

**Memorandum to the Environmental Audit Committee
Inquiry into Personal Carbon Allowances**

‘Cap and Share’

Laurence Matthews

July 2007

Executive summary

The Committee asks whether personal carbon allowances (PCAs) are desirable, and whether they are practical. There remain doubts about their practicality, and PCAs are only desirable because of the ends they achieve – they cap personal carbon emissions effectively and equitably. Cap & Share achieves these same ends, but is simpler, faster and cheaper to implement. Under Cap & Share the UK emissions cap is shared out equally to the adult population: everyone receives certificates which they sell, via banks, to the primary fossil fuel suppliers. Cap & Share delivers personal carbon trading implicitly, avoiding many of the problems with PCAs (impacts, operational feasibility, public acceptability) that concern the Committee.

Contents

- 1 Introduction
- 2 Cap & Share
- 3 A comparison of Cap & Share with PCAs
- 4 The advantages of Cap & Share
- 5 Psychological stumbling blocks
- 6 The personal indirect emissions sector
- 7 Equity and the global situation
- 8 Operational considerations

- Appendices:
- 1 Treatment of electricity
 - 2 A numerical worked example
 - 3 Upstream auctions and carbon taxes
 - 4 The EU ETS, hybrids and transitional arrangements

About the author

I am a writer, previously a university lecturer, and with 20 years’ experience in the transport industry. I gave evidence to the Efracom Inquiry into ‘Climate Change: the Citizen’s Agenda’ in January 2007, and I am now working with the Cap & Share campaign (www.capandshare.org), which is developing and promoting Cap & Share.

Recommendation

That the Committee evaluate Cap & Share as a practical alternative to personal carbon allowances, with a view to advocating the early adoption of Cap & Share as the preferred method of implementing the forthcoming Climate Change Bill.

1 Introduction

- 1.1 Cap & Share (C&S) is a regulatory and economic framework for climate stabilisation, originally developed by Feasta, the Foundation for the Economics of Sustainability (www.feasta.org).
- 1.2 The world has only a very brief window of opportunity to prevent catastrophic climate change. The UK, with its draft Climate Change Bill, is in a position to lead by example, gain valuable operational experience, and demonstrate an approach that could be used globally from 2013 onwards as a successor to the Kyoto protocol. In addition, any global agreement will require practical tools to implement agreed caps domestically. In the UK, a domestic framework is also needed if the exhortations (by Defra and others) for individuals to ‘do their bit’ are not to be undermined by free-riders. C&S is just such a framework.
- 1.3 The emissions from some large companies are being addressed by the EU ETS (not without teething problems), but this does not cover the emissions caused by households. At the moment personal carbon trading is the most prominent proposal for bringing these household emissions under an overall cap.
- 1.4 The mechanism for implementing personal carbon trading is to operate Personal Carbon Allowances (PCAs) using personal carbon debit cards. The overall approach is ‘economically efficient’, but many see it as impractical, possibly intrusive, and at the very least costly and cumbersome - given the history of government computer systems. A typical comment in this vein is:

“... carbon allowances are an administrative nightmare, impossibly complex to run, and could be circumvented in an almost infinite number of ways ... Carbon rationing is an elegant and completely impractical option.”
(Chris Goodall, “How to Live a Low-carbon Life”, Earthscan, 2007, page 41)
- 1.5 The C&S campaign strongly supports the aims of personal carbon trading, but sees a better way of achieving those aims. We want to deliver the benefits fast, at a fraction of the cost of PCAs, and in a way which side-steps many problems and objections which might bog down PCAs. C&S achieves precisely the same ends but by different means: means which are simpler, more flexible, more effective and, we believe, more publicly acceptable.
- 1.6 However, although C&S is a simple idea, it is relatively new. C&S appears at first glance to be very different from personal carbon trading, and we have found that many people initially reject it as a solution – seemingly because of what is called in psychology a ‘framing effect’. There is a story about a visiting Soviet official who asked who was in charge of the supply of bread to the population of London: his question betrayed his frame of reference. It is worth making the effort to jump out of the ‘frame of reference’ of PCAs, because the advantages (fast, cheap, public appeal) are so great.

