up with that guidance for this year. There are still a lot of things to be improved, for sure, but at least it's a good start, and it goes in the correct direction. (Verifier)*

However, a verifier reported that the regulator had initially rejected some SAF claims and that that, at the time of the research, more guidance was needed on the proof of sustainability required for SAF fuel, so that aircraft operators could request the correct evidence from SAF suppliers.

Aircraft operators reported that there were greater incentives for SAF use within the EU ETS than in the UK ETS, including ring-fencing of EUA revenues for SAF investment. Some aircraft operators also reported that the EU ETS took SAF into account in free allocations but this was not substantiated because free allocations to aviation are being phased out in both the EU ETS and UK ETS. Some aircraft operators were concerned that EU ETS support for SAF could lead to distortion of SAF use in the UK and could dampen appetite for SAF supply investments in the UK.

> *…the EU ETS is driving up quite a lot of great demand and investment in SAF, through how they are allocating free allowances and how they're going to be using the ETS scheme to subsidise it. That's not forthcoming at the moment with the UK scheme. So, what you might see is your operation is shifting, and picking up similar aviation fuel in Europe and not doing it in the UK. Then, it's impacting on schedules and impacting movements and emissions that way, as well, so, just more in response to what the other scheme is doing, rather than the UK scheme. (Aircraft operator)*

Interaction with CORSIA

Aircraft operators were potentially covered by the CORSIA system for some international routes. Offsetting under CORSIA is expected to begin from 2024 but many AOs were already considering future CORSIA requirements because they sell flights in advance. Interview evidence suggested that aircraft operators were primarily planning for CORSIA compliance rather than already buying CORSIA credits. Interviewees mentioned that the credits eligible for use in CORSIA were trading at much lower prices than allowances in the UK and EU ETS. Aircraft operators suggested that a comprehensive international system would be ideal, because it would avoid distortion of flight activity and routing.

> *We have the impression that combining both the classical emission trading schemes with CORSIA [would be the way forward]- to not have overlapping effects, double counting, or any additional negative impact on the competitor situation we have in the EU. That would also help, because otherwise we would see the aviation, and so on, moving onto other regions where there's no emission trading scheme. That would not help the planet, to be honest. (Aircraft operator)*

However, they advised that CORSIA would need to be ramped up, and better implemented, to provide a robust equivalent to EU ETS or UK ETS.

> *…the CORSIA price signal is nothing, is very, very small, compared to the EU ETS and UK ETS. (Aircraft operator)*

Aircraft operators reported that, in the short term, they would like to see greater clarity about the interaction between CORSIA and UK ETS. While the EU Commission had made announcements about how the EU ETS would interact with CORSIA going forward, there was less clarity for the UK ETS.

> *The EU, we now know, is going to implement CORSIA. For all intra-EU flights, it will be included in the EU ETS. Everything outside of that will be included in CORSIA, for their operators. For the UK, we don't know what that looks like. [..] And that's a major concern, because we don't really know what our obligations are going to be next year. (Aircraft operator)*

Some specific locations (e.g. the Canary Islands, Gibraltar) were identified as needing clarification in relation to UK ETS, EU ETS and CORSIA coverage, to avoid double-coverage. The time taken for authorities to agree these details was reported to be problematic for airlines, because they tended to sell flights in advance and would be unable to pass any additional costs on their customers.

> *We don't know what the eventual outcome of the agreement between the UK Government and the EU will be, on the scope of the EU ETS and UK ETS overlapping, until the end of the year, when they've finally made their deal, at which point it's too late for us to then price it. (Aircraft operator)*

Guidance and communications

The regulators provide guidance via a number of routes including:

- Published guidance (gov.uk website, Scottish Government website)
- Newsletters (towards the end of the compliance year)
- Email reminders and notifications
- Help desk support
- Additional guidance sent to operators/account holders (e.g. screenshots of registry)
- FAQ documents
- Webinars and telephone conferences (e,g. when new procedures are introduced)

The regulators reported that they provide extensive 'handholding' support to operators. For example, for small aircraft operators, who were difficult to engage, one regulator reporting having produced guidance, sent emails, made phone calls, set up webinars and participated in relevant conferences.

The regulators advised that some elements of UK ETS guidance were being updated at the time of the research.

Communications activity undertaken by the regulator was reported to include:

- Regular communications from the regulator themselves

- Distribution of UK ETS Authority communications to operators and account holders (since there are restrictions on UK ETS contacts being shared with the Authority, for GDPR purposes)
- Liaison with the UK Emissions Trading Group
- Liaison with verifiers (e.g. through an annual meeting)
- Liaison with the aviation sector via the Aviation Carbon conference
- Liaison with EU member states to share ideas on how to deal with common challenges

Other industry groups, such as the Emissions Trading Group and (in some sectors) industry bodies, were also reported to play a role in raising awareness and signposting their members to communications and guidance.

> *I'd say it's [regulator communications] okay. The reason I'm saying that though is because our trade body, [organisation], are actually so much better at it. That by the time we get your information, we've probably heard it, seen the consultations, and had it presented at their quarterly meetings anyhow. So [the regulator communication] it's more supplementary. (Other industry operator)*

The sections below discuss the responsiveness of regulators, the timeliness of processing, consistency between different regulators, quality of guidance, resourcing of regulators and feedback on regulator communications.

Responsiveness of regulators

Many of the operators interviewed reported that their UK ETS regulator was helpful and responsive. There were comments that the level of communication and response was better than that provided by some EU ETS regulators.

> *…the UK ETS are actually very proactive in that regard and are very helpful. So things like I send an email, I get an email the same day, if not the day after. So in that respect, it's very good. (Aircraft operator)*

Many operators reported that they had developed a good relationship with a direct contact at their regulator. There was some suggestion that this was easier for smaller regulators, where the regulator team was smaller.

> *Again, had a very, very helpful inquiries persons, I think her name was [Name], really, really helpful, back and forth, and she started appreciating how many sites- so she started bulking them together and that side of things. (Power operator)*

There was a general view that telephone support was really helpful in working out the solution to complex issues, but not everyone was able to access telephone support. The regulator confirmed that telephone support was only available if arranged through helpdesk email.

> *We can only contact them by email. And if you write something, and the receiver does not understand you correctly, they give you an incorrect answer. So, in a call, in a talk,*

> *you ask something, and you get directly an answer, and you say, "Hm. Could it be? Or have you not understood me correctly?" and ask again in another way. (Aviation trader)*

There was frustration from some organisations about difficulty accessing telephone support for the UK registry portal, although others had managed to access telephone support.

> *…when we've needed to contact the UK portal in the early days to ask questions, they were all very helpful. Obviously, you try and do as much as you can online without having to contact people completely. But I know in my case, when I was getting registered, I had a problem with the app on my phone. I couldn't get it to work, and I ended up speaking to somebody at the UK Government portal, and she did help me. It was basically the usual thing, unload it and load it back on again. (Trader)*

Generally, those who had a more positive view of support services were those who had developed a direct contact within the regulator.

> *I only ever go to one person in the agency, because I have a contact who I always go to with my issues. If I was just sending it to the general email address, I would no doubt find what our other operators find, is that the response can be a bit all across the board, depending on who ends up picking it up. (Heavy industry operator)*

Suggestions to improve the support service included:

- Making telephone support numbers more widely available, particularly for the UK registry portal.
- Avoiding duplication and repeated explanations by having the same regulatory officer for all sites, where an operator/AO has one multiple sites under the same regulator.
- Setting a performance target for email responses.
- Periodically asking operators/AOs for feedback on the service provided by the regulator.

Timeliness of processing requests

While the regulators were generally reported to be prompt in responding to queries, some more complex requests were reported to take a long time to be processed. In one example, a permit variation took more than a year to be resolved.

> *Sometimes you get a quick response within a few weeks. Other times, it could be a few months. In extreme cases and complex cases, it can take [a] very long time. (Power sector operator)*
>
> *Whether there's a backlog of work or something, but we find it frustrating that we can't get answers to certain questions very quickly. There's a six to eight-week backlog on any questions that we have. [..] We have to agree a way forward with the Environment Agency and it takes six to eight weeks. [..] There's not always the technical understanding, so once you are able to discuss the issue, it does take a little bit of time to fully explain the issues and what the problem is..(Heavy industry operator)*

There was some suggestion that processing times had become longer in the past two years, possibly linked to regulator resources being stretched by the transition to UK ETS and the introduction of Activity Level Changes.

> *Processing things they've been very slow this year. In fact, the last couple of years things have been slowing up but actually when you speak to them they're very good, very helpful and very pragmatic at looking to help and support us in any way they can. (Offshore oil operator)*

Consistency across regulators

Consistency across regulators was important for operators that had multiple sites in different parts of the UK. There were mixed views on the extent to which the regulators coordinated their approach to UK ETS regulation. Some operators reported that the regulators approach to the UK ETS was better joined-up than some other regulatory areas (e.g. Pollution Prevention and Control permitting, PPC).

> *…for ETS, I think, in terms of SEPA and the EA, I think what comes out is a joint message. You know, when things do come out, it's not disjointed. It's not like PPC permitting, which is really quite disjointed. In terms of ETS, anything that comes out, that's the EA, SEPA, Wales, so it does seem very joined up. (Other industry operator)*

However, as noted in the section on permitting, some inconsistencies were reported. For example a recent change to permit format was introduced in England ahead of Wales. This suggested that there was room for more coordination and consistency between the regulators.

> *I don't think completely aligned is going to happen, but I meant more in terms of when there is a rule change it does change for each country eventually, but it's just there should be a bit more clarity on- they should maybe talk to each other first before they change anything I think would probably be our view on it. (Compliance consultant)*

Quality of UK ETS guidance

There were also mixed views on the quality of UK ETS guidance. Some aircraft operators reported that the UK ETS support and guidance were better than those provided by other EU ETS regulators.

> *…the level of communication I believe is better in UK ETS, compared to the EU. Just in the fact that it's little things like there was a webinar on Monday [..] Also, there is very regular publication in terms of what's being thought about, in terms of, where could the scheme go? There are publications in terms of help from the previous year, what came up as FAQs or what came up as problems. (Aircraft operator)*

But there was also criticism from operators/AOs who had difficulty locating written guidance or who were critical of EU ETS guidance still being used within UK ETS. The regulators commented that they were particularly dependent on EU guidance for Activity Level Change reporting.

> *…it's been quite appalling, really. We can't find guidance because the portal is- the website for it is still lacking. Because they're still using EU documents because they've not had the- well, I will infer that they've not had the resource to publish their own. Therefore, I've got one issue at the moment with the Environment Agency, where they're making a decision about our future allowances, which is not compatible with the EU documentation. (Other industry operator)*

Aircraft operators expressed frustration that they were still waiting for official guidance on SAF. (The lack of firm guidance was reported to constrain operator investment in SAF, implying that UK ETS (and EU ETS) incentives were important in driving adoption of SAF.)

> *We still don't have proper guidance on what SAF will be allowed to be used in the UK ETS. We have a preliminary guideline, as to, "These are the things that you need to look at." But we don't have any real guidance that we can point the verifiers to and say, "Okay, we've got this, this is the type of fuel, this is how it's done, and this is as per the UK guidance." This is three years after the system's been set up. [..] When you're telling the CEO that you're going to have to spend £10m on this fuel," and you're saying, "Well, it might or it might not work." It doesn't ring true, so you don't get it [the funding]. (Aircraft operator)*

More generally, operator/AO or trader staff who were new to the UK ETS, and who only interacted with the system once a year, expressed a need for simple step by step guidance.

> *As I say, it is just more with people changing roles and things. It is not very- Like it would be ideal- 'You have to surrender your allowances by…'- 'x' date. 'Here is instructions on how to do so' type thing, because you are only doing it once a year also so you can easily forget how to do it. I mean it is pretty straightforward now I know what I am doing, but when I first did it, I was like, "I am clueless." (Offshore oil operator)*

Some traders mentioned that the EU registry had videos showing step by step how to undertake simple tasks (e.g. adding a new authorised representative, initiating a transfer, check balances and so on) with screenshots of a mock registry account. They recommended that it would be useful for the UK ETS to develop similar materials that participants could use in operating procedure manuals.

Resourcing of regulators

A number of operators/AOs commented that the regulators were under-resourced. They suggested that better resourcing could allow better relationships to be built up between regulator teams and operators/AOs in specific industries, including site visits where needed to resolve tricky issues.

> *So, ways in which the UK ETS administration could be improved? So, more resourcing. Enable that relationship to be built up, have some sort of continuity, or like you say, grouping industries together with the same officer, so they build, I guess, that understanding. More responsive in terms of letting you know how things are changing. (Other industry operator)*

There was recognition that resourcing was particularly an issue for the devolved administrations, where there were fewer individuals covering UK ETS. And comment that changes to the UK ETS (e.g. expansion to include energy from waste and domestic maritime) might increase the burden on the regulator teams. One regulator commented that engagement with domestic maritime operators might be particularly challenging because they would not previously have engaged with permitting processes.

> *The incinerators at least work within a kind of a related regime around PPC, which is not the same as UK ETS of course, it's very different. But they at least are familiar with the permitting process in a lot of cases from [regulator]. But maritime, it will just be a totally new sector, which had basically no interaction with [regulator] before, so there will be a lot of comms around that. (Regulator)*

Quality of regulator communications

Operators and AOs were generally positive about regulator communications, finding the newsletter helpful.

> *The website or sending out their newsletters is quite informative, that's actually quite useful, for me. When they do updates on changes in the system, they tend to do a newsletter update, those are actually beneficial, because there's not that many people look at their websites regularly. So the newsletter is actually helpful. (Heavy industry operator)*

There was some comment that notifications should be sent to operator/AO email accounts rather than simply placed on the registry, to help those who do not regularly log in to the registry. And there was mention of some 'help' videos being out-dated.

While there was generally support for the decision to defer the move to METS (see monitoring section above), there was some comment that the move should not have been announced until it was more certain.

There was considerable comment about the timing of the UK ETS Authority's consultation response which is covered in the next section.

Consultation response

At the beginning of the research period, the UK ETS had yet to publish its full response to the March 2022 consultation on the Developing the UK Emissions Trading Scheme[2]. An interim response was published in August 2022 but this did not cover important issues such as the introduction of a net-zero consistent cap on emissions. Both operators/AOs and traders expressed disappointment and frustration at the delay in publication of the response.

> *There was a big consultation, everyone gave their responses, and you're just waiting for the outcome without any real engagement, for nearly a year. (Trader)*

[2] https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets

Some commented that uncertainty about the future direction of the scheme had contributed to market weakness and to uncertainty about industry investments.

> *Two years ago, the government launched a consultation on the future of ETS, and we still don't know, and they're still suggesting further consultations on things. And that uncertainty is meaning investment is moving elsewhere. (Heavy industry operator)*

The lack of industry and market engagement since the consultation was contrasted with the EU ETS approach to consultation on changes, and to the UK ETS Authority's good level of engagement during the transition from the EU ETS to the UK ETS. Market traders commented that the UK ETS Authority could have engaged with industry and the market about emerging ideas (e.g. through working groups), rather than delaying any announcement until it had made a decision.

> *Whereas if you compare that with the EU ETS, maybe they start a consultation and then there will be comments and meetings, which are publicly communicated to the market, until a final decision gets made. And if you look at how it went in the UK, they had a consultation, and then it was kind of… You know, nothing, we didn't hear anything. And then boom, they came out with this announcement, the decision has been made. So I think, as market participants, I would welcome just more regular updates and forward guidance to the market. (Trader)*

Stakeholders' reactions to the 3 July announcement, relating primarily to the proposed introduction of a net zero consistent cap for the UK ETS, are discussed in chapter 9.

Other process comments

Other comments from regulators about UK ETS implementation included:

- UK ETS Authority Resource Pool worked well with the regulators in tackling issues arising during the implementation of UK ETS. This allowed devolved administration regulators to feed views into policy making in a way that was not possible within the EU ETS.
- Regulators suggested that they should review legal drafting instructions that are sent by policy leads to BEIS legal. At this point, they can help to clarify what a policy change is aiming to achieve and advise on how any risks can be mitigated.
- Regulators suggested that a data manager from DESNZ should coordinate data requests made to the regulator.

Other comments about UK ETS implementation from operators/AOs, traders and wider stakeholders included the following points:

- At the time of the research, some operators commented that they were unclear about how the Carbon Border Adjustment Mechanism (CBAM) would work in practice within the EU ETS, particularly for electricity trading.

So from an administrative perspective, CBAM kicks in in October, but the first reporting will be 1st January. And our take is most of the industry don't seem to be aligned on what the processes will be for CBAM. Particularly for electricity trading as well, there are still a lot of big question marks on how that's going to operate. Just because of the nature of electricity markets and how the customs work and where the title is when you're trading across electricity. [..] And electricity is particularly important. It is particularly important because there is in fact an implicit link between the UK ETS and the EU ETS to interconnect in the power sector. So when the carbon price is low in the UK, you will see flows from the UK to the EU, and the other way around. (Wider stakeholder)

- Airlines need a year's notice of significant changes so that they can price changes into sales of flights one year ahead.

  From an airline perspective, and any geographical scope changes, they must be pushed back at least a year in order for airlines to prepare and build those costs into their models. (Aircraft operator)

- There was some suggestion that the threshold for power generators in the UK ETS should be reduced from 20MW to 1MW to avoid unfair competition from small electricity producers who can operate in the Capacity Market for electricity.
- Some installation operators commented that the UK ETS Authority will have to consider carefully how to develop benchmarks in future for those sectors and processes which have few representatives in the UK.

  Now, I think I'm right in saying that we probably now have the only [equipment] in the UK that's in the ETS system. So we've got concerns as to how benchmarks will be set in the future, without them having to look at maybe European performance (Other industry operator)

- Recognition of the source of electricity generation, where it is 'spilled' to the grid, when this is introduced from 2026 onwards.

  …we had a windfarm on a site, so even though it was creating renewable electricity it was still classed as net electricity generator so was deducted allowances for that, which didn't quite make sense. [..]The rule is changing from 2026 so it's a positive step, but I think consideration to not just selling electricity but how that electricity has been generated is probably a consideration that needs to be made. (Other industry operator)

- Regulators in the UK charge for changes to Emission Monitoring Plans, while EU regulators do not charge for this. The consequence is that some aircraft operators hesitate before making changes, or wait to make several changes at once.
- Some UK operators/AOs that have subsidiaries in Europe find it difficult to make submissions via EU ETS portals in other countries. They would welcome an arrangement whereby they could make such submissions via regulators in the UK.

  …it's exceptionally difficult to be able to actually access these portals, if you're not an Italian citizen, for example, and [..] it causes a lot of grief and [..] a lot of work and stress to be able to, even, just submit our EU ETS submission. Where if we could have a

framework agreement with the EU, where we can submit our EU ETS through the Environment Agency in the UK, that would make our life [..] a lot easier. (Aircraft operator)

Chapter 4: Characterisation of trading behaviour in the UK ETS

This chapter sets out findings on the characterisation of trading behaviour in the UK ETS, for both traders and operators/AOs, using realist analysis of qualitative interview data to describe their reasoning and behaviour. This section also presents thematic findings on the evaluation of these trading behaviours, while process issues relating to the UK ETS market are presented in chapter 5.

Operators and AOs can source UKA from free allocations (where eligible for this), by buying UKA at fortnightly auction or by trading physical UKA or UKA derivatives (e.g. futures contracts) on the secondary market. Trades can be made via the Intercontinental Exchange (ICE) or via bilateral trades with any other account holder in the UK ETS Registry (known as 'Over the Counter' (OTC) transactions). Physical UKA and UKA derivatives can be traded by organisations without compliance obligations (e.g. banks, brokers and other traders) provided that they have a trading account in the UK ETS Registry. In the secondary market, daily ('spot') and monthly futures contracts in UKA are traded via ICE, while physical UKA, forward contracts and swaps are traded via OTC transactions.

This chapter presents the nine main trading behaviours observed through the research. These are presented using realist 'context-mechanism-outcome' (CMO) configurations to highlight the organisational reasoning or rationale for a trader or operators/AO's behaviour in the UK ETS market, and the organisational contexts that led to this reasoning or rationale.

It is possible for an organisation to practice more than one form of the identified behaviours (i.e. the behaviours are not mutually exclusive), and this is likely to be the case for at least some of the businesses involved in this research. For example, trader interviewees were generally part of large, often complex, organisations involved in multiple forms of activity. However, while organisations may have been involved in multiple behaviours, individual interviewees were generally only involved in, and able to comment on, one form of the identified behaviour.

The CMO set developed for 'traders' is shown in Appendix 2. Each CMO has been assigned a summary 'nickname'. These are intended to provide the reader with an easily understood summary of the described behaviour, and to enable cross referencing within the report.

In short, the nine main types of trading behaviour observed in the qualitative research were:

- **Speculation:** a firm registered on ICE taking potentially risky positions in the UK ETS market (mainly in December futures) because they feel their commodity trading expertise and energy market insight means that they are well placed to identify and realise opportunities to generate profit through speculative trading in UKA products.
- **Market making**: a firm (usually registered on ICE), that provides a range of financial, risk and asset management services to an existing client base, undertaking trading in

UKA products to meet the needs of clients who have obligations under the UK ETS, thereby enabling their clients to access the market and hedge their compliance risks (mainly using December futures), while generating a profit themselves by charging a margin on sales, hedging their own positions and undertaking some relatively low risk speculation.

- **Broking:** a firm similar to a market maker (usually registered on ICE) but only trading UKA products on behalf of clients, not taking speculative positions and offering services in return for a flat fee.
- **Clearing:** a firm that has considerable financial standing and is an ICE Clearing Member, offering clearing services for UKA to low-risk clients in return for a fee.
- **Compliance – hedging via intermediaries:** a UK ETS operator with medium to high emissions, that sees UK ETS compliance costs as significant to their business, buying UKA (and/or futures/forwards) at multiple points through the year, to avoid the risk of buying at the end of the year, using an intermediary (i.e. broker or market maker) to buy 'Over the Counter' because they don't have the time or expertise to access the market directly.
- **Compliance - hedging on own behalf:** a UK ETS operator with higher emissions, that sees UK ETS compliance costs as significant to their business, buying UKA (and/or futures/forwards) at multiple points through the year, to avoid the risk of buying at the end of the year, and accessing the market directly because they have in-house trading capacity and expertise and are registered with ICE.
- **Compliance - buy to comply:** a UK ETS operator with lower emissions, that sees UK ETS compliance costs as less significant to their business and that wants to keep compliance simple, buying UKA once a year, using an intermediary (i.e. broker or market maker) to buy 'Over the Counter' because they don't have the time or expertise to access the market directly.
- **Compliance - occasional selling:** a UK ETS operator that has excess free allowances (e.g. because of temporary/permanent closure or reduced production) selling UKA assets to benefit the business in the short term, using an intermediary to sell 'Over the Counter' because they don't have the time or expertise to access the market directly.
- **Compliance - sparks market trading:** a UK ETS power sector operator with high emissions trading and ICE membership trading carbon on a daily basis in order to participate in the sparks market (i.e. the differential between the electricity sale price and the purchase price of gas and carbon, which drives the economics of gas-fired power generation).

These nine trading behaviours are explained in more depth below and are summarised in Appendix 2. Some subsidiary compliance trading behaviours are described at the end of this chapter.

Speculation

By ‘speculation’, we mean a firm registered on ICE taking potentially risky positions in the UK ETS market (mainly in December futures) because they feel their commodity trading expertise and energy market insight means that they are well placed to identify and realise opportunities to generate profit through speculative trading in UKA products. This is set out in realist terms below.

Table 1: Summary of speculation CMO

Nickname	Key contexts	Mechanism	Outcome
Speculation	Takes trading positions in other traded commodities. Part of a large, multinational business. Experienced commodity traders with expertise in emissions trading (inc. EU ETS) and related sectors (energy). ICE registered and transact mainly via this route. December futures are the most liquid product.	The UK ETS provides us with a new market opportunity. We feel that our expertise in commodity trading, combined with our energy market insight, means that we are well placed to identify and realise opportunities to generate profit through speculative trading in this market. We prefer to trade in December futures as this is the most liquid form for product, and therefore provides better opportunities for speculative activity.	We take positions in the UK ETS market, mainly in December futures.

Key contexts

With one exception, interviewees involved in speculative behaviour were employed by large and complex businesses. Such businesses were engaged in trading in multiple commodities, with specialisms in one or more of energy (gas, power, fossil fuels, renewables) and metals, and had significant in-house trading expertise and infrastructure (e.g. pre-UK ETS membership of ICE). The exception was a new and specialist firm, staffed with experienced traders, established to complement an existing business.

Trading strategies for the UK ETS were described as being based on extensive market analysis, the aim being to identify and capture potential price discrepancies between the interviewees, and the wider markets, price projections.

> *…the bulk of what we do is we do a lot of analysis, then we build balances and selectively we kind of look at the system. So if we build balances on our side, we look at supply which tends to be formulaic, as they are set by government, we look at the mill which is the real kind of uncertainty in these markets and then look at whether we think price is a fair reflection of the equilibrium position, and off the back of that we may deploy strategies and capturing, you know, whatever discrepancy, whatever difference we see in the market. (Speculator)*

Interviewees whose organisations were involved in energy commodity trading activity noted that this was helpful to their emissions trading work and indicated that they drew on this expertise to inform their carbon trading.

> *…we have obviously specialists in terms of different product areas, so we'll have gas and power traders, emission traders. But then there will be crossovers. Obviously, there is a strong correlation between gas, power and coal, as well, and emissions. (Speculator)*

Interviewees reported that, in addition to taking positions on behalf of their own business, they might also do so on behalf of others.

> *We do a combination of position-taking for ourselves, as well as position-taking on behalf of our trading counterparts. Now those counterparts could be a combination of pure financial players who have a view on UK ETS, either want to go long or short, UKA, or put on a position on the time spreads. (Speculator)*

Mechanism

The establishment of the UK ETS presents a market opportunity for speculators, albeit one where such opportunities were reportedly constrained by a relative lack of liquidity. Interviewees' parent organisations were generally well resourced and experienced commodity traders, and this made it relatively straightforward for them to engage with the UK ETS. Specific energy sector expertise was seen as important in enabling market analysis, as fluctuations in the carbon market are closely tied to fluctuations in the energy markets. There was a general preference for trading in December futures, this being the most liquid product and therefore providing more opportunities for generating profit.

Trading patterns were reported as being irregular and aligned with strategy. Interviewees were unprepared to share detailed insight, but reported approaches included 'buy to hold', with positions being monitored to 'protect' them from unanticipated market fluctuations. No interviewees reported the use of algorithmic trading, in general this was seen as unsuitable in the UK market owing to its low liquidity. It was also suggested that its use was incompatible with strategies involving medium / long term position taking.

> *I think that's very like for automated strategy. You kind of need liquid markets, you need stuff going on, the UK can be incredibly quiet on Sundays. So I don't, I'm sure there's people out there doing their strategy. No, we are for the most part of discretionary trading…We also tend to be pretty medium-term player like it's quite rare for us to go in and out in a day. We tend to hold the position for longer than that, I mean ideally, but we*

> *do a lot of analysis. And so when we do form a view our view tends to play out over weeks or months. (Speculator)*

Those practising speculative behaviour reported a general preference for trading in December futures, owing to this being the most liquid product, but were also involved in trading other products, in line with where their analysis identified an opportunity.

> *They could potentially be any [type of product], but we would specifically pick one on the basis around our investment thoughts. Yes, they could range. (Speculator)*

Outcome

The businesses took positions in the UK ETS market, mainly in December futures.

Trends in the evolution of speculative behaviour

One interviewee noted that they had been more active in the early phases of the scheme as there was a general lack of inventory in the market, but their involvement had since declined. Another, who also observed that their involvement in the market had declined, suggested in their case this was due to low levels of market liquidity.

> *Yes, it has, quite significantly [trading has declined]. I think it's mainly due to its illiquidity. In order to…in any market to have a lot of trading activity and be able to deploy things that your core strategy [involves] requires liquidity, it requires good secondary market liquidity and it requires a diversified range of participants in that market. (Speculator)*

Moving forwards, one interviewee noted that they anticipate that the introduction of the net zero consistent cap (as proposed in the UK ETS Authority's announcement on 3 July 2023) would, in the first few years at least, lead to an oversupply of allowances, and felt that this would make the market less attractive to speculators in general.

> *…the question then becomes, who is willing from the [unintelligible] community to pick up UK allowances today knowing that they're looking at three years of getting terrible dynamics. (Speculator)*

Market making

By market making, we mean a firm (usually registered on ICE), that provided a range of financial, risk and asset management services to an existing client base, undertaking trading in UKA products to meet the needs of clients who had obligations under the UK ETS, thereby enabling their clients to access the market and hedge their compliance risks (mainly using December futures), while generating a profit themselves by charging a margin on sales, hedging their own positions and undertaking some relatively low risk speculation.

This is set out in realist terms below, both for the main CMO and for a non-speculative variant that was also observed.

Table 2: Summary of market making CMO (including non-speculative variant)

Nickname	Key contexts	Mechanism	Outcome
Market Making	Client driven. Perceive themselves as a market intermediary and provider of hedging services. Experienced commodity traders with expertise in emissions trading (including EU ETS) and related sectors (energy). Generally, part of a large, multinational business. ICE registered and transact mainly via this route. Prefer to trade in December futures (and Over the Counter with clients in UKA, forwards and swaps). Business looks to generate income through ancillary trading, in addition to making a margin on trades. Have some appetite/capacity for risk.	We provide a range of financial, risk and asset management services to an existing client base. Some of our clients have obligations under the UK ETS and we trade to meet their needs. Having in-house expertise means that we are able to be active participants in the market and to generate a profit through trading, although our tolerance for risk is low. It is not just about profit, though, it is also about satisfying client demands. Primarily, we see our role as being about enabling market access and the provision of hedging services.	We satisfy client demand through trading, mainly in December futures, and in return generate profit by charging a margin on sales and other ancillary forms of market behaviour, including low risk speculative activity.
Market Making variant – only/mostly back to back trading	Generate income through making a margin on trades.	We provide a range of financial, risk and asset management services. Some of our clients have obligations under the UK ETS and we trade to meet their needs. It is not just	We satisfy client demand through trading, mainly in December futures, and in return generate profit by

with no speculation		about profit though, it is also about satisfying client demands. Primarily, we see our role as being about enabling market access and the provision of hedging services.	charging a margin on sales.

Key contexts

Organisations exhibiting market making behaviour often self-identified as liquidity providers and market intermediaries. Such organisations were invariably large, global companies, that provide a range of financial, risk and asset management services, and expertise and capacity in commodity trading (including carbon and energy products).

> *…so we offer wider services around other commodity markets. Not surprisingly, when you're talking to large industrials about carbon, you get into conversations about energy, conversations about other commodities, so, yes, we've expanded our offering across the desk. (Market maker)*

As with speculators, it was reported that energy-related expertise helped to inform their engagement in the carbon market.

Interviewees noted that within their existing and prospective client base were multiple organisations with UK ETS compliance obligations. They commonly described their trading activity as being driven by their client's requirements.

> *We have dozens and dozens of clients in the UK that from one day to the next, we wouldn't be able to serve if we can't operate in the UKA business. (Market maker)*
>
> *…a lot of our involvement originates from our lending base with a number of corporate clients that have these compliance obligations and we have strong banking relationships with.* (Market maker)

New market entrant interviewees reported that they had entered the market in response to client demand.

> *So, we'd been asked what could we do about to solve this problem. And if you have that from more than a handful, you think, "Right, well, there's obviously a service that we can provide here." So that's what drew us into going into the market.* (Market maker)

Whilst direct profit making was clearly an important driver, there were indications that it was also important to this interviewee type that they be seen to be responsive to client requirements. The reported nature of the services that interviewees provided, varied, but included procurement, hedging and risk management services.

> *…a lot of our effort is to help them understand how the market works, what the dynamics are, provide them with insights and ultimately come up with a strategy that best works for them, so it's really… The last couple of years have fundamentally*

> *changed how we engage with our clients. They look to us much more for policy insights. They look to us for market insights. They look to us for guidance on strategy… (Market maker)*
>
> *I think one function, of not only us but I think other players that are operating mostly on the secondary market, is also ensuring that the compliance actors are always granted the possibility to forward-hedge their carbon risks…If they think that, for whatever reason, the cost of carbon will increase in the next so many years, then there are products that entities like us can offer on the forward market, also on a bilateral level, that they can secure their carbon risk. Meaning they know what the cost is because the risk is passed from them to us, and then it's up to the ability from us to optimise our position and make sure that risk is nullified on our side, hedged. (Market maker)*

Excepting two new market entrants, interviewees primarily traded via ICE, traded regularly (often daily), usually in December futures. One interviewee reported that they preferred December futures as they were the most liquid product and had the tightest bid-ask spread (i.e. the difference between the expected buy and sell price). This was seen as beneficial as it reduced the cost to their clients.

