

Analytical Annex to the UK Emissions Trading Scheme (UK ETS): Non-pipeline transportation of carbon dioxide consultation

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



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This annex covers proposals made in the UK Emissions Trading Scheme: Non-pipeline transportation of carbon dioxide consultation.

Analytical annex

This annex provides analytical context to the consultation covering UK Emissions Trading Scheme (UK ETS): Non-pipeline transportation of carbon dioxide. It gives an overview of the scheme's characteristics and then considers the factors influencing the impacts of the consultation options. It is not intended to reflect the full evidence base on which decisions will be taken, nor the full evidence base on which proposals have been developed to date. It is not a formal impact assessment. We will seek to gain further evidence to inform decisions from this consultation.

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

Section 1: Overview

Characteristics of the UK ETS

To consider the context of scope expansion, this section sets out characteristics of the existing UK ETS.

Scope/size of market

The UK ETS represents approximately 25% of UK territorial emissions based on the latest 2022 data¹. The scheme covers the UK's power sector, energy-intensive industry, and emissions from domestic flights, flights from the UK to the European Economic Area (EEA), flights from Great Britain (GB) to Switzerland, and flights between the UK and Gibraltar.

There were 678 installations and 369 aircraft operators in the UK ETS main scheme in 2022, the most recently reported year.² In addition, the scheme regulates 250 installations under the Hospital and Small Emitter (HSE) opt out, as well as 110 Ultra-Small Emitters (USE)³. Five UK installations – electricity generators in Northern Ireland – remain in the EU ETS under the terms of the Windsor Framework.

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

The Authority confirmed in its 2023 Authority Response⁴ that it intends to expand the scope of the scheme. This would mean including additional sectors in the UK ETS and capping a greater proportion of UK emissions to further contribute to delivering net zero and UK carbon reduction targets at lowest cost for industry. Subject to further consultation on the details of implementation, the expansion of scope would include:

- Maritime by 2026.
- Energy from waste and waste incineration in 2028 (preceded by a two-year phasing period from 2026-2028).
- Non-pipeline transport of carbon dioxide.

¹ DESNZ analysis based on DESNZ (2023), 'Provisional UK greenhouse gas emissions national statistics 2022', <https://www.gov.uk/government/statistics/provisional-uk-greenhouse-gas-emissions-national-statistics-2022>

² Based on operators with recorded 2022 emissions in UK ETS Emissions and Surrenders report published in May 2023: <https://reports.view-emissions-trading-registry.service.gov.uk/ets-reports.html>

³ See published list Hospital and Small Emitter list here: <https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-a-hospital-or-small-emitter>; See published list of Ultra-Small Emitters here: <https://www.gov.uk/guidance/opt-out-of-the-uk-ets-if-your-installation-is-an-ultra-small-emitter>

⁴ DESNZ, Welsh Government, The Scottish Government, and Department of Agriculture, Environment and Rural Affairs (Northern Ireland) (2023), 'Developing the UK Emissions Trading Scheme: main response', <https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets>

Emissions

In 2022, UK ETS-covered emissions amounted to 111 million tonnes of CO₂ equivalent (Mt CO₂e) – of which stationary installations accounted for 103 MtCO₂e and aircraft operators 8 MtCO₂e. This represents a year-on-year increase in UK ETS emissions of 3 MtCO₂e since 2021. This was driven by an increase in aviation activity following the end of the COVID-19 pandemic. This compares to total UK territorial emissions of 417 MtCO₂e in 2022.

Cap

In technical terms, the cap refers to the legal limit on the number of UK Allowances (UKAs) that can be created in each year. There is similarly a cap for the trading period (1 January 2021 to 31 December 2030). Whilst created as a form of a cap on emissions, these allowances will not automatically be surrendered for the year they are created since they can be banked for surrender in subsequent years or borrowed ahead of time. The cap does imply a limit on the emissions in scope of the scheme in the longer term, however, thereby acting as an abatement incentive.

The base annual cap level, before accounting for hospital and small emitters:

- in 2021 was 156 MtCO₂e,
- in 2022 cap was 151 MtCO₂e,
- in 2023 was 147 MtCO₂e,
- in 2024 will be 92 MtCO₂e,

In last year's Authority Response, the Authority committed to reduce the annual base cap to approximately 49 MtCO₂e in 2030 which means decreasing the overall Phase I, 2021-2030, base cap from 1,366MtCO₂e to 936MtCO₂e. This in line with the Carbon Budget Delivery Plan from March 2023, reflecting the full delivery of decarbonisation policies across sectors covered by the UK ETS such that the UK meets its carbon budgets (CBs) and nationally determined contribution (NDC) in 2030.