2 Cap & Share

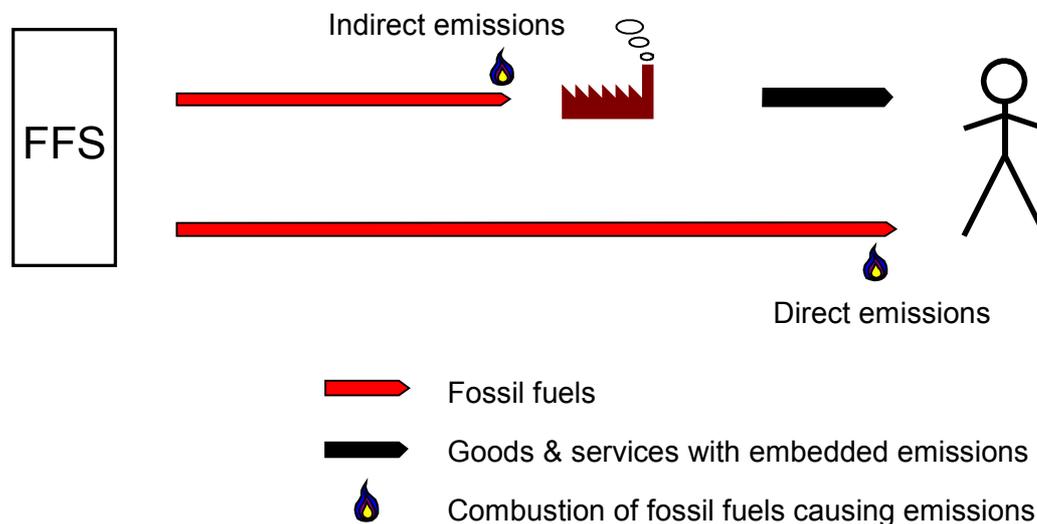
- 2.1 Cap and Share is most naturally explained by standing right back and considering what we are trying to do. In Section 3 we will compare C&S with PCAs, but for the moment let's forget PCAs and look at the big picture.
- 2.2 Climate change is a global problem, so we need to cap and reduce CO₂ emissions globally. (For clarity we will talk in terms of CO₂ only; for other greenhouse gases see paragraph 8.12 below). The best science currently available suggests that to avoid a climate catastrophe humanity needs to maintain global average temperatures at or below 2 degrees C above pre-industrial levels. Emissions reduction paths (a series of caps for each year into the future) that have a reasonable prospect of limiting the temperature rise to this figure can be calculated. The annual caps must cover all CO₂ emissions from the combustion of fossil fuels: there can be no exclusions (such as excluding international aviation "because it is not covered in the Kyoto Protocol").
- 2.3 Methods have been proposed for working out the UK's share of each year's annual global cap (see Section 7), to give an emissions reduction path for the UK. The total amount of CO₂ emissions allowed for each year would be the 'Cap' used by 'Cap and Share'.
- 2.4 UK emissions would be limited to the level set by the cap by means of emissions permits. But before proceeding to consider trading mechanisms, C&S pauses to ask the question: who should own these permits? Do they belong to the government, to big companies, or to you and me? Who owns the sky? C&S takes the view that the Earth's atmosphere and natural sinks are a fundamental common resource, and that the rights to emit the limited amount of greenhouse gases which can be safely be emitted should be shared out equally among everybody in the world (in practice, among all adults). That is the 'Share' in 'Cap and Share'.
- 2.5 In a C&S scheme for the UK, all adults would receive certificates entitling them to an equal share of the emissions permitted under that year's cap. These would arrive monthly (or maybe quarterly or annually; see Section 8), and would then be sold, via banks or post offices, to primary fossil fuel suppliers - the companies who import fossil fuels (or extract them from the ground). Each primary fossil fuel supplier would have to acquire and surrender certificates equal to the emissions from burning the fossil fuels that they introduce into the economy. In other words, C&S enforces the cap at the upstream end.
- 2.6 That's the system in a nutshell. But what are the consequences? The price of certificates (paid by the fossil fuel suppliers) is built into the cost of fossil fuels, which then flows through the economy (as it would under a carbon tax – see Appendix 3). So for consumers, 'carbon-intensive' products and services become more expensive – but on the other hand, consumers get the money from selling their certificates. People with lower than average carbon footprints will come out ahead.