The new entrants reported that they anticipated trading via ICE, but that at present the level of client demand did not justify them doing so. No interviewees reported the use of algorithmic trading.

Interactions with clients were uniformly reported as being conducted Over the Counter (OTC) with the trader generating profit by taking a margin on each transaction. Not all interviewees were clear about the details of such transactions, but several reported that the margin they captured was based on an agreed bid-ask spread. In simple terms, this meant that they aimed to buy products at a lower price than they sold them.

In addition to generating profit through securing margins, interviewees in this category reported that they did not back up all of their trades, and engaged in some ancillary, speculative, trading behaviour. Such behaviour appeared to be relatively small scale, intended to be low risk and somewhat opportunistic.

> *…we are, in principle, a market maker, if you like. So, we're not an agent, and we don't back-to-back every trade, as such, with the client. So, if someone wants a price, [Name] here makes the price and then he decides if he hedges it, keeps it on his book, just like any other kind of market making business, being it in equities or in FX [foreign exchange]. So, we definitely have some amount of risk in the book, but we're obviously very prudent in how we deal with that. (Market maker)*
>
> *[The] client comes in for a price, this isn't just [UKA] emissions, this is across all products, is client comes in for a position, a trade. We don't just go straight back out to the market and hedge it immediately, the idea being we should be able to capture that bit of a spread through trading activities. And if we can capture more, then great. So, that's kind of the rationale, is trying to be competitive in the market against our competitors, but also trying to capture as much value from client flow. (Market maker)*

Some interviewees reported that they bought allowances from clients and then traded these (for profit) before selling them back to their clients. One interviewee provided the following explanation of their approach and suggested that this behaviour was 'common' practice for market makers.

> *So, if we're holding an inventory [allowances purchased from a client], we could then sell an inventory and then buy it back in the future. In that way, we'd be selling to another bank or another hedge fund or another market participant, receiving cash and then buying it back in the future for cheaper [to sell back to the client]. Because we can use that cash to go and fund some other activity, which would return higher than the cost to borrow. (Market maker)*

This practice was described as being beneficial to both parties as it provided the seller with the opportunity to access cheap capital (through the sale of the allowances) and the buyer the opportunity to generate additional profit.

> *…it's beneficial for both, because it allows those compliance entities to free up capital on their balance sheet, instead of having to go to the market and raise debt, because they have all this capital tied up in allowances. And it allows us to purchase these allowances cheaper and then sell them at a profit in the future. (Market maker)*
>
> *…if it was free allowances, then they are sitting on something which has a monetary value. So if they want to, let's say, undertake a modernisation of a factory or retrofit something and this technology costs money, they can't pay for that in allowances, right? But you need those allowances in the future. So you can sell them to the bank today, we give you money for them, give you cash. And then, in the future, they buy them back. So they're able to raise cash without having to actually go to the debt markets. (Market maker)*
>
> *So what we do is we – and not just we, but as banks – typically have much lower borrowing costs than utilities and airlines, steel manufacturers, because we have much higher credit quality obviously. So you have an entity which has all these allowances on their balance sheet, and they don't need them until a year from now. So a lot of bank activity surrounds buying allowances off a client and selling them back to them shortly before they need them for programme surrender. And because we can finance them at a much cheaper rate, obviously it's advantageous for the client. So it frees up their balance sheets. Instead of a utility holding on to tens of millions of pounds' worth of allowances, we can take that onto our balance sheet. It frees up capital for them to actually operate their business, and then they buy them back, right before they need them for surrender. (Market maker)*

Other contexts

There was considerable consistency within the market maker group, but one point of difference was the extent to which organisations traded 'back to back'. An example of a 'back to back' trade would be a market maker agreeing to supply a given quantity of UKA to a client at a given price (either now or at a specified future date) and immediately buying that amount of UKA to cover the deal (either on the 'spot' market' or via a futures contract). Some

interviewees indicated that they tended to fully back up their trades, meaning that each trade in UKA, was backed up, or hedged, with an equivalent trade in some form of UKA derivative.

> *…usually, we have a back-to-back booking system, so we normally see two trades come through [the buy or the sell], and either side is hedged with another bank. (Market maker)*

This form of behaviour was associated with new entrants and smaller businesses. This group also tended to be less frequent traders. However, new entrant interviewees indicated that they anticipated that the scope of their activities would expand over time.

With the exception of new entrants, all market makers were registered on ICE and some market makers participated in the auction. Auction participation was restricted to those market makers that met Financial Conduct Authority (FCA) regulatory requirements: to participate in UK ETS auctions, non-operators were reported to require permission from the FCA under Part 4a of the Financial Services and Markets Act (2000).

Mechanism

Those engaging in market making behaviours were found to work within organisations that provide a range of financial, risk and asset management services; and generally, have expertise, and commercial interests, in the energy sector. Trading activity was driven by demand from their existing client base. These clients had compliance obligations under the UK ETS but were unable, or chose not to, access the allowance market directly and so looked to work through an intermediary, ideally one with whom they have an existing relationship. This represented an opportunity to market makers both to secure profit, and to satisfy their clients.

Market makers used their existing expertise and trading infrastructure to facilitate access to the market for their clients, in return for a margin on each transaction. The more risk averse market makers chose to back-to-back all trades and to be content with securing their margin. A more common approach, though, was to undertake ancillary trading activity, including short term speculative activity, in order to generate additional profit.

Outcome

Market makers satisfied their client's needs and demands, generating profit by charging a margin on sales and other ancillary forms of market behaviour, including low risk speculative activity in the UK ETS market.

Trends in the evolution of market making behaviour

Market maker interviewees provided little insight into trading strategies or market behaviour. One noted that they were seeing a peak of client related activity in September but felt unable to explain this. Another suggested that they were seeing fewer secondary market peaks in weeks between auctions, which they suggested might be associated with an oversupply in the UK ETS and with compliance firms having gradually built up an inventory of UKA since the start of the scheme.

> *…if you look at the chart of over time, you can always see this often peaks in the secondary market price in a non-auction week. Then that corrects by the time you get to the auction. It's less so at the moment. It has been less so in recent weeks, and I think that's testament to the fact that we are starting to see that, ultimately, the scheme is running in surplus now. We've had two years of verified reports. The market is, in theory, in surplus, so that buffer is coming to the market. We're starting to see some operators sell allowances, as well as buy them. (Market maker)*

Broking

By broking, we mean a firm similar to a market maker (usually registered on ICE) but only trading UKA products on behalf of clients, not taking speculative positions and offering services in return for a flat fee. This is set out in realist terms below.

Table 3: Summary of broking CMO

Nickname	Key contexts	Mechanism	Outcome
Broking	Client driven. Provide a fee-based service, they charge commission on each transaction that they undertake. Do not engage in speculative behaviour. Carbon trading is an ancillary activity, complementing a wider offer, including energy (fossil and or green). Have in-house commodity trading expertise. Registered as an ICE member and this is their main way of securing allowances. Trade mostly in futures (and some 'Over the Counter' trades with clients in UKA).	We provide a range of services, including in relation to energy, to an existing client base. Some of our clients have obligations under the UK ETS and we entered into the UK ETS market to meet their needs and because we see the provision of carbon trading as complementing our wider service offer. Primarily, we see our role as being about enabling market access and the provision of hedging services.	We satisfy client demand through trading, mainly in futures, and in return generate profit by charging a commission on each transaction we facilitate.

Interviewees classified as brokers shared a number of contexts with market makers. The key distinction was that they generated income through a fixed commission only.

Key Contexts

Brokers were located within, or adjuncts of, businesses delivering a range of services (including energy services), with carbon trading being an ancillary activity and forming part of a wider offer. Some clients of the wider business had UK ETS compliance obligations, and preferred to procure allowances and their derivatives, through a third-party intermediary.

> *Like I said, the business model for us is to kind of act as the final financial intermediary on behalf of companies that have exposure to the scheme. We don't really work all that much with speculators or people who are just trading in that sense. It's serving a purpose for businesses to fill their carbon allowance requirements before the compliance windows on each calendar year. (Broker)*

Interviewees reported that they were responding to client need but also noted that engaging in UK ETS trading complemented their existing business offer and in particular work in the energy/climate sphere.

> *So, five years ago we started an energy team and that energy team is growing rapidly because of the demand of clients. Within the product scope, EUAs [and UKAs] are obviously also a product that is highly needed and clients want, for buy-side clients. So, we are getting requests out of that team. (Broker)*

In some cases, interviewees had in-house commodity trading teams in place before the establishment of the UK ETS, in others these were established in response to the UK ETS, and then staffed by experienced traders.

Trading was reported as being mostly conducted through ICE and to be mainly in futures. Some small level OTC trading was reported to fill client quotas, as well as buying from clients. There was some evidence of a preference for dealing in daily spot, with one interviewee, from a smaller company, noting that a lack of financial reserves constrained their ability to deal in other products.

> *So, a lot of clients now are looking to lock in, future, lock in the price today for payment and delivery at a future date. So, that's great, but that presents a risk for a company like us because it means tying up a lot of capital, and we have to make a lot of capital available to transact forward transactions. (Broker)*

Another interviewee, an employee of a much larger organisation, noted that they preferred to deal in daily futures (in order to provide spot UKA to their clients) but would offer December futures if preferred by their client.

> *…but sometimes if a client has some funding needs because he can only pay in two weeks' or four weeks' time, then we hatch it off with a December Future, yes, and then*

> *we wait until the client is ready to pay and then we roll the December Future to the spot market. (Broker)*

Irrespective of the product, broker interviewees reported that they only traded on behalf of their clients, and that in return they charged a flat fee.

> *…we only trade on behalf of clients, so we have zero position on our own. (Broker)*
>
> *We work on a commission that's normally shown in the final prices that we send over. (Broker)*
>
> *…we have an administration fee, so we will secure allowances on ICE on behalf of our clients. And we will charge a fee on top of the price. (Broker)*

None of the broker interviewees reported buying through the auction. One broker noted that this was partly because of auction participation rules, and partly because there was no interest from their clients in buying via this route. As noted above, to participate in UK ETS auctions, non-operators were reported to require permission from the FCA under Part 4a of the Financial Services and Markets Act (2000).

> *No, the auction, I've never used. First of all, because I couldn't get permission for it at that time and right now I'm not asking for permission because I'm not getting any requests on it. (Broker)*

Mechanism

Interviewees identified as providing brokerage services worked within, or for an adjunct of, organisations that provide a wide range of services, including energy related services. As with market makers, trading activity was driven by demand from their existing client base. These clients had compliance obligations under the UK ETS but were unable, or chose not to, access the allowance market directly and so looked to work through an intermediary, ideally one with whom they had an existing relationship. Interviewees reported that this demand was sufficient to warrant their business entering into carbon trading and noted that doing so was seen as complementing their wider business offer. Primarily, broker interviewees felt that their role was primarily about enabling market access, to enable their clients to hedge risk. This service was provided in return for a fixed commission on each transaction.

Outcome

‘Brokers’ traded, mainly in futures, to secure products on behalf of their clients. In return, they generated profit by charging a commission on each transaction they facilitate.

Trends in the evolution of broking behaviour

Broker interviewees reported that they had seen a change in operator buying habits, with a move away from last minute and annual procurement, to approaches based on regular purchases, over the course of the compliance year. This was attributed to the rising cost of compliance.

So, historically, they've left it until, sort of… a lot of people leave it until they understand what their emissions have been for the year, and then they come to market February, March, April, buy the allowances to surrender back to the government which is okay when the prices have been very low, but prices are much higher now and it becomes a significant financial issue for industry now. (Broker)

The change has moved from a one-off annual purchase to a regular purchase, a regular weekly or monthly purchase. I've got one client who buys every week now, which is the right thing to do so that's the change and that's due to price change, of course. So due to the price increasing significantly. (Broker)

Clearing

By clearing, we mean a firm that had considerable financial standing and was an ICE Clearing Member, offering clearing services for UKA to low-risk clients in return for a fee. Firms needed either to be an ICE Clearing Member, or to contract with an ICE Clearing Member, to complete transactions in futures on ICE or to take delivery of allowances bought at auction.

This is set out in realist terms below.

Table 4: Summary of clearing CMO

Nickname	Key contexts	Mechanism	Outcome
Clearing	Global business, banking and financial service. Other parts of the business likely to be involved in UK ETS trading. ICE Clearing member. Activity is client driven. As clearers, they have no view on, or commercial interest in, the nature of the trades they facilitate. Clients include big banks and asset managers, larger hedge funds and some large compliance actors. There are some	Some of our clients have occasional need of a clearing service. We are keen to meet client needs, in return for a fee, and as we have experience of providing this for the EU ETS and so it was relatively easy for us to provide a similar service for the UK ETS. We vet our clients carefully, to minimise our exposure to risk, but have no view on the activity that we are facilitating.	The firm generates income whilst meeting client needs.

	significant hurdles to becoming a client. Act as a clearer for the EU ETS as well as UK ETS.		

Clearers sit in the middle of the market and facilitate the exchange of payments and UKA products on the ICE platform (e.g. where ICE sold futures or the auction sold UKA to an operator). Their function is process-oriented: they have no commercial interest in the trade itself.

> *…we basically facilitate the physical settlement of futures that are listed on European exchanges, so that includes emissions products, so EU emissions and the UK emissions, which are obviously settled through the UK ETS system. (Clearer)*

Key contexts

Interviewees that were identified as clearers were global businesses, providing a range of banking and financial services, with clearing forming part of a wider service offer.

> *So, the account was established for the purpose of being able to continue the activity in the futures market. And bearing in mind we're supporting our clients who are active globally on many, many markets. And most of them probably don't trade on this particular product, but we are set up to support it, should someone want to trade it. (Clearer)*

Clients (known as 'counterparties') were described as usually large; they included a mix of banks, hedge funds and operators. There was some degree of risk involved in being a clearer (i.e. the risk that a client could not pay for a product that they had purchased on ICE via the clearer). Clients were therefore vetted on the basis of their financial health and strength.

> *I guess the strategic element of what we do is that we have a counterparty risk evaluation that kind of sets our appetite for which clients we provide our services to. So we do not have an open door policy in that regard, we're generally taking the strongest balance sheets and the top credits across both the end user space and institutional space and providing them access to these markets. So that is the one strategic element, in the clearing space that is the primary risk that we face, counterparty, and we control that by establishing certain standards in that regard. (Clearer)*

> *…the kind of clients that we would do, we've got a very, very strict onboarding and compliance and credit and risk process about bringing clients on board. For example, we don't have any retail clients, just in general, directly with us - we just won't have it. And there is a big…, whether it be the size of institution, there are quite big hurdles just to get across the line to be a client. So most of our clients in this would be big banks or big asset managers or the larger hedge funds. But there are some corporates in there as well who would be doing this to hedge. (Clearer)*

Clients using clearers are required to pay a transaction fee. There was also some evidence that additional charges might apply, depending upon the credit worthiness of the client.

> *…generally a commission based business per trade. There is also, for us, on the clearing side of it there are capital requirements to support that activity and we have various charges that assess clients for the use of that capital. (Clearer)*

Clients' need for clearing depended upon the strategy that they were following. Clearers described themselves as being client driven, i.e. they only undertook clearing in response to requests from clients.

> *…we're basically driven by our client activity. They trade the futures in the market, whether they're daily futures or monthly futures, and then basically when they go to delivery, when they cease trading, we facilitate the delivery of the allowances through the UK ETS system. (Clearer)*
>
> *I'd say for the daily [futures], it's a much smaller list of clients because, basically, if you trade the daily, you are going to delivery. You obviously have other clients who may be trading the monthlies and they could be trading in and then trading out. You know, there are going to be, obviously, people out there who are trading the futures contract because they think it's going to go up, think it's going to go down. Hedge funds or whatever else. But we do have corporates who have a requirement, who either have a requirement to hold these, and to hold these anyway, so they're using a futures to hedge that, or they're using the future to access. (Clearer)*

Other arms of the wider business were reported as being engaged in other forms of trading behaviour, but the parts of the business undertaking clearing took no view on the nature of the trades that they facilitated.

> *…certainly from my side on the ops side, we are literally just acting on whatever the [client] trades and once it goes to delivery, we're then transferring the allowances. So price wise we're not really aware of that and we don't monitor that from an operational standpoint. (Clearer)*

Clearers were also found to be active in the EU ETS market, and therefore had experienced staff, and were already clearing members of the ICE platform prior to the establishment of the UK ETS.

Mechanism

Clearers were found to provide a range of services to an established client base. Some of these clients have need of UK ETS clearing services and clearers appeared keen to offer these, to complement their wider service offer, in return for a transaction fee. Clearers had no commercial interest in the detail of the trade itself.

As clients are or were involved in the EU ETS, clearers had in-house trading expertise and established systems and this made it easier for them to provide a similar service for the UK ETS. Interviewees reported that clearing involved taking on a degree of risk, and so precautions were taken to mitigate this.

Outcome

The firm met client needs in return for a commission on each transaction that they facilitate.

Trends in the evolution of clearing behaviour

One clearer interviewee reported that they had seen an increase of activity in relation to daily futures trading but felt unable to comment as to why this might be.

> *We've seen an increase in client interest on the daily contracts, which then obviously means we can see a lot more activity. So we see that fairly regularly. So we are transferring positions on a regular basis, you know, a few times a week, depending on the client activity. But yeah, we have seen that increase since the [start of the UK ETS]. (Clearer)*

Compliance trading - overview

Within the operator-trader interviewee group (i.e. UK ETS installation operators, aircraft operators and trading arms of these operators/AOs), the most widely reported form of trading behaviour was focused on meeting compliance obligations. Interviewees reporting this type of behaviour, noted that their organisation's trading activity was wholly, or primarily, intended to meet their compliance obligations.

> *…first and foremost we are compliance players in the market. We are not there to speculate. We are not there to make money out of a commodity. (Heavy industry operator)*

Within this group, though, there was considerable variation in approach, and therefore insight is presented under five separate CMO configuration headings. In some instances, where there appeared to be other substantive differences between organisations within the same CMO sub-group, reporting also includes the identification and discussion of variants.

Compliance – hedging via intermediaries

A typical operator-trader in the 'Compliance – hedging via intermediaries' sub-group had medium to high emissions, saw UK ETS compliance costs as significant to their business and bought UKA (and/or futures/forwards) at multiple points through the year to avoid the risk of buying at the end of the year. They used an intermediary (i.e. broker or market maker) to buy 'Over the Counter' because they did not have the time or expertise to access the market directly. This is set out in realist terms below.

Table 5: Summary of CMO for hedging via intermediaries

Nickname	Key contexts	Mechanism	Outcome
Hedging – via intermediaries	Generally medium to high emitters (above 25,000t CO2e per annum). Purchase of allowances is seen as a significant cost for the business. Aware of fluctuations in UKA prices. Want to manage impact of UKA purchases on cashflow and business accounts. Lack the time/expertise to access the market directly. Existing relationship with broker/intermediary(ies) (usually from EU ETS).	We now see the cost of UK ETS costs as significant, and are aware that prices are higher towards the end of the compliance period so look to hedge our exposure by buying over the year. We don't have the time/expertise to access the market directly so need to procure external support.	Buy UKA (and/or futures/forwards) at multiple points through the year, via an intermediary (i.e. 'Over the Counter').

Key contexts

Operator-traders fitting within this CMO configuration were generally medium to high emitters who reportedly saw the procurement of allowances as a significant and increasing cost. Interviewees stated that they were aware that the price of allowances fluctuated, particularly towards the end of the compliance period, and reported that their organisations were looking to manage costs, whilst also taking account of cashflow and other business concerns.

Procurement was found to be undertaken primarily 'Over the Counter' and, owing to a lack of internal time and expertise, to be conducted via third party intermediaries.

> *…we use the brokers for the purposes of our trading. It just works better for the company in terms of the payment dates and also the effort that one person would have to put in to doing that themselves. So, it takes away that added workload for what would be myself in the business. So that is probably the reason why we use a broker to do that for us. (Offshore oil operator)*

> *We don't want to spend our time looking at markets, doing that. We're using somebody who's trading with lots of people, so they get a lot more relevant information than we have. You know, they will see things coming up, and they'll notice trends that we can't possibly see. (Other industry operator)*

These intermediaries tended to be organisations with whom the operator/AO had previously dealt with, when subject to the EU ETS, or had some other form of ongoing commercial arrangement with. Examples given included banks and 'sister' companies.

> *So, when the UK ETS first went live, we had very few counterparties that we could deal with. I think we only had one willing to trade with us. So, we did look to using a third party, a broker. But we really don't like doing that if our banks can do the business. Because, like I said, we borrow quite heavily, so we have to have a good relationship with the banks. For them to lend for us, they want ancillary business if they can get it. As more and more banks have come in, they all really want to have that UK business. (Industry trader)*

In some cases, though, interviewees reported that they used panels of suppliers, and then took the best price on offer.

> *It's a competitive market, so as [Name] just mentioned, we do not rely on one banking partner to buy UK certificates from, but we will always ask several partners for their price indications, and we take the best offer we get. (Aircraft operator)*

Interviewees identified three main types of procurement strategy:

Variant 1 – buying regularly to get the average price over the year

In this case, operator-traders looked to manage their costs by seeking an average price (usually for UKA), which they achieved by buying at set intervals, for example monthly, over the course of the compliance year. This required them to have the cashflow to support this strategy.

> *…doing it monthly is just evening it out so it is a risk management approach, and you are not inclined to, say, use next year's allowances if you have got a bit of a shortfall or buying a bit extra if you see it as cheap. You are very much about just trying to keep level year-on-year? (Offshore oil operator)*
>
> *The reasons for doing it that way are because, clearly, we're dealing with a very volatile market, with a lot of price risk, so we've always gone very much for the principle that we want to spread our allowance purchases over the year. (Heavy industry operator)*
>
> *We don't want to wait until the year is finished and then cover the deficit, because then you're buying it all at once. We've always determined that we want to have a strategy where we're buying the allowances as evenly as possible through the year, to spread that price risk. That's the way we manage the price risk: just spread it out over time. (Heavy industry operator)*

Operator-traders practising this behaviour valued the level of cost certainty that this approach brought (i.e. progressively fixing the cost of compliance ahead of year-end) and were not confident that they could achieve a lower cost outcome by pursuing a more flexible approach.

> *…so banks will just provide a price that they can deliver a UKA for, for instance, 3 April or whenever we decide we want that allowance delivered. We will fix the price today with the bank. Then, in the future, they will deliver the allowance and we'll pay for it. (Heavy industry operator)*

> *…if you're buying monthly, you get the average over the year. So we don't really go in for- in the early days, we would speculate a bit, and see a good deal, and buy a lot in. But then, that works all right, until the market suddenly changes, and it all goes wrong. (Other industry operator)*

Variant 2 – buying futures/forwards when we make forward sales

Operator-traders in this category also identified cost certainty as a priority but tended to be aircraft operators working to a longer time horizon than Variant 1. Interviewees reported that their business was selling products 1-2 years advance and they therefore wanted to lock in their future costs. Consequently, they looked to procure derivatives (futures/forwards) in volumes that matched the emissions associated with future sales.

> *…we sell our flights and our holidays, about a year and a bit out in advance, and therefore we have a good understanding of what the fuel requirement is going to be and therefore we have an understanding of what the carbon requirement is going to be. So we tend to hedge out into the future, knowing roughly what our flight programme is going to look like. And that can be up to about 18 months, and it depends on the market conditions as to whether we'd be 80% hedged / 20%, hedged, kind of thing. It's very much dependent on market conditions. (Aircraft operator)*

> *We are also considering our planned exposure, so for the next year and maybe the year afterwards, for other compliance periods. We already start purchasing certificates for those periods, just by the fact that we want a mixed purchase price over a longer period to reduce volatility. This is to have a stable plan and certainty in the business numbers, because our shareholders and investors are also asking, "Hey, how is your P&L looking in the next year?" You only have that certainty when you already have some certificates covered on this. (Aircraft operator)*

Variant 3 – buying when the price is right

This type of behaviour was associated with cost minimisation. Unlike Variant 1, this sub-group of operator-traders were reportedly confident that, over the course of the year, they could minimise their cost of compliance by buying when the price of allowances dipped, accepting that they might need to engage in supplementary buying, should this approach not allow them to secure sufficient allowances to meet their obligations.

> *From experience, we've found that overall we get a much better price if we trade regularly throughout the period, leaving orders and picking up the dips, if you like. (Industry trader)*

> *…our emissions are fairly standard, and we can predict, reasonably well what they will be. So, it's highly unlikely we'd ever have an excess. So, what we do is, at the beginning of our calendar year, we have a rough forecast for this based on the previous year. Then, what we like to do is divide our shortfall roughly into smaller chunks, and we place orders if we can. We leave orders with banks, so that we're just below market prices, and should there be a dip, we might have some of them fill. (Industry trader)*

Mechanism

Operator-traders in this CMO category were concerned about the rising cost of UK ETS allowances and did not want to take the risk of paying higher prices at the end of the compliance period. Consequently, they had implemented procurement strategies intended to reduce their exposure to this risk:

- Variant 1: Were concerned about cost certainty, and felt that seeking an average cost for allowances, would both help control their costs, whilst also providing an acceptable level of certainty regarding their expenditure.
- Variant 2: Prioritised cost certainty as they sold their products up to 2 years in advance and so needed to lock their costs in. They therefore chose to buy futures and forwards, to match the emissions they anticipated from their sales.
- Variant 3: Prioritised cost reduction and felt that they could 'beat the market' by taking a flexible approach to procurement, by buying when the price of allowances dipped.

Lacking time and expertise, and being unable or seeing no need to address this situation, operator-traders in this CMO category chose to use third party intermediaries to procure allowances on their behalf. Where they had an existing commercial relationship in place, some operator-traders found it simpler to use the incumbent than to procure a new service provider, although others reported shopping around for the best deal from different intermediaries.

Outcome

Operator-traders conforming to this CMO bought UKA (and/or futures/forwards) at multiple timepoints over the course of the compliance year, via a third-party intermediary (i.e. 'Over the Counter').

Evolution of hedging behaviour via intermediaries

The interviews provided little information on the evolution of hedging behaviour. One interviewee noted that their trading behaviour had not changed over the last year, while another suggested that they bought spot more regularly but noted that this was down to an administrative change.

Compliance - hedging on own behalf

A typical operator-trader in the 'Compliance - hedging on own behalf' sub-group, had higher emissions, saw UK ETS compliance costs as significant to their business, bought UKA (and/or

futures/forwards) at multiple points through the year to avoid the risk of buying at the end of the year, and accessed the market directly because they had in-house trading capacity and expertise and were registered with ICE. This is set out in realist terms below.

Table 6: Summary of CMO for hedging on own behalf

Nickname	Key contexts	Mechanism	Outcome
Hedging – buy on own behalf	Generally higher emitters (above 150,000t CO2e per annum) Purchase of allowances is seen as a significant cost for the business. Have in-house trading expertise. Corporate policy is risk averse/and or have corporate policies prohibiting speculation.	UK ETS costs are highly significant for us and we don't want to risk leaving UKA purchase to the end of the compliance year (both in terms of price risk and cashflow impact). We are confident in our expertise and capacity to buy UKA products in the auction and/or through ICE.	Buy UKA (and/or futures) at multiple points through the year at auction or via ICE .

Key Contexts

Operator-traders in this category tended to be large scale emitters that were concerned about the current and future cost of UK ETS compliance to their business. In response they had implemented procurement strategies designed to control such costs.

> *…there is, essentially, a risk averse strategy. We don't want the risk. And unfortunately, obviously you will understand, the carbon market price is so unpredictable, that provides a lot of risk for a business. So buying regularly, sort of, flattens that risk, as much as you possibly can. (Heavy industry operator)*
>
> *I think it's just an approach to remove volatility and risk. You know, it's about having some forward certainty, or as much forward certainty as you can on these things. It's not our policy to effectively try and predict where the market is going and gamble on the market and, "Oh, that looks a good price, we'll buy a whole load more carbon." The policy is you're hedging it to kind of smooth it out and take the volatility and provide certainty for the future. (Heavy industry operator)*
>
> *So from a budgeting and financial management point of view, accurate forecasting and then purchasing allowances within the spread of what we've put into budgets is important. So that gives a level of cost certainty to us. So whilst we might not get the*

> *best deal, if we can manage it within budget, then that is also seen to be quite an acceptable way of doing it. (Other industry operator)*

A key contextual characteristic of operator-traders fitting this CMO type was the presence of in-house trading expertise, although some interviewees stressed that they were not trading, and that the process might better be considered procurement.

> *It's not necessarily trading, we don't trade, we just purchase. (Other industry operator)*

Two variants were identified, with these being differentiated by whether operator-traders bought mainly UKA allowances, or UKA derivatives, and by the main route that they used to procure these products.

Variant 1 – buying UKA at primary auction

This variant comprised operator-traders that were registered for the UK ETS auction, were regular participants, and reported using this as the main (and in some cases the only) means of procuring allowances. Operator-traders fitting this category had strong cash flow and were therefore able to engage in the regular procurement and holding of UKA.

> *We buy for compliance, essentially. We're not trading or hedging. We're purely buying for compliance. And, at the moment, we 100% buy from auction. (Heavy industry operator)*

Auctions were valued by these operator-traders because they allowed purchase of large volumes of allowances and were felt to be held frequently enough to enable them to procure the allowances they needed.

> *…we generally buy regularly, at each auction if we can, to try and spread, and to get the average annual price for allowances. So we split out our forecast position, essentially, and try and buy as regularly as we can. (Heavy industry operator)*

Some interviewees suggested that using the auction could be more cost effective than procuring via ICE, was less 'hassle', and, when buying in volume, carried less risk of moving the prices in the secondary market. However, some reported using ICE as a secondary route to market.

Variant 2 – buying UKA derivatives on ICE

The second, less common, variant comprised operator-traders that mainly, or exclusively, procured allowances via ICE, A key reason given for this was a preference, or simply an inability, to pay the upfront cost and the opportunity cost of holding UKA.

One smaller emitter noted that they preferred to use ICE owing to its flexibility. This interviewee reported that they looked to procure in line with their emission profile, and wanted to take a daily settlement price, to allow them to take an average price over the course of the year.

> *…it's [ICE] liquid, it's truckable, and it's compliant with our procedures. It's transparent and we want to trade at the daily settlement price. So, the only way is trading on an exchange. (Industry trader)*

Mechanism

Interviewees in this category reported that their organisations were concerned about the rising cost of UK ETS allowances and did not want to take the risk of paying higher prices at the end of the compliance period. Operator-traders in this category had in-house trading expertise and were confident that they could develop procurement strategies that fitted their operational circumstances and delivered acceptable outcomes in terms of controlling costs.

Outcome

Operator-traders conforming to this CMO procured UKA (and/or futures/forwards) at multiple timepoints over the course of the compliance year, via the auction and/or ICE .

Evolution of hedging behaviour on own behalf

Some Variant 1 interviewees reported that they had started to buy allowances more regularly, in response to the rising cost of allowances.

> *And I think again, some of this will be driven by the fact that actually our prices of both EU and UK have gone up over the last, what, two or three years? Quite a bit. So our belief is, if we do that, it's kind of akin to hedging when you're buying your natural gas volumes, to be honest. (Other industry operator)*

Some Variant 1 interviewees noted that they were considering the possibility of using ICE in the future as they perceived that liquidity was improving and saw an advantage to using ICE, in the form of reduced pressure on their cashflow. Another noted that, owing to a new person coming in, their company was taking more interest in their carbon emissions, and were looking at developing the businesses capabilities.

> *…emissions had dropped down the pecking order in terms of its priorities within the company. We were just doing what was required for meeting our obligations and not really doing anything else. Now there is much more interest from HQ in developing our capabilities within the wider emissions space. (Industry trader)*

Compliance - buy to comply – allowances bought towards the end of the compliance period

A typical UK ETS operator-trader in the 'Compliance - buy to comply' sub-group had lower emissions, saw UK ETS compliance costs as less significant to their business and wanted to keep compliance simple. They therefore bought UKA once a year, using an intermediary (i.e. broker or market maker) to buy 'Over the Counter' because they did not have the time or expertise to access the market directly. This is set out in realist terms below.

Table 7: Summary of 'buy to comply' CMO

Nickname	Key contexts	Mechanism	Outcome
Buy to comply	Low emitters (below 25,000t CO2e per annum). Free allowances don't fully cover emissions. Cost of shortfall in allowances is low relative to other operating costs, and not a major risk for the business. Don't have in-house capacity or expertise in trading. Existing relationship with broker/intermediary(ies) (usually from EU ETS).	We want to comply but also want to keep it simple. Our UK ETS compliance costs aren't big enough to justify a sophisticated strategy. We lack time and in-house expertise and so need to procure external support.	Buy UKA once a year via an intermediary.