Section 2: UK Emissions Trading Scheme: Non-pipeline transportation of carbon dioxide

As noted in the consultation, the Authority is seeking stakeholder views on transportation of carbon dioxide.

The purpose of this section is to provide an overview and analysis of the impacts for the options. It is not intended to reflect the full evidence base on which decisions will be taken, nor all evidence on which proposals were developed, and we seek further evidence as part of this consultation.

In the Authority Response to this consultation, the Authority will set out impacts of combined proposals, considering the interaction of proposed options and overall scheme impacts.

Overview

Currently the UK ETS does not expressly recognise the transportation of CO₂ via other methods of transport for permanent geological storage in the same way as it does via pipelines.

As part of the 2022 consultation and response⁵, the Authority proposed that, in addition to allowing for transport via pipeline, the UK ETS expressly provide for the transportation of CO₂ through non-pipeline transport (NPT), which would be road, rail or shipping, by including them as a regulated activity. The Authority confirmed it planned to regularise treatment of pipeline and non-pipeline approaches and make clear that operators using NPT carbon capture storage (CCS) may claim ETS deductions. It also announced it would consider means of tracking and regulating NPT journeys.

The policy adjustment will make it clear that UK ETS participants who use NPT for CO₂ storage purposes are able to make carbon subtractions. This will be essential in encouraging greater uptake of carbon capture technologies outside of the industrial clusters and in driving further industrial decarbonisation.

The next step agreed by the Authority is to explore options for how NPT emissions can be handled through an appropriate regulatory model with the aim of implementation of the policy by the mid-2020s. This Consultation explores the different options to achieve this.

⁵ See the published documents for further details: <https://www.gov.uk/government/consultations/developing-the-uk-emissions-trading-scheme-uk-ets>

Rationale

The overall rationale for the change is to ensure consistent cost and benefit treatment for those operators using pipelines and those using other forms of transport.

This means that operators should not have to surrender allowances for each tonne of CO₂ transported via road, rail or shipping, just as they would not do so for transportation by pipeline, if the eventual result is sequestration of the CO₂ in geological formations.

This additionally means that emissions that occur because of transporting CO₂ – those from road vehicles, trains or ships – are in scope for consideration (pipelines do not generate emissions generally, but can result in fugitive emissions⁶). This requires considering the CO₂ emitted by the transport itself when calculating the overall deductions / cost.

Not ensuring this consistent treatment risks creating perverse incentives. This is because including pipelines only (or having that as the interpretation) means operators may make their CCS transportation choice based primarily or solely on whether the journey counts as within or outside of the UK ETS (because of the UK ETS costs and benefits). Instead, they should consider their choice based on the costs of the transportation itself and the cost of transportation emissions. It may result in operators not transporting CO₂, or less CO₂, as they do not see benefits from any non-pipeline transportation, reducing the overall use of CO₂ storage. It may also mean that non-pipeline transport would be considered over-priced compared to pipelines (if the CO₂ appears to be charged to operators as being emitted when it is instead on route to storage) which is likely to result in little or no non-pipeline transportation.

Transportation Options

This section looks at the options considered in the consultation. It considers their impact compared with current arrangements, setting out a qualitative assessment of these. More quantitative analysis of the approach will be developed for the Authority Response.

The options under consideration follow on from each other as the overall approach is considered before moving to the specifics. The consultation is structured to hear from participants on the options in sequence.

Option set 1: Methodology for when CO₂ is transferred

There are two approaches:

- NPT to be a regulated activity where transport companies require UK ETS permits and are responsible for the CO₂ in their custody.

⁶ Fugitive emissions are emissions not caught by a capture system which are often due to equipment leaks, evaporative processes and windblown disturbances.

- The responsibility for the CO₂ rests with the last UK ETS installation.

These have very different impacts.

NPT to be a regulated activity where transport companies require UK ETS permits and are responsible for the CO₂ in their custody

This approach would be in line with treatment of existing regulated activities – NPT operators would report their emissions (including transport and fugitive emissions) and these emissions would be subject to carbon pricing.

There are several impacts from this approach, primarily because additional operators in land transport would become part of the UK ETS. These operators would need to monitor, regulate and verify (MRV) their emissions. These new arrivals would have the additional costs of understanding and participating in the scheme or the alternative opt-out schemes. If they joined the main scheme, they would participate in the UK Allowance markets.