- 2.7 Since only the fossil fuel companies need to be policed, this is a cheap system to run and a quick one to implement. It is clearly equitable, and engages the public imagination with a positive psychology: my certificate is my tangible connection to the national effort to reduce carbon – and I even get paid for it! All this is achieved without the need for the machinery of carbon debit cards – and we could also do away with the red tape of carbon trading for companies both large and small.
- 2.8 C&S is potentially a global system. In the future, with a successor to Kyoto in place, it could be the mechanism for averting catastrophic climate change while also helping Africa to ‘make poverty history’. We have found a public appetite for the ‘global justice’ aspects of a transfer of wealth from (say) the EU to Africa if both blocs were trading in a future scheme.
- 2.9 However, C&S is flexible and can be introduced initially at the EU level, at the UK level, or even at a sectoral level. So let’s stick with the UK for the moment. The following section compares C&S with PCAs.

3 A comparison of C&S with PCAs

- 3.1 Using the standard terminology, we can regard each individual as responsible for two types of CO₂ emissions: personal direct emissions and personal indirect emissions. Personal direct emissions cover the CO₂ emitted directly by the individual when burning petrol, gas or other fossil fuels. Personal indirect emissions are caused by organisations producing the goods and services bought by the individual.
- 3.2 Figure 1 illustrates these two types of emission, and shows the flows of fossil fuels from the primary fossil fuel suppliers on the left-hand side of the diagram to the individual citizens on the right-hand side.

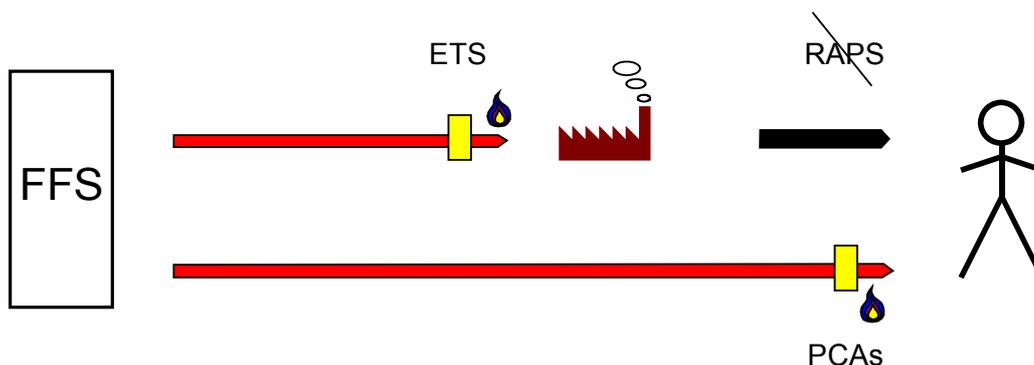
Figure 1



- 3.3 A downstream system applies the cap at the downstream end of each of these energy flows. For personal direct emissions, this is usually taken to mean personal carbon trading using PCAs.
- 3.4 PCAs (and many carbon footprint calculators) focus on the personal direct emissions. Household electricity is generally also included, although strictly speaking this is an indirect source of emissions. This complicates the situation and for clarity I will ignore electricity for the moment (the full picture is given in Appendix 1 where electricity is separated out).
- 3.5 Personal indirect emissions cannot be covered downstream in this way. To do so would entail Rating All Products and Services (RAPS), that is, working out how much embedded carbon was contained in all goods and services (every pair of scissors, every haircut). This is widely seen as impractical. So instead, personal indirect emissions are usually tackled by considering them as the direct emissions of the companies which provide these goods and services.