Key contexts

Interviewees identified as practising ‘buy to comply’ behaviour represented operators that had relatively low emission levels, but that needed to secure allowances (in addition to their free allowance allocation) to meet their compliance obligations.

> *Our only concern is that we should have sufficient allowances to cover whatever is used in the UK market. (Aircraft operator)*

Overall, interviewees reported that the cost of compliance was considered low and not a business risk. Such organisations were found not to have in-house trading expertise but had relationships with expert third party intermediaries. Relationships with such intermediaries may have existed prior to the establishment of the UK ETS, for example, as a result of organisations having drawn on their services to ensure compliance under the EU ETS.

> *We use a company called [Company] as an adviser for our energy purchases. They’re experts in the energy market and they’ve supported- they actually buy energy on our behalf, given the set of branches we’ve given them. So, we reached out to them to see did they have any access to market, did they have any advice they could provide. Basically, we use them as a kind of an agent, if you like. They flag to us when they think*

> *it's a good time to buy. Then, we buy- They organise the price from the dealing desk, and we buy through them, basically. (Other industry operator)*

Mechanism

Buy to comply behaviour was found where organisations felt that the cost of compliance was low and deemed insufficient to justify complex trading behaviours, or high levels of dedicated staff time. Such organisations were found to have existing commercial relationships with third party intermediaries, for example, as a result of their participation in the EU ETS, and felt it simplest to use their services for the UK ETS as well.

Outcome

'Buy to comply' organisational reasoning led organisations to buy allowances once a year, via third party intermediaries, generally towards the end of the compliance period (e.g. January to April).

Evolution of buy to comply behaviour

Few interviewees in the qualitative research fitted this CMO, possibly because the research was targeted primarily at operator-traders with relatively high emissions. There was some suggestion that some operators/AOs had moved away from 'buy to comply' behaviour towards more regular 'hedging' behaviour because UK ETS costs had become more significant to their business, both because of free allowances declining and because of UKA prices increasing since the start of the UK ETS.

Compliance - occasional selling

A typical UK ETS operator-trader in the 'Compliance - occasional selling' subgroup had excess free allowances (e.g. because of temporary/permanent closure or reduced production) and sold UKA assets to benefit their business in the short term, using an intermediary to sell 'Over the Counter' because they did not have the time or expertise to access the market directly. This is set out in realist terms below.

Table 8: Summary of 'occasional selling' CMO

Nickname	Key contexts	Mechanism	Outcome
Occasional selling	Operator/AO receives free allocation of allowances. Conditions in this industry mean that production has been reduced or a plant has been closed	We want to realise the value of our UKA assets to benefit our business in the short term. We don't have the time/expertise to access the	Sell UKA via a third party intermediary.

	(temporarily or permanently). The reduction in production activity meant there was a temporary surplus of UKA. Business wants to improve cashflow. Business does not have any expertise or capacity in trading.	market directly so bring in external support. We choose the timing of the sale to get a good price, if we can.	

There were reports from market makers of operators/AOs selling free allowances during the compliance year and then buying them back in time for compliance, but this operator/AO behaviour was not directly observed during the research. Selling of allowances was not widely reported by operator/AO interviewees.

Key contexts

Interviewees who reported this behaviour had found themselves with surplus free allowances as a result of an unfavourable business environment (e.g. COVID-19, the invasion of the Ukraine) and a subsequent reduction in business activity. Owing to internal business pressures, allowances were sold to generate income.

> *…allowances are a tradable commodity in their mind, and we are holding a commodity that we don't need at the moment, and therefore we should sell it. But in the long term that's bad for us. (Heavy industry operator)*

Allowances were sold via a third party intermediary owing to a lack of internal expertise in this area. Interviewees reported that these intermediaries had maximised income by drip feeding allowances into the market, in order not to drive down the price.

> *If we have to do it [sell allowances] we try and persuade our [geographic reference] colleagues to do it little and often, not all in one bit. Because the UK ETS is a relatively small market, and if we put [quantity] of allowances on the market all at once the price would move down considerably. (Heavy industry operator)*

Mechanism

Selling organisations, with surplus allowances, saw these as a source of profit and so looked to sell them, rather than hold them. Lacking internal expertise, they commissioned third party intermediaries to sell on their behalf. The sales process looked to maximise profit, by releasing allowances in small batches, to avoid depressing the market.

Outcome

These organisations generated income from the sale of surplus allowances. They reported that this made it harder for the organisation to return to historic levels of production, because of the dynamic adjustment of free allocations (see Activity Level Changes in chapter 3).

Evolution of selling behaviour

The interviewees in this category did not anticipate selling allowances in the future, but noted that neither did they anticipate returning to historic levels of production owing to a reduction in their free allowance allocation, as a result of the two-year time lag in the Activity Level Changes mechanism (See Activity Level Changes in chapter 3).

There was some suggestion from market makers that selling behaviour was becoming more common, as operators had gradually built up a buffer of UKA since the beginning of the scheme and more operators might now feel that they had sufficient reserves.

Compliance - sparks market trader

A typical UK ETS operator-trader in the 'Compliance - sparks market trader' sub-group was a UK ETS power sector operator-trader with high emissions trading and ICE membership that traded carbon on a daily basis in order to participate in the sparks market (i.e. the differential between the electricity sale price and the purchase price of gas and carbon, which drives the economics of gas-fired power generation). This is set out in realist terms below.

Table 9: Summary of 'sparks market trader' CMO

Nickname	Key contexts	Mechanism	Outcome
Sparks market trader	Power sector operator. Wish to trade in the sparks market for the purposes of hedging future power sales. Spark spread requires that a trader simultaneously buy/sell matching units of electricity, gas and carbon. Operate in a dynamic market, and so are frequent traders. May both buy and sell in line with	We need to trade in carbon to enable us to participate in the sparks market. Ours is a dynamic sector and our requirements can quickly change, so we trade regularly, in futures, via ICE, this being the most flexible route to market.	Buy and sell futures on ICE on a daily basis, to enable participation in the sparks market.

	changing market conditions. Mainly deal in futures, via ICE (may use an intermediary or trade direct).		

Businesses that traded in the sparks market needed to trade simultaneously in electricity, gas and carbon. They were identified as a form of compliance trader, as participation in the sparks market created a need for them to engage with the UK ETS marketplace, in order to address the emissions associated with the sparks product.

> *A power price is derived from the cost of gas that a power generator would purchase to put into their gas turbine. They then produce power. As they're producing power, they're obviously producing carbon emissions, so they need to buy those carbon emissions to offset it. A spark spread is the cost of the fuel, the cost of the carbon element that you produced and then the worth of the power that you produce. (Power sector trader)*

Context

A number of power sector interviewees reported trading in the sparks market, stating that this formed part of their hedging strategy.

> *…as a base hedging strategy for our generating assets, we're typically buying carbon in the market at the same time or simultaneously as we sell power and we buy gas, for example. And that's to limit the exposure in terms of our commodity risk by closing down each of the legs in our hedging strategy. (Power sector trader)*

Trading patterns associated with this type of behaviour were reportedly dynamic, and involved both buying and selling, primarily of futures (of all types, but December futures were preferred as they were the most liquid). Interviewees reported that their sparks-related trading was conducted via ICE as this provided the most flexible timing.

> *So that means because we're trading power and gas continuously, then it's not appropriate to use the UK auction, which is fortnightly of course. So we can really only use the futures market to access the carbon instantaneously when we've transacted the other commodities. (Power sector operator)*
>
> *But we're constantly re-evaluating that position. So if we can buy power cheaper than we can produce it, we'll buy back power that we've previously sold. [..] we've then got carbon that we don't need, and we'll sell that carbon back. But ahead of delivery in the futures markets, that might happen several times. So we might have bought and sold the actual power five or six times by the time… or even more. So that's why we're active on both sides all of the time. (Power sector operator)*

One interviewee noted that it could be difficult to buy the volumes they require via ICE, but addressed this through a process they described as ICE 'blocking'. This entailed agreeing a sale with a broker directly but managing the trade via ICE.

> *It all goes through ICE. Some I'll do on the ICE screen, but if we need big lumps, we speak to brokers who can then speak to other counterparties who are the other side. When they get the deal done for us, it gets pushed through ICE. It's known as ICE blocking. (Power sector operator)*

Another interviewee noted that their company had bought via the auction during the early stages of the UK ETS transition, to hedge their risk, but had moved towards prioritising the secondary market as this matured. They suggested that others in their sector acted likewise. A further factor behind initial auction purchases was that power sector operators were not able to trade UKA carbon in the first five months of the scheme. Unlike their normal trades, these 'catch-up' trades were not time sensitive and could be done through fortnightly auctions.

Traders in the sparks market reported that they might take holding positions in carbon, but that this was solely to enable sparks related activity. One noted that they were not speculating and had no interest in the carbon market per se and might even trade sub-optimally in carbon (at a small loss), as their priority objective was to secure power.

> *It's purely the fact that the outright power liquidity is far, far more important. A few pence for me on the carbon market is absolutely nothing. Our power market can move by a few pounds in that time, and that's the far more valuable market for me. (Power sector trader)*

Mechanism

Spark traders worked for power companies and participated in the sparks market for hedging purposes. This required them to trade in the carbon market. Their hedging needs were dynamic and so they traded regularly in futures, via ICE, as this was the most agile and flexible route to market.

Outcome

Sparks traders bought and sold futures on ICE on a daily basis, and in significant volumes.

Evolution of sparks trading behaviour

The power sector activity in general (and therefore by default their engagement with the carbon market) was described by some operator-traders as being heavily influenced by Ofgem policy. During the period of Ofgem's energy price cap during 2022, when power generators were at risk of insolvency, this was reported to have driven a move towards a shorter-term time horizon than would otherwise be the case.

> *Suppliers, in order to remain solvent, or to be protected against default, are then- they've been told by Ofgem to buy their power within a specific period, over a three-monthly period. And so, all their requirements tend to then go into this front quarter, we*

> *call it. But it's the quarter ahead. And so, what that's meant, is that for gas generators, less power gets sold, or there's less ability to sell power twelve months ahead. (Power sector operator)*

The qualitative research did not generate sufficient evidence to understand fully the possible interaction between the Ofgem price cap and UK ETS prices.

Compliance - other observed behaviours

In a handful of cases, it was not possible to assign an interviewee to a particular CMO classification owing to there being an unusual context or set of contexts. These cases are summarised in the following table.

Table 10: Summary of CMOs for other observed behaviours

Nickname	Key contexts	Mechanism	Outcome
Customer buys allowances	Medium emitter. Single customer. Receives free allowances, but less than required. Customer procures the shortfall in allowances.	We don't need to buy allowances to make up the shortfall, because our arrangement with our customer means that they deal with this.	Customer procures on behalf of the emitting company.
Swap surplus EUAs for UKAs	High emitter. Receives free UK ETS allowances, but less than required. Wider business has surplus EUAs.	We don’t need to trade UK ETS as our parent company provides us with UKA allowances that they have swapped for EU ETS allowances.	UK ETS allowances deficit is made up by swapping EU allowances.
Banking surplus UK allowances	Small emitter. Surplus free allowances because of previous abatement investment. Aware that free allocations will decrease in future.	We want to make sure we cover future compliance requirements, so will retain some surplus. We haven't decided when/what to sell but may eventually sell some via an intermediary, because it's not possible to transfer UKA to our parent	Sitting on surplus UKA for now.

	Previously transferred surplus EUA to parent company in Europe for use in EU ETS. Don't have the time/expertise to trade directly in the market.	company in Europe for use in the EU ETS.	

Chapter 5: Perceptions of the UK ETS market

This chapter presents findings on the UK ETS market, including user perceptions of market quality and feedback on the design and implementation of UK ETS market processes.

Rationale in relation to the trading of different products

Interviewees mainly reported trading in physical UKA and UKA futures (mostly daily and December Futures). Speculators, market makers and brokers reported dealing with a range of products, in line with client demand, but the research found very few explicit references to trades in Forwards, options or the use of swaps. A number of interviewees noted that they bought and sold a wider range of products in the EU market.

Rationale for trading in UKA Allowances

Some operator interviewees reported that they preferred the simplicity of dealing in physical or 'spot' UKA.

> *Simplicity is the basic answer. [Company] sees itself as an operating company and doesn't want to get involved in advanced trading. So we obviously buy a lot of gas. We don't use derivatives. We tend to just do some very simple forward buying. But other than that it's spot, because we just don't want to be in a place where we're exposed to trading risks that we don't need to be exposed to. (Heavy industry operator)*

Some market maker interviewees also suggested that buying spot UKA via auction was preferred by some operators owing to the simplicity of this approach.

> *…predominantly your industrial compliance buyers will trade spot. It's straightforward, simple contracts, no credit checks, done and dusted. The futures, and particularly the exchange trading, will be the realm of the power generators. (Market maker)*

Others, however, reported that their operator/AO clients preferred to avoid buying or holding UKA until near the end of the compliance period. As noted elsewhere in this report, and in the following section, the reason for this difference in view is likely to be associated with the organisation's cashflow.

Rationale for trading in UKA futures

Experience of buying and selling of futures was widespread amongst all interviewee types. In some instances, interviewees reported that they traded in both physical UKA and UKA futures, with these approaches being seen as complementary.

Others, though, reported that they only bought futures. The main reported reason for operators preferring to buy futures was to avoid having to pay upfront for allowances.

> *Because we don't need to have the physical delivery or the commodity during the year, since the compliance is several months after December, another year. The main impact is that we postpone our payment to the end of the year. (Industry trader)*
>
> *…we don't like letting cash go out of the door. If we actually only need the allowances for the following April for compliance purposes, we can strike a deal with the bank, and only pay for them the following April. So, the price is slightly higher, but we get to keep the cash for our day-to-day activities. It just helps us to forecast and manage our cash a little bit better. (Industry trader)*

In the case of speculators and market makers, futures, and in particular December futures, were the preferred product owing to their being the most liquid. One clearing house noted that most of the trades they dealt with were in futures, and only a small amount of these mature into physical UKA.

> *..so the volume is primarily in the futures. In general, a very small amount of the trades that our clients or affiliates enter into actually end up going into a delivery activity. (Clearer)*

One market maker noted that futures trading was important to them in hedging their own risk.

Rationale for trading in forward contracts

As with futures, buyers of forward contracts benefit from not having to pay the full value of a product up front. Forwards were rarely explicitly referenced by interviewees so it was difficult to assess how much they were used. It is possible that operator/AO interviewees sometimes used the term 'futures' when they actually meant 'forward contracts'.

One interviewee who reported dealing in this product stated that their clients preferred to buy forwards as this allowed them to buy at a fixed and unchanging price. This reduced price uncertainty, but also was simpler for clients. This interviewee noted that, in contrast, a future contract, was associated with a fluctuating cost called the variation margin and this meant that clients might have to authorise additional and uncertain payments to their supplier.

Rationale for trading in swap contracts

Interviewees offered very few views on swaps, other than to say that they did not deal in them. There were a few examples of surplus EU ETS allowances being swapped for UKA, as already reported in the realist trading section of this report (chapter 4).

There was also reference to December futures for one year being 'rolled into' December futures for the following year, by operators that wanted to hedge far in advance. It was not clear whether such transactions would be classed as 'swaps'.

Rationale for trading in option contracts

The research generated no insight into the use of options in the UK ETS market. Some interviewees (mostly market makers and speculators) noted that an options market was slowly emerging, while others indicated that they had not seen any evidence of activity. The lack of options trading was associated with the lack of liquidity in the market.

> *Options, no, because it's very illiquid. But I have seen people trading it. (Trader)*

No insight was generated into why operators might or might not wish to procure these products.

Rationale in relation to the use or otherwise of auctions, ICE and OTC

Rationale for use of auctions

Some operator/AO interviewees reported that they simply wished to meet their compliance obligations and that the primary auction allowed them to secure all or most of their UKA needs on a sufficiently regular basis. For example, one large operator noted that they forecast their emissions, and bought on a continuous basis, via the auction, over the course of the year.

> *We make something and so we have a fairly clear idea of how many emissions we're going to be making every month, and our forecasts. We know those really well and always seek to run at 100%, so the forecasting is pretty reliable. What we want to do is to make sure that we're managing the risk of commodity prices increasing, principally, so that we can pass that risk on to our customers as part of our pricing mechanism. So, really, it's trying to minimise the risk of movement in price. (Other industry operator)*

Market maker type interviewees noted that the auction was useful in securing large volumes of product. As explained further in the following section, this was more difficult to achieve through ICE.

> *Auction is handy if you have a lot of volume to buy. If you have little volume to buy, which will not impact the market that heavily, you could trade daily futures, as well. If you buy 10 or 50 futures, it doesn't impact the market. So, you can easily buy up to 50,000 or 100,000 certificates without any impact. (Market maker)*

Buying via the auction was reported as being, generally, more cost effective than using ICE, because the cost of future products was generally higher than the cost of physical UKA. However, as reported in the following section, other interviewees reported that they lacked the cashflow to be able, or willing, to buy and hold physical UKA prior to the end of the compliance period.

Others reported that they saw the auction as being too much of a 'hassle'. One, for example, suggested that their company saw auction participation as something that might conceivably cause them to breach governance strictures intended to constrain speculative behaviours.

> *…it's going to be very difficult for [Company] to get comfortable from a compliance point of view with trying to participate in auctions. That will feel far too close to gambling for a US company to feel compliant. (Heavy industry operator)*

Some compliance buyers noted that they might register for the auction if the volume of their UKA needs justified the associated costs.

> *The running system is costly, and it needs to have exceeded a certain threshold where you say, "Okay, it makes sense to get active in the primary auction". (Aircraft operator)*

Similarly, some market maker interviewees noted that they might register for the auctions in the future if there was sufficient demand from their clients. This demand might be indirect, with the market maker buying on behalf of operators/AOs. Indirect auction participation was reported to be favoured by some types of operator/AO, providing them with the benefits of auction participation (i.e. lower unit cost, regular access, volume) without requiring them to register for the auction.

Finally, some traders were looking at registering for the auction, but had found the regulatory process to be something of a hurdle. As noted above, to participate in UK ETS auctions, non-operators were reported to require permission from the FCA under Part 4a of the Financial Services and Markets Act (2000).

> *…we've found that that regulatory setup has caused us some issues in taking part within the UK auctions. It's something that we were looking into, and we are still looking into, but we've hit a bit of a block. (Trader)*

One such interviewee noted that they were unable to participate in the auction as they lacked a registered office in the UK.

Rationale for use of ICE

The most widely reported benefit of ICE was its relative flexibility. One market maker interviewee reported that their clients bought regularly (e.g. every couple of days), and that others were sensitive to market price signals and wished to be able to move swiftly in the market to take advantage of price dips.

> *We have clients that sell power, they want to buy every two days, every week. We have clients that have price signals, so if the price drops below 55, 50, they want to buy. So, the majority of the clients are not interested in buying at the auctions, but they are more interested in price signals or on certain timing to match it with the business. (Market maker)*

Another operator interviewee noted that they had started to buy allowances via ICE, in addition to the auction, in the belief that it would help them to spread their risk. Their premise was that they might, on occasion, be able to save money by buying during price dips on the secondary market.

> *I think it's just to get another avenue for us to purchase through, to be honest. It's all about risk management for us, the belief being that we can spread our risk and pricing risk a little bit better if we do that.* (Other industry operator)

Some trader interviewees noted that it could be difficult to satisfy client demands solely through ICE. For example, traders found it difficult to meet client requirements for 'all or nothing' transactions (i.e. a requirement that a large trade be satisfied in a single transaction).

> *On my normal trading screen for power and gas I can put a number on screen and you call it all or nothing. It's basically saying, unless you give me that full volume, I'm not interested. I want to get all of that volume executed. That's something that we can't do on ICE, so that's the limitation. If I could do that, I could put it up on the ICE screen, I can just wait for someone to come along and give you the full volume. Instead, if you put a number up you could get filled in… Let's say you were bidding 25,000 tonnes. You could get filled in 1,000 tonnes and then the market has moved away. That leaves me in quite a difficult position and it doesn't achieve what I need, which is that big lump in one go. That's a slight limitation of the ICE screen and where a broker comes in very useful. (Power sector trader)*

In such cases interviewees noted that they might resort to OTC to help them secure the necessary product. As noted in the realist section, the interviewee quoted above noted that they sometimes organised large volume trades with brokers outside of ICE, but then managed the trade via the ICE using so called 'ICE blocking'.

As with the use of the auction, some interviewees reported that their engagement with the allowance market was constrained by organisational policy and their organisation's interpretation of regulations applying to their business. An interviewee working in the financial sector noted that they were simply not allowed to trade in anything other than UKA.

> *Whatever we do, whether it be forward fixing on these markets or the power markets, which I've done a lot of, we're not allowed to get to derivatives and hedging [..] practices and things like that, we're not qualified to do it, we're not permitted to do it, so it's very much around buying to comply and whatever it be, whatever commodity it is, and this, of course, is just another commodity, as far as we're concerned. (Heavy industry operator*)

This interviewee was aware that such restrictions meant that they might not be pursuing the most cost effective approach, but noted that this was not a significant factor for their business, owing to the small relative size of the cost of operating sub-optimally, in comparison to other drivers.

Rationale for buying 'Over the Counter'

Simplicity

Buying Over the Counter (OTC) was valued by some operator interviewees for its simplicity. Interviewees regularly reported that they had relationships with entities (for example, banks) who were able to supply them with UKA products, and preferred to deal via such intermediaries, rather than to set up their own trading accounts.

> *I think our exposure in the UK is at a size where it's probably easier to just engage on the secondary market, where we already have our partners, and just need to call them, "Hey, bank a, b, c, can you please sell some UK emission allowances." Then, they will very likely help us purchasing them. (Aircraft operator)*

One operator pointed out that they could only participate in ICE via a clearer (e.g. bank) anyway, so might as well trade via an intermediary.

> *I think ultimately with the ICE structure, when we looked at it, it's a little bit difficult. We have to have a bank set up anyway. We have to go through someone. We can't be directly linked with ICE. It's either- you still have to have someone act on your behalf, I suppose, to go in and do it. And we just felt, at the time, trying to get that structure set up, may be difficult. So, we had counterparties that had them available. (Aircraft operator)*

In some cases, interviewees noted that those they dealt with OTC (e.g. brokers) had more expertise than they did, and that they (the interviewee) preferred to focus on their core business.

> *I think we have many other different things to do and becoming a broker ourselves is not our core business. We prefer to leave this operation to professionals, to better professionals than we could be. (Other industry operator)*

Other interviewees reported that they did not feel that they had the expertise to determine which approach to procurement was best, and so stuck with their 'traditional' approach.

> *We've never used the auctions, we've just bought from the market. I suppose, I would be confused as to whether it would be better to buy at auction, or not. I get very different opinions, and so we just bought directly from the market. (Other industry operator)*

Concerns about 'moving the secondary market'

Interviewees identified OTC as a useful adjunct to the auction and ICE. Some traders used it as mechanism for supplementary buying, for example to enable them to buy a given amount of product to satisfy a client, without moving the secondary market price.

Another interviewee suggested that they resorted to OTC (for UKA derivatives) when their organisation's cashflow precluded them buying via the auction or ICE. In this instance, it was noted that sellers were prepared to defer client payments, in return for a fee.

> *It's pretty much immediate payment [when buying via ICE], where with the bilaterals there may be certain leeway. There may be certain agreements where we we're able to pay a couple of days after and what have you. That's obviously worth it for us for whatever fee they charge. (Trader)*

Feedback on trading processes

Feedback on the auction platform and access

There were no criticisms of the auction process itself from operators or traders. The ICE auction platform was generally well received.

> *ICE is pretty well experienced in this now. It's one of the leading providers of carbon markets on EUAs and others, so, yes, they bring a lot of experience. I've certainly not heard any real criticisms about how the auction platform works. (Trader)*

There were only two minor comments on the auction platform process:

- One trader noted a discrepancy between the minimum lot size on the auction (500 UKA) and on the ICE platform (1000 UKA). This was described as potentially confusing for firms new to the two systems.
- A wider stakeholder noted that it would be helpful if ICE published more data on the auction (e.g. maximum bids, median bids, auction coverage ratio and so on), as Europeal Energy Exchange (EEX) already do for auctions of other products.

Some operators reported that they understood they were not allowed to access the auction directly. They appeared to be referring to the requirement that they placed bids via an ICE clearing member. Other interviewees reported that they did not participate in the auction because the two-weekly timing did not fit their needs. Auction frequency is discussed further below, while the rationale for use of the auction is presented above.

Other operators and financial bodies did not participate in the auction because they regarded it as a hassle. There were reports that signing up for the auction was quite cumbersome and bureaucratic for both financial institutions and operators. For example, auction participants were apparently required to sign up as members of ICE and to have a physical address in the UK. This was challenging for foreign-based traders.

> *I think we'd like to get involved in the auction, I think, but we found it quite [..] cumbersome and quite bureaucratic to [..] get involved in the auction. So we haven't entered the auction. (Trader)*

In addition to the administrative hassle of registering and participating in the auction, some operators referred to the hassle of obtaining internal approvals to participate in auctions. Internal approvals were reported to be particularly challenging for operators that were part of US-owned organisations, possibly because of strict banking regulations.

> *Well, it is perfectly possible for us as an operator to register for the auctions, but it's another risk-taking process. As a company, to participate in an auction is something that our US compliance people would just fall off their chairs about. So it just isn't worth going there. [..] it's going to be very difficult for [Company] to get comfortable from a compliance point of view with trying to participate in auctions. That will feel far too close to gambling for a US company to feel compliant. (Heavy industry operator)*

A further barrier to auction participation was that participants needed to pay for allowances immediately, or at least within 3 days of the auction. This was challenging for some traders that were not part of large financial institutions.

Some traders were led by their clients and did not access the auction unless they were asked to by clients.

> *If the client [..] wants us to go to auction on behalf of them, that's something we'll explore. But at the time being, that's not something that we're actively involved in. (Trader)*

Feedback on auction frequency

UK ETS auctions are held at fortnightly intervals. Qualitative interviews with compliance operators did not generate any comments about auction frequency. The evidence on trading behaviour, presented in chapter 4 above, suggests that some types of compliance operator, in particular power generators and aircraft operators, engage in frequent trading activity, with the implication that price discovery between auctions is likely to be important for these groups.

A number of trader interviewees reported that they would like auctions to run more frequently than the current fortnightly system. This view was also expressed by an association representing emissions traders. These views were volunteered in response to open questions about how the auction process or liquidity of the market could be improved.

It is worth bearing in mind that traders have an interest in changes to the system that would generate more trading activity. Further detail on trader views is presented below, balanced with the views of the delivery body responsible for running the auctions on behalf of the UK ETS Authority.

Rationale for more frequent auctions

It was suggested by some trader interviewees that the auctioning of large quantities of allowances every two weeks might be limiting the efficiency of the market.

> *On an auction day, you've got 3, 4 times the normal liquidity coming into the market, so it does have an impact. I think the one thing I've looked at, in terms of improving the efficiency, is more regular auctions. (Trader)*

It was also suggested by traders that trading is currently more active in auction weeks, with a relatively inactive market in non-auction weeks.

> *At the minute it seems to be very much one week on, one week off in terms of trading. Monday, Wednesday, Thursday are good days for us on the week of the auction. You see a lot more opportunities, people are a little bit more interested. If there's no auction that week, people are kind of just like… very stagnant. (Trader)*

So, two closely-related arguments about price discovery and liquidity were put forward for more frequent auctions:

- Firstly, more frequent auctions would help price discovery.

> *And then [liquidity is] worsened by having auctions only every two weeks. So you have less data and price formation that is coming from those primary auctions. (Wider stakeholder)*

- Secondly, more frequent auctions would lead to more frequent trading activity which would itself contribute to liquidity. There was reported to be increased trading activity before and after auctions. Some traders explained that increased trading activity was observed immediately before and after auctions because the secondary market anticipated, or reacted to, price discovery in the auctions.

  > *[Interviewer:]So, you see [..] a step change in the secondary market prices after the auction? [Respondent]: Ahead of and after the auction. In auction week, the activity the morning of, the day after, it has a big impact on appetite in the market because it's the only indicator we have of who is going to buy 3 million allowances. (Trader)*

The delivery body agreed that the secondary market price generally moved to align with the auction price.

> *As soon as the auction clears, then the secondary market price will then trade at the auction price, so the spot price immediately then aligns with, falls, or jumps accordingly. (Delivery body)*

At a more basic level, an argument was put forward that more frequent auctions would increase the options available to market participants.

> *…in terms of auction in the UK ETS, you have fortnightly auctions. In the EU ETS, you have daily ones, of course because the level of liquidity and level of release of the auction is different. But an enhanced level of auction in the UK ETS might also be useful to some degree. Because it gives more optionality, in terms of how many options you have around at a given time (Trader)*

Suggested auction frequency

Where traders said that they would like to see more frequent auctions, they suggested weekly or higher frequencies (e.g. twice weekly or daily).

> *I understand that the total cap in the UK is a lot smaller than the EU ETS, so having a daily auction probably doesn't make sense. But sometimes I wonder, if the auction took place on a weekly basis, would that encourage better liquidity in the secondary market? (Trader)*
>
> *I would say [there should be a auction] at least twice a week. And that would also not bring the volume down to an insignificant level. [Interviewer: That would still be an okay volume, as it were?] Respondent: Yes, it would be four times the cadence of today. (Wider stakeholder)*

A further suggestion was that auction timing could be tied in more closely with gas and power auctions, because of the importance of 'sparks' trade for power generators.

> *I think because of the relationship with the gas and power markets, having auctions and having products that mirror the gas and power auctions, is always helpful, and helps*

> *that liquidity as well. You know, trying to keep the markets as close together as possible helps with that. Because generally, quite a lot of them are done back-to-back. As you do power trades, you're going to be doing the carbon on the back of that, to match that, quite often as well. So ensuring there is alignment between those, I think is important as well, for that liquidity. (Trader)*

Counterarguments to increasing auction frequency

The auction delivery body commented that fortnightly auctions represented a continuation of the frequency of UK Government auctions under the EU ETS, when the UK participated in that scheme. They also commented that the fortnightly UK ETS auction frequency had been set on the basis of extensive market consultation, taking into account the size of the market, the level of interest in UKAs and the volumes to be offered at auction. They were mindful that auction volumes would decrease in future, as the cap tightens. A key concern of the auction delivery body was that auctions should clear.

The auction delivery body saw the secondary market as providing price formation between auctions.

> *Those who were opponents of it and wanted a more regular, a more granular, weekly frequency, were mostly commenting on the power sector's ability to have better price formation, more regular price formation, and be able to hedge. Of course, our response, of course, is that, "Well, that is, hopefully, what the secondary market should be able to provide," so there's a trade-off. (Delivery body)*

One trader explained how secondary market access worked in practice. When a client wanted 'spot' allowances for delivery between auctions, they quoted the ICE spot price, hedged temporarily using December futures and then 'rolled-back' the December futures back into 'daily Futures' (or 'spot'). This trader did not comment on the need to increase auction frequency but they did share the view that the UK ETS was relatively illiquid.

> *Well, we like to participate in the auctions, every two weeks. [And then..] There is a spread quoted on ICE spot deck that means that if we want to buy spot, we can either buy it on the screen or we do it in the spread. [..] We hedge with futures, and then we roll it back to spot if someone wants it today or tomorrow. If [..] a UK industry client says, "I want to buy 20k UKAs," we can quote it the spot price, we hedge with the futures and roll it back to spot. (Trader)*

Another trader commented that, while the market for December futures was fairly liquid, the market for 'daily futures' was not sufficiently liquid to support larger trades between auctions (e.g. 50,000 or 100,000 UKA). This trader saw the auction as important for these larger 'spot' trades.

Feedback on ICE process

The Intercontinental Exchange (ICE) offers a range of futures contracts in UKA (daily futures or 'spot', and monthly futures contracts for the current year and future years). The most actively

traded contract is the December futures contract for the current year: traders reported that they tended to focus on this single product in order to maximise liquidity. No clear evidence was available on why the December rather than March contract was the most actively traded (given that surrender of allowances is at end March or early April), but there were suggestions that this might be driven by accounting practices.

Some traders (e.g. in the power and aviation sectors) were interested in trading beyond this horizon, for reasons explained in chapter 4. They tended not to buy December futures for upcoming years, because liquidity in these products was low. Instead, they tended to buy December futures for the current year and then sell them towards the end of the year, buying December futures for the next year instead.

Ease of use of the ICE platform

Registering to use the ICE platform was reported to be quite complex. Firms wanting to trade on the platform needed to find an 'ICE clearing partner' to handle their financial transactions. This was reported to involve significant costs and the provision of financial information, as clearing partners wanted to minimise the risk of default.