The responsibility for the CO₂ rests with the last UK ETS installation

Transport operators would not require a UK ETS permit under this methodology. When CO₂ arrived at the next UK ETS installation, the previous installation would transfer custody and, at that point, surrender allowances for fugitive and transport emissions (or just not be allowed to deduct emissions equivalent to fugitive and transport emissions). This leaves UK ETS responsibility with stationary installations (see also shipping) that are regulated by the UK ETS within existing obligations. Under this model, when CO₂ is transported via NPT methods, it will be moving “outside” the UK ETS. When it re-enters, fugitive emissions can be calculated via start and end-point metering.

The impacts for this are slightly different. The MRV requirements would sit with existing UK ETS operators so there would not be a learning curve about the scheme. However, agreement would need to be reached on the calculation of transport emissions, the regulation of intermediate/buffer stores, the approach to instances where CO₂ from multiple installations is mixed during the NPT journey, and the point at which final UK ETS responsibility for CO₂ should transfer. The overall cost will depend on agreement of all these factors. Responsibility for fugitive emissions would also rest with the last installation which sent the CO₂ for transportation (see Box 1). This is consistent with the other monitoring, reporting and verification (MRV) arrangements.

Box 1: Fugitive emissions example

If 1000 tonnes of CO₂ is sent from an installation A, and 980 tonnes of CO₂ arrives at the next installation B: the first installation can only deduct 980 tonnes of CO₂ from its surrender obligations. So, it effectively surrenders allowances for the missing 20 tonnes.

This has the impact of effectively assuming that any leakage or similar between installations is the responsibility of the “sending” installation rather than the “receiving” one.

Option set 2: Calculation of transport emissions

This category is about the approach to calculating emissions for road, rail and shipping.

Road

For road transport emissions, the option being considered is to apply an emissions factor to the mileage travelled. Emissions factors for road transport would likely be consistent with Government conversion factors for company reporting of greenhouse gas (GHG) emissions⁷.

According to the guidance:

There are two types of data which can be used to calculate the [Scope 1] vehicles emissions:

1) Fuel consumption data in litres, tonnes or kWh. In the instance of litres or tonnes, this can easily be converted to kWh using the fuel properties tab. This is the preferred and more accurate data to use.

2) Journey distance in km or miles. If the organisation doesn't have fuel consumption data (option 1), it may have a record of the distance travelled, for example, from expenses claims. In this instance, the km or miles data will need to be converted into kWh.

For road transport emissions, the second option seems to be the appropriate one. However, further work will consider whether fuel consumption data might be available. Box 2 gives an example approach to calculating the emissions from journey data with assumptions about the type of vehicle and load. This provides an initial estimate of the impact. Again, further work will determine if this is the best classification of the type of vehicle and its load for the transport of CO₂ by road. This would also be updated annually with the source data.

Box 2: Road emissions factors - calculation example

Note: This uses Government conversion factors for company reporting of GHG emissions 2023. Emissions factors for Heavy Goods Vehicles (HGVs) and conversions for diesel are shown in Appendix A copied from this source.

The calculation to determine emissions is:

GHG emissions = activity data x emission conversion factor

The calculation depends on the categories of Activity, Type and Laden level for the vehicle transporting CO₂. This produces a value in terms of kilowatt hours for net calorific value per tonne per kilometre.

In this example the assumption is HGVs using the type of "all HGV" and assuming "100% laden".

⁷ <https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting>

Source data gives 0.28 KWh (Net CV) per tonne per km

For the fuel used the value in kilowatt hours (net calorific value) can be converted to CO2 equivalent by using the appropriate fuel data.

In this example it is average biofuel blend diesel and the units are given in kilowatt hours for net calorific value.

Source data gives 0.25 kg CO2e per KWh (net CV).

So, emissions = $0.28 \times 0.25 = 0.07$ kg CO2e per tonne per km.

Therefore, if such a HGV was laden with 25 tonnes of CO2 and travelled 100 km:

GHG = $0.07 \times 25 \times 100 = 175$ kg CO2e = 0.2 tCO2e

The impact, in terms of the emissions that operators could be charged for, would be determined by the final emissions factors and journey length. This means establishing the specifics of the carriers (that is, what size of lorries, whether they would need to be refrigerated and what fuel they would use) as well as the length and number of journeys made.

Rail

The emissions from rail are calculated similarly to those from road (see Box 3). Emissions factors for rail would be consistent with Office for Road and Rail statistics⁸. As for road emissions, further work will determine if this is the most precise figure for transporting CO2 by rail. As for road, emissions factors are updated on a roughly annual basis.

Box 3: Rail emission factors – calculation example

According to the guidance, freight train emissions per net tonne kilometre were 26 grams of CO2e in 2022-23.

So this is 0.026 kg CO2e per tonne per km.