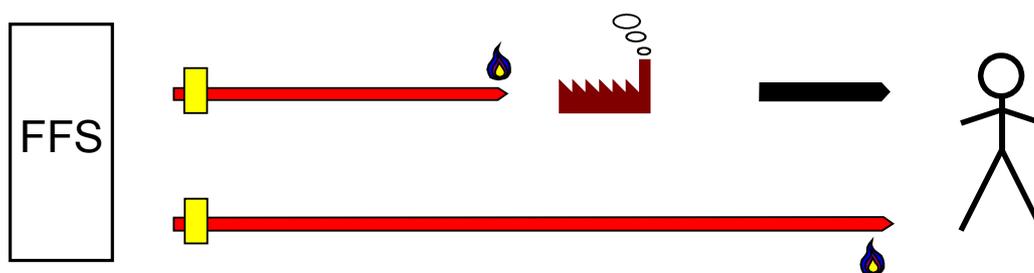
- 3.6 This is done by having companies trade carbon too, for example in an emissions trading scheme (ETS). It is usually assumed that around 40% of the total UK cap is allocated to the PCA scheme (on the basis that 40% of UK emissions arise from the personal direct emissions sector at the moment), with the remainder going to the ETS. Notice that by rejecting RAPS and moving to an ETS, we have tackled the personal indirect emissions sector by moving (halfway) upstream.
- 3.7 Proposals for downstream systems thus take the form of a combined PCA+ETS package, as illustrated in Figure 2. TEQs (alias DTQs) are an economy-wide proposal which has two parts like this (although the two parts can trade in a single combined market, or the ETS could be replaced by a process of tendering). In such a downstream scheme all CO₂ emissions are being capped at the point of combustion.
- 3.8 In Figure 2, and subsequent diagrams, the small rectangles straddling the horizontal lines represent the emissions permits and indicate the point at which each energy flow is capped.

Figure 2



- 3.9 An upstream system, on the other hand, applies a cap by requiring the fossil fuel suppliers to surrender certificates. Examples of upstream systems are an upstream auction of emission certificates (see Appendix 3), and C&S. Figure 3 illustrates this.

Figure 3



- 3.10 In its simplest form, C&S is a substitute for TEQs, or in other words it can replace the whole of a combined PCA+ETS package.
- 3.11 However, C&S is flexible, and we can apply C&S in just the personal direct emissions sector if desired, leaving an ETS to cover the personal indirect sector. In order to compare C&S directly with PCAs, we will confine C&S to the personal direct emissions sector for the rest of this section.
- 3.12 On this level, the main point is that C&S delivers the same result as PCAs. And we stress that C&S is not just a vaguely similar alternative approach; C&S delivers *precisely* the same effects as explicit personal carbon trading.
- 3.13 To illustrate this, let's just consider 2 people, A (for affluent) and B (for basic), whose only purchases are petrol. (The following example is described in more detail as a numerical worked example in Appendix 2).
- 3.14 Suppose that last year A and B bought 100 litres and 20 litres per week, respectively: a total of 120 litres. Now suppose we bring in a cap for this year which limits them to (the emissions from) 110 litres per week. Consider how this is achieved by PCAs and by C&S.
- 3.15 In 'PCA-world', A and B are each issued with a carbon debit card and are allocated emissions allowances equivalent to 55 litres per week each. A and B must each swipe their carbon debit cards at each petrol purchase.
- 3.16 Now A is used to buying more than his allocation of 55 litres. To achieve this, A can buy some allowances from B (probably through a broker). A buys the right to buy more litres of petrol, and B gets money for selling the right to buy those same litres. But there are only 110 litres of allowances in total, so A and B will have to reduce their joint petrol purchases slightly compared with last year.
- 3.17 Now let's see what happens to their counterparts in 'C&S-world'. Here, A and B are both allocated certificates equivalent to 55 litres. They sell them at the bank or post office. The fossil fuel suppliers must buy them (in order to be allowed to introduce 110 litres of petrol into the system) and they then pass this cost on, resulting in higher petrol prices. So A and B find that the petrol price is higher; but in compensation they get the money from selling their certificates.
- 3.18 In C&S-world, there are no explicit restrictions on what A or B can buy; but the price is higher than it was, so A and B will not buy quite as much as last year. Initially, one might suppose that A and B would try to carry on as before, swallowing any petrol price rise, but here is the crucial point: in C&S-world too, there are only 110 litres in the system (as that is the limit the fossil fuel suppliers can sell). So if the demand is high, the price of petrol rises until demand falls back to 110 litres per week (see Section 5 for more discussion on this point).