> *Whilst government would say you can do it, it is very difficult to do it. Because you have to have the clearer position as well. And there's significant costs associated with being on ICE and having a clearer. So the cost that we incur in having a clearing account and an ICE account are significant. And it's not something that industry in general would get involved in. (Trader)*

This process was easier for firms that were already members of ICE (e.g. because they traded in other products) and that simply wanted to add UK ETS to their trading portfolio. It was also easier for firms that were part of large financial institutions which were themselves clearing members of ICE.

> *You know, we're members of the [ICE] clearing house, it's easy for us. Because we trade not just emission products but we trade oil, we trade gas, we trade power, we trade – you name it – with them. (Clearer)*

Other than access issues, there were few comments about ICE :

- One broker reported that it was problematic that operators/AOs were not set up to settle futures trades quickly. They were used to settling the financial side of trades quickly for other products (typically on the day of the trade or within a couple of days), because they were dealing with companies that were used to trading and were set up to make quick settlements. In contrast, operators/AOs that seldom traded typically wanted to settle invoices over a much longer period (e.g.30 days). This could cause cashflow problems and financial risks for the broker, or require them to structure the trade so that the client had time to pay.

  The clients are not set up to do a T+0 or T+1 settlement, yes? So, they buy something, then they need to go to legal and they need to go to finance and finance needs time to pay, etc. That just takes time.. (Trader)

- Some traders commented that the spreads tended to be wider than they would have liked. This point relates to liquidity which is discussed in more detail below.

  The only thing is that the quotes are a little bit too wide. So, it would be better if there would be more liquidity providers on the platform, so that the quotes would tighten up, so that the end client gets a better price. (Trader)

- One trader commented that they would like to see more frequent uploading of trading positions on the ICE platform under Markets in Financial Instruments Directive (MiFID) rules.

  …everybody could see and track the movements of the volumes that are in the portfolios of traders across time. Instead of once a week, it will be a bit [..] easier to track. And also you can make connection with any changes that happen day to day, to the fundamental changes that happen in the energy market. (Trader)

Feedback on OTC trading

As explained in the chapter on trading behaviour, many of the operators/AOs interviewed in this research bought UKAs from intermediaries 'Over the Counter' (or 'Off Exchange'). The reasons for doing this, as explained in the trading behaviour section, were to avoid the hassle and cost of registering on ICE or registering for auction, and to access trusted advice.

As explained above, one operator commented that they would have to partner with a clearing house to trade on ICE, so reasoned that they might as well partner with an intermediary who could provide more assistance.

As explained in chapter 4, many operators/AOs reported that they used an intermediary who was also used for the EU ETS, or a broker/trader that they already had a relationship with.

In contrast, some of the larger operators/AOs reported that they approached multiple intermediaries at once, when they wanted to trade, and took the best price offered.

Interviewees did not flag any problems with OTC trading and did not make any suggestions for improvement.

Auction Reserve Price

At the time of the research, the Auction Reserve Price (ARP) (£22/tCO2e) was well below the prevailing market price. The ARP was reported to have been set because of concerns that UKAs might trade lower than EUA when the scheme opened.

> *They [UK ETS Authority] were super worried about when the UK ETS started trading, that it would trade very low. And the optics of it being very out of sync with the EU ETS. Whereas what they did instead, and they didn't put enough [allowances out there]. [..] So, they increased [the ARP] from £18 to £22. We were just sitting there thinking, "Not in your right mind [is it] going to trade at £22." (Power sector operator)*

In practice, UKA prices rose from their initial price of £45/tCO2e and reached nearly £100/tCO2e in August 2022, exceeding the EUA price at that time. Interviewees attributed this primarily to the shortage of UKA in the early stages of the UK ETS, combined with the effects of the Ukraine war on power generator behaviour. The UKA price declined from the peak in August 2022, with a pre-compliance plateau around £80/tCO2e in March 2023. Prices have generally declined since then, falling to between £40-50/tCO2e after the UK ETS Authority announcement on 3 July 2023. The UKA price reached £34/tCO2e on 20 September 2023 but this was after the research period and did not influence interviewee responses.

Most operators commented that the ARP was irrelevant because prices, up to that point, had remained well above £22/tCO2e and the ARP had not actually taken effect.

> *Clearly, the auction reserve price has been set at £22 per tonne, I believe, and the market has traded nowhere near that level in the history of the UK ETS so far. Although I've seen a few analysts suggest, when UKAs were falling quite significantly this year, that maybe that's where they were going to go, I can't see them ever going there. (Heavy industry operator)*

There was some comment that the ARP had been worked out in a transparent way, being based on historic prices in the secondary market.

> *I think current setting, it's fair enough. Even the way it was worked out, I think it was really, really transparent. No comments at all from my end. (Aircraft operator)*

However, other traders commented that the level of the ARP should be more consciously chosen to support the UK ETS decarbonisation objectives, rather than simply reflecting historic secondary market prices. They thought that the ARP looked low and should be reviewed upwards if the UK ETS Authority was serious about incentivising decarbonisation.

> *I think, if anything, the UK should try to come up with a better support mechanism, if they still want this carbon market to play the role that it's supposed to play.[..] because, the way the emissions scheme works, it only works when the market is tight enough to actually drive behavioural changes, right? So if you just have a lot of carbon credits supplied to the market, people will just buy at a cheap price and don't switch to cleaner fuel. (Trader)*

Some traders referenced the California 'Cap and Trade' scheme which has both a floor and a ceiling price. The floor price in the California scheme was reported to increase at 5% plus inflation each year. This increase was reported to generate increased trader confidence in the long-term direction of price movements.

> *[In the California 'Cap and Trade' scheme] it was $15 at the time, and every single year it went up by 5% plus CPI. I mean, it's a 10% escalator on the minimum price. It kind of provided, I would say, one, a lot of financial interest into the markets. Because if you could buy something at auction for the auction price and you knew the auction price was going up by 5% plus CPI the next year, there were a lot of hedge funds, a lot of money managers, who saw this as a great trade. So from there, they're buying allowances, which made the market tighter, which then picked up prices off the auction floor, which*

> *then gave it a more true supply/demand market discovery dynamic, versus just hovering along at auction price. So I think the auction floor serves a very important purpose. [..] Just pinning it to where the secondary market has been trading, in my view, maybe isn't the best idea. I think [..] fitting into a much bigger picture [..] about understanding where they want emissions 10, 15, 20 years from now, that makes a lot more sense to me. (Trader)*

However, there was recognition that the UK ETS had to choose between using price-related controls (as used in the California Cap and Trade scheme) or volume-related controls (as used in the EU ETS).

> *You need to choose what kind of scheme you want to be because [..] California has a clearly defined price floor, ceiling and the levels in between. And it's [linked] to inflation and it increases at a steady rate year on year. Europe doesn't have one: Europe has chosen to not look [at] price, but only to look at supply. (Trader)*

Cost Containment Mechanism

The Cost Containment Mechanism (CCM) is designed to address major, sharp increases in UK ETS prices. It is triggered when UKA prices rise significantly relative to recent prices. When triggered, the UK ETS Authority has a choice about whether and how to intervene in the market. This section presents high-level views on the design of the CCM, followed by specific comments about the CCM being triggered on two occasions, one in 2021 and one in 2022.

Feedback on the overall design of the CCM

Smaller operators (e.g. those from 'other industry' sectors) tended not to have views on CCM design, because they were not familiar enough with the details of the UK ETS. However, traders and heavy industry stakeholders put forward their views.

There was recognition amongst some traders that some form of mechanism was needed to protect the market against exceptional price movements.

> *as we learned in the last year with the Ukraine conflict, the extreme moves in markets may not necessarily lend themselves to that T+1 settlement. We may need to collect monies from the clients' intraday when we see these types [of] big movements. So the existence of some of these price caps, price floors, price control mechanisms, while there may be many market participants who feel that those are non-market forces that don't lend themselves to a healthy marketplace, they are certainly helpful for controlling those extreme movements I would say. (Trader)*

Some traders expressed concern about the discretionary nature of the CCM, in terms of UK ETS Authority having discretion about how and whether to intervene in the market when the CCM was triggered. They expressed concern that leaving the intervention decision to 'judgment' caused uncertainty that was not good for the UK ETS market or for companies that were potentially making investments to meet net zero targets.

> *Traders, markets and people investing want certainty and not moving goal posts. If you think something will happen then you want it to happen.[..] The rules need to be more black and white. If these decisions are left to judgement (especially of politicians) then investors get nervous. This is not good for encouraging investment in net zero. (Industry trader)*

One trader commented that the early stages of the CCM were flawed because the calculations treated the price of UKA as zero between 1 January 2021 (when the scheme opened) and 19 May 2021 (when trading started). They suggested that the CCM might not have been triggered in 2021 and 2022 if the CCM had been designed to use the EUA price during this period, as it did for the period prior to January 2021.

Some traders and operators commented that there was general recognition that the CCM would only be triggered in the near future if prices rose to £200-300 or more, which looked unlikely at the time of the research. This made the CCM seem irrelevant to them going forward. Some operators would like to see a more sensitive mechanism that was designed to keep UK ETS prices in check if they rose to levels that put industry at risk (e.g. if they rose too high relative to EU ETS prices).

> *[the] cost containment mechanism seems to be out of touch with reality in the market. [..] And that's got to be £220 for the next six months before the government will even consider entering the market to cool prices. Now, in my view, if we have £220 for six months, that is a significant issue for industry. I mean, at current prices, £60, it's quite significant. If it went to £220, it would be a major issue. So [..] I don't think the Cost Containment Mechanism gives any comfort really for industry, anymore. (Trader)*

The fact that the CCM was less likely to be triggered at the time of the research meant that concerns about the discretionary nature of the mechanism were less of a priority, but traders and wider stakeholders still voiced these concerns.

Perspectives on decision not to intervene when CCM triggered in 2021/2022

Some attributed high UKA prices during 2021 and early 2022 to the shortage of UKAs at the start of the UK ETS (since trading only started in May 2021, five months after the scheme opened in January 2021). There were mixed views on the UK ETS Authority's decision not to intervene in the market when the CCM was triggered in December 2021 and January 2022. Even amongst operators and AOs, there were those who thought that the UK ETS Authority should have intervened to reduce prices and others who welcomed high carbon prices as drivers of decarbonisation investment.

> *Sometimes you'll meet customers who are very, very angry, "They should have intervened. They should have put a cap on the price." Or what have you. Then you have other customers who are, "Well, we need to go down this route for decarbonisation, so we welcome some of the measures of the ETS." A range of different opinions really. (Trader)*

Generally, heavy industry operators thought that the UK ETS Authority should have intervened by issuing more allowances, in order to keep UKA prices lower. Their primary rationale for this

was they wanted UKA prices to be close to EUA prices, to avoid the UK economy being at a competitive disadvantage compared to Europe. Competition issues are discussed further in chapter 7.

> *So [company] has operations in the Netherlands and in the US. So [..] they have options of where they maximise production, whether it's in the UK, whether it's in the Netherlands, whether it's in the US. And it's a global product. So they can move production from one place to the other. So when the UK price was taking off relative to the EU price it was doing nothing to reduce CO2 emissions, which I guess is the ultimate policy intent. All it was doing was moving them from the UK to the Netherlands, where they could produce relatively cheaper at that particular point in time. (Heavy industry operator)*

Industry traders and operators commented that non-intervention allowed UKA prices to rise to high levels, above those in the EU ETS, which had an adverse impact on their businesses, even if only for a 6-month period.

> *So industry in that period, which was '21 and '22, COVID recovery period, was unnecessarily stressed because the government chose not to act.[..] Realistically, I would say, typically, we were probably looking at between £10 and £15 additional cost per tonne. And in a business that is reporting [over 1.5 milllion tonnes] per annum, in tonnes, that's a lot of money for us. (Heavy industry operator)*

Furthermore, some operators, across a range of sectors, thought that the UK ETS Authority's decision not to intervene made the CCM seem meaningless.

> *…at the time the prices were escalating quickly. If I remember, I think it was during part of COVID as well, prices were going up, the start of inflation in the UK, if you like, and there was no action taken. So it just all felt a bit meaningless to us. And a lot of people that I liaise with externally on this sort of stuff were in the same position, from an industry point of view. It felt as though it [CCM] was a very meaningless clause. (Other industry operator)*

However, some stakeholders (including some heavy industry operators and traders) reported that they could understand the UK ETS Authority's rationale for not intervening (e.g. because prices were on a downward trajectory or because prices reflected the fundamentals of the market at the time). However, these stakeholders also commented that the CCM, if interpreted this way, was unlikely ever to prompt intervention, even if it was triggered.

There was also comment that, at this early stage of UK ETS development, intervening could have set a precedent for UK ETS Authority intervention in the market, which would have been unattractive to traders (particularly speculators).

> *In my personal opinion, I think intervening at that particular point was too soon. You know what markets are like, if you set a precedent that you are willing to intervene in a market, I think it spooks sentiment in a lot of cases, especially speculator. If you see lots of government involvement in a particular market early on, it doesn't really inspire all that much confidence the market will evolve in a natural and organic way. (Trader)*

Suggestions to improve market stability

Operators generally wanted to see stability within the UK ETS. As a small and less liquid market than the EU ETS, they perceived the market to be less stable and to require some form of stability mechanism.

> *It needs a bit more to take the volatility out of it and have some control and keep it more aligned because liquidity is an issue, and small things have a big impact (Heavy industry operator)*

Several stakeholders, including traders and heavy industry representatives, voiced preference for a volume-based mechanism (akin to the EU Market Stability Reserve, MSR) instead of the price-based CCM. Their reasoning was that the EU MSR was more 'rules based' and less discretionary than the CCM, and that the MSR thresholds were based on volumes rather than prices.

> *The cost containment mechanism, as I understand it, is a cost-based mechanism, where the Market Stability Reserve is volume-based. So from purely a principle base, we would rather have a volume-based mechanism because you don't touch the price, or you don't take the price as a reference, but you take the volume, right? (Trader)*

Some stakeholders mentioned that the UK ETS Authority had initially envisaged introducing an equivalent of the MSR, in the form of a 'Supply Adjustment Mechanism'. While it had been expected that this mechanism might be introduced in 2023 or 2024, this was not included in the July 2023 announcement.

Perceptions of quality in the UK ETS market

Perceived lack of liquidity, especially in comparison to the EU ETS

Comments regarding the quality of the UK ETS market were largely centred arounds concerns about a perceived lack of liquidity. This was associated with a range of challenges for market actors, and in particular traders engaging directly with the market, as opposed to those relying on intermediaries. Interviewees often used the EU ETS market as a comparator and frequently contrasted their experience of that market, with their experience of the UK market.

> *Interviewee: We also have the ability to trade on a proprietary basis for [Company] in both the UK and EU ETS's and we have not done anything in the UK ETS but we do trade in the EU ETS. [Interviewer: Right. Is there a reason you choose not to do so in UK?] Interviewee: Yes, the market depth is much worse, the liquidity is horrible, the regulatory uncertainty is higher. (Industry trader)*

This section sets out challenges identified as being associated with low liquidity in the UK ETS

Difficult to meet client requirements

It was reported that a lack of liquidity makes it difficult to meet client needs, at least in doing so quickly and at a price agreeable to the client. Trading frequency was reported as being

relatively sluggish and large orders were observed to be difficult to fill as offers were often made for relatively small volumes of product.

> *In terms of the actual trading itself, you're also quite limited in what kinds of levels you can work at…There are some clients, counterparties of ours that have the approach of, "At 12:00 today I would like you to pass over a price for X amount of carbon allowances." This works very well with the EUA, of course, because it's a fairly liquid market. It's more probable that you will get the order filled, especially if it's a reasonable quantity, if we're talking maybe anything over 5,000 allowances. For the UKA this is probably one of the trickiest things, principally down to the liquidity. (Trader)*

A trader, buying on behalf of their own organisation, noted that they found it difficult to hedge their position and associated this with a lack of liquidity.

> *Just a lack of liquidity, it's just not available for sale. So obviously the UK ETS scheme is a much smaller scheme than the EU ETS scheme, so initially there just weren't people who bought enough allowances that they were comfortable to… Or the visibility of it wasn't there to be able to hedge a position. (Heavy industry operator)*

A lack of liquidity was seen as a particular constraint in relation to the futures market. One interviewee observed that there was some liquidity in the near-term, but that it was difficult to meet the needs of clients who wish to buy futures or forwards outside of the current trading year.

> *…the liquidity is on the spot market and then a December period is when the next liquidity comes available, really. So we've got December '23, '24, '25. Now I've got clients looking to secure allowances for Dec '24, '25. But if I look there now, if I'm just look- let me have a look at Dec '24. I'll tell you now, actually, there's one allowance available. You know, a thousand, there's a thousand units available on Dec '24 as we speak. You know, it's just difficult to secure. Very, very difficult to secure. (Trader)*

Higher risk owing to lack of price certainty

A lack of certainty regarding the price of market products was perceived as a challenge, and one which increased the risk for market participants, in particular active traders (market makers and brokers). For example, satisfying a large order might require the trader to buy multiple small blocks of product, with the trader making a loss on the price of some of these blocks.

> *This is more a problem for the trading houses/liquidity providers. An end client will not notice it, but for us it can be tricky for the reason I said before. If you quote a client a certain price, and I hedged on the futures, and four days later I want to turn, and the liquidity is much less, it means I have to give away money to turn the same position. So, for companies like us, it's a bit more tricky. (Trader)*

As a result of these challenges interviewees reported that they took a cautious, and in some cases less ambitious, approach to trading.

> *It's hard to trade, in as much as- Well, it's not hard to get into the market, but it's hard to get into sufficient positions, because you never know if you can get out of them. So, it*

> *ends up being almost a bit experimental, in terms of what to do, and you can't really engage with it in an awfully meaningful way. So, we have to go in small and careful. (Trader)*

Market movement in response to trades

One reason for trader caution, and a source of price uncertainty, was the need to avoid moving the market price. It was reported that even 'small' trades could move the UK ETS market.

> *It's a lot smaller. We noticed that a lot with liquidity in the market. The bid offer, the volume on the bidding offer is pretty small, and if you try and lift an offer or get a bid, there isn't the depth of market that you have in the EUAs. So, if you went and bought 50 kt [50,000] of UKAs, you'd more than definitely move the market. Whereas, with the EUAs, you probably wouldn't. It's kind of the rough guide. It's a lot thinner and there's a lot less volume trading during the day. (Trader)*

Liquidity constrains the derivatives market

Market maker and broker interviewees reported that they felt that the UK ETS derivatives market was constrained by a lack of liquidity. One interviewee observed that options and swap trades were relatively risky, and traders relied upon liquid market conditions to enable them to hedge such risk. As a result, trading in derivatives was reported to be largely conducted in 'standard' forwards or futures contracts.

> *Just on that basis, I mean, if the market was more mature or liquid, there would probably be more action around things like options and consumer derivatives as well. But because it's so small, the players or your likely traders, financial traders that would provide that, you can't because there's not the liquidity there to cover off the risk that goes against them. So you are pretty limited in terms of either a spot or just standard Forward transactions, really. (Trader)*

> *…most of what the clients are asking is spot, let's say 80% or 90% even, and in the UK higher, even. In Europe they were selling marketing options, which is quite a lively- for example where, I guess, the liquidity in the UK, and you can see [..] probably is a lot, lot smaller and a lot less liquid. So, then it's also harder to get an active derivative market going. (Trader)*

One interviewee, however, noted that the options market was emerging, but was, as yet, quite constrained.

> *We have been encouraged to see that the options market has kind of kicked off this year, that's a positive. But in short, it's slower moving, there are fewer trades than in other markets where we're active. And yes, it can be tough to get out of a position, if it's too large. (Wider stakeholder)*

Trends in liquidity

Market initially challenging

Initially, some interviewees, reported that the UK ETS was found to be very challenging. Uncertainty, and the associated lack of liquidity, exposed some types of businesses to large and unanticipated costs as a result of the higher, initial, pricing of UK ETS allowances.

> *The extreme volatility that we saw as the market opened was absolutely horrendous and it left us as a business exposed to really quite significant costs and risks. You saw, it opened and the markets didn't trade as one, they traded independently. It means that we've effectively got a spread on and we're exposed to the movements of those two legs. It was pretty horrendous. (Power sector trader)*

The lack of liquidity in the secondary market also meant that some operators looked to procure UKAs, rather than derivatives. This had a detrimental impact on their cash flow.

> *So the transfer from the EU to the UK market, because the UK market wasn't born with the same liquidity, with the same market fundamentals, with the same derivative market products available to use, it's had a detrimental impact on the cashflow of the business. (Heavy industry operator)*

Liquidity has since improved

A number of interviewees reported the view that initial illiquidity had been an inevitable consequence of setting up a new scheme but noted that liquidity had improved. Amongst this group, there was also an expectation that liquidity would continue to improve.

Some, however, caveated their comments, observing that the size of the market placed inherent constraints on its development.

> *So I think it's a function in time, it's going to take- I think, as the years progress, I think we'll see the secondary markets, like the screen, will see volumes pick up, we'll see probably more active participants. But if you're a big institution, if you're an insurance company or you're a pension fund, arguably the UK market isn't deep enough for you to put money into. You know, they'll be six lots up on [Deck] contracts at times. It's not a deep enough market for some institutions. (Trader)*

One interviewee noted that this meant that they anticipated that, as a smaller scheme, they anticipate lingering challenges with liquidity, price discovery and volume buying risk.

> *…that's a very small scheme by the time you have that many allowances moving around. The smaller the scheme, I think, the harder the challenges are around effective price discovery, liquidity, [and around] having a market that lets compliance companies do what they want to do within the scheme, to cover their price risk and volume risk. (Heavy industry operator)*

Some interviewees, felt that, whilst the market was inherently limited, it was functioning effectively, at least effectively enough for them to operate in, provided that participants tailored their approach to market conditions.

> *…to be honest, it's illiquid, but hey, you live with it. It can be done. Everybody understands the market now in terms of the limitations. You don't really have people coming to market saying, "Buy 30,000." The idea is there… I think, to be honest, they've probably asked various traders, various brokers and they've said, "Can we do these kinds of clips?" People have just said, "Yes and no, but you have to give me time. (Trader)*
>
> *It is what it is. As I say, it's manageable, and within… If you understand how the market works, you can develop an effective strategy to do that, so I don't think there's anything… You're not going to change the design of it so far, so the market works as well as it can do, in my view. (Trader)*

Options for improving liquidity

Increase auction frequency

It was suggested that a lot of secondary market trading centred around the auction, and that therefore it might improve market liquidity, by smoothing trading activity out, if these were held more frequently. This is discussed in more detail in the auction process section above.

> *From a liquidity point of view, might be helpful to have weekly auctions. There is higher liquidity in auction weeks. (Trader)*
>
> *Just in terms of secondary market liquidity, sometimes I wonder whether, if the UK has more frequent auctions, you would see better liquidity in the secondary market. I understand that the total cap in the UK is a lot smaller than the EU ETS, so having a daily auction probably doesn't make sense. But sometimes I wonder, if the auction took place on a weekly basis, would that encourage better liquidity in the secondary market? (Trader)*

Attract more market makers

There was a widely held view that there was a need to draw more market makers into the UK ETS market. However, there was evidence of uncertainty about how best to achieve this, or even whether it could be achieved.

> *…there's only one way to improve liquidity and that's more participants in the market, so more trading participants in the market. How do you get more trading participants in the market? Yes, that's difficult, I don't know. I'm not sure, that's something you need to ask the ICE exchange. (Trader)*

Those who offered solutions, suggested that the UK ETS would be more attractive if larger. It was suggested that this could be accomplished by linking to the EU ETS, or expanding the scope of the scheme to include other forms of UK based activity. One interviewee noted that developing liquidity took time in the EU ETS, and would be expected to improve in the UK scheme, but might still benefit from some form of intervention.

> *Liquidity is a bit like Rome, it wasn't built in a day. You do have to attract certain entities to provide you with liquidity. I think that generally the reforms that have been announced will probably do so. It took a long time for the EU ETS to get speculators in. Maybe*

> *with… I don't know. Maybe launch with an ETF [Exchange Traded Fund] or something of this nature, kind of opening it a little bit more. I get the feeling at the moment it is very kind of industrial based. I know there are some speculators that work on it, on the UK ETS, if I'm not mistaken. (Trader)*

Other suggestions

Another interviewee suggested that they felt that the market was seen, by operators at least, as mainly being a mechanism for them to meet their needs, rather than being seen as an opportunity to optimise their costs.

> *…the liquidity is not really there, and people aren't necessarily doing hundreds of transactions to get to the point that they need to be, it's still very much seen [by] the end user as a means to an end, not a way to help ultimately look to really engage and optimise their transactions to deliver the lowest possible price, is my gut feel at the moment. (Trader)*

Barriers to more active participation and trading – and participant suggestions on how to broaden participation

Interviewees' primary concerns, in relation to trading, related to the liquidity related challenges reported in the preceding section. Aside from these, one interviewee reported that they had found it difficult to get their clients ready to engage with the market in a more dynamic way, as opposed to once a year 'buy to comply' behaviour.

> *So, by set up to trade, we have to do on boarding checks. We have to do a contractual process, so we agree with them a contractual framework for buying the allowances. There's a lot of legwork that needs… Then we get to the point that you're talking about volumes and price. Now, once they've got approved, so if they have to get approval for this – and that could take time – you need to get that in play before they can ever push the button on saying, "Right, I want to buy 5,000 allowances at a price of £60," for whatever. That has been the real challenge in where companies are at, is just getting their heads around the processes that, if they're not used to market-based systems. (Trader)*

A small number of interviewees reported confusion about the rules of the scheme. For example, some representatives of large financial institutions reported in interviews that their understanding was that they could not participate in the auctions. It was not clear where the confusion arose. Another interviewee reported that they had problems in securing regulatory approval from the FCA.

> *So, we had to explain to them, in such great detail, what we're actually doing, and that we're actually servicing clients, that it took them a long time to understand it. So, in that sense, it's not easy to enter the UK for this market, and not even for a [size] player like ourselves. (Trader)*

Perceived risks to the effective functioning of the carbon market and participant suggestions on how these can be mitigated

Price volatility

When asked about threats to market function and stability, interviewees often referenced back to comments regarding liquidity, with their main concerns being about market volatility and their inability to predict prices forward.

Policy uncertainty

Interviewees widely reported that government policy was a key source of market uncertainty. Some interviewees described this as the main threat to the scheme. One concern was that carbon markets, being a creation of policy, were highly vulnerable to changes in the political priorities of government.

> *So if there's a change in policy, a new government gets voted in, and let's say it's easy to disband the programme, that's a huge programme risk. If it's politically unpopular, if prices go to £1,000 per metric ton and no-one can fill up their car, it becomes politically unpopular, it's pretty easy for politicians to say, "Let's get rid of this thing." (Trader)*

Interviewees commented that there was more policy certainty in the EU ETS, because the nature of decision making in the EU meant that it was more difficult to change tack once a policy had been agreed.

> *Yes, and, as I said, the EU ETS benefits from the EU's bureaucracy because it is harder for them to make changes. That means the regulatory uncertainty is much lower because everything is flagged up quite a long time in advance and they can't really do anything in a hurry because you have to get 27 countries agreeing on it. Whereas the UK ETS can be changed at the whim of the government. (Industry trader)*

Operator interviewees stressed the long-term nature of business planning cycles and the importance of a predictable policy environment in determining whether investment happens at all or, in the case of multi-national companies, whether it happens in the UK.

> *So if the schemes are volatile, if they're unpredictable, if they're potentially going to put us at a disadvantage, then all that will happen is that commitment for the 2037 project here won't happen. They'll [the parent company] just accept the cost. And then they've got the option to abandon the site rather than to commit, if there's potential uncertainty around what they're committing to out to 2037. (Heavy industry operator)*

> *…there is a frustration that it's difficult to predict the future because UK government is constantly changing, if that makes sense. And that is called- industry is very frustrated about that and we see, in a global market, we need some stability because why would you do something in the UK when you can do it cheaper in the US or China or something like that? (Trader)*

The Carbon Border Adjustment Mechanism

The introduction of the Carbon Border Adjustment Mechanism (CBAM) was a concern to some power operators with the additional regulatory burden associated with the export of power being a source of concern. Interviewees noted that this could be avoided by linking the UK ETS with the EU ETS.

> *I think the real risk at the moment is the European Carbon Border Adjustment Mechanism coming in in 2026. If we're not harmonised with that then it is going to increase the regulatory burden for power exports by a huge amount. I think we will see that the interconnectors just won't be utilised as effectively as they should be. (Industry trader)*

Algorithmic trading

One interviewee felt that algorithmic trading was a threat to the UK market noting that the small size of the market would make it easier to influence the price with relatively small volumes of trading.

> *The EU market can handle it because it trades 20 million allowances a day, so no speculator is going to be able to influence the price to that extent. If some want really get to grips with the UK market that trades, on average, about 800,000 allowances a day, they could pretty easily do it. (Trader)*

Another interviewee, also identified algorithmic trading as a problem, suggesting that its use effectively forced operator traders into paying higher prices. This respondent suggested that the practice should be banned in the UK market.

Chapter 6: Characterisation of UK ETS abatement behaviour

This chapter sets out findings on the characterisation of GHG abatement behaviour by UK ETS operators, based on realist analysis of qualitative interview data. Additional themes relating to abatement behaviour are presented at the end of the chapter.

This section presents the seven main abatement behaviours observed through the research. This chapter presents each of these using realist 'context-mechanism-outcome' (CMO) configurations to highlight the organisational reasoning or rationale for operators' abatement behaviour, and the organisational contexts that led to this reasoning or rationale. Further detail on the realist analysis approach is set out in chapter 1.

This chapter presents a typology of seven abatement behaviours under the UK ETS. In summary, the main types of abatement behaviour observed in qualitative research were as follows:

- **Frequent abatement:** power sector operators that were changing their daily or hourly operations, partly in response to the UK ETS costs. These operators were constantly assessing market conditions and deciding whether it was more affordable to run their plants, change fuel source or buy electricity on the open market.
- **Both current and future abatement:** operators/AOs that had already invested in abatement options and were actively investing in future abatement interventions, with varying levels of UK ETS influence. These operators/AOs were diverse in terms of size, sector, allocation of free allowances and overall emissions, but demonstrated a clear commitment to present and future decarbonisation.
- **Current abatement and researching future options:** operators/AOs that had previously implemented emissions reduction activities and were continuing to do so. They were in the process of identifying viable and feasible future abatement options but had not yet invested in any meaningful way in these solutions. Levels of UK ETS influence varied.
- **Current but no future abatement case:** operators/AOs that were currently reducing emissions but had no intention of implementing significant future abatement solutions. These operators were constrained by the amount of control they had over future investment decisions.
- **No abatement:** operators/AOs that were not abating their emissions in any meaningful way and were not intending to implement any large-scale abatement solutions.
- **No abatement, but with possible future options:** operators/AOs that were not currently implementing abatement activities but with potential for future abatement if technical and financial barriers could be overcome.

- **Abatement through closure**: installation operators that saw significant reduction in GHG emissions resulting from part or full closure of one of their plants, exacerbated by UK ETS costs.

In examining abatement behaviour, respondents commented on both their present and anticipated future activities, as well as the influence of the UK ETS on these decisions. The evidence was categorized based on this temporal distinction (current versus future activities) into CMOs representing organisations either currently engaged in abatement or actively investing in future abatement solutions. Among these categories, the most prevalent group in the qualitative research sample involved operators/AOs that were both implementing current abatement measures and also engaged in researching future activities. The second most prevalent group consisted of operators/AOs that were actively reducing current emissions while also making tangible investments in future abatement solutions. Within both these common CMO groups, there were variations in terms of the level of UK ETS influence on abatement decisions. All other behavioural patterns were less commonly observed, with only a subset of operators/AOs interviewed for qualitative research exhibiting these less frequent behaviours.

The set of abatement CMOs is shown in Table B of Appendix 2. Each CMO has been assigned a summary 'nickname'. These are intended to provide the reader with an easily understood summary of the described behaviour, and to enable cross referencing within the report.

Frequent abatement

Frequent abatement was defined as operators that were changing their daily or hourly operations partly in response to the UK ETS. These operators in the power sector were constantly assessing market conditions and deciding whether it was more affordable to run their plants, change fuel source or buy electricity on the open market.

> *The UKAs is an input cost to the power stations, so it's a constant dynamic in terms of whether the station's profitable to run or it's cheaper to buy in the market. (Power sector operator)*

Table 11: Summary of 'frequent abatement' CMO

Nickname	Key contexts	Mechanism	Outcome
Frequent abatement	Large international companies involved in power generation. Have plant that can be operated on a discretionary basis.	UK ETS costs are significant to our business so we take account of them when deciding whether it is economical to run our plant.	We change our day-to-day operations to assist with abatement, and we are also investing in medium and long-term abatement.

