Dr John Leach
E-mail: john.leach@jlis.co.uk

A carbon tax or an emissions trading scheme for reducing the UK's greenhouse gas emissions

In this paper I explain the principles behind how a carbon tax and an emissions trading scheme (ETS) work and discuss some of the key design considerations that need to be thought through. I compare the suitability of each approach to the problem of avoiding catastrophic climate change and come to a conclusion as to which approach I think would be best for the UK (and for most other regulators) to take in order to achieve net-zero GHG (greenhouse gas) emissions by a chosen date[1].

Conclusion

The strongest argument in favour of an ETS is an appropriateness argument. In the situation where there are emissions tipping points at which the environmental harm from GHG emissions could quickly become catastrophic, and we do not have the political or economic tools to get globally coordinated action or agreed costings of climate or environmental harms, an ETS is a far more appropriate solution than a carbon tax.

The strongest argument in favour of a carbon tax is its relative simplicity, immediacy of implementation and breadth of reach. In the situation where we need to achieve significant emissions reductions immediately and we need those reductions to be achieved across all sources of GHGs, a carbon tax is a far more appropriate solution than an ETS.

Regardless of whichever approach is adopted, a carbon tax or an ETS[2], the overwhelming requirement bar none is that the carbon price (whether achieved by an ETS or set by a tax) must be high enough and that price must be applied robustly enough that the chosen approach can achieve the crucial goal of getting the UK to net-zero or negative GHG emissions by 2050 at the very latest.

I am of the view that, for the UK, given the size of its economy, its willingness to accept market regulation, its prior experience operating its own ETS and participating within the EU ETS, and the need for countries to act urgently without having to wait for globally coordinated action, the balance of the argument falls in favour of an ETS and that the UK (and many others, for the same reasons) should develop an ambitious ETS in preference to imposing a carbon tax. The ETS would need to be implemented in a way that addresses the issues that otherwise make the carbon tax approach attractive such as implementing it as a matter of urgency and achieving as broad a coverage of all UK GHG emissions as it practicably can. If the UK and most other countries were to implement a carbon tax instead, mankind would be less likely to achieve the crucial (if not existential) goal of achieving net-zero GHG emissions by a chosen date.

[1] My primary reference for my discussion of how a carbon tax and an ETS might work has been *Trade and climate change: WTO-UNEP Report. Geneve: WTO. 2009*

[2] In theory, the UK could implement both, an ETS and a carbon tax, but that would seem to me to mean twice the effort for no additional benefit.

Dr John Leach
E-mail: john.leach@jlis.co.uk

Introduction

A carbon tax and an emissions trading scheme (ETS) are two different ways of achieving the same aim: to internalise the environmental cost of GHG or CO_2 emissions by setting a price, known as a carbon price, on the emissions generated by polluting activities. Putting an appropriate price on carbon should:

- Ensure that polluters pay some or all of the environmental costs that arise from their GHG emissions;
- Encourage individuals and businesses to move away from the use of high-carbon goods services and operations, and to invest in low-carbon alternatives; and,
- In the long run, promote innovation in new methods, products and services that meet consumer demand while reducing GHG emissions.

In order to be fully efficient, a carbon price should be set at a level that internalises the full costs of the environmental damage caused by GHG emissions, so prices reflect real environmental costs. A compromise would be to set the carbon price at a level sufficient to influence taxpayers' behaviours enough to achieve national environmental objectives. In each case, the carbon price indicated should be very much higher than the carbon prices being set today by existing taxes and ETSs. All existing initiatives suffer from timidity.

Models employed to determine the optimal trajectory of a carbon tax show it rising many-fold over time. The logic is that the current carbon price should be set to equal the marginal damage caused by current emissions. Over time, this marginal damage will increase as the amount of CO_2 in the atmosphere grows so that, to internalise these rising costs, the carbon price must increase to match. We need to be thinking in terms of a carbon price in the range £100-200 per tonne of CO_2. The carbon price within the EU ETS in March 2019 was 22€/tonne.

A carbon tax

A carbon tax could work in a variety of different ways.