- 3.19 In fact, because the cap is the same as it was in PCA-world (110 litres), the price will rise until A and B buy *exactly* the same amount of petrol as in PCA-world. Moreover, A and B are each *exactly* as well off financially as they were in PCA-world. It turns out that the extra paid by A in C&S-world (to buy petrol at the higher price, minus the amount he got for selling his certificates) is exactly the same amount of the money A would have spent in PCA-world to buy the allowances from B. Meanwhile B has come out ahead in C&S-world (because for him the money he gets for selling his certificates outweighs the petrol price rises), and the amount by which B is ahead is exactly the same amount he would have received from A in PCA-world. The numerical example in Appendix 2 shows in detail how this happens.
- 3.20 This is what is meant by saying that C&S delivers implicit personal carbon trading. The end result, both in terms of petrol sold, and in terms of A's and B's financial positions, is the same in both worlds.
- 3.21 But although the two worlds may produce the same result, they *feel* very different. In PCA-world, A and B have their every petrol purchase tracked; they have to keep checking they have enough allowances; and they buy and sell allowances accordingly. In C&S-world, A and B simply sell their certificates once a month: they never have to worry about carbon budgets; they don't have carbon credit cards; they simply choose to buy petrol or not, according to the pump price.

4 Advantages of Cap & Share

Advantages which C&S and PCAs have in common.

4.1 *Effective*

PCAs and C&S are both mandatory systems which guarantee that a cap is met (unlike relying on incentives and voluntary solutions, which are inadequate responses to the crisis we face).

4.2 *Complete coverage*

Both PCAs and C&S give complete coverage of the personal direct emissions sector. C&S also gives complete coverage of the indirect emissions sector (see Section 6), and PCAs could achieve this by teaming up with a total-coverage ETS or tendering system (as advocated under TEQs).

4.3 *Equity*

C&S is inherently equitable, and captures the same robust fairness as PCAs. It also resonates strongly with global equity issues (see Section 7). Equity is a very strong plus point when considering public acceptability. In tackling windfalls (see Section 6), C&S is more equitable than the existing EU ETS.

Advantages of C&S relative to the alternative of PCAs.

4.4 We start with the practical advantages, more relevant to feasibility and efficiency, and then move on to the more intangible points which are important to public acceptability.

4.5 *Cheap*

C&S has very low capital costs (setting up a register based on the electoral roll, as opposed to setting up a computerised transaction system); low running costs (printing and distribution of certificates, as opposed to tracking each individual fuel purchase); and low enforcement costs (only the fossil fuel suppliers need to be policed).

4.6 *Fast*

C&S could have a lead-time of less than a year, compared with several years for PCAs. We cannot afford to fritter away the next 5-10 years putting a system in place to reducing our CO₂ emissions substantially. This is particularly so if we are looking (as we should be) to the global situation: the experience gained by operating a scheme early on in the UK will prove invaluable in shaping global schemes and furthering global agreements, both of which are urgently needed. Early implementation would also mean that experience can be gained in relatively benign conditions (when caps are mild).

4.7 *Simple*

'Simple' leads to 'fast' and 'cheap', as already noted. But simplicity is also valuable in itself. Firstly, simple systems are easier to implement (some would go as far as to say that only upstream systems are feasible in the first place: I have heard the comment "doing it downstream is madness"). There are two further important reasons for keeping things simple:

- As it is, we will have many other climate-related tasks on our plate, from dealing with deforestation to planning adaptation measures, so we cannot afford to become bogged down with a complex method of capping CO₂ emissions.
- Early adoption by the UK of an effective system is likely to be used as a model elsewhere, and even for an embryonic global system. Only simple systems have any hope of being practical in this context, especially in developing countries.