Therefore, if a typical freight train was laden with 25 tonnes of CO2 and travelled 100 km (to compare with the road example):

GHG = $0.026 \times 25 \times 100 = 65$ kg CO2e = 0.065 tCO2e

If a typical freight train was laden with 250 tonnes of CO2 and travelled 100 km:

GHG = $0.026 \times 250 \times 100 = 650$ kg CO2e = 0.65 tCO2e

⁸ <https://dataportal.orr.gov.uk/statistics/infrastructure-and-emissions/rail-emissions/>

The impact, in terms of the emissions that operators will be charged for, is similar to that for road. The volume of emissions will depend on the final emissions factors and journey length. This, in turn, means the specifics of the trains used and the length and number of journeys made.

Shipping

The Authority aims to expand the scope of the UK ETS to include maritime emissions based on vessel activity from 2026. Therefore, the shipping element of NPT is different from that for road and rail as shipping will be part of the traded sector. This means there are a number of options for covering the shipping of CO₂.

Option 1 is to align with existing maritime proposals. This means that the last stationary UK ETS installation would retain UK ETS custody of CO₂ moved by ship, until it was transferred to another stationary installation or storage site. This would not make transport by ship a separate regulated activity, but would instead use the UK ETS provisions for maritime to cover these emissions.

In terms of impact, this would have no direct impact on the maritime sector, although it is possible that there would be indirect impacts as the installations would not have to pay for the maritime emissions in the same way as they would for road and rail, but maritime would be expected to have passthrough costs from their inclusion in the UK ETS.

Option 2 is to align with existing maritime proposals, but with additional MRV requirements. Under this approach, ships over 5000 gross tonnage (GT) would have to comply with fuel based MRV requirements as given in the UK ETS Maritime proposals. These ships would also be required to MRV the flows of CO₂ to and from the ship, and surrender allowances for any differences between CO₂ transferred in, and CO₂ transferred out, making them responsible for any fugitive/vented/lost CO₂. Installations transferring CO₂ to a UK ETS-regulated ship would be allowed to deduct that CO₂ from their UK ETS surrender obligations. Otherwise, this is as above, that the last stationary UK ETS installation would retain UK ETS custody of CO₂ moved by ship, until it was transferred to another stationary installation or storage site.

In terms of impact, this would require the maritime sector to have the additional MRV put in place. There would also be the possibility, as under option 1 of indirect impacts; maritime would be expected to have passthrough costs from their inclusion in the UK ETS.

Option 3 is to make transport of CO₂ by ship a separate regulated activity. This would mean ships transporting CO₂ would form some of the nodes in the regulated Transport and Storage (T&S) network. As regulated UK ETS installations, they could also take over UK ETS responsibility.

In terms of impact, this would mean additional MRV for maritime vessels including requiring them to cover the emissions where CO₂ is moved from ships to road and/or rail before reaching its next installation.

There is an additional question of how to treat ships below the 5000GT threshold. The current maritime proposals do not include regulation of shipping under 5000GT. However, if carbon pricing is applied via transport emissions factors to road and rail, then for completeness, the emissions of all ships transporting CO₂ should be captured also (this means Option 3 would apply to all ships). Therefore, the Authority is considering a proportionate approach using a single, per tonne per kilometre based emissions factor.

In terms of impact for these smaller vessels, this will depend on how transport on such ships is included and the emissions factor chosen.

The consultation also covers the possibility of ships collecting CO₂ from more than one store or port. In these circumstances, more than one UK ETS installation might be responsible for the CO₂ on the ship. To share responsibility for any vented, fugitive emissions, a proportionate tonne kilometre based approach is set out (see Box 4).

Box 4: Shipping example

If a ship transports:

1000 tonnes of CO₂ from Installation A for the whole of a 30km journey,
plus a further 1000 tonnes of CO₂ from Installation B for only 10km of the 30km journey,
the whole journey is $(1000 \times 30 + 1000 \times 10) = 40,000$ tonne kilometres.

Installation A is responsible for 30,000 tonne kilometres, or 75% of the total for the journey. Therefore, 75% of any fugitive emissions or venting, as calculated at the final delivery point, are assigned to Installation A.

Installation B is responsible for 10,000 tonne kilometres, or 25% of the total for the journey. Therefore, 25% of any fugitive emissions or venting, as calculated at the final delivery point, are assigned to Installation B.

This means each installation is responsible for the proportion of total emissions that they represent in tonne kilometres of the journey. The final delivery point for CO₂ and any pick-up points would be either UK ETS regulated, or the responsibility of a single UK ETS installation which would be able to take on UK ETS custody for the CO₂ delivered.