- Ideally, a carbon tax would be applied to the measured outputs (CO_2 emissions) generated by the use of fossil fuels.
- To avoid the complexity of measuring outputs, it is more often based on measured inputs, i.e. on the emissions expected given the quantity and type of fuel used (the carbon content of the fuel – coal, oil, natural gas – times the quantity of that fuel used).
- If the tax is based on fossil fuel consumption, it can under-tax other sources of CO_2 emissions that are not solely fossil fuel-based (e.g. cement industry).
- Sometimes it is applied as an energy tax rather than as a carbon tax. This penalises non-fossil fuel energy (which would have a zero carbon tax liability) and lightens the tax load on coal relative to oil and gas (coal has a lower energy density than oil and

gas even though it produces more CO_2 for the energy released). Neither of these attributes is desirable.

- Also an energy tax incentivises energy savings and energy efficiency (so has a de-facto effect on emissions) but does not incentivise the generation of clean (zero GHG) energy. For this reason, an energy tax is not a good solution for combating climate change. Given there is abundant sustainable energy available should we wish to harness it, we do not need to reduce energy consumption, only fossil fuel-generated energy production. An energy tax does not do this.
- The carbon tax could be levied on producers or on consumers. These two approaches would normally be revenue-equivalent but can have different incentivisation outcomes. Usually the tax is applied on consumers, i.e. 'at the pump' as this is normally simpler and cheaper to apply.

Finland was the first country to enact a tax (1990), joined swiftly by a handful of other European countries. Taxation has not been adopted widely outside Europe except in a few places and then it was adopted primarily at a provincial-level rather than national-level (two Canadian provinces in 2007 and the SF Bay Area in 2008).

A small number of countries have introduced taxes on other GHGs: notably France (N_2O); Norway (HFCs and PFCs); Denmark (HFCs, PFCs, SF_6).

Emissions Trading Schemes

Concept

The basic idea of an ETS is:

- Fix a scheme-wide cap on permitted GHG emissions for the year (typically expressed in tonnes of CO_2);
- Translate this into the total number of emissions permits to be brought into existence for that year;
- Each emitter is required to hold permits to cover its emissions for each year;
- The scheme regulator usually issues a proportion of the permits free-of-charge and allows the remainder to be bought from them at a fixed price or traded on a market to set a going price;
- Old permits are retired at the end of the year and new 1-year permits created and allocated, sold or auctioned.

Provided sufficient permits are auctioned, the going price for a permit should reflect the marginal cost of emissions reduction in those places within the participating industries where emissions reduction can be achieved at the cheapest price.

History

The first ETS was set up in the USA in 1977 with the aim to reduce air pollution rather than GHG emissions (it was created in response to the Clean Air Act Amendments of 1977). It was extended in 1990 to cover SO_2.

The idea of using ETSs as a way for countries to drive down their GHG emissions was recognised as an acceptable method within the Kyoto Protocol (1997). This resulted in a small number of national mandatory ETSs being created (Denmark in 2001; Norway in 2005; Switzerland 2008; New Zealand 2008; Canada 2010) and sub-national schemes (in Australia, USA). It also led to the creation of a small number of voluntary schemes (the UK in 2002; Chicago Climate Exchange in 2003; Japan in 2005).

The EU created the first mandatory multi-national multi-industry ETS in 2005. It was easily the largest ETS in operation and remained so until 2017 when it was overtaken in size by the then new Chinese national ETS. The EU ETS remains in operation and is expected to persist for another decade at least.

ETS design

Several design criteria are key to the effectiveness of an ETS at reducing GHG emissions:

Type – 'Cap & Trade' or 'Rate-based'.

- Cap & Trade is where the regulator sets an overall emissions cap and creates permits to that level. The cap falls over time to drive emissions down.
- Rate-based is where the regulator decides on a standard amount of emissions for each unit of production in each industry and members of that industry are required not to exceed that rate.
- Rate-based generates uncertainty regarding the overall level of emissions that will be produced and is administratively heavier to operate than Cap & Trade.

Scope – size of participants.

- The concern here is what should the lower bound be on the amount of emissions an emitter produces for that emitter to be required to participate in the scheme? If it is set low, 'small' emitters are included which is burdensome for the small emitter given that their contribution to reducing overall GHG emissions is trivial. If it is set high, the aggregate GHG emissions from non-participants will remain too high for the ETS to have enough effect on overall GHG emissions. In the current (3rd) trading period of the EU ETS, emitters emitting less than 25,000 tonnes of CO_2 p.a. are permitted to opt out of the scheme.

Scope – sectors covered.

- The wider the range of sectors covered by the ETS, the more fair and economically efficient the ETS will be and the greater the potential for it to have a worthwhile effect on GHG emissions.