4.8 *Not onerous*

Whilst C&S captures a feeling of involvement in solving the climate crisis (see below), it avoids having to persuade the whole population to adopt carbon budgeting, educating them how to do so, providing them with help in doing so, etc. PCAs claim the advantage that carbon budgeting raises awareness, but this is only a means to an end, and not something we should have to rely on in order to implement a scheme.

4.9 *Robust*

C&S is much less vulnerable than PCAs to power cuts (under C&S people can simply pay for petrol with cash), software failures and the like.

4.10 *Less corruption*

Policing a small number of fossil fuel suppliers would give fewer opportunities for fraud than policing myriads of small companies and petrol retailers. Furthermore, upstream systems provide little opportunity for black markets. PCAs have a white market in allowances, so avoid a black market in allowances, but still leave open the potential for a black market in petrol. The black market incentive arises because in PCA-world petrol itself is still cheap if it can be acquired illegally without parting with allowances. In C&S-world, petrol itself has the certificate price built in, so the incentive disappears.

4.11 *Positive psychology*

C&S does not have the negative connotations of a 'tax', or the restrictive connotations of 'allowances' or 'rations'. Instead, everyone is given a certificate, which they can then sell. Consumers do not face any explicit restrictions on their purchasing decisions, other than those set by price and their own financial constraints – constraints which they are used to.

4.12 *Not intrusive*

As already mentioned, there is no need to track individual fuel and energy purchases. C&S avoids civil liberties implications, whereas mandatory carbon debit cards are already seen in some quarters (rightly or wrongly) as being akin to ID cards.

4.13 *Public engagement*

Under simple C&S (covering the whole economy) my certificate is exactly my equal share of the country's carbon budget, and is my tangible connection with the national effort to reduce carbon. I am part of the solution to climate change, not part of the problem. (Under a global system, it would be my *global* share of humanity's emissions – see Section 7). By contrast, my PCA is only my share of 40% of the country's carbon budget.

4.14 *Rights-based*

My certificate is my *entitlement* to my share (of the country's carbon budget), which I then sell upstream; it is not an 'allowance' or 'ration' handed down to me. It is not a state handout (which I may or may not trust the government not to raid in the future).

Disadvantages of C&S

- 4.15 The main handicap suffered by C&S is its recent emergence and hence its unfamiliarity (compared with PCAs). As discussed in the next section, this means it sometimes faces difficulties in persuading people (not least policymakers and commentators) of its effectiveness.

5 Psychological stumbling blocks

- 5.1 But it can't work, can it? On hearing about C&S, many people instinctively feel that something doesn't add up; it can't be that simple. In communicating C&S, I have encountered this reaction many times, even among economists versed in PCAs, and so it is worth exploring what the stumbling blocks are. Ironically, public understanding is sometimes easier to achieve.
- 5.2 The first point is that C&S is *functionally* equivalent to (achieves the same results as) PCAs in the personal direct sector, but it is not *psychologically* equivalent. People often fail to make this distinction. C&S has no apparatus of downstream rationing, and so it doesn't feel like PCAs; but that does not mean that it can't deliver the same result.
- 5.3 The first step then is to realise that functional equivalence is different from psychological equivalence. We can then look more dispassionately at whether or not C&S might be functionally equivalent to PCAs, for example by looking at the numerical worked example in Appendix 2 in detail.
- 5.4 However, even if this is convincing intellectually, people often still have a residual feeling of unease. This second psychological block amounts to a distrust of upstream systems, and is best encapsulated by the question, 'What's to stop someone just buying more petrol?'
- 5.5 What seems to lurk behind this question is that we think we know how rationing works – from tales (and experience) of rationing during and following the second world war. In such a system, everyone is issued with ration coupons and they are highly visible to individual citizens. The coupons are issued and everyone must stay within their limit. Moreover, when buying goods you have to surrender some of your precious supply of coupons, so you can see the limit being enforced.
- 5.6 Ration coupons were not legally tradable, but if they had been, we would have had a system very similar to PCAs. So, ask the same question in PCA-world: what's to stop someone just buying more petrol (by buying a few allowances off someone)? Indeed, in PCA-world, people would be allowed to buy allowances at petrol stations. In PCA-world, the answer is more obvious: buying and selling allowances does not affect the total number in circulation, and so it's easy to see that the cap is still being enforced.
- 5.7 What this amounts to is that to cap the volume of petrol used, we rely on counting up all the petrol coming out of all the petrol pumps in the country, and then accounting for it all by checking it off against PCAs. This is one way of capping the petrol used. It simply remains to realise that another equally valid way to cap the volume of petrol coming out at the bottom end of the system is to cap the amount going in at the top. This is true even if the petrol comes out at the bottom end *at a remote location and at a later point in time*.