In terms of impact, this proposed approach should spread the cost of emissions proportionately and is therefore in-keeping with the overall approach of consistent treatment.

Option set 3: Intermediate Storage

Intermediate storage refers to a temporary storage phase during the transportation or handling process of CO₂. Intermediate stores may be used:

- Before CO₂ leaves a capture facility.

- Before transfer into the T&S network/storage site.
- As buffer during the capture, transport, storage process.
- To facilitate transfer between transport types (e.g. at port).

Existing legislation covers emissions from intermediate storage facilities at capture facilities and in the pipeline network. However, intermediate storage during NPT journeys is not currently captured. The Authority is considering three approaches to the regulation of intermediate storage.

Option 1 – Limit regulation to in/out flow metering

This means not tracking or assigning responsibility for CO₂ during the NPT journey; instead, calculations are made once the CO₂ arrives at a known final delivery point. Each originating installation would be allowed to deduct a proportion of the CO₂ delivered to storage, based on the proportion of total CO₂ it transferred out.

The effect on operators of this option would be no additional MRV requirements for any installations, but that less would be known about where CO₂ was held at any one time. If CO₂ disappeared (for example, a sunk ship, or it being mixed with a batch that meant it no longer passed purity test) then there is a greater risk that it would be unclear at what stage it had happened and what the possible consequences were.

Option 2 - Regulate all storage sites as if they were in the CCS T&S Network

This means that there would effectively be no intermediate storage as all intermediate stores in the NPT process would become UK ETS installations with full MRV requirements.

This would mean a larger number of installations coming into the UK ETS or there would be less construction of CO₂ storage, or closing down / non-completion of any CO₂ storage, because of the costs. The CO₂ overall would be much easier to monitor, but might make the overall transportation network more costly as only UK ETS installations could be involved in any sort of storage.

Option 3 – Use a mixture of light-touch and full regulation

This option involves a mixture of light-touch and full regulation, depending on the scale/type of storage site, requiring different metering and testing. Sites that are exclusively within the NPT chain of a single originating UK ETS installation could either have simple flow metering or no metering within existing permitting regimes and emissions could be calculated at the point of transfer to the next UK ETS installation. Sites that store CO₂ from multiple installations would be treated as nodes in the T&S network, that is as standard storage sites and would be regulated UK ETS installations, subject to those requirements.

The impact on operators and therefore CCS use might be complex and there are various risks involved. This means it could bring some intermediate sites into the UK ETS and they would be subject to the costs of the scheme. Alternatively, it could persuade operators to serve one installation which would lead to fewer installations but possibly more expertise at them. There

are risks that it might discourage operators building CO₂ storage, and/or that it might close any existing CO₂ storage / result in non-completion of planned storage.

Option set 4: Mixing of CO₂, and Transfer of UK ETS responsibility

The NPT regulatory model will need to provide appropriate, consistent oversight when CO₂ from multiple UK ETS installations is stored in the same facility. This includes setting when UK ETS responsibility, that is custody of CO₂, should transfer between installations. The approach will need to be consistent with the decisions on treatment of intermediate storage.

Regulation of mixed CO₂

Where CO₂ from multiple installations is stored or transported together, a clear determination of UK ETS responsibility is needed. The Authority is considering three alternatives.

Option 1 is to prevent contamination and ensure chain-of-custody is traceable by only allowing CO₂ to be transported in sealed ISO (International Organization for Standardization) standard gas containers. Transport emissions would be simple to calculate as containers could be tracked through their journey. Only metered and regulated sites could open or transfer from these containers.

One impact would be a simple traceable chain of CO₂ with clear ownership. However, another is that it would limit the movement of CO₂ to those operators for whom this one approach fitted their operation and there could be large set-up costs for others wanting to enter this market.

Option 2 is to restrict mixing to regulated UK ETS intermediate stores.

The impact would be that any storage site used for mixing would need to be a UK ETS installation with MRV requirements. This means there could be a number of possible outcomes. The first is a larger number of installations entering the UK ETS compared to when not having this restriction, the second that fewer sites will mix CCS than would have happened without this restriction because they do not wish to join the UK ETS, the third is that it could result in closing down CO₂ mixing in existing sites because of the costs of belonging to the UK ETS, the fourth outcome is some combination of the previous options. Under any of them, the CO₂ overall would be much easier to monitor, but might result in the overall transportation network more costly as only UK ETS installations could be involved in any sort of mixing and being in the UK ETS has administration costs which are likely to be passed on.

Option 3 is to limit regulation of intermediate storage and allow unregulated mixing of CO₂ outside the UK ETS. This would require stores to meter and assign CO₂ to originating installations.