	Continually (daily or more frequently) decide whether it's profitable to run their plant, depending on energy costs and other factors. No free allowances.	The UK ETS costs affect whether we run our plant and therefore affect our emissions on a frequent basis (daily or hourly) basis. Our current and long-term abatement is driven by corporate targets, government policy and other factors (including the costs of UK ETS).	

Key contexts

Frequent abatement operators were large, international power sector companies with multiple installations participating in the UK ETS. These operators received no free allowances. Their abatement strategies were multi-pronged, incorporating reducing emissions through daily or hourly operational changes, investments in renewable energy and forward-looking initiatives such as investigating in green hydrogen. However, achieving their future emissions reduction targets was constrained by external factors such as the availability of low emission fuels.

> *You need a carbon-free electricity sector by 2035, to stay in line with our net zero commitments in the UK. And we have none of that infrastructure there at the moment. So we've got to go from essentially nothing to everything in the next 12 years. (Power sector operator)*

The power sector operators had abatement plans in place, but decarbonisation was not firmly entrenched in the corporate culture.

> *We have to have a strategy. We have to have a roadmap. Otherwise, we're seen as the enemy. (Power sector operator)*

The operators were also part of industrial clusters (e.g. HyNet) or associations (e.g. the Carbon Capture and Storage Association) or were actively pursuing linkages with a nearby industrial cluster.

Mechanism

Frequent abatement operators integrated UK ETS costs into their daily operational decisions. The UK ETS (amongst other costs) influenced the financial viability of running plants or processes, thereby impacting on emissions on a daily basis. Investment strategies focussed on current abatement options, such as renewable energy and biofuel, as well as long-term

financially viable options including green hydrogen and Carbon Capture, Utilisation and Storage (CCUS).

> *The business models for carbon capture and storage are a bit more advanced, gives us a bit more certainty for investment. So, we're currently looking to build a CCGT [Combined Cycle Gas Turbine power plant] with carbon capture and storage, so a brand-new site. (Power sector operator)*

These investment decisions were multi-faceted, influenced by corporate targets, government policy, customer expectations, investor demands, and recruitment considerations, alongside the direct impact of UK ETS costs.

> *I suppose it's [UK ETS] an input to production, but it's not the sole driver of renewable builds but it's clearly one of them. (Power sector operator)*

Outcome

Frequent abatement operators adapted their day-to-day operations resulting in frequent emissions abatement. Concurrently, they invested in medium and long-term abatement options influenced in part by the UK ETS.

Both current and future abatement

'Both current and future abatement' operators/AOs had already invested in abatement options and were actively investing in future abatement interventions, with varying levels of UK ETS influence. These operators/AOs were diverse in terms of size, sector, allocation of free allowances and overall emissions, but demonstrated a clear commitment to present and future decarbonisation.

Table 12: Summary of 'current and future abatement' CMO

Nickname	Key contexts	Mechanism	Outcome
Both current and future abatement	Companies already invested significantly in improving their current operational assets Companies investing in long term abatement solutions A strong sense of decarbonisation being part of the	We are committed to decarbonising and are already investing in current and future abatement. Abatement is being driven by a range of factors other than ETS.	We are investing in abatement of current processes and we were already investing in long-term future abatement options.

	corporate identity and companies see themselves as leaders within the industry.		

Key contexts

These operators/AOs invested significantly in upgrading existing assets (e.g. boilers, heat pumps and an anaerobic digestors in the 'other industry' sector) in order to reduce emissions. Heavy and other industry operators were also reducing operational emissions through energy and process efficiencies, while one heavy industrial operator was investing in fuel switching from coal to biomass and waste fuels.

> *But they're multimillion-pound investments[..]. The one in [location] is change to the boilers and the hot water system through the plant, replacing steam with hot water, and more efficient, modern kit with better inducting and control systems. (Other industry operator)*
>
> *It's started being built in [Location], a brand new dedicated anaerobic digestion plant, to take crops as our feedstock, and create biomethane. And that will provide additionality, so creating new capacity in the UK, and that'll be used directly by our [..] big sites, as [Company]. So that's the big one. (Other industry operator)*
>
> *So the first thing was fuel switching, wholesale moving away from coal to alternative products. So we burn everything from domestic waste, meat and bone meal, animal waste, byproducts. We're constantly on the lookout for new and innovative fuels. (Heavy industry operator)*

These operators also invested capital in long-term abatement solutions, including CCUS plants in the heavy industry and power sectors, sustainable aviation fuel (SAF) plants in the aviation sector and anaerobic digestors.

> *But we've also just announced that we've invested directly in a SAF production facility in the UK, which will guarantee us a certain level of sustainable aviation fuel. (Aircraft operator)*
>
> *We've already got a lot of waste heat, so we're basically building a power station to run the CCS plant. So it's got to capture the emissions from the power station and the CCS plant, all within the same thing. (Heavy industry operator)*

These operators positioned themselves as industry leaders and decarbonisation formed an integral part of the corporate identity. Within the heavy industry, other industry and power sector operators, their decarbonisation commitment was backed by specialised decarbonisation teams and strong senior leadership support.

> *So [Company] as a business worldwide have said, "Not only do we care about the environment, but we want to be number one in the space for our efforts to improve the environment and reducing CO2. So however much I care, however much I think I want*

> *to do something about it, somebody above me, at a corporate level, is saying, "You will do something about it." (Heavy industry operator)*
>
> *We've got a CEO who's really, really passionate about sustainability, believing that, you know, one, it's the right thing to do (Other industry operator)*

A few operators in the power sector noted the importance of existing and future government support to further drive innovation and investment in future abatement. This support could be in the form of revenue protection (e.g.. Hydrogen production business model, Green Gas Support Scheme), dispatchable power agreements or subsidies.

> *Everything that we do, is based on government policy support. Our CFD [Contracts for Difference], our RO [Renewables Obligation], we are a highly-subsidised business and that will only continue until [CCUS] scales up around the world. (Power sector operator)*
>
> *And we are literally waiting to have conversations with the government, when they see fit, around- we need- it's not a subsidy, it's a revenue support mechanism. It's just saying, "In order for you to finance your debt, this is the power price that you can assume". (Power sector operator)*

Mechanism

Operators/AOs in the 'both current and future abatement' group expressed a strong commitment to decarbonising which was demonstrated by existing abatement interventions and investment in future abatement options. This abatement was being driven by a range of factors other than UK ETS. These drivers included internal targets, company leadership, customer pressure, government support and energy prices.

> *I think it actually comes from a broad range of stakeholders. Yes, from investors, they're obviously under pressure themselves to be investing in green technologies and low-carbon solutions, that's a lot more prominent. Government as well. Obviously the government in the UK has its own net zero target and carbon removals target, hydrogen targets, and stuff like that. So it's certainly a pressure there to deliver. Customers, yes, I would say are more and more interested in sourcing from us or us being their supplier. Small and large businesses. The public as well, I would say there is also pressure from groups like NGOs and think tanks as well. So for us, we're seeing all of those pressure points come together. So again, all part of this idea of why we're doing what we're doing. (Power sector operator)*

The influence of UK ETS on abatement decisions varied between operators/AOs, as outlined below.

Outcomes

These operators/AOs are implementing abatement of current assets and processes and are investing in long-term future abatement solutions.

Variation in UK ETS influence

As noted above, the operators/AOs that were considered part of the 'Both current and future abatement' group varied in terms of their size, sector and emissions. There was however consistency in terms of their commitment to current and future abatement. There was one key difference between operators/AOs within the group, which related to the level in which the UK ETS was reported to influence future abatement decisions. Some operators/AOs noted that, although there were a range of factors affecting abatement investment decisions, the UK ETS and EU ETS played a key role in making a business case for abatement.

> *It has been particularly useful in regard to [the] SAF business cases because, under the ETS scheme we can allocate our SAF consumption as a way of reducing our compliance requirement. So, leveraging the cost of ETS allowances, within those business cases, allows us to make those investments more confidently. So, I would suggest from that standpoint, ETS has been particularly useful in regard to driving sustainable behaviours to other business, and aiding decision-making, as well. (Aircraft operator)*

The sub-group reporting joint UK ETS/EU ETS influence were all aircraft operators and were making significant investment in SAF facilities. These AOs also had limited large-scale abatement options available (beyond SAF) and were high profile companies. It was not clear from these interviews whether the UK ETS or EU ETS played a more significant role in influencing abatement, but it is possible that more influence was coming from the EU ETS (as operators reported that EU ETS revenue was being used to incentivise SAF uptake).

For cases where UK ETS influence was reported to be lower, 'other industry' representatives noted that abatement was taking place in sites outside of the UK ETS, as well as those inside the scheme.

Current abatement and researching future options

The 'Current abatement and researching future options' group was the most well represented abatement CMO within the qualitative research sample. This group included operators/AOs from a range of sectors, emission profiles and sizes. Within this group there was variation in terms of mechanisms and contexts, but there was consistency in terms of the overall abatement behaviour outcomes. These operators/AOs had previously implemented emissions reduction activities and were continuing to do so. They were in the process of identifying viable and feasible future abatement options but had not yet invested in any meaningful way in these solutions.

Table 13: Summary of 'current abatement and researching future options' CMO

Nickname	Key contexts	Mechanism	Outcome
Current abatement and researching future options	Range of companies in terms of size, sector, allocation of free allowances and overall emissions. Companies are committed to decarbonising, but have concerns about financial and technical viability of solutions. Some companies have Science Based targets. with short-term targets being achievable but long-term targets dependent on external factors (e.g. electricity grid connection or CCUS).	We are committed to decarbonise, and are investing in energy efficiency where we can, and also researching longer term. The rising cost of UK ETS is a driver for abatement, amongst other factors, although UK ETS also reduces the funds available to invest.	We are investing in abatement of current processes and we are researching future abatement options.

Key contexts

This group included a range of operators/AOs in terms of size, sector, allocation of free allowances and overall emissions. All operators/AOs in this group had an abatement plan in place demonstrating a consistent commitment to decarbonising, and many had near term targets set for 2030 and more ambitious abatement targets set for 2040 and 2050. Some industrial operators noted that their targets were being adjusted to align with the requirements of the Science Based Target Initiative (SBTI).

> *But we also have recently submitted an application into the Science-Based Target Initiative process, and that application is currently going through the validation process. And we won't hear back from that until the end of the year. So that will no doubt change that target number. (Other industry operator)*

> *[Company] have committed to a 30% reduction in carbon emissions by 2030, and that's in Scope 1, 2 and 3. Within [Company], we have the same target as that, and we've also got SBTI targets associated with cement production as well. And that target will be 33% reduction. (Heavy industry operator)*

However, some heavy industry operators noted that their ability to achieve the ambitious long-term targets was dependent on the availability of technologies such as CCUS and hydrogen.

> *So, these are really, really big projects, and really, the only way that we can reduce more than just becoming a bit efficient here and there, making tweaks, is with hydrogen, which as [Name] mentioned, massive infrastructure needed for that. I think that's the situation for a lot of [product] manufacturers in the UK. It's a big conversation that we're having (Heavy industry operator)*

> *But our 2030 goals don't rely on carbon capture and storage, for example. Our 2050 goals do, or our net zero goals, at some point before 2050, do completely depend on carbon capture. But our 2030 targets don't. (Heavy industry operator)*

Many 'other industry' representatives noted factors outside their own control, but dependent on UK government policy and support, that may impact their ability to achieve the abatement targets. These factors included access to infrastructure (such as the hydrogen, CCUS pipelines, electricity grid) and the processes involved in gaining access to this infrastructure.

> *But [..] the thing that we're in less control of is we don't know when we can have the electrical connections that we need. So, given that we have- for every one unit of electricity, we use ten units of gas, it means that nominally, we've got to increase our electrical connections by a factor of ten or eleven, to be able to electrify. And we're going through the process now of understanding when those grids might be available. We've only got the five facilities, it's tens of millions of pounds. It's not that we can just go and put a new plant in where the electrical supply is. (Other industry operator).*

> *The current stumbling block actually, is the G99 application [i.e. application to connect to electricity grid], which, to make it feasible we've got to sell some back to the grid, and obviously that then means that you've got to apply for G99, and then you've got to make sure you don't have fog currents and various things you've got to make sure. (Other industry operator)*

Some industrial operators specifically noted that importance of hydrogen and electrification as the most viable alternative for fuel switching away from fossil fuels. However, although these options were reported to be technically feasible, operators commented that they were not financially viable in the UK market. As a result, abatement investments were reported to be taking place in international markets where the technologies were more financially viable.

> *Electrification or hydrogen are going to be expensive. That's why natural- it just uses natural gas because the price of the natural gas and the carbon are cheaper than the alternatives. As a group, they are investing in low-carbon plants. So, in [Place], we've got a completely electrified plant. It's happened in [Place] because of the amount of hydroelectricity, and the UK is too expensive for it. There's been subsidies in [Place], in [Place] where a plant has been moved to electric. We've got a plant that's moving to*

> *hydrogen for glass in [Place]. And again, it's because the local governments provide more incentives than the UK do. (Other industry operator)*

Some other industry representatives also noted the need for policy clarity in order to help industries commit to a particular abatement technology.

> *Government policy forward-looking trajectory is inconsistent and not very certain. And it's almost like the decisions for us around some of these decarbonisation decisions, particularly the bigger ones, when you get into fuel-switching- So reducing energy usage is always going to be good for us. When you're trying to look at the alternative fuels or technologies to switch away from natural gas, that is a 20, 30, 40-year decision for us typically. We don't want to be revisiting that in 5 or 10 years, having made the decision on the back of a government policy that then gets changed in 10 years' time. We'd almost like to hear bad news, but it's going to be consistent. So hydrogen is going to be supported, but it's going to cost whatever. What's the right horse to back, almost? (Other industry operator)*

Mechanism

Operators/AOs in this group were committed to current and long-term abatement interventions. They were actively conducting research on addressing the barriers to long-term abatement solutions but they had not begun large-scale investment in these options because of these barriers.

> *Fuel switching, we are looking into the low carbon fuels, biofuel type things but at the moment it's studies that we're doing and we're keeping an eye on it. (Offshore oil operator)*
>
> *Feasibility studies and engineering design are being progressed for some major decarbonisation projects and investments, such as the [Name] carbon capture project (Heavy industry operator)*
>
> *The problem on all of those has been that we need a pipeline. There were large-scale trials, we had queues of hydrogen tankers sat queuing up and we get about two hours of production with them. Yeah, so we've got small-scale hydrogen, larger scale, which isn't a huge amount still, but it needs to be pipeline connected, effectively (Heavy industry operator)*

In the past other operational costs were the drivers for abatement. However, the rising cost of UKAs was reported to make UK ETS costs an increasingly important driver for abatement.

> *… historically the cost of fuels has been probably the biggest economic driver, so the cost of fossil fuels has driven us down the route of alternative fuels. But that has now been surpassed as a driver by the cost of carbon. So the economic drivers effectively come from the ETS scheme. But it's something that we see as necessary for us to be in a position to do the right thing, and for all companies to do the right thing. So we'd be wanting to decarbonise anyway, but the fact that all sizeable industrial emitters are in the same position, in terms of being governed by an ETS scheme, creates a framework*

> *and a level playing field for us to be in a position to put that investment and cost into our process for carbon capture, for example. (Heavy industry operator)*

However, operators in heavy and other industry sectors, as well as aircraft operators, noted that the rising ETS costs and a reduction in free allowances might also affect business viability in future and result in investment taking place in other locations.

> *We are so concerned about the process of allocating free allowances, as reducing or even removing totally the free allocation of CO2 would affect the economical feasibility of these investments. For sure, we would have a reduction in CO2 costs. That's clear. But free allowances would help us to have a better feasibility. (Other industry operator)*

> *I mean, as I say, it may form part of the cost calculations, but, for example, there's been an investment in a [Company] site in [City outside the UK]. We wanted that in [Location within the UK]. So that's general taxation, and taxation will be part of that sort of decision-making process, as well, but we're getting a lot of investment going outside of the UK, to other countries. (Other industry operator)*

> *What is influenced by the UK ETS price is the global decision about whether to manufacture at that site. So the decision is more likely to be we just won't do that there, we will just stop production in the UK at that site. So it will be a decision made at a global level to switch the whole plant off. (Heavy industry operator)*

The potential impact on future business viability through the allocation of free allowances was highlighted in the aviation sector. Representatives noted that airlines with only UK or European flights would be less viable than airlines that also had long haul flights, as the long-haul flights could effectively cross subsidise the local flights carbon costs.

> *Another argument for retention of free allocation, because those [long haul] airlines, basically, don't have to pay anything for the vast majority [of their emissions]. They may be able to out compete the airlines that are currently in that space. [Company] emissions are somewhere in the region of 25 million tonnes, ours is 2.5. So we're 10 times smaller than them, yet at least 65% of our emissions are covered under the current scope of the ETS and it's only about 10% of theirs. So we're paying on a vastly higher price.*

These issues are discussed further in chapter 7 on carbon leakage risks.

Outcome

Operators/AOs were investing in decarbonisation of current processes and assets. They were also researching future abatement options in order to overcome potential barriers to achieve their long term abatement targets.

Variations in UK ETS influence

As noted above, there was variation within this group in terms of the mechanisms and drivers for abatement. These variations were grouped by the level in which the UK ETS had influenced the operators' abatement decisions. In the overarching group, outlined above, the UK ETS and

EU ETS prices helped to make the business case for investment in abatement, amongst other drivers. However, in the variations below, different levels of ETS influence were observed, as follows:

- Variant 1: The UK ETS is not currently a driving factor, but could become more significant in the future.
- Variant 2: UK ETS is effectively a tax, not a driver for abatement.
- Variant 3: Sale of past surpluses of ETS allowances helped to fund investment in a new energy efficient equipment.

Variant 1: The UK ETS is not currently a driving factor, but could become more significant in the future

In this variant, where abatement was not currently influenced by the UK ETS or EU ETS, operators/AOs exhibited a set of common characteristics. They reported a history of significant investment in abatement assets. This included fleet renewal (aviation sector), investment in a biomass-fired Combined Heat and Power (CHP) boiler, energy efficient kilns and major fuel switching investments. However, there were both technical and financial challenges to future abatement options.

> *So we have become a lot more energy efficient. But the type of kilns we use, although they're probably still state-of-the-art in terms of [product] manufacture around the world, they are not available in the electrical firing mode. And plus, to be honest, the cost differential in the UK between gas and electricity per kilowatt hour, if we had to fire with electricity, we'd be out of business, to be fair, it's as simple as that. (Other industry operator)*

The concerns about a lack of a technical solutions was particularly prevalent amongst aircraft operators, where all respondents in this variant noted that there were no viable technical solutions in the aviation sector beyond SAF.

> *But obviously, for the big bang, you need the new technology, and you need the SAF. They'll save you small bits around the edges, but they're not going to be meaningful. (Aircraft operator)*

The operators in this sub-group also received a free allocation of emissions allowances covering 40% or more of their total emissions. However, some respondents noted that the reduction in these free allowances was becoming an increasing concern for the long-term sustainability of the business.

> *The free allowances were pretty much covering where we were emissions-wise. But now, as the baselines, the targets, and the free allowances are reducing, then, obviously, it is focusing us more, which I suppose, on one side of the coin, I could say, "Well, yeah, that's probably the actual intention of an emissions trading scheme." But on the other hand, I can see the potential pain to the longevity of the business. (Other industry operator)*

Operators/AOs in this sub-group also raised concerns about not being part of clusters and how this may negatively affect them in the future.

> *We're way, way away from any of the government hydrogen cluster areas as well. I think the nearest one to us is Merseyside. And, in fact, I think the [industry name] have made the point that I don't think there are very many [industry name] sites at all within any of the government's hydrogen cluster areas. (Other industry operator)*

> *So if other plants in the UK sit in clusters or get access to pipeline and we don't, then the potential there is for a massive market distortion on costs and prices and things like that. (Heavy industry operator)*

In this variant, operators/AOs had previously invested capital in abatement measures. Going forward, there were limited technical options available, and this abatement was being driven by a range of factors other than UK ETS (e.g. the cost of electricity and internal targets). However, the reduction in free allowances and a changing market were reported to be increasingly important factors that could drive future abatement.

> *I mean, obviously, a lot of our customers now ask what our CO2 per tonne of [product] is that we produce. So that's the important factor for us on the ESG [Environmental Social Governance] side. But of course, cost wise as well, with the way energy has moved over the last couple of years, of course there's a driver there as well to look at if there are any other technologies available, which we might have dismissed three years ago, but now actually might have a good payback. (Other industry operator)*

Variant 2: UK ETS is effectively a tax, not a driver for abatement.

In the second variant, operators in heavy industrial sectors saw the UK ETS as effectively a tax. As with the previous variant, these operators had already invested significantly in available decarbonisation technologies, driven by cost reduction. However, operators in this sub-group had higher free allowance allocations (more than 70%). Respondents also noted that there were only small emission reduction gains left through efficiency and operational changes.

> *I would say probably 95% of that is done. The low hanging fruit has been taken and captured, and all the optimisation that we can do has pretty much been done. Invariably, there's always something small out there. But there's nothing that would make a significant contribution. (Heavy industry operator)*

Respondents also noted that, to fill the gaps left by future reductions in free allowances, abatement would need to be met by large-scale investment in technologies that were not available.

> *We've pretty much encroached on maximum efficiency already, so you're looking at quite some years before we can deploy CCS. In the meantime, we get hammered. Then integrated [product] production, there are small efficiencies that can be made, very minor. Certainly in the context of that gap between free allocation and emissions, there's no way you can bridge that gap with efficiencies, so what you need to do is make a paradigm shift. That's one of the technologies we described, but hugely capital intensive (Heavy industry)*

One respondent also noted that industries faced complex choices for long term abatement solutions. By way of example this operator was considering investing in green hydrogen (an untested and risky technology) or green electricity (an expensive and limited commodity).

In this sub-group, heavy industrial companies were committed to abatement, as illustrated by their past investments. However, because there were not viable future solutions, the UK ETS was not driving investment in abatement, but was perceived to be acting as an additional tax or financial strain on the business.

> *One of the problems is, again going back to the design of ETS, you've got a policy instrument which is seeking to incentivise through a carbon price signal. It's trying to incentivise you to do something that you want to do anyway but you can't afford to do, so it's like a double whammy. (Heavy industry operator)*
>
> *So it's a bit like the incentive, as an energy intensive industry, to do things, optimise, and use as little as you possibly can, are already there. And effectively, the ETS is just more pain that you've already got (Heavy industry operator)*

Variant 3: Sale of past surpluses of ETS allowances helped to fund investment in a new energy efficient equipment

In this variant, one installation operator reported using the sale of past surpluses of ETS allowances (UK and EU) to fund investment in new energy efficient equipment. The operator also relied heavily on the allocation of free allowances to remain profitable. The new technology was about to come online, but there would still be a shortfall in emissions. There were no additional viable large-scale abatement options available as the operator was not located close to likely CCUS infrastructure. The decrease in free allowance and possible increased costs of the UK ETS were seen as a risk to the future financial viability of the operator and would become an additional operational tax.

> *My worry is, in the future, what's going to happen. Because once there's no free allocation, it really is just a tax, and you might as well get rid of it all and just put the price on the fuel, and stop all the argy-bargy, and all this verification (Other industry operator)*

In this sub-group, the UK ETS (and EU ETS) played a significant role in ensuring the short-term viability and emission abatement of the business. However, in the long-term the reduction in free allocation may impact on the financial viability as there were reported to be no available technical solutions.

Current but no future abatement

The 'current but no future abatement' group consisted of operators/AOs that were currently reducing emissions but had no intention of implementing significant future abatement solutions. These operators were constrained by the amount of control they had over future investment decisions.

Table 14: Summary of 'current but no future abatement' CMO

Nickname	Key contexts	Mechanism	Outcome
Current but no future abatement	The firms operate on behalf of a larger company. Operational abatement options have been implemented. The parent company controls assets and makes decisions about abatement investment. Parent company not currently investing in new assets.	We are committed to decarbonise, and are investing in operational abatement but there are limits to what is in our control. The drivers for abatement are company leadership and sector-wide initiatives, more than UK ETS.	We are investing in the abatement of our current processes but we are unable to invest in long-term abatement.

Key contexts

These operators/AOs had previously implemented abatement through operational efficiencies and continued to do so. By way of example, an aircraft operator had implemented abatement through improved taxiing and flying with the lowest possible additional fuel volumes, while an operator in the oil and gas sector was implementing abatement through energy efficiency, methane monitoring, flaring and venting.

> *I think within the limited possibilities that we have, we are surely doing the best we can to reduce the greenhouse gasses that we are making (Aircraft operator)*

Current abatement was being driven by a range of factors, including the UK ETS. A respondent from the oil and gas industry noted that abatement drivers were diverse and included cost reduction, corporate targets as well as compliances with the Energy Savings Opportunity Scheme (ESOS) and The North Sea Transition Deal and Offshore Energies UK's Methane Action Plan. Similarly, an operator in the aviation sector noted that current abatement was being driven by a combination of cost (including UK ETS) and compliance requirements.

A key factor limiting investment in future abatement options was lack of control over the assets. The aircraft operator was operating their fleet on behalf of another company and was being supplied with fuel by the same company. As a result, there were limited options for investment in new fleet or in SAF.

> *We are limited a bit by it is our customer actually supplying the fuel to us directly. So, we're not involved in the procurement of the fuel. I think that- I know that [Company], or our client, should give it numerous- they are looking into SAF, and other measures. So, it is certainly within the scope of us, but it is not- you could say that our business plan, or our plans cannot cover the [Company] part. (Aircraft operator)*

An oil and gas operator was similarly restricted by a parent company that was in control of the assets. In this case, the parent company had a clear decarbonisation strategy, but this included disinvesting in carbon intensive assets in the UK and electing to rather invest in different technologies in other international locations.

> *They [Parent Company] have a huge desire to go down the greener energy route. So you could argue that part of that decision is the fact that our company, there is no extension to field life or investment in the UK oil and gas industry. There are other oil and gas units as well across the world, but, yes, I guess that is part of the bigger plan, that it is all about the safe execution of decommissioning […], but I think the focus on the large-scale ambitions with that are in the other countries, and the different types of the business, transport and distribution or power generation (Offshore oil operator).*

Mechanism

These operators/AOs were committed to decarbonise and were investing in current energy efficiency and abatement where options were available. The drivers for this short-term abatement were regulations, related schemes (e.g. the Energy Saving Opportunities Scheme, ESOS) and corporate leadership as well as UK ETS.

> *So I think it is fair to say there are a lot of regulatory drivers. So we do have a company emission reduction or emissions management strategy, and we have had that since 2021. However, there is no getting away from the fact that it is a bit chicken and egg because we had the ESOS system that looks at energy saving before the internal plan. We also have ETS driving certain behaviours.(Offshore oil operator)*

However, operators/AOs were not able to commit to future abatement solutions due to a lack of ownership and decision-making powers over the assets they run.

Outcome

The operators/AOs were investing in abatement activities of their current processes but were unable to invest in long-term abatement.

No abatement

The ‘no abatement’ group was defined as operators/AOs that were not abating their emissions in any meaningful way and were not intending to implement any large-scale abatement solutions. This CMO was observed in only one case, which was an operator in the power sector in the UK with peaking plants in the UK ETS.

Table 15: Summary of 'no abatement' CMO

Nickname	Key contexts	Mechanism	Outcome
No abatement	Large company primarily involved in peaking power generation. Operational decisions based on market prices and available permits. No free allowances or significant shortfall in allowances.	We have limited commitment to current or future large-scale decarbonisation. UK ETS is effectively a tax, not a driver for abatement.	We do not currently abate in any meaningful way and we are not planning on any significant future abatement.

Key contexts

The operator operated peaking power plants. These plants were only operated when requested by the operator's customers, who absorbed to cost of the UK ETS. The frequency of operations were constrained by Medium Combustion Plant Directive (MCPD) permits rather than the UK ETS.

The operator had only invested in relatively small-scale abatement solutions (e.g. boilers) as decarbonisation and the impact of the UK ETS was not a primary focus for the operator. The operator had not identified any viable large scale abatement options and was technically limited by their processes. As a result, the operator was not investing in any future abatement options.

The operator was however investing in technologies that could enable abatement for other power generators and there was increased awareness of the need to consider future decarbonisation within the business because of UK ETS costs.

Mechanism

The operator was able to pass the costs of UK ETS directly on to their customers. UK ETS did not particularly encourage abatement, but the financial cost was attracting increasing attention.

> *I wouldn't say the actual scheme itself is particularly good at promoting [abatement]. It is more when you've got the figures on an Excel at the end, going, "Oh." Your mindset goes, "Right, we need to do something about it."(Power sector operator)*

Outcomes

The operator was not implementing any meaningful abatement solutions and was not planning on any significant future abatement. But there was increased awareness of the need to reduce costs through abatement.

No abatement with possible future options

The 'no abatement with possible future options' group was defined as operators/AOs not currently implementing abatement activities but with potential for future abatement if technical and financial barriers can be overcome. This CMO was observed in only one case, which was a heavy industry operator in the UK.

Table 16: Summary of 'no abatement with possible future options' CMO

Nickname	Key contexts	Mechanism	Outcome
No abatement with possible future options	Company in the heavy industry sector with one customer. Customer issues free allowances for any shortfall. Efficiency linked to production (higher production results in higher efficiency).	We are committed to decarbonise but have limited options for short-term abatement and are researching longer term options. UK ETS and energy prices are not a driver for abatement because these costs are met by the customer.	We do not currently abate but we are investing in future abatement.

Key contexts

The operator had a single customer that paid for their product and paid for any allowance shortfall. The customer had a larger portfolio of ETS allowances and was able to issue allowances to the operator to make up the shortfall.

The business model incentivised higher absolute emissions as the company made a profit margin on the overall volume of product produced. In addition, the efficiency of plant was dependent on the load factor. The higher the production, the higher the overall efficiency.

The operator identified CCUS as a potential future abatement route but had not identified other abatement activities in the short term. The operator was being supported through UK Government funding of the industrial cluster programme, which made future large-scale abatement a potential option.

> *So the plant was one of the successful projects that government are taking forward for carbon capture and storage. So there's work underway. So there's a cluster within [place] of plants. So this plant has funding to move towards carbon capture and storage going forwards... (Heavy industry operator)*

Mechanism

The operator had limited options for short-term abatement. However, the operator was committed to decarbonise and was actively preparing for longer term options (e.g. CCUS). The UK ETS and energy prices were not a driver for abatement because these costs were met by the customer.

Outcome

The operator was not currently reducing their emissions but they were optimistic about future abatement potential.

Abatement through closure

The 'abatement through closure' operator was a heavy industrial operator that saw significant reduction in GHG emissions resulting from part or full closure of one of their plants. UK ETS costs were reported to contribute to one of their plants remaining closed.

And our [other] facility, which remains operational, is currently running on imported [product], because it's cheaper to buy [product] on the open market than it is to manufacture your own. And within that decision ETS is absolutely a key factor. (Heavy industry operator)

Table 17: Summary of 'abatement through closure' CMO

Nickname	Key contexts	Mechanism	Outcome
Abatement through closure	International company with plants in UK but main parent company outside the UK. Emissions are from industrial processes rather than energy.	We could not afford to run some of our operations given UK ETS costs, energy costs and wider market conditions. The potential future UK ETS allowance adjustment costs were a significant	Our abatement was a result of partial or full plant closure.

	Plant closed due to high energy and ETS costs. Oversupply of free allowances (due to plant closure). Oversupplied free allowances traded by parent company, resulted in economic disincentive to restart the plant in the future.	factor in keeping some of our operations closed. The lack of an available low carbon technical solution was an additional factor keeping some of our operations closed.	

Key contexts

This operator had plants in the UK but was also part of a larger international company with plants in other countries. Emissions for the UK operations were predominately from one industrial plant. The by-products of the plant were very well placed for decarbonisation technologies (e.g. CCUS) and these have technologies had been successfully demonstrated in plants overseas.

The cost of UK ETS combined with the cost of electricity resulted in it being more affordable to buy an intermediate product on the open market, rather continue to manufacture the intermediate product in the UK. Closing the UK plant resulted in a reduction in emissions and an oversupply of allowances. The free allowances were traded by the parent company. However, the two-year timescale for adjustments to free allocations (via Activity Level Change mechanism) was reported to act as an additional financial barrier to restarting the closed plant.

> *… [UK] allowances are a tradable commodity in their mind, and we are holding a commodity that we don't need at the moment, and therefore we should sell it. But in the long term that's bad for us. (Heavy industry operator)*

Mechanism

It was not affordable for the operator to run one of their plants because of UK ETS costs, energy costs and wider market conditions. A viable technical abatement option (i.e. CCUS) was being used by the parent company outside the UK. However, market conditions and the two-year timescale for Activity Level Change mechanism for free allocation adjustments were acting as disincentives to reopening the plant in the UK.

Outcomes

The 'abatement through closure' operator abated a considerable volume of emissions through closure of one of their plants.