- In the 2nd trading period of the EU ETS, the ETS covered power generation, iron and steel, glass, cement, pottery and bricks, plus a few others. In the 3rd trading period, that was extended to include petrochemicals, ammonia and the aluminium sector.
- Some sectors are not as simple to address than others. For example, international aviation and shipping; when the people or goods are being transported to/from a port outside the jurisdiction of the scheme, in which cases should the associated emissions be deemed within scope (Outbound? Inbound? Nationally licensed carriers?) and what proportion of those emissions should be counted (all or 50%?).
- A somewhat similar concern applies to manufacturing, and how to address 'embedded' emissions, the emissions released in the production of the goods. If the goods are produced within the regulated territory but consumed outside the territory, or conversely produced outside but consumed within, in which cases and how much of those emissions should be counted?

Scope – gases covered

- The huge majority of ETSs (including the EU ETS to 2012) cover only CO_2. New Zealand considered covering methane (CH_4) but decided against the idea.

Permits – the balance between allocate, sell and auction

- Usually a proportion of the permits are allocated, i.e. issued free of charge (FoC) by the regulator, either based on historical emissions ('grandfathering' when a scheme is new) or on the basis of a standard of emissions per unit of output ('benchmarking' for trade-exposed industries, i.e. industries commercially exposed to competitors residing outside the scheme).
- Some of the unallocated permits are sold by the regulator at a set price and the remainder auctioned and traded between participants. Auctioning provides the price signal that should then influence emitters and aggregate emissions.
- The balance between the proportions of permits allocated, sold and auctioned reflects the strength of the regulator's emissions-reduction intent vs other national concerns such as competitiveness. Switzerland started by allocating 100% of its permits. The EU, in the 2nd trading period, allocated all but 4% of its permits. In the 3rd trading period, it set that to be nearer 50%.

Permits – supply of permits

- A permit permits the emission of one tonne of CO_2 (or CO_2e if other GHGs are covered). Those who emit less than the amount permitted by the number of permits they hold can sell their excess permits (or cancel them). Those who emit more are required to purchase additional permits to cover their excess emissions.
- If there is a limited supply of permits for sale, the market price for each available permit will rise until the supply matches the demand. This should happen when those

who can achieve reductions most easily choose to reduce their emissions so they can sell their unused permits at a premium to their reduction cost.

- The going price will depend on the proportion of permits allocated FoC as well as the marginal cost of emissions reduction. The supply needs to be sufficiently tight otherwise the price will not get high enough to incentivise reductions. This was the case in the 1st and 2nd trading periods of the EU ETS (to 2012).
- The penalties for non-compliance (i.e. emitting more than is covered by the permits held) has to be high as that serves as the ceiling for the spot price for permits.

Permits – applied upstream or downstream

- Permits can be applied to upstream or downstream sources. Upstream means applied to producers and importers of fossil fuels. Producers and importers have few options to reduce the emissions from the fossil fuels they produce but are few in number so the scheme is administratively simpler to operate. Downstream means applied to the users of fossil fuels, these being the actual emitters. Users have many options for reducing their emissions but, as they are many in number, the scheme is administratively heavier to operate.
- Most schemes apply to downstream users except where the user is a consumer (e.g. a user of private transport) in which case it can be applied one step upstream of the user (i.e. to the sellers of fuel to consumers) with the supplier passing the cost on to the consumer.

Linkage between ETSs

- Harmonisation is needed where schemes abut in a competitive market otherwise one set of participants (those residing in the most ambitious ETS) will be competitively disadvantaged against the others (those residing outside that ETS).
- Linkage between ETSs creates larger schemes in practice which should reduce the cost of permits, increase liquidity and reduce price volatility (all of which are normally considered to be positives).
- Offsets are where credit is given for achieving reductions in one market that are accepted as offsetting emissions that occur elsewhere in another market. For example, verified tree planting or methane capture overseas could be used to offset emissions covered within a scheme if deemed acceptable by the scheme's regulator.

Banking and borrowing

- Banking is where unused permits can be carried over to the next year. This helps reduce supply and price volatility while large emitters find their feet within a scheme and want to avoid penalties for accidental non-compliance. It also compensates emitters who achieve higher than necessary reductions in a year, and provides cover for investment in multi-year emissions reduction plans.

- Borrowing is the obverse of banking. An emitter can 'pull forward' some of next year's allowance into this year in anticipation that for them the cost of making reductions next year will be cheaper than doing so this year. Only short term borrowing can be allowed if emissions caps are to remain effective.