The impact is the CO₂ would be more complex to track. It would require additional consideration for assigning fugitive emissions and there would be a risk of penalising compliant installations if their batch was then mixed with non-compliant CO₂ from elsewhere.

Transfer of UK ETS responsibility

The Authority is considering two approaches to transferring responsibility.

Option 1 is that UK ETS responsibility transfers at each installation in the chain, with each major intermediate store treated as a full installation.

The impact is that there is greater oversight of the transportation of CO₂ but may mean some installations will have additional UK ETS responsibilities and administrative costs. This is similar to making temporary storage sites comply with the UK ETS and will reflect those impacts.

Option 2 is that UK ETS responsibility transfers only when CO₂ reaches final geological storage or the T&S pipeline network.

The impact is that this allows storage sites to not comply with the UK ETS arrangements and, depending on the final Authority Response, possibly MRV arrangements. However, there are also impacts, as given earlier, around unregulated mixing: that the UK ETS installations responsible will have less control over issues arising from mixing and fugitive emissions.

Interdependency

There is overlap between the options under consideration. For example, the decisions about when a storage site should be a UK ETS installation will depend both on which sites they serve and whether mixing takes place.

The impact of the choices made will depend on the combination of options rather than each option being valued independently.

Interactions with Greenhouse Gas Removals (GGRs)

In the Authority Response to the Developing the UK ETS consultation, the Authority stated that it believed the UK ETS was an appropriate long-term market for GGRs and intended to include engineered GGRs in the UK ETS, subject to further consultation and consideration.

Some engineered GGRs may use NPT as part of their processes to capture and store carbon. It is therefore important that the regulatory options proposed for NPT under the UK ETS address any specific implications for GGRs.

The impact will depend on the planned arrangements for GGRs, these would need to incorporate measuring or metering CO₂ transfers.

Adjustment to the UK ETS cap

The Authority proposed not to make a cap adjustment for NPT. This is because it would not constitute a change in the composition of the traded sector through either: a) the inclusion of a new sector into the UK ETS, or; b) an expansion of coverage in existing sectors of the UK ETS.

Making clear provision for NPT in the UK ETS may make CCS more economically viable, and thus more accessible, for some dispersed industrial sites. This NPT policy will likely lead to a small amount of additional Scope 1 emissions. These may include transport emissions from trains/trucks carrying CO₂, and any direct process emissions (e.g. on-site fossil fuel combustion) from UK ETS-regulated storage sites. However, these are currently expected to be very small in proportion to the total amount of CO₂ being transported by NPT. The main impact of the policy on total emissions within the traded sectors will be through increased use of CCS: more CO₂ being stored by some installations, and therefore lower total CO₂ emissions for those installations.

CCS is a decarbonisation technology, and as a point of policy, increased access to or viability of decarbonisation technologies should not lead to a cap adjustment. In this sense, increased access to CCS for dispersed sites would be no different than if any other decarbonisation technology were to become less expensive or more technologically viable. Investment in NPT CCS technology would be analogous to investment in, e.g., energy efficiency or electrification.

On this basis, the Authority proposed that a cap adjustment is not required for NPT.

Section 3: Analytical considerations for the Authority Response

Following the consultation, the Authority Response will assess the feasibility and impact of setting out clear legislation for the use of NPT of CCS in more detail, considering stakeholders' responses to this consultation. This will be based upon analysis of the options presented in this consultation.

There are a number of options under consideration, grouped into sets, and the overall effect, including any costs or benefits will depend on what the Authority agrees for its approach. As CCS transportation is primarily a new sector, these costs and benefits will generally be future impacts rather than current ones.

The Authority Response will also assess the following considerations.

Emissions reductions and carbon prices, and wider environmental impacts

The primary benefit of an emissions trading scheme is the benefit to society of emissions reductions (abatement) that are achieved as a result of the policy. The consultation to cover NPT in the UK ETS will not change overall emissions directly. However, it may incentivise abatement in this sector and have some effect on the carbon price depending on whether the response changes the transportation used. The Authority will also look to consider wider environmental impacts where data allows.

Compliance costs

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

The effect on compliance costs will depend on which changes are made. In general, it will allow operators using NPT CCS to claim UK ETS deductions but will also result in adding NPT journeys to the traded sector, which would previously not come within the UK ETS.

Administrative costs

These will depend on which changes are made and how they affect the operators both currently within the UK ETS and those that are brought in as a consequence of the changes in the Authority Response. Administrative costs, those relating to belonging in the UK ETS, may be applied to a greater or smaller number of, mainly future, installations, depending on the options chosen. Any new installations which join the UK ETS as a result of the changes will also have set-up costs, based on previous assessments⁹.