> *[The] ETS wants us to reduce emissions, and therefore we've turned it off. (Heavy industry operator)*

Other qualitative research findings on abatement behaviour

How has the capability and capacity of firms affected their ability to pursue carbon abatement plans?

Many operators/AOs across all sectors noted that they have the internal capacity and skills to implement abatement activities. Some aviation, other and heavy industry respondents noted that abatement activities were embedded in existing responsibilities, while some operators/AOs across all sectors had set up dedicated teams responsible for different components of abatement.

> *We've effectively got a team set up on this, a dedicated team. So we've got procurement energy manager sort of specialism, procurement, and then finance, comms, programme management. So we've got a team set up on this, to look at all the various programmes. (Other industry operator)*

Some operators in the food and drink sector noted that although they did not have the internal capacity, they were able to appoint external consultants or specialists for the more technical components of abatement.

> *No, we use a lot of consultants. This is quite, you know… Some of the stuff is pretty advanced and we wouldn't have that expertise in-house (Other industry operator)*

Frequency of UK ETS operators reviewing carbon abatement opportunities and associated costs

Many operators/AOs noted that reviewing and identifying abatement opportunities was a continuous process. However, reporting of abatement would take place at more regular intervals (e.g. quarterly or annually). Many operators/AOs also noted that reviewing abatement opportunities was often linked to regular accreditation and internal compliance requirements, such as the environmental management systems standard ISO 14001[3].

> *It's something we're looking at all the time. Because, I mean, we're ISO 14001 accredited. So energy is a big part of our objectives and targets. (Other industry operator)*

Sources of information used on carbon abatement opportunities and their costs

Many operators/AOs did not note specific sources of abatement information, although some industrial companies did note that they were adjusting their abatement targets based on input from the Science-Based Targets Initiative, an initiative that requires companies to define their path to reducing emissions in line with Paris Agreement goals[4]. One 'other industry'

[3] https://www.iso.org/standard/60857.html
[4] https://sciencebasedtargets.org/

representative also noted that they were introduced to new information and technologies by participating at annual industry meetings organised by a sector body.

> *We're also part of a body called the Major Energy Users Council, which meets very regularly. And then, obviously, they basically represent all of the big industrial energy users in the UK, or most of them. They have a conference once a year, and they have regular meetings. Again, all of the 'out there' technology and the more near technology is always discussed at their meetings, from energy efficiency stuff, to stand alone nuclear power stations. (Other industry operator)*

Influence of other government policies in influencing the availability of, and informing business decisions about, operators' abatement options?

Some operators/AOs noted that the UK and Devolved Government net zero targets were a driver for their abatement activities.

> *Obviously the government in the UK has its own net zero target and carbon removals target, hydrogen targets, and stuff like that. So it's certainly a pressure there to deliver. (Power sector operator)*

As noted above, for some installation operators in the oil and gas sector, other government policies and programmes played as significant a role as the UK ETS in driving abatement behaviour. These policies included compliance with the Medium Combustion Plant Directive (MCPD) permits, the North Sea Transition Deal and the Monitoring Certification Scheme (MCERTS).

In relation to energy efficiency, some installation operators mentioned influence from the Energy Saving Opportunities Scheme (ESOS) and the Climate Change Agreements scheme, Climate Change Levy and (for power generators) Carbon Price Support.

Some installation operators were being supported through grants and other schemes offered by the UK Government or hoped to access these schemes (e.g. innovation programmes, hydrogen production business model, CCUS business models, Green Gas Support Scheme). A few operators were aware of these programmes but had not yet accessed this support.

> *We're interested in the Green Gas Support Scheme. (Other industry operator)*
>
> *In the UK, there are different biomass feedstock innovation schemes, there are carbon capture innovation schemes. We haven't necessarily, I don't believe, gone into those. (Power sector operator).*

However, some heavy industry operators noted that incentives offered by the UK were not as generous as other countries, with the United States American Inflation Reduction Act (IRA) being referenced as providing strong incentives for operators to invest in decarbonisation.

> *And then you're back into the discussion about the economic evaluation of UK government policy versus American policy. And, frankly, the UK's CCS business models are not very generous at all compared to the American Inflation Reduction Act. (Heavy industry operator)*

> *The US approach through the IRA to incentivise capturing/reducing carbon, without punitive measures for emitting, is far more appealing to business and has generated some considerable momentum. (Heavy industry operator)*

As noted above, some heavy industry operators also highlighted the importance of policy certainty, particularly given the long-term investment periods required for large-scale abatement interventions.

> *Certainty, having a policy and sticking to the policy, instead of setting up a policy that was a 10-year plan, and 5 years down the line it's going to radically change. (Heavy industry operator)*

A final observation about government policies related to unintended consequences. A representative from the heavy industry sector pointed out that the introduction of the Renewable Heat Incentive (RHI) led to competition for the waste-based fuel source they had been using. They reported that the incentive structure of the RHI resulted in other companies burning this fuel primarily to take advantage of the incentives, while the heavy industry operator had been using the same fuel resource for abatement purposes.

Other findings on abatement behaviour

Many representatives across all sectors noted that there were no (or very few) low-cost abatement measures left to implement. These low-cost measures had largely been implemented as cost saving and energy savings interventions in the past. An ‘other industry’ representative also noted that low-cost savings tended to be linked to electricity savings, which did not affect their UK ETS compliance requirements. This is because UK ETS applies to ‘primary’ rather than ‘secondary’ energy sources. Power generation is covered by the UK ETS at power generation sites, so - to avoid double counting – industries that consume grid electricity do not have to report electricity usage for UK ETS emissions purposes. Power generators may, however, pass UK ETS costs on to industrial consumers via electricity pricing.

> *…most of that, though, falls outside the scope of the emissions trading scheme because it's mainly electrical savings. (Other industry operator).*

Many aircraft operators and a heavy industry and a power operator noted they were using offsets as part of their set of abatement activities. A representative from an airline noted that the aircraft operator also offsets its free allowances as a way to demonstrate commitment to abatement and to aid in the discussion with UK ETS Authority about revising the current UK ETS.

> *If I'm being completely brutally honest, [the driver for offsets is to] lobby the government as well to say, “You need to take us seriously, because we are taking serious action. We're not saying reduce obligations in these areas, because we want to reduce what we're doing. We are happy to pay for every tonne of carbon, but we want to do it in the right way and have the right policy measures in place.” So it enables us to make those arguments. (Aircraft operator)*

A representative from an ‘other industry’ operator noted that in terms of their internal reporting they were already ‘net zero’ (through a range of abatement activities and offsets). However,

despite this commitment they were still required to pay for the UK ETS, because offsets were not taken into account in the scheme.

> *We're paying a carbon tax, when we're actually zero carbon. Does that make sense? (Other industry operator)*

Many industry representatives highlighted that, to achieve the decarbonisation targets, significant infrastructure challenges need to be overcome. Over and above these challenges, a heavy industry representative also noted that access to infrastructure was only part of the technical solution. For example, the availability of a low carbon source to supply the energy required to operate CCUS was an additional barrier they needed to address.

> *But whether you're grid-connected or a remote site, the biggest single problem is the huge volume of power that's required. So we're pretty much having to double our consumption on site to run the CCS site on that. (Heavy industry operator)*

Suggestions to encourage abatement

The summary above also outlines a number of barriers that operators/AOs are facing in implementing abatement. Despite these challenges, many operators/AOs have already implemented low-cost abatement interventions and large-scale investment in abatement is taking place in all sectors. In order to encourage abatement, several additional suggestions for future policy were made by respondents.

- As noted in chapter 9 on wider findings, some airlines suggested that revenue from the UK ETS should be ring-fenced and reinvested in decarbonisation initiatives. This approach of revenue being hypothecated and reinvested in SAF subsidies was reported to be implemented already in the EU ETS.

  Yes, I would like, and I'm sure every airline has said the same, I think what we'd like to see is the money that's been taken under the ETS scheme, to be reinvested in the industry. (Aircraft operator)

- Representatives from the power and aviation sector also highlighted the importance of investing in GHG removal (GGR) and including these technologies in the UK ETS.

  …if you had removals acknowledgement in the ETS, up to even 10%, to then allow companies like [Company] to then make investment into removal knowing that there is a solid business case behind it, that would be particularly useful. So, my big plea would be, "Get removals acknowledged and help us drive investment towards those technologies." (Aircraft operator)

- Finally, representatives for the oil and gas sector emphasized the need for clear communication and guidelines on reporting and the future reduction of methane emissions.

  …we're all on a journey with the methane measurement side of things now I think. But, yeah, it's how that will be implemented, how and when that will be implemented I think is my only major concern. (Offshore oil operator)

Chapter 7: Carbon leakage risks

This chapter sets out findings on the extent to which the UK ETS contributes to carbon leakage risks for different sectors. It also explores the extent to which free allocation of allowances helps to mitigate carbon leakage risks for these high-level sectors.

Introduction

The UK ETS Authority defines 'carbon leakage' as the displacement of production and its associated emissions, due to different levels of carbon pricing and climate regulation across jurisdictions. The UK ETS is designed to mitigate carbon leakage risks through increased free allocations to operators in sectors identified as being at risk. Sectoral risk factors include high levels of emissions intensity and high levels of trade in commodities produced by the sector.

Carbon pricing or climate regulation in one country can increase the production costs of domestic firms, relative to those in other jurisdictions which may have lower carbon pricing or regulation. This may affect relative competitiveness, alongside a number of other factors including: regime stability, security, location vis a vis markets and supply chains, costs of labour, energy and other inputs, energy security, policy certainty, availability of skills and expertise, tax regimes, investment incentives and wider social/environment/governance factors.

Under the definition used here, 'carbon leakage' is primarily attributable to differences in carbon pricing and climate regulation between the UK and other countries. Where levels of carbon pricing and regulation are broadly similar (e.g. between the UK and EU countries, subject to some variation over time), differences in competitiveness are not interpreted as carbon leakage.

In considering carbon leakage, this report considers the following ways in which higher carbon pricing and climate regulation in the UK relative to other countries might affect UK economic activity, now or in future:

- UK exports competing with cheaper production or services from these other countries in overseas markets (referred to here as 'export leakage').
- Cheaper imported goods or services from these countries competing with UK-based production within UK markets ('import leakage').
- International firms scaling up production or service volumes from their sites in other countries and scaling down volumes at their UK site(s) ('production leakage').
- International firms deciding to invest in new (or upgraded) equipment (potentially including decarbonisation investments) in other countries instead of making these investments in the UK ('investment leakage').

- UK-based plant or services closing fully or partially, temporarily or permanently, because of competition from these other countries.

The Porter Hypothesis argues that strict environmental regulations could stimulate innovation, improving production technology and creating competitive advantages for domestic companies in the longer run[5], but qualitative research with operators and AOs did not provide direct evidence of this.

In theory, if carbon prices and climate regulation were lower in the UK than in other countries, there might be 'reverse leakage' where production, services and/or investment moved to the UK because it offered a lower carbon regime.

The qualitative research explored the reported level of international competition in different sectors and the extent to which operators/AOs could pass UK ETS costs on to their customers. In sectors at risk of carbon leakage, the inability of operators/AOs to pass-through the costs of UK ETS compliance was one factor potentially contributing to carbon leakage risk, although other factors may also affect this.

The findings on carbon leakage, pricing models and competition are presented below by sector. Some of these findings, particularly for specific industries within the 'other industry' category, are based on interviews with a small number of operators and should be treated with caution. All the findings on carbon leakage are self-reported by industry and may be open to 'lobbying bias'.

A slightly different sector grouping was used to analyse carbon leakage risks, because of the competitive pressures on sectors producing commodities that are widely traded internationally. The commodity production sectors were defined as a variant of 'heavy industry', comprising cement, chemicals, iron and steel, oil and gas but also including lime, ceramics and food-based commodities sometimes included in the 'other industry' group. The analysis below focuses on the power, aviation, commodity and remaining 'other industry' sectors.

Power sector

Pricing and competition

In the power sector, operators tended to report using a 'cost plus' pricing model which involved passing costs on to customers, including the cost of carbon.

> *…the whole pricing of power would be incorporated into pricing methodology that we'd have for our customers. [..] So we would incorporate UKAs into that, as well as we would for anything with cost of production really. (Power sector operator)*

[5] Porter, M. and van der Linde, C. (1995) Towards a New Conception of the Environment-Competitiveness Relationship, The Journal of Economic Perspectives Vol.9, No.4 (Autumn, 1995), pp. 97-118.

There were some caveats about the ability of these sectors to pass on costs. For example, one power generator had bespoke arrangements with a major customer which precluded passing through UK ETS costs to that customer.

For the power sector, the reported pass-through of UK ETS costs was consistent with the fact that imports and exports of electricity were relatively limited, being constrained by the size of interconnectors between the UK and other countries. One operator commented that peaking generation was more at risk of competition via interconnectors.

Carbon leakage risk and influence of UK ETS

The relative price of electricity in the UK versus EU involved comparison of EUA prices to UKA prices plus Carbon Price Support (currently around £18/tCO2e). Since establishment of the UK ETS, there have been periods when total carbon prices in the UK were higher than the EU, and vice versa.

Provided that carbon pricing and climate regulation regimes in the UK and EU remain broadly similar, electricity trade via the interconnector (in either direction) would not be classed as either ‘carbon leakage’ or ‘reverse leakage’. So there appeared to be a low risk of carbon leakage in the power sector. Consistent with this assessment, the power sector received no free allowances within the UK ETS.

One power sector operators suggested there was a risk of firms investing in power plant in the EU rather than UK, were EUA prices to be consistently below the combined carbon price for power in the UK (i.e. the UKA plus CPS price).

> *Since the Ukraine invasion, I think more countries want to be self-sustainable from a power perspective, so if we rely – have too much overreliance – on interconnectors from a price point of view, then some operators, yes, may not choose to invest in this country. (Power sector operator)*

Aviation sector

Pricing and competition

Pass-through of UK ETS costs to customers was reported by most aircraft operators. For some operators, this appeared to be a ‘survival strategy’ for operators operating in a highly competitive market with slim margins:

> *…everything is passed onto the customers, because as a privately organised company, that is the only way to survive, which is making profits in the long run. (Aircraft operator)*

There were some caveats about the ability of the aviation sector to pass on costs. For example, one aircraft operator chose to absorb UK ETS compliance costs within their operating costs, while some reported that compliance costs were passed on indirectly within overall costs rather than flight by flight. One aircraft operator commented that UK ETS costs for

'ferry flights', where a plane needed to be flown empty between two locations, could not be passed directly to customers.

Flights from the UK by overseas airlines are also subject to the UK ETS, so aircraft operators reported that the UK ETS did not directly distort competition for airlines flying the same route. However, there was reported to be price competition between long-haul operators that could cross-subsidise prices against non-European flights (not subject to UK or EU ETS) and short-haul operators that could not cross-subsidise. The potential cost to long-haul flights of CORSIA compliance (with offsetting under CORSIA expected to begin from 2024) were reported to be smaller than UK ETS or EU ETS costs. Interview evidence suggested that aircraft operators were primarily planning for CORSIA compliance rather than already buying CORSIA credits. There were suggestions that there might be perverse incentives for passengers to fly, more cheaply, to more distant destinations outside the UK and EU.

> *And so flying to North Africa, Tunisia, Morocco, Egypt, Israel, those kinds of areas, or even further afield, towards Dubai and things like that, by having such a strong price signal for carbon, what may actually happen is airlines emit more on routes that are not covered by those systems. And the CORSIA price signal is nothing, is very, very small, compared to the EU ETS and UK ETS. (Aircraft operator)*

There was some mention of proposals for the EU ETS to be extended to long-haul flights at the end of 2026 if CORSIA was not deemed fit for purpose, and uncertainty as to whether the UK ETS would follow suit.

Carbon leakage risk and influence of UK ETS

Aircraft operators reported that flight patterns, frequencies and routing may be affected by competition from flight destinations outside the UK and EU. Turkey and North Africa were mentioned as competing regions, with Dubai being considered by some as an alternative hub to the UK.

> *Well, it's the biggest risk, from an airline perspective, that ultimately, from [UK and EU] connectivity, there's a risk that maybe there won't be as many frequencies.[..] But the UK, there may be risks here that just become too expensive. (Aircraft operator)*
>
> *The Turkish airlines are growing quite a lot quicker than any of the other airlines in Europe, purely because flights to and from Turkey aren't included in the ETS so they don't have those additional obligations on top of them. (Aircraft operator)*
>
> *…short haul, low cost of travel in Europe is not going to be low cost anymore. Whereas if you're hopping in and out of Dubai, you can do bigger routes, longer routes, get people involved, and that's a significant amount of carbon leakage. (Aircraft operator)*

As discussed in chapter 4, there was recognition from airlines that free allowances for the aviation sector will decline in coming years. Given widely varying levels of free allocation between different airlines, there was a sense from some aircraft operators that removing free allocation would mean that UK aircraft operators were on a level playing field with each other, even if not with operators serving destinations outside the UK and EU.

Commodity producers

Pricing and competition

The commodity production sectors were defined as a variant of 'heavy industry', comprising cement, chemicals, iron and steel, oil and gas but also including lime, ceramics and food-based commodities sometimes included in the 'other industry' group.

Heavy industry operators producing internationally traded commodities reported minimal ability to pass on UK ETS costs to their customers. This was because the commodity price was set internationally and there was competition from potential imports with lower prices from areas with no or lower carbon costs. Operators in this category included oil, chemicals, fertilisers, metals, ceramics and some basic foodstuffs. The status of cement and lime is discussed further below.

> *…the [..] manufacturing businesses who are producing, globally traded commodity [product]. So in that respect, they have absolutely zero ability to pass on the cost of ETS compliance to their customers. And that's the reason why their free allocation and indirect compensation for the cost of ETS on electricity, become absolutely critical to them trying to maintain their international competitiveness. (Commodity sector operator)*

> *…increasingly now we are competing with products from outside the EU coming into the UK at much lower prices. So there's a lot of product coming in from the Far East. There's a lot of product… [from] Turkey [..]. And particularly some [product] come in from South America, particularly Brazil. (Commodity sector operator)*

There was one example of a commodity producer being able to pass costs on to customers temporarily (when product prices were much higher than input costs), but this was a transitory phenomenon attributable to exceptional market conditions.

The situation in the cement and lime sectors was reported to be complex, partly because these 'quasi' commodities have a shelf-life (and, although not mentioned by respondents, probably because their low value-density makes transport less economic). Respondents reported that these sectors had passed ETS costs on to customers in the past, and there was some indication of gas and carbon costs being explicitly passed on within some contracts with major customers. But stakeholders reported that there was growing international competition (e.g. with increasing import infrastructure in the cement sector making cost pass-through more difficult). While costs could be passed on to some degree in the short term, operators reported that this was likely to lead to more imports in the longer term.

> *During the time that I've been involved with ETS in the last 15 years, the importation of cement has gone from pretty much near zero to about 15% of the market. So the increasing cost of production in the UK, [..] and we can't say we've not tried to pass on the cost of production to the customer, that's having a direct effect on the imports. At the moment, I think there are three new importation terminals being built, I think there are two making clinker and one about to bring cement in. (Cement operator)*

Another reason cited for inability to pass on UK ETS costs was that – in certain markets - operators were competing with producers in the UK that were not covered by the UK ETS (because their thermal capacity was below the UK ETS threshold).

Carbon leakage risks and UK ETS influence

Various forms of production and investment leakage risk were mentioned, attributable to the combination of UK ETS costs with other elements of production costs (e.g. energy costs). Examples were given of these effects already being observed to some degree:

- UK customers buying cheaper product produced at lower cost outside the UK and EU

  …if you look at the [commodity] that's landing on the docks in the UK, one of the products we make, [product], it's coming in from countries which don't have carbon pricing (Commodity sector operator)

- Export customers buying cheaper product from elsewhere

  Some of the reasons that we've lost out in export markets are because of competitiveness of product coming in from Australia, or even from the Netherlands and France. So, that's a direct impact, partly attributable to [general] costs in the UK and partly attributable to the sustainability agenda [including UK ETS]. (Commodity sector operator)

- International firms deciding to scale up production in other countries and scale-down production in the UK, because of the combined effect of energy prices and UKA prices

  It just moves volume from the UK to other countries. And that's generally what we've been seeing. Certainly the impact last year on volume. More from the energy price than the UK allowance price. But it's the combined effect [on] production. Volume was driven elsewhere. Particularly to the US last year, when their equivalent energy price was way cheaper than the UK or Europe. (Commodity sector operator)

- UK-based plant closing, fully or partially, temporarily or permanently, and reporting that this was attributed (at least in part) to carbon pricing

  …we've seen discussions happening in Parliament where an MP will talk about a glass manufacturer in their constituency and how the UK ETS is one of the reasons why they have really high costs and they're looking to close down. (Wider stakeholder)

- International firms deciding to invest in new (or upgraded) plant in other countries instead of making these investments in the UK.

  Other locations in the world, such as China, India, and the Middle East are growing heavy industry, including, [industry] capacity, whereas UK heavy industry capacity has been shrinking since the '90s. Therefore, UK industry is competing on an unlevel playing field with its international competition, which will only be exacerbated by increasing carbon costs, and could lead to further closures of domestic production in favour of imported goods, and result in carbon leakage. (Commodity sector operator)

There were also reported examples of investment being made in EU countries rather than the UK, but this was based on wider consideration of relative competitiveness, including energy costs and taxation, rather than carbon costs per se.

> *I mean, as I say, it may form part of the cost calculations, but, for example, there's been an investment in a [Company] site in [EU city]. We wanted that in [Location within UK]. So that's general taxation, and taxation will be part of that sort of decision-making process, as well, but we're getting a lot of investment going outside of the UK, to other countries. So, politically, you know, we hear the prime minister and business secretary standing up and saying, "We're going to be a powerhouse for [our industry], we're going to attract every investment into the UK." [..] We would love that, but we need the right market conditions for that, with the taxation, and support from government for any sort of future investments that we might make. (Other industry operator)*

One of the reported mechanisms for carbon leakage was that the additional cost of UK ETS eroded the profit margin of commodity operators who were unable to pass the cost on to their customers.

> *Sorry, [UK ETS was a] £20 per tonne on-cost. That is a big difference. That really erodes your profit margin. Indeed, it can turn some of your business into mere contribution business where you're not even making a positive margin. You're just covering your fixed costs – your variable costs. (Commodity sector operator)*

There was direct evidence of operators closing part of their production base in the UK, in certain sectors. These operators were in sectors that were already vulnerable (as evidenced by other operators having closed in recent years), so they were less able to cope with erosion of their margins.

> *Well, up to a few years ago, we did have some UK competitors. We are now the single only mass producer of [product] in the UK left. Our last UK competitor went out of business about three to four years ago. (Commodity sector operator)*

Where operators were owned by international firms, they reported that a decision to shut or mothball a marginal plant in the UK would be made on a pragmatic basis by their parent company.

> *It's not a competitive plant to run because of the high costs of this and high costs of carbon, so it's just another asset, they'll shut it rather than… if it's not making money, they'll not go out to have lots of little purchasing agreements and they'll try and scratch £500,000 back a year, they'll just close it, or mothball it, until the market looks better for them, and that's the way they look at it. (Commodity sector operator)*

The two-year timescale for adjustment of free allocations via the Activity Level Change mechanism was reported to have implications for re-opening moth-balled plant, as discussed further below.

Other energy-intensive industries

Pricing and competition

For the purposes of this analysis, ‘other industries’ excludes lime, ceramics and food-based commodities. Findings for the remaining ‘other industries’ were mixed. Although paper and vehicles are not generally traded as commodities, paper and vehicle manufacturers reported that competition in their markets (within or beyond the UK) meant that they could not readily pass-through UK ETS compliance costs to customers. Some cost pass-through was reported in certain other industries (e.g. bespoke food products and glass). As noted for commodity sectors, industries were affected by competition in their export markets as well as their UK markets.

> *We compete against European competition, in Europe and in the UK, and we also compete against Canadian and US [product] in the UK, and a little bit in Europe as well. (Other industry operator)*

Carbon leakage risks and UK ETS influence

The types of carbon leakage risk, and UK ETS influence, reported by other industry operators were similar to those reported by commodity sector operators. For example, operators that were part of international organisations reported active consideration of where production should take place to fulfil orders, taking into account production capacity and costs in different countries.

> *If Europe can produce [product] cheaper, because of their energy costs being cheaper, then our line will close, and they will make the [product]. So, because we are a European organisation- well, in fact, we’re not European, we’re global. We’ve got [factories] in America, we’ve got [factories] in China. So…But if [Company] get an order in for [product], then they will look to see who can make it the cheapest. (Other industry operator)*

Carbon prices were reported to affect investment decisions by parent companies, but there was recognition that carbon prices were only one of several factors in these decisions.

> *So we’ve got a site in India, we’ve got a site in China, that I was reading about yesterday, their energy costs will be quite different to ours. Hopefully we’re more efficient in other areas, and it tries to balance out, but it does form an important factor of those decision points of where the next plant gets built, or where the next [product] gets packed, or made. It is an important factor. (Other industry operator)*

There were reports of closures of plants or production lines in vulnerable sectors within these ‘other’ industrial sectors, as well as in commodity sectors. Again, UK ETS costs were cited as one factor that reduced the operating margins of these plants, and the dynamic allocation of free allowances was cited as a barrier to restarting production.

To what extent have free allowances mitigated carbon leakage risks?

Free allowances were reported be very important to energy intensive industry, particularly in commodity sectors. The value of free allowances helped vulnerable industries to maintain operations in the UK.

> *…the underlying rationale for free allocation remains the same. Which is if you are exposed to international competition your ability to pass on carbon costs to your customers is limited, if not zero, and therefore free allocation is essential. [..] There are businesses that are relatively energy intensive, carbon intensive, for which this is a huge cost, like ours. And, simply, if we didn't have free allocation we would have shut down years ago, because there would just be no way of operating in the UK. (Commodity sector operator)*

Some respondents commented that free allowances had decreased significantly from Phase III of the EU ETS to the UK ETS, and that – combined with increases in UKA costs since the start of the scheme – this meant that their carbon costs had increased substantially. Some respondents, particularly in commodity sectors, reported that there was a risk of closure if free allowances were reduced further. There were comments that reducing free allowances further was likely to contribute to decarbonisation through de-industrialisation.

> *My most major concern [..] when the expression is, "Oh, we're going to incentivise you to decarbonise by reducing your free allocation." And [I] go, "No, you're just making me internationally uncompetitive. And I will probably decarbonise, but I'll do it by closing, not by actually producing the same products with less carbon footprint." (Commodity sector operator)*

Other industry sectors were also reported to be at risk.

> *I know the current energy crisis has hit five [production sites] in the UK and closed them down. So we are all at risk of that, in one way or the other. So free allowances are a good part of that mix, where we can get them. (Other industry operator)*

Some installation operators commented that the two-year timescale for adjusting free allocations via the Activity Level Change mechanism could have an adverse effect on re-opening mothballed plant. This was particularly the case if the surplus free allocation was sold (e.g. for cashflow reasons) while production was reduced or closed. The Activity Level Change mechanism meant that, when production was reduced or stopped, free allowances were adjusted downwards over a two-year period. As reported in the chapter 3, in the section on 'Activity Level Changes', this could become a barrier to restarting production, since free allowances would only recover over a two-year period.

> *So right now the rationale is the difference between the cost at which we can turn [input] into [product] using our own plant versus the cost of imported [product]. And if you ignored ETS then we would probably be starting the [..] plant right now. But if you add in*

> *the additional cost of ETS we're not. We're importing [product]. (Commodity sector operator)*

Some interviewees understood that a similar two-year time lag applied to the New Entrants Reserve for installation operators, but the Environment Agency clarified that operators could apply for free allowances to cover activities in the year following the start of new operations.

In some less energy-intensive sectors, where UK ETS liabilities and free allocation were both smaller scale, changes in free allocation were not seen as having much impact.

> *…it's quite a small amount, so you take it because you can take it, but it's not really a big influence, to be honest. (Other industry operator)*

What changes would be needed to mitigate carbon leakage risks more effectively?

A number of suggestions were made to mitigate carbon leakage risks more effectively. Some were sector-specific, such as a suggestion that there should be one global ETS for the aviation industry.

> *…we would definitely prefer the option to have one global ETS, and that is basically the kind of CORSIA. But we know that CORSIA is only on international flights. We understand that UK and Europe want to have their own, but as I said, now France is coming up with its own as well, we just can wait for the other states somewhere in the world coming up with their own. [..] The preferred option would be one for each or everything, but we know, as well, this is challenging. (Aircraft operator)*

Some power sector operators commented that Carbon Price Support (CPS) encouraged higher power imports via the interconnector, because it created a price differential between electricity generated in the UK and EU, irrespective of any differential between UKA and EUA prices. While this would not technically be classed as 'carbon leakage', because of the broad equivalence between the UK and EU carbon regimes, they advocated reviewing CPS.

> *…carbon price support is a particular culprit here in terms of carbon leakage. The UK imports a lot more relatively carbon-intensive electricity than it needs to because we've got £18, you know, in there as a wedge between European and UK prices. (Power sector operator)*

Similarly, across a range of sectors, there was appetite for the UK to introduce the Carbon Border Adjustment Mechanism (CBAM), matching as closely as possible the CBAM system introduced in the EU ETS, to avoid differences in competitiveness between the EU and UK.

> *we have to have a cross-border adjustment mechanism equal in magnitude to the EU. Otherwise, not just for our own products, we will just become the dumping ground [.. given] resistance to getting [product] into Europe, they'll just bring it into the UK instead. (Other industry operator)*

More far-reaching suggestions, discussed further in chapter 9 on 'wider findings', included:

- Building linkages between the UK ETS and other markets. There was extensive comment on the potential advantages of linking UK ETS to the EU ETS (covered in chapter 5 on markets perception) but also some comments on potential links to international credit markets (including developing countries).

  …really it's the international crediting market that's probably the best path forward. Understanding that all of those crediting approaches are going through a process of upgrade right now. (Wider stakeholder)

- Recycling revenue from UK ETS to support decarbonisation, thereby achieving decarbonisation objectives while making the UK a more attractive place to produce and invest in the long-term.

  And whether you can take the goodness out of it, that we will get afterwards, and use it now to actually pay for the investment as well, rather than just penalising and making it more expensive anyway. Because we're talking of hundreds of millions of pounds, probably, to change what we need to change. (Other industry operator)

Chapter 8: Unanticipated consequences of the UK ETS

This chapter identified some unanticipated consequences of the UK ETS and presents wider comments on the scheme, based on thematic analysis of qualitative research with operators/AOs, traders, regulators and wider stakeholders. It does not explore carbon leakage as this is discussed in chapter 7.

Unanticipated consequences of UK ETS

This section focuses on unanticipated consequences other than carbon leakage, which has already been discussed in the chapter above.

Firms downsizing equipment to avoid being part of the scheme

A few installation operators mentioned that there was a risk of firms choosing to install smaller equipment to avoid being part of the UK ETS. The evaluation found evidence of this in one case where an operator had multiple sites in the Hospitals and Small Emitters scheme and was gradually replacing the equipment on these sites with equipment below the UK ETS threshold. The operator reported that they were competing with other producers that had equipment below the UK ETS threshold.

> *…we've been gradually getting the smaller emitters out of the scheme. [..] So they were in a Hospital and Small Emitters scheme. So we're gradually getting rid of those by reducing their thermal capacity. (Heavy industry operator)*

Time required to deal with UK ETS distracts from decarbonisation

As explored in the chapter on abatement behaviour, some operators commented that the time and money spent on UK ETS distracted from some operators/AOs' decarbonisation activity, rather than driving it.

> *…here's the whole extra admin because we have to put in UK-specific protocols because we can't be supported by our group. [..] The time that I could have spent, that I've spent on the [UK] ETS, I could be investing in our electrification. (Other industry operator)*

Perverse effects of two-year timescale for Activity Level Changes

As noted in other sections, some instances were cited where there was a perverse incentive to carry out an activity in order to avoid losing free allowances, even if this would lead to greater emissions. This was reported as a risk by one operator (in relation to avoiding the Activity Level Change threshold for reduction in production, which would lead to a reduction of free allowances) and by one regulator (in relation to potential flaring of gas in the offshore oil sector, in order to obtain/retain free allowances).

> *We had, for instance, one aspect where we had a little discussion around safety flaring, flaring more broadly, free allocation around flaring. [..] It has kind of concluded, but I'm not sure anyone is overly happy with how it was concluded. There are a lot of questions remaining about, how do you treat this kind of energy inefficiency from a legislative point of view? Because it is effectively burning fuel for no purpose, to get the free allocation for it, which is not really the incentive the free allocation is meant to provide. (Regulator)*

And, as noted elsewhere, the two-year timeframe for Activity Level Change adjustments to free allowances was reported to have the effect of disincentivising the restart of production where a plant or production line had been closed for some time.