Compare and contrast – a carbon tax or an ETS

Economic efficiency

In the case of a carbon tax, the carbon price is determined directly by the regulator through the tax rate it sets, leaving the quantity of emissions reduction that will be achieved to emerge as the aggregate result of all the measures taken by each of the scheme's participants to reduce their individual emissions in order to reduce their tax liabilities. Each participant adjusts its level of emissions individually to the carbon price set by the tax. A tax provides carbon price certainty for participants but emissions reduction uncertainty for society at large.

In the case of an ETS, the quantity of emissions reduction to be achieved is determined by the regulator in the form of an emissions cap leaving the carbon price to be determined by the market according to the supply and demand of emissions permits. The carbon price adjusts itself to the marginal abatement cost, that is the cost of reducing one additional unit of emissions somewhere within the scheme. An ETS provides emissions certainty for society at large but carbon price uncertainty for participants.

Because, under an ETS, the carbon price is set by the lowest abatement cost that can be found anywhere within the scheme, an ETS is generally considered to be the most economically-efficient approach to achieving emissions reduction.

Appropriateness to the climate challenge

Price certainty is always desirable as that makes it easier for regulated participants to plan for and manage the emissions reductions society at large needs them to achieve. The question to be considered here is what criteria could possibly make emissions certainty become more important than price certainty?

In the case of stock pollutants (pollutants that accumulate over time) where the damage the pollution causes is a steadily rising function of the total amount of pollution emitted over time[3], then (in principle) society can decide democratically at what level it chooses to cap emissions and what amount of consequential climate change harm it is prepared to tolerate. I.e. mankind can decide globally how much disruption and cost it is prepared to put into capping global atmospheric GHG concentrations at a particular level against how much disruption and cost it would then need to put into dealing with the consequences of that level of atmospheric GHGs (sea-level rise, sea acidification, wild fires, tornadoes and hurricanes,

[3] That is, the harm increases smoothly as the total level of pollution increases, in a way that need not be exactly linear but does not vary radically away from linear over a broad range.

desertification, habitat loss, species extinction, etc.). The carbon price could be set so that the emissions that would take us from where we are today to that agreed level of atmospheric GHGs would provide all the revenues needed to finance all the adaptation and mitigation that that level of atmospheric GHGs would necessitate. The carbon price could be published and each polluter could determine for itself its optimised long term rate of emissions in response to that price and their particular abatement costs. Each polluter would then finance the costs of adaptation and mitigation its remaining emissions necessitated through the tax it paid on those emissions. In this case, overall emissions certainty is not needed, making a tax the preferred option.

However, this is not a complete description of the climate catastrophe problem mankind faces, for two key reasons. Firstly, there is the possibility of 'tipping points'. Tipping points are threshold levels of global atmospheric GHG concentrations where the environmental damage might increase steadily with GHG concentrations below the tipping point, and could be made bearable through democratically accepted adaptation and mitigation actions, but increases radically above it and quickly becomes unbearable. If a tipping point exists that is reachable, and it (or a threshold level safely below it) can be identified, emissions certainty becomes crucial to mankind avoiding severe if not catastrophic environmental damage.

Secondly, climate change is a global problem and we do not have the global political tools needed to agree, democratically or otherwise, what level of atmospheric GHGs mankind is prepared to tolerate, and we do not have the economic tools needed to quantify some of the harms climate change would cause such as habitat loss and species extinction. As a result, no global political decisions regarding tolerable levels of atmospheric GHGs get made and the unquantifiable harms arising from climate change too easily get ignored.

Together these make it crucial we focus on achieving emissions targets rather than economic (price) targets, and that those emissions targets are defined in absolute terms that each country can take as its national goal without requiring every country to move in lock-step towards a shared global goal. We can do this with emissions trading schemes[4], we cannot with carbon taxes. ETSs put the focus on achieving emissions goals directly rather than using price as a proxy, and enable mankind to set an absolute goal – a date by which to achieve net-zero global GHG emissions – whereas we cannot set an absolute carbon price goal because we do not know in practice what price will be needed to get us to emissions safety by any given date.

This provides a very strong argument in favour of an ETS.

[4] Scientific analysis can be used to set a best estimate for a maximum tolerable level of atmospheric GHG concentrations. That can be enshrined in the form of a date by which mankind needs to achieve net-zero global GHG emissions. Each trading zone, country and polluter can then take that as the date by which it needs to achieve net-zero or negative emissions, and each can take its own actions towards that goal without the necessity for global coordination.