⁹ See *Assessment of costs to UK participants of compliance with Phase III of the EU emissions trading system*: https://assets.publishing.service.gov.uk/media/5ccb1d40e5274a34eb6b991f/Cost_of_Compliance_Report.pdf

Appendix A: Emission Data for Road

Road emissions factors¹⁰

Activity	Type	Unit	0% Laden	50% Laden	100% Laden	Average Laden
			kWh (Net CV)	kWh (Net CV)	kWh (Net CV)	kWh (Net CV)
HGV (all diesel)	Rigid (>3.5 - 7.5 tonnes)	tonne.km		1.75	0.95	2.02
		km	1.78	1.93	2.09	1.91
		miles	2.86	3.11	3.36	3.08
	Rigid (>7.5 tonnes-17 tonnes)	tonne.km		0.99	0.55	1.39
		km	2.12	2.43	2.73	2.33
		miles	3.42	3.91	4.40	3.75
	Rigid (>17 tonnes)	tonne.km		0.79	0.47	0.60
		km	2.93	3.57	4.21	3.83
		miles	4.71	5.75	6.78	6.17
	All rigids	tonne.km		0.84	0.49	0.70
		km	2.58	3.08	3.58	3.24
		miles	4.16	4.96	5.75	5.21
	Articulated (>3.5 - 33t)	tonne.km		0.45	0.27	0.45
		km	2.40	3.00	3.60	3.00
		miles	3.86	4.83	5.79	4.83
	Articulated (>33t)	tonne.km		0.36	0.23	0.29
		km	2.46	3.28	4.09	3.57
		miles	3.95	5.27	6.59	5.75
All artics	tonne.km		0.36	0.23	0.29	
	km	2.45	3.26	4.07	3.55	
	miles	3.95	5.25	6.55	5.71	
All HGVs	tonne.km		0.47	0.28	0.38	
	km	2.51	3.19	3.87	3.42	
	miles	4.03	5.13	6.23	5.50	

Activity	Type	Unit	0% Laden	50% Laden	100% Laden	Average Laden
			kWh (Net CV)	kWh (Net CV)	kWh (Net CV)	kWh (Net CV)
HGV refrigerated (all diesel)	Rigid (>3.5 - 7.5 tonnes)	tonne.km		2.09	1.13	2.41
		km	2.12	2.31	2.49	2.28
		miles	3.41	3.71	4.01	3.67
	Rigid (>7.5 tonnes-17 tonnes)	tonne.km		1.18	0.66	1.66
		km	2.53	2.90	3.26	2.78
		miles	4.08	4.66	5.24	4.47
	Rigid (>17 tonnes)	tonne.km		0.94	0.56	0.72
		km	3.49	4.26	5.03	4.57
		miles	5.62	6.86	8.09	7.36
	All rigids	tonne.km		1.01	0.59	0.83
		km	3.08	3.67	4.27	3.86
		miles	4.96	5.91	6.87	6.22
	Articulated (>3.5 - 33t)	tonne.km		0.52	0.31	0.52
		km	2.78	3.48	4.17	3.48
		miles	4.48	5.60	6.72	5.60
	Articulated (>33t)	tonne.km		0.42	0.26	0.34
		km	2.85	3.80	4.75	4.14
		miles	4.58	6.11	7.64	6.66
All artics	tonne.km		0.42	0.26	0.34	
	km	2.85	3.78	4.72	4.11	
	miles	4.58	6.09	7.60	6.62	
All HGVs	tonne.km		0.55	0.33	0.45	
	km	2.94	3.74	4.54	4.01	
	miles	4.73	6.02	7.30	6.46	

¹⁰ <https://www.gov.uk/government/collections/government-conversion-factors-for-company-reporting>

UK ETS: Non-pipeline transportation of carbon dioxide consultation: analytical annex