Chapter 9: Wider comments on the UK ETS

There were a range of wider comments that relate to fundamental aspects of the design of the UK ETS. This chapter presents these wider comments.

Views on level of cap

The qualitative research period included interviews both before and after the UK ETS Authority's announcement on 3 July 2023 about its proposed approach to introducing a 'net zero consistent cap'.

Views expressed before the July 2023 announcement

Before the July announcement, there was an expectation amongst UK ETS participants that the UK ETS Authority would announce its decision about whether to introduce a 'net zero consistent cap'. Amongst some operators/AOs, there was a recognition that the cap needed to be tightened to be consistent with the UK and Devolved Governments' net zero strategy. Some commentators (e.g. traders) were aware that there was a surplus of UKA, in that the actual level of emissions were significantly below the level of the current UK ETS cap, so there was an expectation that the cap would be tightened.

In line with these expectations, operators/AOs expected that the UK ETS Authority would lower the cap and reduce the number of allowances in the market, from 2026, and that this would push up the market cost of UKAs. For example, one operator commented that they expected UKA prices to go up and would have bought UKAs forward if they had the cash required to do this.

> *If the business had the cash availability we would try and buy forward. It's not something we do a lot of because we've not been in the position to, but, ultimately, in an ideal world, that would be the strategy. (Heavy industry operator)*

There was concern amongst operators/AOs that progressive tightening of the cap would not necessarily be matched by operators' opportunities to decarbonise. Some installation operators that already had energy efficient plant, or that had limited options for fuel-switching (e.g. due to grid constraints), saw decarbonisation as requiring major step changes in the long term (e.g. eventual implementation of CCUS and hydrogen). They were concerned that gradual tightening of the cap would not be reflected in the timing of abatement opportunities.

> *I think the biggest thing we'd learnt from the road mapping study[6] was that we'll be able to do a little bit, but until that big decision, when there is going to be then this very big*

[6] Operators in some sectors referred to 'road map' studies, led by the relevant sector body, which set out a path to net zero for their sector. One example was the Mineral Products Association/UK Concrete's Net Zero Roadmap (October 2020). https://www.mineralproducts.org/MPA/media/root/Publications/2020/MPA-UKC-Net-Zero-Roadmap_Summary_Oct2020.pdf

> *step change, and I think quite a lot of the things, like the cap slowly being reduced, of course, doesn't really reflect that. (Other industry operator)*

Those operators/AOs who perceived there to be a lack of viable decarbonisation options for their sector were concerned that they would be hit hard as the cap tightened and free allowances were reduced. This included some aircraft operators.

> *So the lowering of the cap will impact different sectors differently, I suppose, is the overall message and the aviation sector will, again, be hit harder than everybody else. And those airlines that have fewer free allowances for the amount of time that we still get them, will be even harder still. (Aircraft operator)*

However, a few operators/AOs that were strongly committed to decarbonisation reported that they would like to see a tighter cap that would raise carbon prices to a level that supported investment in CCUS, hydrogen or other low-carbon fuels.

> *We support that cap. It's needed for companies to decarbonise. [..] If you don't reduce the cap, then people won't decarbonise, and the price [..of..] allowances won't increase. If you want to switch to CCS, or hydrogen, or other low-carbon fuels, [..] you need to have an incentive or a disincentive. [..] If you can switch to a fuel and make more profit, you're more likely to do it. (Power sector operator)*

And those operators/AOs that were able to pass UK ETS prices on to their customers were less concerned about the future level of the cap (and the associated level of free allowances).

> *For us, we're quite different from the commercial aviation. Considering that most of the charges are recharged to the customer, it doesn't make that much difference. However, obviously, we would like to keep the internal cost down as much as we can. (Aircraft operator)*

Irrespective of decisions on the cap or on future levels of free allowances, some operators/AOs interviewed before the July announcement said that they needed more clarity about the UK ETS beyond 2026, and particularly about the level of reduction in free allowances, to inform their business planning.

> *Well, from a business perspective, obviously we would like more clarity over the reduction of the free allowances in the future. I think the EU have been very clear, even if they're being very aggressive with the level of step change reduction of free allowances. At the moment it's quite unclear for us beyond 2026. I think what that looks like- Because I think a lot more clarity of what that looks like long-term to help us plan, for sure, and I think that's the main thing that we're concerned about. (Aircraft operator)*

Views expressed after the July 2023 announcement

Interviews with traders suggested that the market had expected that the UK ETS Authority would commit to a net zero consistent cap, and that there was some disappointment from traders when they realised that the weakest version of net zero consistent cap was proposed and that some of the proposals were still open to further consultation.

The price of UKA December futures rose initially from £54/tCO2e to £58/tCO2e when the announcement was made on 3 July 2023 but subsequently started a gradual decline, reaching £34/tCO2e by 21 September 2023. Interviews with traders suggested that the initial rise was fuelled by the fact that the consultation response had finally been published, before readers had time to review the details.

Stakeholders interviewed after the July 2023 announcement recognised that the proposals involved introduction of a 'net zero consistent cap', but that the UK ETS Authority was proposing the least stringent cap that was consistent with the UK and Devolved Governments' net zero strategies. One wider stakeholder pointed out that the proposed cap would only be consistent with net zero if emissions savings were made elsewhere in the economy.

> *…if that weaker end is taken for the cap, that means that more would need to be done elsewhere in the economy, [..] outside of the emissions trading scheme. [..] I think it could be consistent with their targets, but there's a question there of, you know, how would they make it consistent? What would they do to have greater emissions cuts elsewhere, basically? (Wider stakeholder)*

Most traders expressed concern that the July announcement implied continued availability of relatively high levels of free allowances for industry during the three-year transition period to the net zero consistent cap, because of the commitment to protect current levels of industrial free allocation until 2026. They commented that the market would still be oversupplied with allowances and contrasted this with the removal of free allowances in EU ETS under the 'Fit for 55' programme. They commented that the UK Authority's approach was weaker than the EU ETS approach and contributed to UKA price weakness since the July announcement. Some traders commented that the UK ETS Authority's announcement on 3 July was unclear in certain respects (e.g. around how the 'Reserve Pot' of allowances would be used).

> *So, they are committed, but then if you start reading all the measurements, almost every important UK company gets an exemption. So, they want the system, but they don't want it to hit the companies. So, fair enough, but then I'm not sure where the price goes. [..] they are reducing [the cap by] 30%, which I think is good, based on the numbers that were given by analysts that there was an annual over-supply of 50 million. So, I think it's good that they are doing something. But if you see the market now, the market thinks that it's not enough, and there's still quite some over-supply. [..] they had a certain bandwidth which they can choose to cap the amount of allocation. They chose the least ambitious one. [..] Well, in the past, the UK was always more on the forefront of climate ambition in the EU Parliament, and they are now a little bit on the other side, are a little bit less ambitious, I would say, than the EU at the moment. (Trader)*

Nevertheless, there was some recognition that the UK ETS Authority's announcements were pragmatic, taking into account that there was likely to be a 10-year timeframe before industry could make a big step change in decarbonisation (e.g. through adoption of CCUS and hydrogen).

> *It's great reducing the cap for next year and beyond but nobody can do anything about it. It's a 10-year plan before anybody can really move away from fossil fuel to hydrogen*

> *or electrification. So reducing the cap quickly is an issue because it takes time to move away from fossil fuel. What I see the government have done is reduced the cap significantly, but they've brought in continuing the free allocation of allowances and also bringing allowances out of the reserve which I think will smooth the cap for industry. So, yeah, whilst I think it's a worry [in terms of market weakness], I think it's… I do think government seem to be listening to industry a little bit and trying to smooth it a little bit and try and help a little bit, made more of a linear fall than a significant fall really. (Trader)*

However, there was also concern from industry that the UK ETS Authority's approach would not give sufficiently strong price signals to support investments in CCUS and hydrogen that need to start now if the UK is to meet its carbon targets in 2030. They saw the UK ETS Authority's stance as less ambitious than the EU ETS, both in terms of ETS prices and in terms of accompanying financial support for industrial decarbonisation.

> *One thing that did concern me is that, at the end of, let's say the EU review, it was sufficiently ambitious at the beginning that we're starting to see price action now or earlier. Whereas after the UK review, it was so lenient for the next few years that, not only have we not seen prices go up, but in fact we have seen them go down a little bit since the review, and it's now trading under £50. That's concerning, when you think about the way industrial companies in particular operate, and their investment cycles. So the UK is quite ambitious in CCS, and yes there is some support for it. But also, if you want to start building best-in-class low-carbon units by, let's say 2030, when the cap is meant to be halved, so emissions should be quite a lot lower than they are now, then that investment needs to happen today. And there isn't a sufficient price to trigger that discussion or investment today. There needs to be some sort of circuitry around that. So if you're thinking long term, the price we have today isn't enough to drive investment right now, and therefore it won't drive emissions reductions when they are needed, just to stay within the cap. (Wider stakeholder)*

And some traders commented that an oversupplied market was unattractive to financial players. They commented that the UK had initially decarbonised faster than the EU (e.g. through decarbonisation of the power sector) but that the UK ETS Authority had not taken sufficient steps to remove oversupply in the market.

> *And then a lot of people referred to the fact that the UK has decarbonised itself at a much faster pace than the EU. So naturally, one would have thought that, once it exited the EU ETS, it would have also have a downward adjustment to its submission cap in line with this current situation. But it hasn't really done so. So that has led to basically an oversupplied market. And I think that's what also discouraged a lot of financial players. (Trader)*

Despite traders' concerns about oversupply and market weakness, some operators interviewed after the July announcement were still concerned about the timing of reductions in the cap vis a vis the availability of decarbonisation options such as electrification, CCUS and hydrogen. They saw future reductions in free allowances as potentially affecting the viability of their business, as explained further in the carbon leakage chapter below.

> *So you have this cap, there's a bit of a cliff edge coming, and I'm sure they've done the numbers, but we're sat here waiting for extra capacity on the grid, which isn't going to happen in the short term. We're sat here waiting for carbon capture and storage, which isn't going to happen in the next few years. We're sat here waiting for hydrogen, which isn't going to happen. And yet they're rushing ahead with this cap and yet we're all sat waiting for all these mitigation measures that are going to enable us to decarbonise, and they're not even in sight. And we're not talking in small things here, we're talking about half a billion pounds of investment to put carbon capture. We've got nowhere to take it to at the moment because we don't know what the pipeline's going to be. So my point to them is that they've got this ambition and all this cap, but we've got nowhere to go, so what happens when the allowances run out? (Heavy industry operator)*

Calls to replace UK ETS with a carbon tax

Some installation operators would prefer to pay a carbon tax instead of being part of the UK ETS. They saw this as easier for participants to manage, fairer to all participants and as providing more price predictability to industry, compared to an emissions trading scheme. There was a sense that some operators saw the carbon market as a distraction from their main business and from the task of decarbonisation.

> *I think that, from my perspective, I think that it will be far more efficient just to put extra charges to the fuel prices, instead of using this huge, enormous system, that is being used right now. [..] I think it could be fine-tuned, but I think some sort of charge to the fuel would be much more efficient, and actually more fair to all, to newcomers compared to the existing customers, or to existing operators. (Aircraft operator)*

> *I think having predictable pricing would be helpful, but we just have to operate it as a market. It just makes it a bit more of a thing that we're trying to manage, rather than just running our business. (Other industry operator)*

It was not clear whether these operators acknowledged the role of the UK ETS, and ETS systems worldwide, in contributing to the emergence of carbon prices.

Call for closer alignment between UK ETS and EU ETS

There was a strong theme from many operators/AOs that they would like prices and rules in the UK ETS to be closely aligned with the EU ETS. Traders also commented that the UK ETS tended not to be viewed in isolation, but in relation to the EU ETS, and that their energy markets were interlinked.

> *But one thing that needs to be taken, which is important to understand, is that all of the entities that operate on the UK ETS also are taken as a reference or a comparison with the EU ETS, right? So you don't simply assess the dynamics in one market, you always reference to the other one. (Trader)*

> *…the UK is an island, but it's interlinked with gas and electricity interconnectors that have an influence. So, carbon prices filter into European gas prices, and there is a correlation between what's happening on UK gas versus European gas and electricity. So, there is an interplay there, even though the trading schemes aren't linked. (Trader)*

A number of reasons were given by those who wanted to see alignment of the two systems:

- **Reducing carbon leakage between the EU and UK:** maintaining a 'level playing field' between the UK and EU would help to avoid the distortion or movement of activities between the EU and UK. This was point raised by respondents in a range of sectors, including aviation, industry and power generation, as explained in the carbon leakage chapter above.
- **Providing more certainty about the future of the UK ETS:** where operators/AOs were considering major investments, including future decarbonisation investments, they saw alignment between UK ETS and EU ETS as providing more certainty and hence supporting their investment decisions. This was particularly an issue for organisations with international parent companies.

  …a lot of our sector operate across the EU and the UK, and having significantly different schemes is very unhelpful for us, and just undermines our ability to get investment from our parent company [..] one of the key obstacles is a divergence between UK and EU carbon pricing and the scheme rules. So having closer carbon prices that more match each other, and the UK getting clarify on what the scheme is going to look like beyond 2025 and putting a CBAM into place would massively help us move forward. (Heavy industry operator)
- **Reducing the potential for compliance loopholes:** some operators/AOs commented that differences in scope might allow the development of loopholes. For instance, the EU ETS is proposing to bring international shipping into the system, while UK ETS is only proposing to bring in domestic shipping. This might provide incentives for international shipping to route via the UK. Similarly, the application of CBAM within the EU ETS might give rise to other compliance loopholes.

The overall message was that the interaction and level of alignment between the UK ETS and EU ETS has implications for operators/AOs, particularly for sectors like aviation which are continually operating in both systems.

> *But for us the interaction with the world is just as important as those other elements, because half of our obligation is outside the UK, the departing flights coming back. And they have been ignoring that, if I'm being honest. They've been absolutely ignoring it. "We do what we do in the UK, and let the EU do what it does in the EU." Well, unfortunately, that doesn't work, because you both have to come to an agreement at the end, as to how these two systems will interact. (Aircraft operator)*

Calls for linkage between UK ETS and EU ETS

There were also strong calls from operators/AOs and traders for some form of linkage between the UK ETS and EU ETS, both to increase the size of the UK ETS market and to ensure future alignment of the two systems. Many interviewees were aware that linkage was a possibility envisaged in the design stage of the UK ETS and they would like to see it pursued.

> *But I think probably more of the kind of things that I hear about it that are critical would be around linkages, and whether it's going to be big enough, for the long term, to operate in isolation, or whether the UK has sort of ceded leadership. Because, for many of us in carbon markets, the UK was always kind of the standard bearer, dating back to the UK ETS of the early 2000s. Right? And so I think there's a set of my members that are understanding all of the complexities of Brexit, but still believe that a linkage with the EU would be advisable. (Wider stakeholder)*

Operators/AOs that were subject to both the UK ETS and EU ETS referred to the added time and effort required to comply with both systems, particularly since UKA and EUA were not interchangeable. The additional burden was particularly referenced by the aviation sector, with many operators being covered by multiple ETS schemes (e.g. UK ETS, EU ETS, Swiss ETS) and – in future – potentially CORSIA as well.

A number of reasons were given for pursuing linkage with the EU ETS:

- **Improving the liquidity of the UK ETS market** (see chapter 5 on market perceptions).

  How could you improve [liquidity]? You link it to the EU ETS. [..] The market would benefit from it, to some extent, because you'd be in that wider liquidity pool. (Trader)

- **Being part of a larger market** that was less subject to large price fluctuations arising from relatively small events.

  And I think because it's a smaller system, you're more significantly exposed to bigger fluctuations in any of the changes or market demand either way. (Heavy industry operator)

- **Ensuring alignment between prices and rules in the two systems**, which can lead to carbon leakage and distortions in industrial, aviation and power markets (see chapter 7 on carbon leakage and the alignment sub-section above).

  …without a doubt, as a big European business, we think we would like to see linking. There's no secret in that. So we'd like to see the EU and the UK price aligned, for all sorts of reasons, and they're not. Last year, we've seen high prices right through, that causes us problems, it causes us issues around carbon leakage, and then this year we've seen the price go the other way, and that causes problems because we've already built in cost recovery with our customer base, so now we're constantly having to go back and re-assess that because the price has fallen significantly. (Heavy industry operator)

- **Improving efficiency and reducing the management burden** for pan-European businesses that were covered by both systems.

> *Because it just makes things really easier, especially if we talk about settlement [..] Sometimes we have excess certificates in one subsidiary, and then- because they haven't maybe reduced their flight schedule, so we have certificates left on the one hand side, and we can't use them for the other group company. [..] We would really encourage to put that back on the agenda, that we have a closer connection between the two markets, that we can use UK allowances within the EU, and also the other way around. (Aircraft operator)*

The links between the EU ETS and Swiss ETS was cited as an example of an approach to linkage that appeared to be working.

> *The Swiss way is much better. [..] It's fully integrated. So it's the same register from European and Swiss, and we buy the same allowances, and we have to report, 'These are for Europe, and these are for Swiss,' but they debit in one amount. (Aviation trader)*

However, some interviewees recognised that it might be challenging to pursue linkage between the UK ETS and EU ETS while UKA prices were below EU prices. They noted that, if this changed in future, linkage might be more realistic. There was also recognition that changes in scope between UK ETS and EU ETS would make linkage more unlikely (e.g. proposals for UK ETS to cover domestic shipping while EU ETS would cover international shipping; proposals for Greenhouse Gas Removals to be included in the UK ETS but not EU ETS).

> *And the more that we see changing in the EUA market, one would kind of assume that that makes that linkage harder. And it's the changes they would have to make to the UK scheme to bring it back in line with the EUAs ahead of a link, if that link is to happen, I think is the big question that surrounds UKAs. (Trader)*

Some power generators suggested that linking to EU ETS and removing Carbon Price Support (CPS) would avoid distortions in the power market, making UK ETS more efficient and thereby increase its influence on overall greenhouse gas emissions.

Calls for more certainty in the direction of travel for UK ETS

Both operators/AOs and traders commented that the UK ETS Authority needed to clarify how the UK ETS will operate beyond 2030, to help industry plan major capital projects. They commented that the EU ETS had provided firmer long term plans.

> *I think the biggest issue has been the EU have put out information and data about how their scheme will operate beyond 2030. So there's more of a longer term plan in the EU. The UK hasn't really established too much about what they're going to do beyond 2030, which industry, when they're doing capital projects for 10 year paybacks and things like that, they need more information on how the carbon market, UK carbon market is going to develop in the long term. (Trader)*

Ideally, operators/AOs would like to see cross-party agreement on the direction of travel for the UK ETS, which would give more confidence on likely future policy.

Several stakeholders commented that policy confidence would be improved if the UK ETS Authority worked more collaboratively with industry and market players, sharing emerging thinking and using a 'working group' approach on tricky issues. This would mean that the market was better aware of emerging policy issues rather than there being a period with little or no engagement between a consultation round and a final policy decision. It was suggested that the UK ETS Authority could follow the approaches used in the power and gas markets. For instance, National Grid has a partnership with a governance body called the 'Joint Office for Gas Transporters'.

> *…there's a monthly forum where, as a group, National Grid will share their ways of thinking and share exactly what they've been working on. And then, once the industry has decided okay, this is fit for purpose, we have debated it, National Grid may or may not adapt their view. Then it can go to consultation. So in that case, the transparent governance process, you're always looped into what the latest policy thinking is. And it's not just what National Grid is thinking, it's also thinking in cooperation with whatever the energy department is at the time. (Wider stakeholder)*

> *…if government are a bit more open with us [..] None of us are experts, but together, we can be a better team, I think, really. I think everybody on our side of the fence wants to reduce emissions as much as government does, that's pretty much what I'd say. (Heavy industry operator)*

Calls for ring-fencing of UK ETS revenues for abatement

As noted in chapter 6 on abatement, a number of operators/AOs made comments about use of UK ETS revenues. These comments came primarily from the aviation sector, where aircraft operators were aware of EU ETS revenue being used to support use of SAF. At the simplest level, some operators/AOs suggested that there was a need for more transparency about how UK ETS revenues were used.

> *…every year the EU ETS issues a report. At least there is something. I'm not saying it's correct or not, I can't say that, but the EU ETS issues a report, every country, how much they've contributed towards the EU ETS and, to a certain extent, how it will be redirected against environmental projects or against research. (Aircraft operator)*

These operators/AOs would like to see hypothecation of some or all UK ETS revenues (e.g. to fund decarbonisation). They pointed out that the new EU ETS rules allocated 75% funds raised towards decarbonisation and 25% to a social fund, to alleviate the social impacts of carbon prices on consumer prices.

> *The European Union has hypothecated the revenues from the EU ETS, under the new rules, so 100% of it, okay 75% towards climate initiatives, 25% towards social fund, however you want to talk about that. The UK has no commitment to any revenues being hypothecated. And that's directly the opposite direction that the EU are going and it's also in breach of what they stated post-Brexit, that the environmental obligations would not be lowered. Our environmental obligations and aspirations will not be lowered by us*

> *leaving the EU. Well, there you have it. They've got 100% hypothecated revenue, and you've got zero. (Aircraft operator)*

This was linked to a separate point that policies needed to provide incentives for decarbonisation (i.e. 'carrots') as well as disincentives for emissions (i.e. 'sticks') – see separate sub-section below. One wider stakeholder commented that having a fund from UK ETS hypothecated revenue might improve political perceptions of UK ETS, as well as providing further impetus for decarbonisation:

> *…my observation is that there is some kind of mismatch between the prioritisation that civil servants place on the UK ETS and the carbon agenda, understanding the importance it has for decarbonisation and 'UK plc', I'm not convinced it's the same understanding in [Westminster]. And perhaps if there was some funding ring-fenced by [HMT], then that could change. (Wider stakeholder)*

Calls for 'carrot' as well as 'stick' policies on decarbonisation

Many stakeholders commented that there was a need for UK and Devolved Government policies to include incentives for decarbonisation ('carrots') as well as disincentives for carbon emissions ('sticks'). They viewed the UK ETS as a 'stick' policy and pointed out that there were a range of other policy tools that could be used, including CBAM, product standards, grant funding and so on.

> *I think one of the challenges is that at times it feels like the emissions trading scheme is the only decarbonisation tool the government understands. And, actually, there are other ways of influencing businesses to decarbonise. And some of the stuff they're talking about in their carbon leakage consultation is important there. Things about carbon border adjustments, product standards. There's more than one tool that needs to be in the toolbox. And certainly ETS, from our point of view, feels all stick and no carrot. (Heavy industry operator)*

Some interviewees were aware of government funding programmes for innovation (which include innovation competitions for hydrogen supply, CCUS and fuel switching, plus the UKRI's Industrial Decarbonisation Challenge Fund) and similar funding mechanisms for deployment (such as the Industrial Energy Transformation Fund, the Hydrogen Business Model, Green Gas Support and the CCUS Business Model). But they still commented that other jurisdictions, such as the EU and US, offered clearer support mechanisms for near-term decarbonisation investment and that additional funding would help to stimulate investment, provided that there was confidence in the consistency of government policy and support.

> *…the EU has very clear funds to support new technologies and renewables and carbon removal and CCS and the rest. But in the case of the UK, it feels like it's a bit more of a black box. They have a lot of these programmes, R&D programmes, to support technologies that- Some that don't have commercial readiness but are technically ready, and others that still are in the FOAK stage, first-of-a-kind stage, and need that R&D*

> *support. But those are very, very long-term thinking, looking towards the 2030s, 2040s, when they're likely to be able to survive off a lot less subsidy. (Wider stakeholder)*
>
> *You may like it or not like it, but the US Inflation Reduction Act, simple, understood, you know what the rules of the engagement are, and that's not quite the case in the UK. We're patting ourselves on the back by having nuanced and very clever approaches, but we're fiddling around with so many different moving parts at the same time. (Heavy industry operator)*

One stakeholder commented that policy makers had become better at developing policies that complemented rather than competed with ETS systems, following experiences from around 2010 to 2017/18 when renewable energy subsidies were the main driver of decarbonisation of the power sector, which had the effect of depressing EU ETS prices. In developing 'complementary policies', their potential interaction with the UK or EU ETS needed to be considered.

There was also comment that the UK ETS needed to be considered alongside other elements of policy in the UK (e.g. the Climate Change Levy, Carbon Price Support, Climate Change Agreements, grid network charges and the mechanisms for operating cost support for CCUS, hydrogen and green gas). Operators commented that there were risks to developing policy in a 'siloed' manner, when businesses have to see the whole picture.

> *DESNZ seems to operate in a siloed, independent manner, where the people developing the business models keep on saying that's independent of ETS, and business is going, "Well, we look at the whole thing all at once, and you're not making it an environment that we can make an investment decision on." So that's my biggest fear. [..] it is a distinct fear, that this meddling could undermine those significant investment decisions that we all need to have made. (Heavy industry operator)*

Calls to extend the scope of UK ETS

As noted in chapter 6, there was considerable interest amongst interviewees about the potential inclusion of Greenhouse Gas Removals (GGR) in the UK ETS. This was seen as a potential incentive for investment in GGR in the UK, provided that carbon prices were sufficiently strong.

> *…think there is a big opportunity, in regard to help subsidise the removals industry in the UK, of which, I think, there is a really exciting potential. Without the ETS support, currently the investments into that industry in the UK is fairly minimal. So, it's not necessarily something that the ETS has done wrong, it's just that I think it's a potential opportunity that isn't being realised. (Aircraft operator)*

A few interviewees called for the scope of UK ETS to be extended in other ways. In particular, there were calls for the system to be extended to transport sectors beyond aviation, on the grounds that this would be fairer to the aviation sector. The California Cap-and-Trade system was cited as an example of an ETS that had a fuels directive and covered usage of transport fuels upstream.

> *But the other point I would make, in terms of competition between the markets as well is, there are other sectors, transport sectors, that aren't included, as well, in the ETS, that have bigger impacts. The road transport is far, far bigger, in terms of GHG emissions than aviation. So I don't understand why one sector should be allowed to have no carbon price put onto it, and another sector shouldn't. (Aircraft operator)*

One wider stakeholder commented that the UK ETS should consider extending its scope to include nature-based solutions and agriculture.

> *I think the UK has had more openness to than European colleagues, in the past, is around the role of nature-based solutions, and the greening of agriculture, potential for better soils management, and integration also of forest-related credits into the carbon market. I think, right now, that's a bit more of the sphere of voluntary markets in the UK, with the Woodland Carbon Code, but I think that's an area where, again, there could be some really interesting collaborations with other jurisdictions on how you approach that. (Wider stakeholder)*

Calls to link UK ETS with developing country systems

Finally, one wider stakeholder commented that linkages could be made with developing countries, if linkage with the EU was not feasible. The purpose would be to access lower cost abatement opportunities, while contributing to decarbonisation in the global south. They saw this as an opportunity to use Article 6 of the Paris Agreement, which allows 'Cooperative Implementation' of national climate goals.

> *…as you're approaching these high pricing levels of £100, £125, £150 a tonne, and meanwhile countries that you're close to, Chile, South Africa, Brazil have stuff on offer at £30, and they don't have the investment to achieve it, or Senegal, or Kenya, they have mitigation that they can't afford to harvest [..] Couldn't the UK achieve its goals better, and faster, and more affordably in collaboration with other countries, rather than in isolation. (Wider stakeholder)*

They suggested that this could be an area where the UK could show market leadership, either through a private sector model, where companies had limited amounts of credit that they could use from other countries, or through a government purchasing option.

Appendix 1: Candidate theory for trading and abatement

We have developed these context-mechanism-outcome (CMO) configurations as realist hypotheses about the types of behaviour that may be observed during the 'outcomes' evaluation of the UK ETS. The first set of behaviour types focus on UKA market behaviour (including trading and allowance management), while the second set focus on carbon abatement behaviour.

The intention would be to test these patterns of behaviour, and causal influences, during the analysis of qualitative research. The list of CMOs was too long for all to be explicitly tested during qualitative interviews, but topic guides were designed to collect the evidence necessary to test the CMOs during the analysis stage.

The candidate CMOs were revised in response to comments from DESNZ, before drafting of the topic guides.

Note: the CMOs are not mutually exclusive. Organisations may exhibit more than one type of behaviour, so more than one CMO from each set may apply to them. For example, they may forecast their requirements of allowances and invest in abatement technologies.

Table 18: Candidate realist hypotheses about UKA market behaviour, including trading and allowance management

Nickname	Contexts	Mechanism	Outcome	Relevance
Frequent trading	Firm with capacity, capability and interest in trading of UKA and UKA derivatives. Business model involves daily speculative (and possibly algorithmic) trading in financial instruments and/or commodities, including both EUA/UKA and their derivatives.	Our UK ETS trading account [resource] allows us to include trading of UKA and UKA derivatives in the portfolio	Firm buys, sells, trades and holds UKA and its derivatives actively on a daily basis, via the auction or ICE trading platform or 'Over the Counter' (OTC) trades. Market outcome: frequent trading contributes to the liquidity of the UKA market.	Commodity Traders/ Power Sector Traders/ Financial counterparties/ Industry traders/ Aviation traders (including the trading

Nickname	Contexts	Mechanism	Outcome	Relevance
	Regard UKA and UKA derivatives as worth trading (e.g. to provide complete coverage of energy market in Europe; or because of interest/demand from market) PP If a clearing member of ICE AND registered participant in the UKA auctions, frequent traders may acquire UKA directly at auction. If not, they acquire UKA and UKA derivatives via clearing members, financial counterparties and/or commodity traders.	of financial instruments and commodities that we trade on a daily basis, thereby enabling us to increase our profits from trading activity. [reasoning]	Possible market outcome: algorithmic trading could contribute to instability in the UKA market.	arms of large operators)
Developing long-term trading positions	Firm with at least some capacity, capability and interest in trading of UKA and UKA derivatives. Business model involves longer term speculative trading, including 'buy and hold' strategies involving taking positions on UKA and UKA derivatives, as well as (possibly) EUA and other financial instruments and/or commodities.	Our UK ETS trading account [resource] enables us to develop long-term positions in the UKA and UKA derivatives market, based on our expectations	Firm buys, sells, trades and holds UKA and UKA derivatives as needed to take advantage of longer-term trends in UKA prices, resulting in increased trading profits. Possible market outcome: depending on the scale of positions taken, this could have a significant impact on UKA prices (e.g. 'buy and hold' positions could lead to short-term tightness in the UKA market and the risk of price falls at a later date).	Commodity Traders/ Power Sector Traders/ Financial counterparties/ Industry traders/ Aviation traders (including the trading arms of large operators)

Nickname	Contexts	Mechanism	Outcome	Relevance
	Willingness to take risky positions and to develop long term views of likely changes in the value of UKA and UKA derivatives relative to other financial instruments and commodities. If a clearing member of ICE AND registered participant in the UKA auctions, frequent traders may acquire UKA directly at auction. If not, they acquire UKA via clearing members and/or financial counterparties.	of movements in UKA prices.		
Providing auction clearing services	Major financial institutions (e.g. investment banks) which are clearing members of the ICE and registered participants in the UKA auction (only 8 such firms). Business model may involve trading (see trading CMOs) in addition to sale of auctioned UKAs to other organisations who want to acquire them (e.g. financial counterparties, commodity traders, power sector traders, aviation	Our UK ETS trading account, ICE membership and clearing status within the UKA auction [resource] allows us to buy UKA at auction on behalf of	Firm regularly buys UKA at auction on their own behalf and/or on behalf of other organisations. Market outcome: this facilitates access to UKA by other organisations.	Financial counterparties

Nickname	Contexts	Mechanism	Outcome	Relevance
	traders, industry traders), including to UKA auction participants who are not clearing members.	other organisations, in return for a financial gain of some form. [reasoning] [as well as possibly engaging in trading in our own right – see trading CMOs]		
Providing specialist broking services	Firm specialising in providing energy and carbon services to industrial clients. Not a clearing member of the UKA auction, so acquire UKA and/or UKA derivatives via clearing members, financial counterparties or other traders.	Our UK ETS trading account [resource] allows us to offer UKA procurement as part of our offer and service to clients, in return for a %	Firm regularly buys UKA via auction clearing members, financial counterparties or other traders and sells them on directly to their clients via 'Over the Counter' trades. Market outcome: this facilitates access to UKA by other organisations.	Commodity traders

Nickname	Contexts		Mechanism	Outcome		Relevance
			commission [reasoning]			
Need to buy allowances – with periodic forecasting (some aspects of behaviour similar to hedging, but undertaken less frequently)		Firm has limited capacity, capability or interest for active trading in UKA. Requirement for allowances significantly exceeds free allocation (in absolute or % terms). Firm perceives there to be no further economically viable abatement options in the short term. Procuring UKA represents a significant part of operating costs.	We need to buy a significant quantity of UKA to meet our UK ETS obligations [resource] so we periodically review our predicted requirement for UKA, and the level of UKA prices in the auction and ICE platform, and we de-risk our compliance costs by buying UKA through the year rather than leaving all our buying to the end of the year when prices may be higher [reasoning].	Firm buys UKA from time to time during the compliance year (generally via an intermediary or 'Over the Counter' trades). Market outcome: low frequency trading still makes some contribution to the liquidity of the UKA market.	Subset of Energy intensive industry operators Possibly also new aircraft operators which have no access to free allowances Possibly small power generators?