It is true that we don't know for sure what emissions levels constitute tipping points and hence what the 'safe' emissions threshold should be, though the IPCC is able to provide the most robust estimates possible at any time. Therefore, an ETS will have to be responsive to changing demands, and possibly rapidly changing demands, as we learn more about how the climate responds to ever-increasing concentrations of atmospheric GHGs. This does not weaken the argument in favour of an ETS; if anything it strengthens it. A carbon tax would need to be similarly responsive as neither do we know for sure what carbon prices will be needed to keep polluters to an accepted global emissions trajectory and safely below any accepted global threshold. If anything, an ETS provides a more direct way to respond to changing emissions demands than a tax and, because, in contrast to a tax, the end point (net-zero or negative by a given date) remains fixed even if actual global emissions vary from the desired trajectory, an ETS is able to provide a more stable trajectory for polluters to plan against.

Simplicity of implementation

The main advantage a carbon tax has over an ETS is that national governments are well used to applying and administering taxes. A new tax can be brought in promptly, it can be applied easily to all fossil fuel consumption, it is simple for those affected to understand, and it is relatively simple to administer. This provides a very strong argument in favour of a carbon tax. However, the complexity of running an ETS is not overwhelming. There are many ETSs in existence today and we have gained the experience and knowledge needed to operate them. However, ETSs will always struggle to have the breadth of reach that a carbon tax can achieve with ease.

The degree of weight to be given to the simplicity argument will depend on a number of factors. One is the sheer size of the economy that is to be covered within the scope of the tax or ETS. Another is the philosophical approach the economy has to market regulation. The larger the economy, the more practicable a carbon tax relative to an ETS. Likewise, the more hostile the economy to the principle of market regulation the more likely a tax is to gain acceptance than an ETS. However, whilst there is evident support for a federal tax rather than a federal ETS in the USA, both China and the EU have opted for an ETS rather than a carbon tax.

Transparency and predictability

As with price certainty, regulated participants need to know what the main drivers and objectives of the carbon market are for the government that is behind it, and what that means in terms of the regulatory landscape they are likely to face over the long term. They need this transparency and predictability so they can de-risk the strategies they will need if they are to achieve the emissions reductions society will call on them to achieve.

Under an ETS, participants will want to understand the trajectory of emissions caps over the long term. Under a carbon tax, participants will want to understand the trajectory of the regulated carbon price over the long term. It is easier to give participants this predictability

under an ETS than under a carbon tax. We know to some extent what our GHG emissions are today and we know what we need our GHG emissions to be by 2050 (net-zero or negative). This makes it possible for the regulator to plot the trajectory of future emissions caps needed to get us from 2020 to 2050 and for participants to understand the parameters that might influence that trajectory. We do not know what carbon price trajectory we will need for us to get to net-zero or better by 2050. The regulator might set expectations for the carbon price over the coming half decade but will have to recalculate that trajectory repeatedly as the emissions reductions achieved in response to that carbon price trajectory are measured and assessed. This consideration favours an ETS over a tax.

Compliance enforcement

Compliance under an ETS requires the regulator to be able to monitor (e.g. through emitter reporting) or measure emissions and to detect non-compliance. A regulator's ability to do this will vary with the sector being regulated and the size of the participants in the scheme. Monitoring takes effort and takes more effort the smaller the size threshold of installations being monitored (due to scale increases and the need for the monitoring mechanism imposed on the entity being monitored to be made cost-efficient for small participants).

Compliance under a carbon tax is generally considered to be a simpler problem as it can be based on inputs rather than outputs. However, it is not without the need for vigilance by the regulator (c.f. VAT fraud). It also requires a competitive and innovative marketplace to be in place for those subject to the tax, otherwise sector participants could form a cartel under which all the participants agree just to pass the additional carbon cost on to their consumers without making any emissions reductions (c.f. the tobacco industry denying the health damage caused by smoking; the oil industry denying the reality of the climate crisis).

Political resilience

Would an ETS be politically easier to carry through than a tax?

A rapidly reducing emissions cap would send a clearer social responsibility signal to the public and to regulated participants than a rapidly escalating tax. This could make an ETS more socially acceptable to the citizens it burdens than a tax.