Activity	Fuel	Unit	kg CO ₂ e	kg CO ₂ e of CO ₂ per unit	kg CO ₂ e of CH ₄ per unit	kg CO ₂ e of N ₂ O per unit
Liquid fuels	Aviation spirit	tonnes	3193.69	3,127.67	39.52	26.50
		litres	2.33	2.28297	0.02885	0.01934
		kWh (Net CV)	0.26	0.25135	0.00318	0.00213
		kWh (Gross CV)	0.24	0.23878	0.00301	0.00203
	Aviation turbine fuel	tonnes	3178.37	3,149.67	2.20	26.50
		litres	2.54	2.51973	0.00176	0.02120
		kWh (Net CV)	0.26	0.25826	0.00018	0.00217
		kWh (Gross CV)	0.25	0.24535	0.00017	0.00206
	Burning oil	tonnes	3165.04	3,149.67	8.40	6.97
		litres	2.54	2.52782	0.00674	0.00559
		kWh (Net CV)	0.26	0.25849	0.00069	0.00057
		kWh (Gross CV)	0.25	0.24557	0.00066	0.00054
	Diesel (average biofuel blend)	tonnes	3015.65	2,976.42	0.35	38.89
		litres	2.51	2.47887	0.00029	0.03290
		kWh (Net CV)	0.25	0.25076	0.00003	0.00330
		kWh (Gross CV)	0.24	0.23595	0.00002	0.00310
	Diesel (100% mineral diesel)	tonnes	3203.91	3,164.33	0.35	39.23
		litres	2.66	2.62600	0.00029	0.03308
		kWh (Net CV)	0.27	0.26469	0.00003	0.00330
		kWh (Gross CV)	0.25	0.24881	0.00002	0.00309
	Fuel oil	tonnes	3228.89	3,216.38	5.39	7.12
		litres	3.17	3.16262	0.00530	0.00701
		kWh (Net CV)	0.29	0.28413	0.00047	0.00063
		kWh (Gross CV)	0.27	0.26709	0.00045	0.00060
	Gas oil	tonnes	3226.58	3,190.00	3.68	32.89
		litres	2.76	2.72417	0.00315	0.02809
		kWh (Net CV)	0.27	0.26978	0.00031	0.00278
		kWh (Gross CV)	0.26	0.25359	0.00029	0.00261
	Lubricants	tonnes	3181.00	3,171.09	3.43	6.48
		litres	2.75	2.74	0.00	0.01
		kWh (Net CV)	0.28	0.28013	0.00030	0.00057
		kWh (Gross CV)	0.26	0.26332	0.00028	0.00054
	Naphtha	tonnes	3142.38	3,131.33	3.82	7.23
		litres	2.12	2.11	0.00	0.00
		kWh (Net CV)	0.25	0.24804	0.00030	0.00057
		kWh (Gross CV)	0.24	0.23564	0.00029	0.00054
	Petrol (average biofuel blend)	tonnes	2806.66	2,787.93	10.84	7.89
		litres	2.10	2.08354	0.00806	0.00587
		kWh (Net CV)	0.23	0.23242	0.00090	0.00065
		kWh (Gross CV)	0.22	0.22021	0.00084	0.00061
	Petrol (100% mineral petrol)	tonnes	3154.08	3,135.00	11.04	8.04
		litres	2.35	2.33086	0.00820	0.00597
kWh (Net CV)		0.25	0.25289	0.00090	0.00065	
kWh (Gross CV)		0.24	0.24025	0.00085	0.00061	
Processed fuel oils - residual oil	tonnes	3228.89	3,216.38	5.39	7.12	
	litres	3.17	3.16262	0.00530	0.00701	
	kWh (Net CV)	0.29	0.28413	0.00047	0.00063	
	kWh (Gross CV)	0.27	0.26709	0.00045	0.00060	
Processed fuel oils - distillate oil	tonnes	3226.58	3,190.00	3.68	32.89	
	litres	2.76	2.72417	0.00315	0.02809	
	kWh (Net CV)	0.27	0.26978	0.00031	0.00278	
	kWh (Gross CV)	0.26	0.25359	0.00029	0.00261	
Refinery miscellaneous	tonnes	2944.32	2,933.33	3.80	7.19	
	litres					
	kWh (Net CV)	0.26	0.25864	0.00034	0.00063	
	kWh (Gross CV)	0.25	0.24571	0.00031	0.00060	
Waste oils	tonnes	3219.38	3,171.09	3.55	44.74	
	litres	2.75	2.71	0.00	0.04	
	kWh (Net CV)	0.27	0.27047	0.00030	0.00381	
	kWh (Gross CV)	0.26	0.25256	0.00028	0.00357	
Marine gas oil	tonnes	3245.30	3,205.99	0.91	38.41	
	litres	2.77	2.73782	0.00077	0.03280	
	kWh (Net CV)	0.27	0.27113	0.00008	0.00325	
	kWh (Gross CV)	0.26	0.25486	0.00007	0.00305	
Marine fuel oil	tonnes	3154.75	3,113.99	1.42	39.34	
	litres	3.10	3.06194	0.00140	0.03868	
	kWh (Net CV)	0.28	0.27509	0.00012	0.00348	
	kWh (Gross CV)	0.26	0.25858	0.00012	0.00326	

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