Nickname Contexts		Mechanism Outcome		Relevance
Need to buy allowances – with end of year compliance	Firm does not have the capacity, capability or interest for active trading in UKA. Firm doesn't have the capacity, capability or interest to participate in the auction or the ICE trading platform (e.g. because perceived high transaction costs). Requirement for allowances exceeds free allocation to a limited degree (in absolute or % terms). Firm perceives there to be no further economically viable	We need to buy UKA to meet our UK ETS obligations [resource] but we want to minimise the time spent on compliance and our obligations are small enough that the financial risk involved in leaving compliance to the end of the year are acceptable to us [reasoning]	Firm reports emissions at the end of the compliance year and buys any extra UKA from an intermediary (e.g. a commodity trader) at that point, via 'Over the Counter' trade(s) Market outcome: very limited trading so makes little contribution to the liquidity of the UKA market, except at one time of year.	Subset of energy intensive industry and aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	abatement options in the short term. Procuring UKA represents a relatively small part of operating costs (compared to those buying allowances more frequently) Possibly: “allocation of free allowances uncertain until activity level change approved”.			
Using free allowance allocation from next year’s allocation	Requirement for allowances exceeds free allocation to some degree Firm expects to need more UKA this year than next year (e.g. because of changes to operations).	We need to access more UKA to meet our UK ETS obligations [resource], but we are minimising compliance costs [reasoning] by using some of our free allocation from next year to meet our compliance requirements for the current year.	Firm borrows from the next year’s free allocation to cover UK ETS obligations for the current year. Market outcome: no trading in the UKA market so no contribution to the	Subset of energy intensive industry and aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	Firm does not expect UKA prices are unlikely to rise significantly next year (despite possible cap tightening). Firm's accounting rules allows them to borrow allowances between years. Firm perceives there to be no further economically viable abatement options in the short term.		liquidity of the UKA market.	
Occasional selling of surplus free allowances	Firm does not have the capacity, capability or interest for active trading in UKA. Firm has more free allowances than they	As the UKA price is currently high and we have surplus free allowances [resource], we want to take advantage of current high prices for UKA to generate a profit (and/or provide a payback on earlier abatement investments). [reasoning]	Firm periodically sells some UKA via intermediaries, direct trades or via the ICE trading platform, but does not fully engage in trading or hedging activity.	Subset of energy intensive industries and/or aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	expect to need in the coming years (e.g. because of changes to their business since the free allocation baseline, previous carbon abatement investments, or changes in activity levels). Firm thinks that UKA prices are unlikely to rise significantly in the next few years (despite tightening of cap).		Market outcome: low frequency trading still makes some contribution to the liquidity of the UKA market.	
Holding surplus free allowances (some links to 'developing long-term trading positions', but an	Firm does not have the capacity, capability or interest for active trading in UKA. Firm has more free allowances than they expect to need in the	We have surplus free allowances [resource], but we want to carry them forward to reduce our compliance exposure in future years because we anticipate that (a) UKA may increase in price in future years and/or (b) our requirement to buy UKA may	Firm holds surplus free allowances and carries them forward to future years. Market outcome: no trading in the UKA market so no contribution to the	Subset of energy intensive industries and/or aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
operator rather than trader,, behaviour)	coming years (e.g. because of previous carbon abatement investments, or changes in activity levels). Firm perceives risks of UKA prices rising further (e.g. as the cap tightens) and/or firm perceives risk of free allocations reducing in future .	increase in future years. [reasoning]	liquidity of the UKA market.	
Autarchy (i.e. self sufficient) group	Firm does not have the capacity, capability or interest for active trading in UKA. Firm doesn't have the capacity, capability or interest to participate in the auction or the ICE trading platform (e.g. because	We can meet our UK ETS obligations [resource] by moving allowances between installations and managing our carbon emissions/abatement options in-house, thereby minimising our interaction with the external market for UKA. [reasoning])	Firm manages their allowances and carbon emissions/abatement options in-house, thereby minimising their interaction with the external UK ETS market. Market outcome: little or no trading in the UKA market so only a limited (if any)	Subset of energy intensive industry and aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	perceived high transaction costs). Firm has multiple installations, with different situations on free allowances and abatement options. Firm does not like to interact with the UKA market and prefers to be self-sufficient. Procuring UKA represents a relatively small part of operating costs (compared to those buying allowances on the market).		contribution to the liquidity of the UKA market.	

Table 19: Candidate realist hypotheses about carbon abatement behaviour

Nickname	Contexts	Mechanism	Outcome	Relevance
Frequent hedging of operational risks (as for Market behaviour – this is both a market and a carbon abatement behaviour)	Large firm with the capacity and capability to buy UKA futures and/or other UKA products on a daily basis at auction, via the ICE trading platforms or 'Over the Counter' trades. UK ETS costs form a significant proportion of each plant's operating costs. No (or limited) free allowance allocation for these plants. Plant operation, fuel use (and associated carbon emissions) can be varied on a daily basis.	Based on our product sales prices, UKA prices and other operating costs [resource], we decide whether/how to operate our plant on a daily basis. When we do operate our plant, we use futures contracts to 'lock in' the margin between our anticipated sales revenue and operating costs, thereby reducing our business risk. We generally sell rather than hold free allowances to avoid tying up capital during the year. [reasoning]	Firm buys futures contracts (or other UKA products) for the main elements of their operating costs on a daily basis (via auction, the ICE platform or 'Over the Counter' trades) and may also trade in UKA Emissions outcome: UK ETS has a short-term influence on the level of GHG/carbon emissions.	Power sector operators/ Industry operators/ Aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
Periodic adjustments to operations (similar to hedging, but undertaken less frequently)	Firm-level decarbonisation plans. High carbon cost per unit of production. Some awareness of UK ETS prices. Opportunity to make cost-effective operational or fuel use adjustments that will significantly change carbon emissions.	The cost of allowances required to comply with UK ETS obligations [resource] provides a business case for adjusting our operations up or down on an occasional basis, switching fuels – or even temporarily halting or restarting operations. [reasoning]	Firm manages GHG emissions (and associated UK ETS allowance costs) by adjusting operations up or down. Emissions outcome: UK ETS has a short-term influence on the level of GHG/carbon emissions.	Subset of energy intensive industry operators (possibly also aircraft operators and smaller power sector operators)
Investing in abatement technologies	Firm-level decarbonisation or 'net zero' plans. Confidence in the future of UK operations (possibly including confidence in government policy support). Able to pass some of the costs of UK ETS on to customers.	The current and future cost of UK ETS allowances [resource] improves the business case for proceeding now with investments that will reduce future carbon emissions from our operations. [reasoning]	Firm reduces future emissions by investing in carbon abatement technologies that are available now. Emissions outcome: UK ETS has a long-term influence on the level of GHG/carbon emissions.	Any/all UK ETS operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	Expectations of high UK ETS prices in future. Perceived opportunity to make new, economically viable investments in the short term to reduce carbon emissions (e.g., replacement plant, onsite renewables, energy saving measures). Able to access internal capital (or willing & able to access external finance) to fund investment.			
Investing in innovation or research	Firm has considerable capability and capacity to engage with decarbonisation and net zero issues. Firm has well-developed decarbonisation strategy. Confidence in the future of UK operations (possibly including confidence in government policy support).	The current and future cost of UK ETS allowances [resource] justifies investment of our time and/or money in research, development and/or innovation, in the hope of identifying cost-effective abatement options	Firm invests in innovation or R&D around carbon abatement options. Emissions outcome: UK ETS potentially has a very long-term influence on the level of GHG/carbon emissions for this firm/sector.	Larger power operators, industry operators and aircraft operators

Nickname	Contexts	Mechanism	Outcome	Relevance
	Expectations of high UK ETS prices in future. Uncertainty around the feasibility and cost-effectiveness of different carbon abatement options for this firm/sector. Collaborative approach to technology development and to obtaining innovation/research funding for their sector.	for the future. [reasoning]		
Deferring abatement	Firm-level decarbonisation or 'net zero' plans. Confidence in the future of UK operations (possibly including confidence in government policy support). Expectations of high UKA prices in future. Firm perceives there to be no further economically viable	The current and future cost of UKA [resource] is likely to improve the business case for proceeding with future abatement investments. [reasoning]	Firm delays abatement investments in the expectation of more economically attractive options becoming available in future. Emissions outcome: UK ETS is not currently influencing the level of GHG/carbon emissions for this firm but may do so in future.	Any/all UK ETS operators, particularly those located in industrial clusters

Nickname	Contexts	Mechanism	Outcome	Relevance
	abatement options in the short term. Perceived opportunity to access more economically attractive abatement opportunities in future (e.g. cost-competitive hydrogen supply, and/or CCUS via an industrial cluster or electricity supply via onsite renewables or grid reinforcement).			
No viable abatement options at this time	Firm-level decarbonisation or 'net zero' plans. Periodically review abatement options. Firm perceives there to be no further economically viable abatement options in the short term Additional abatement options not perceived to be economically viable without major advances in technology	At current UK ETS prices [resource], we have already undertaken all the viable abatement options open to us at this time. We have investigated other current abatement options but they are too costly to implement at current UK ETS prices. [reasoning]	Firm effectively treats UK ETS as a carbon tax for now. They comply with its requirements but it does not influence their short term emissions behaviour Emissions outcome: UK ETS is not currently influencing the level of GHG/carbon emissions for this firm.	Any/all UK ETS operators, particularly those NOT located in industrial clusters

Nickname	Contexts	Mechanism	Outcome	Relevance
	(e.g. hydrogen, CCUS), major investment in infrastructure and/or reductions in cost.			
Not yet aware of decarbonisation options	Firm has limited capability and capacity to engage with decarbonisation and net zero issues. Firm has not yet developed decarbonisation plans. Probably - low carbon cost per unit of production. Low awareness of carbon abatement options for their sector. Reliance on second hand information about the likely suitability (or otherwise) of carbon abatement options. Possibly a firm that is struggling for its survival.	We fulfil our UK ETS obligations [resource], but we have been too busy or too pre-occupied with other issues to look seriously at abatement options [reasoning]	Firm effectively treats UK ETS as a carbon tax for now. The firm complies with its requirements and has low awareness of potential decarbonisation options. Emissions outcome: UK ETS is not currently influencing the level of GHG/carbon emissions for this firm.	Smaller firms and those that are less energy intensive

Nickname	Contexts	Mechanism	Outcome	Relevance
Not yet decided on best decarbonisation option	Firm has limited capability and capacity to engage with decarbonisation and net zero issues. Firm has not yet developed decarbonisation plans. Uncertainty around the cost-effectiveness of different carbon abatement options Possibly – other uncertainties about operations on UK ETS sites.	At current UK ETS prices [resource], we are waiting for further information before taking a decision, because of current uncertainty as to which abatement option would be best for us. [reasoning]	Firm effectively treats UK ETS as a carbon tax for now. They comply with its requirements and do not yet have the information or confidence required to proceed with an abatement option. Emissions outcome: UK ETS is not currently influencing the level of GHG/carbon emissions for this firm but may do so in future.	Any/all UK ETS operators
High carbon leakage risk	Lack of confidence in the future of UK operations (possibly including lack of confidence in government policy support). High carbon cost per unit of production.	The current and future cost of UK ETS allowances [resource] makes our UK business less viable, so we cannot currently justify investment in carbon abatement. [reasoning]	Firm treats UK ETS as a tax on their business – they comply with its requirements but it doesn't change their emissions behaviour and it potentially constrains their future investments and operations.	Energy intensive industry at risk of carbon leakage

Nickname	Contexts	Mechanism	Outcome	Relevance
	Unable to pass the UK ETS costs on to customers because of international competition.		Emissions outcome: UK ETS is not currently influencing the level of GHG/carbon emissions for this firm and is reported to increase carbon leakage risks.	

Appendix 2: Revised theory for trading and abatement

Table 20: Summary of revised trading behaviour CMOs

Nickname	Key contexts	Mechanism	Outcome
Speculation	Takes positions in other traded commodities. Part of a large, multinational business. Experienced commodity traders with expertise in emissions trading (inc. EU ETS) and related sectors (energy). ICE registered and transact mainly via this route. December futures are the most liquid product.	The UK ETS provides us with a new market opportunity. We feel that our expertise in commodity trading, combined with our energy market insight means, that we are well placed to identify and realise opportunities to generate profit through speculative trading in this market. We prefer to trade in December futures as this is the most liquid form for product, and therefore provides better opportunities for speculative activity.	We take positions in the UK ETS market, mainly in December futures.
Market making	Client driven. Perceive themselves as a market intermediary and provider of hedging services. Experienced commodity traders with expertise in emissions trading (including	We provide a range of financial, risk and asset management services to an existing client base. Some of our clients have obligations under the UK ETS and we trade to meet their needs. Having in-house expertise means that we are able to be active participants in the market and to generate a profit through trading, although our tolerance for risk is low. It is not just about profit though, it is also about satisfying client demands. Primarily, we see	We satisfy client demand through trading, mainly in December futures, and in return generate profit by charging a margin on sales and other

Nickname	Key contexts	Mechanism	Outcome
	EU ETS) and related sectors (energy). Generally part of a large, multinational business. ICE registered and transact mainly via this route. Prefer to trade in December Futures (and Over the Counter with clients in UKA, forwards and swaps). Business looks to generate income through ancillary trading, in addition to making a margin on trades. Have some appetite/capacity for risk.	our role as being about enabling market access and the provision of hedging services.	ancillary forms of market behaviour, including low risk speculative activity.
Broking	Client driven. Provide a fee-based service, they charge commission on each transaction that they undertake. Do not engage in speculative behaviour. Carbon trading is an ancillary activity, complementing a wider offer, including energy (fossil and or green).	We provide a range of services, including in relation to energy, to an existing client base. Some of our clients have obligations under the UK ETS and we entered into the UK ETS market to meet their needs and because we see the provision of carbon trading as complementing our wider service offer. Primarily, we see our role as being about enabling market access and the provision of hedging services.	We satisfy client demand through trading, mainly in futures, and in return generate profit by charging a commission on each transaction we facilitate.

Nickname	Key contexts	Mechanism	Outcome
	Have in-house commodity trading expertise Registered as an ICE member and this is their main way of securing allowances. Trade mostly in futures (and some Over the Counter trades with clients in UKA).		
Clearing	Global business, banking and financial service. Other parts of the business likely to be involved in UK ETS trading. ICE Clearing member. Activity is client driven. As clearers, they have no view on, or commercial interest in, the nature of the trades they facilitate. Clients include big banks and asset managers, larger hedge funds and some large compliance actors. There are some significant hurdles to becoming a client. Act as a clearer for the EU ETS as well as UK ETS.	Some of our clients have occasional need of a clearing service. We are keen to meet client needs, in return for a fee, and as we have experience of providing this for the EU ETS and so it was relatively easy for us to provide a similar service for the UK ETS. We vet our clients carefully, to minimise our exposure to risk, but have no view on the activity that we are facilitating.	The firm generates income whilst meeting client needs.

Nickname	Key contexts	Mechanism	Outcome
Compliance - hedging via intermediaries	UK ETS operator with medium to high emissions (above 25,000t CO2e per annum). Purchase of allowances is seen as a significant cost for the business. Aware of fluctuations in UKA prices. Want to manage impact of UKA purchases on cashflow and business accounts. Lack the time/expertise to access the market directly. Existing relationship with broker/intermediary(ies) (usually from EU ETS).	We now see the cost of UK ETS costs as significant, and are aware that prices are higher towards the end of the compliance period so look to hedge our exposure by buying over the year. We don't have the time/expertise to access the market directly so need to procure external support.	Buy UKA (and/or futures/forwards) at multiple points through the year, via an intermediary (i.e. Over the Counter)
Compliance - hedging on own behalf	UK ETS operator with higher emissions (above 150,000t CO2e per annum) Purchase of allowances is seen as a significant cost for the business. Have in-house trading teams.	UK ETS costs are highly significant for us and we don't want to risk leaving UKA purchase to the end of the compliance year (both in terms of price risk and cashflow impact). We are confident in our expertise and capacity to trade in the auction and/or through ICE.	Buy UKA (and/or futures) at multiple points through the year at auction or via ICE .

Nickname	Key contexts	Mechanism	Outcome
	Corporate policy is risk-averse and/or have corporate policies prohibiting speculation.		
Compliance - buy to comply	Low emitters (below 25,000t CO2e per annum). Free allowances don't fully cover emissions. Cost of shortfall in allowances is low relative to other operating costs, and not a major risk for the business. Don't have in-house capacity or expertise in trading. Existing relationship with broker/intermediary(ies) (usually from EU ETS).	We want to comply but also want to keep it simple. Our UK ETS compliance costs aren't big enough to justify a sophisticated strategy. We lack time and in-house expertise and so need to procure external support.	Buy UKA once a year via an intermediary.
Compliance - occasional selling	Operator receives free allocation of allowances. Conditions in this industry mean that production has been reduced or a plant has been closed (temporarily or permanently).	We want to realise the value of our UKA assets to benefit our business in the short term. We don't have the time/expertise to access the market directly so bring in external support.	Sell UKA via a third party intermediary.

Nickname	Key contexts	Mechanism	Outcome
	The reduction in production activity meant there was a temporary surplus of UKA. Business wants to improve cashflow. Business does not have any expertise or capacity in trading	We choose the timing of the sale to get a good price, if we can.	
Compliance - sparks market trading	Large power sector operators with high emissions. Wish to trade in the sparks market for the purposes of hedging future power sales. Spark spread requires that a trader simultaneously buy/sell matching units of electricity, gas and carbon. Operate in a dynamic market, and so are frequent traders. May both buy and sell in line with changing market conditions. Mainly deal in futures, via ICE(may use an intermediary or trade direct).	We need to trade in carbon to enable us to participate in the sparks market. Ours is a dynamic sector and our requirements can quickly change, so we trade regularly, in futures, via ICE, this being the most flexible route to market.	Buy and sell futures on ICE on a daily basis, to enable participation in the sparks market.

Table 21: Summary of revised abatement behaviour CMOs

Nickname	Key contexts	Mechanism	Outcome
Frequent abatement	Large international companies involved in power generation. Have plant that can be operated on a discretionary basis. Continually (daily or more frequently) decide whether it's profitable to run their plant, depending on energy costs and other factors. No free allowances.	UK ETS costs are significant to our business so we take account of them when deciding whether it is economical to run our plant. The UK ETS costs affect whether we run our plant and therefore affect our emissions on a frequent basis (daily or hourly) basis. Our current and long-term abatement is driven by corporate targets, government policy and other factors (including the costs of UK ETS).	We change our day-to-day operations to assist with abatement, and we are also investing in medium and long-term abatement.
Both current and future abatement	Companies had already invested significantly in improving their current operational assets. Companies were investing in long term abatement solutions. There was a strong sense of decarbonisation being part of the corporate identity and companies saw themselves and leaders within the industry.	We are committed to decarbonising and are already investing in current and future abatement. Abatement is being driven by a range of factors other than ETS.	We are investing in abatement of current processes and we were already investing in long-term future abatement options.

Current abatement and researching future options	Range of companies in terms of size, sector, allocation of free allowances and overall emissions. Companies were committed to decarbonising, but had concerns about financial and technical viability of solutions. Some companies had Science Based targets. with short-term targets being achievable but long-term targets being dependent on external factors (e.g. Grid connection or CCUS).	We are committed to decarbonise, and are investing in energy efficiency where we can, and also researching longer term. The rising cost of UK ETS is a driver for abatement, amongst other factors, although UK ETS also reduces the funds available to invest.	We are investing in abatement of current processes and we are researching future abatement options.
Current but no future abatement	The firms were operators on behalf of a larger company. Operational abatement options had been implemented. The parent company controlled assets and made decisions about abatement investment. Parent company was not currently investing in new assets.	We are committed to decarbonise, and are investing in operational abatement but there are limits to what is in our control. The drivers for abatement are company leadership and sector-wide initiatives, more than UK ETS.	We are investing in the abatement of our current processes but we are unable to invest in long-term abatement.

No abatement	Large company primarily involved in peaking power generation. Operational decisions based on market prices and available permits. No free allowances or significant shortfall in allowances.	We have limited commitment to current or future large-scale decarbonisation. UK ETS is effectively a tax, not a driver for abatement.	We do not currently abate in any meaningful way and we are not planning on any significant future abatement.
No abatement, but with possible future options	Company in the heavy industry sector with one customer. Customer issued free allowances for any shortfall. Efficiency linked to production (higher production results in higher efficiency).	We are committed to decarbonise but have limited options for short-term abatement and are researching longer term options. UK ETS and energy prices are not a driver for abatement because these costs are met by the customer.	We do not currently abate but we are investing in future abatement.
Abatement through closure	International company with plants in UK but main parent company outside the UK. Emissions are from industrial processes rather than energy. Plant closed due to high energy and ETS costs.	We could not afford to run some of our operations given UK ETS costs, energy costs and wider market conditions. The potential future UK ETS allowance adjustment costs were a significant factor in keeping some of our operations closed. The lack of an available low carbon technical solution was an additional	Our abatement was a result of partial or full plant closure.

	Oversupply of free allowances (due to plant closure). Oversupplied free allowances traded by parent company, resulted in economic disincentive to restart the plant in the future.	factor keeping some of our operations closed.	

Appendix 3. Methodology

Sampling

In-depth qualitative interviews lasting 45-60 minutes were undertaken by telephone or online during June and July 2023 with:

- Representatives from 36 companies with compliance obligations in the UK ETS, referred to as 'operators' and 'aircraft operators' (AOs).
- Representatives from 26 companies with trading accounts in the UK ETS registry, referred to as 'traders' (a few of which were the trading arms of operators).
- 9 other stakeholders, including representatives from UK ETS delivery bodies, wider stakeholders and verifiers/compliance consultants.

The sampling and interview process for each of these groups is described further below.

Operator/AO sampling

Operators and AOs were sampled from the list of UK ETS operating account and aircraft operating account holders, as provided by the Department of Energy Security and Net Zero.

The qualitative sample was purposively targeted at operators/AOs with high emissions, because the behaviour of these operators/AOs was important for both abatement and trading outcomes from the UK ETS. In total, the operators/AOs interviewed for qualitative research generated approximately half of the emissions covered by the UK ETS (i.e. 55 million tCO2e out of a total of 111 million tCO2e emissions in 2022).

The sample was also purposively selected to represent a range of high-level sectors and sub-sectors across the UK ETS, as shown in Table 22 below. While operators/AOs with very high emissions (above 500,000t CO2e per annum) were the primary focus of the qualitative research, the sample included a number of operators/AOs with medium to high emissions (25,000-500,000t CO2e per annum) and low emissions (2,500-25,000t CO2e per annum). Low emitters were only interviewed in those sectors where the UK ETS population included considerable numbers of low emitters (i.e. aviation and other industry). Within each sub-sector and emissions group, the sampling also aimed to select operators/AOs with differing levels of free allocation coverage, as far as this was relevant to the sector and possible within the other sampling constraints.

For operators/AOs with high emissions (above 100,000t CO2e per annum in 2022), the in-depth interviews were used not only to generate qualitative findings but also to generate quantitative responses for a small subset of the quantitative survey questions. This was done to ensure that high emitters were adequately represented in quantitative survey findings. The methodology used for this process is set out in the quantitative survey report.

Table 22: Breakdown of operator/AO sample

High-level sector	Number of interviewees by range of emissions (2022) at organisational level	Breakdown by sub-sector	Number of quantitative responses from qualitative interviews	Total
Aircraft operators	4 (above 500,000t CO2e per annum) 3 (25,001-500,000t CO2e per annum) 2 (2,500-25,000t CO2e per annum)	9 Aviation	4	9
Heavy industry operators	10 (above 500,000t CO2e per annum) 2 (25,001-500,000t CO2e per annum)	2 Iron and steel 2 Refining 3 Chemicals 3 Cement 2 Offshore oil and gas	11	12
Other industry operators	1 (above 500,000t CO2e per annum) 6 (25,001-500,000t CO2e per annum) 3 (2,500-25,000t CO2e per annum)	2 Food and drink 3 Paper 1 Pharmaceuticals 1 Vehicles 3 Non-metallic minerals (lime, glass, ceramics)	3	10
Power generation	3 (above 500,000t CO2e per annum) 2 (25,001-500,000t CO2e per annum)	4 Power generation 1 Peaking plant	3	5

High-level sector	Number of interviewees by range of emissions (2022) at organisational level	Breakdown by sub-sector	Number of quantitative responses from qualitative interviews	Total
Total	18 (above 500,000t CO2e per annum) 13 (25,001-500,000t CO2e per annum) 5 (2,500-25,000t CO2e per annum)		21	36

When approaching an operator/AO for interview, the interview team emailed the primary contact for one of the organisation's UK ETS accounts. If no response was obtained initially, the primary contact and other authorised representatives were approached by email or telephone. If no response was obtained after four attempted contacts, the interview team approached a reserve organisation in the same sampling category. In total, 59 organisations were approached to obtain the 36 interviews set out in Table 18.

A briefing note setting out the scope of the proposed interview was included with the email invitation, to enable the initial contact to identify the best person within their organisation to undertake the interview. Where there was no single person within the organisation who could cover all the topics to be covered, and where feasible within the constraints of a 60-minute interview, online interviews were broadened to include more than one interviewee within the organisation. If this was not feasible, the interviewee was encouraged to consult with relevant colleagues ahead of the interview or was asked to provide further clarification from relevant colleagues by email after the interview.

Trader sampling

The sampling frame for trader interviews was the list of UK ETS trading account holders, as provided by the Department of Energy Security and Net Zero. Trading account holders included the trading arms of operators ('industry traders'), together with financial institutions registered as clearers with ICE ('financial counterparties') and other traders (classed as 'commodity traders'). The list of trading accounts was screened to exclude inactive accounts (i.e. those where the UK Transaction Log showed no trading activity since the start of the UK ETS), duplicate accounts held by one organisation and 'industry trader' accounts where the primary contact was the same as an operator account (to avoid duplication with the operator interviews). The remaining 77 UK ETS trading account holders were approached for interview. A total of 26 interviews were completed and one further response was received by email. This

was close to the target of 30 trader interviews agreed with the department. The breakdown of trader interviews between the three trader groups is shown in Table 23 below.

Table 23: Breakdown of trader sample

Category	Number
Financial counterparties	10
Commodity traders	10
Industry traders (including energy intensive industry, aviation and power sector traders)	6
Total	26

When approaching a trader for interview, the interview team emailed the primary contact for the organisation's UK ETS trading account. If no response was obtained initially, the primary contact and other authorised representatives were approached by email or telephone, up to a maximum of six times. In total, 77 organisations were approached to obtain the 26 interviews set out in Table 18.

As for the operator/AO interviews, a briefing note setting out the scope of the proposed interview was included with the email invitation, to enable the initial contact to identify the best person within their organisation to undertake the interview. Where there was no single person within the organisation who could cover all the topics to be covered, and where feasible within the constraints of a 60-minute interview, online interviews were broadened to include more than one interviewee within the organisation. If this was not feasible, the interviewee was encouraged to consult with relevant colleagues ahead of the interview or was asked to provide further clarification from relevant colleagues by email after the interview.

Wider stakeholder sampling

Three categories of wider stakeholders were also purposively selected for interview, to give a broader perspective on UK ETS. As shown in Table 24, these included UK ETS delivery bodies (i.e. representatives from regulators and from the Intercontinental Exchange (ICE)) and verifiers/compliance consultants. The external stakeholders comprised representatives of the Climate Change Commission and of trade associations representing the carbon trading industry (i.e. the European Federation of Energy Traders and the International Emissions Trading Association). Interviews lasting 45-60 minutes were undertaken by telephone or online.

Table 24: Breakdown of wider stakeholder sample

Category	Number of wider stakeholder interviewees
Regulators/delivery bodies	4
Verifiers/compliance consultants	2
Climate Change Commission	1
Trade associations representing the carbon trading industry	2
Total	9

An example of a topic guide used for the operator interviews is shown below.

Example: operator/AO topic guide

Context

- Ask respondent to briefly explain their role vis a vis the UK ETS within their organisation Establish how long the respondent has been in this role.
- Ask respondent to briefly confirm the nature of the organisation's business and roughly how much of their business activities are covered by the UK ETS.
- Ask the respondent to briefly summarise who else in their organisation is involved with the UK ETS.
- Confirm whether they have multiple installations in the scheme and whether they have a separate trading arm/desk.

Interaction with market for UK allowances

- Ask the respondent whether their organisation has ever bought or sold UK allowances (UKA) or derivatives?
- If yes:
    - ask them to outline their approach to buying/selling UK allowances and/or derivatives.
    - If not already clear, ask them what types of UKA products they generally buy or sell.

    - Establish how important these different products are in their overall buying/selling strategy.
- Ask the respondent why they take this approach to buying/selling UKA allowances and/or derivatives (or not buying/selling anything) - i.e. what's their rationale?
- What is it about their organisation's circumstances that drives this rationale? (i.e. the rationale for their buying/selling strategy - or their rationale for NOT buying/selling.)
- If they have ever bought or sold UK allowances (UKA) or derivatives:
    - Establish what channel(s) they use for acquiring, buying or selling the UK allowances and/or UKA derivatives that they outlined earlier.
    - Establish how much use they make of these different channels for buying/selling.
    - If they use intermediaries for buying or selling UKA or UKA derivatives, what type of intermediary do they use?
    - Explore why they use these channels.
- Establish whether and how their approach to acquiring, buying or selling UKA and/or EUA has changed since the start of the UK ETS.
- If their approach has changed, explore the reasons for these changes, and what influence different factors had.
- Do they have any comments on the Auction Reserve price and how it affects the UK market?
- Do they have any comments on the Cost Containment Mechanism and how it affects the UK market?
- Do they have any comments on the level of the UK ETS cap and how this affects the UK market?

Behaviour on Greenhouse Gas (GHG) reduction

- Establish whether the organisation is reducing, or planning to reduce, its direct GHG emissions in future?
- Establish whether they are reducing or planning to reduce emissions through operational changes and - if so - how often they will do this (e.g. daily, weekly, occasionally, once-off..)
- Explore the reasons why the organisation might be taking forward GHG reduction (i.e. the main drivers for this organisation).
- Explore how they review options for decarbonisation (e.g. technologies, costs) - and how often they do this?
- Establish whether they are reducing or planning to reduce emissions through the installation of low-cost measures.

- Establish whether they are reducing, or considering reducing, emissions through measures that require major investment.
- Explore the factors that influence how they reduce emissions (i.e. their choice between operational changes vs low-cost measures vs major investments).
- Ask for any early insights about whether the UK ETS is influencing their GHG reduction activities, and if so how.
- Ask whether they have any wider comments on whether/how the UK ETS influences GHG reduction and how its influence on GHG reduction could be enhanced?

Feedback on transition from EU ETS to UK ETS

- Ask the respondent to explain what worked well in the transition from the EU ETS to the UK ETS, from their viewpoint.
- Explore what worked less well in this transition, and why this was.
- Find out whether there any costs or disruption for this organisation from the transition to the UK ETS [or - for those still in the EU ETS - from the introduction of the UK ETS alongside the EU ETS], and if so what these were.
- Explore what could have been improved in the transition from the EU ETS to UK ETS, and whether there is scope for adjusting these aspects of the UK ETS going forward.

Feedback on UK ETS processes

- Explore the respondent's experience of UK ETS administration and compliance requirements - what works well or less well.
- Ask the respondent how responsive they have found their regulator to be, in processing matters and responding to queries?
- Ask the respondent about their views on communications from the UK ETS Authority.
- How does their experience of UK ETS administration compare to the administration of the EU ETS?
- Are there any ways in which the UK ETS administration could be improved?

Mitigation of carbon leakage

- Explore the extent to which their business is significantly affected by international competition, and if so how.
- Explore the extent to which their business is competing with imports/exports from (or activity in) countries which have lower (or no) carbon price, and weaker carbon regulation.
- Establish their perspective on the extent to which free allocation mitigates the risks of carbon leakage for their organisation, both now and in potentially in future.

Anything else?

- Ask whether UK ETS is having any consequences that the UK Authority might not have expected.
- Ask whether there is anything else that they would like to share with the evaluation team, in terms of how the UK ETS is currently operating.

This publication is available from: www.gov.uk/government/publications/evaluation-of-the-uk-emissions-trading-scheme-phase-1

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