A carbon tax could be a simpler target for competing interests to lobby against than an ETS. Because we know what emissions goal we need to aim for (net-zero or negative by 2050) it is hard for lobbyists to argue against a proposed emissions trajectory if that means arguing for a softer trajectory that will not get us to the 2050 goal. Because we do not know what 2050 carbon price to aim for, it is easy for lobbyists to claim a proposed tax trajectory is set to high and to lobby for it to be reduced.

These considerations suggest an ETS would be more resilient against countering political pressures than a carbon tax and therefore more likely to survive in a strong enough form to achieve a long-term net-zero goal.

Boundary issues

There are two boundary issues of concern and they affect both approaches (a carbon tax or an ETS) equally:

- Competitiveness – for emissions-intensive industries exposed to competition from players outside the regulator's jurisdiction, both a tax and an ETS would impose competitive disadvantages on those who do fall within the jurisdiction.
- Carbon leakage – emissions-intensive companies could relocate to jurisdictions with weaker emissions regulations (in the language of the global market, high-emissions companies such as steel producers will say they are "being forced to relocate by the high price of carbon"), thereby undercutting the effectiveness of the measures taken within more stringent jurisdictions.

These are important issues as, in today's globalised trading world, they make it difficult for any single country to take a tougher line on emissions than its trading neighbours, and make it hard for regulators to act collectively to establish the much higher carbon price that is needed to address the climate crisis.

The possible solutions are:

- For a carbon tax – import taxes or tariffs so imports bear the cost of their emissions at the carbon price that prevails within the more stringent jurisdiction.
- For an ETS – either import taxes or tariffs as above or importers having to hold permits to cover the emissions released in the creation of the imported product or service.

Both approaches suffer from the difficulty of assessing the emissions created in the manufacturing of specific products created overseas. They also suffer when the prevailing carbon price can vary over the short term. Variation is an issue for an ETS (where the price varies in response to a fixed emissions cap) but not for a carbon tax (where the price is fixed for a stated period by the tax).

Whichever approach to these boundary issues the regulator adopts, they would be sending a clear signal to the weaker jurisdictions they abut that they recognise that the global price for carbon needs to rise significantly and quickly, and that they are prepared to take the lead. This could induce weaker jurisdictions to adopt more stringent measures and to increase their carbon price even if only so they get the additional revenues themselves rather than the importing country. This helps reduce emissions globally.

ETS design

As I explain in the Conclusions section on page 1 of this paper, based on the discussion above I am of the view that, for the UK, the balance of argument falls in favour of an ETS and that the UK (and many others, for the same reasons) should develop an ambitious ETS in preference to imposing a carbon tax. If that is accepted, then there are a few details of the ETS's design that need to be settled.

- A 'Cap & Trade' ETS has clear advantages over a 'Rate-based' ETS. I see no substantial reason for the ETS not to be of the 'Cap & Trade' variety.
- The emissions cap should fall as indicated by the science, preferably following the precautionary principle and falling in line with worst-case scientific predictions not median predictions. The cap trajectory should not be subject to political pressures. It being driven by the science provides industry with clear long-term signals regarding the emissions caps that will be imposed each year. In contrast, the cap being subject to political pressures will bring both short-term and long-term uncertainty. The UK CCC is well placed to advise the UK government on what the emissions cap trajectory needs to be all the way through to 2050, providing the transparency and predictability all participants need.
- The ETS should be mandatory, not voluntary, and it should cover all sectors that contribute at all significantly to the nation's GHG emissions, including aviation, heavy shipping and the emissions embedded in imported products.
- The emissions threshold at which an emitter's participation in the ETS becomes mandatory should start at the current EU ETS threshold (25,000 tonnes of CO_2 pa) but should fall rapidly (say, over the next five years) to cover all but the smallest emitters.
- The aim should be to start out with only a minority of permits being allocated rather than sold (starting at say 20%) and to phase out the allocation of permits entirely within five years. The experience gained from membership of the EU ETS should guide the regulator on the proportion to be sold at a fixed price and the trajectory of that price over time, the remining proportion to be auctioned.
- The penalty for a regulated participant emitting more than is covered by the permits it holds should be a fixed multiple of the sale price of the permits required. Finite-term banking and borrowing of permits should be allowed to avoid accidental non-compliance and provide room for multi-year investments in emissions reduction techniques.
- Tariffs should be used to ensure imports bear in full the carbon price that prevails within the UK.

The UK government should be proud to take a strong stand on reducing its GHG emissions. By creating an ambitious ETS the UK could lead the world in setting an appropriate price on carbon and put itself credibly on a trajectory to achieve net-zero by 2050 or even sooner.