- 5.8 Nevertheless, a niggle remains about how this is achieved: with an upstream system, there seems to be no control at the point of sale. What if I want to buy more petrol - surely this will breach the cap?
- 5.9 Again, the missing element is the time factor. C&S works at the consumer level through the price mechanism. If there is more demand than supply (at a given fuel pump price) in a given week, say, then the system quickly adjusts. The fuel retailers will demand more petrol from the fossil fuel suppliers. But these suppliers only have a fixed supply to sell (governed by the quantity of emissions permits they have bought), and so will put up the price to the retailers in accordance with supply and demand. The retailers will pass this cost on, and the pump prices will rise. The next time the motorists fill up, they will face a higher price. Over a (fairly short) period of time, the price will rise until the demand levels off (see the numerical example in Appendix 2). Meanwhile, the fossil fuel supplier would dearly like more permits, to meet the demand for fuel from the retailers, and so he seeks further permits, driving the permit price up. (This means that all citizens get more money when they sell their next batch of certificates.)
- 5.10 Markets adjust to supply and demand. For example, the housing market operates on the basis of there being a finite supply of land. The fact that “there is nothing to stop me buying another house if I want” doesn’t increase the amount of land.
- 5.11 Also, it is worth pointing out that the same problem lies buried in PCAs. PCAs do not form a self-contained solution to emissions capping, as they only apply to the personal direct sector. They can only work if combined with a scheme (such as an ETS) to tackle the indirect personal emissions. And as we noted in paragraph 3.6, these emissions are capped not downstream at the consumer level, but (halfway) upstream.
- 5.12 Note that these arguments are different from the related objection to trading, on the grounds that “rich people can just go on buying petrol” (with an implied “what about the poor?”). This objection applies equally of course to PCAs. Rich people can also buy apartments in Mayfair; life is like that. However PCAs and C&S both result in a transfer of wealth from the rich to the poor. (Fuel poverty is discussed in paragraph 8.6).
- 5.13 After all this we have a final stumbling block, a feeling that “surely it can’t be that simple”. Once people have grasped the idea of C&S, they can still find it hard to shake off thought-patterns from the more complicated systems. A typical question is, “Yes, I see how C&S works, but how do people work out their allowances?” The answer, of course, is that they don’t: there are no such things as allowances. There is no need for carbon budgeting: people make choices based on price alone. The budgeting is all done for them. There are many similar questions which a ‘visiting Soviet official’ (see paragraph 1.6) might ask.

6 The indirect emissions sector

- 6.1 C&S sees no distinction between personal direct and indirect emissions. In its simplest form, C&S replaces both parts of the ETS+PCAs package. Although this inquiry is into the PCAs, the personal indirect emissions sector is relevant (as we shall see below), and is briefly considered in this section.
- 6.2 In the personal indirect emissions sector, an upstream system has the same advantages over a downstream ETS, as C&S enjoys over PCAs in the personal direct emissions sector: it is effective, cheap, simple, fast, has no red tape, and renders completely irrelevant the ‘visiting Soviet official’ questions about which companies should be included, how to treat new entrants, how to treat retiring plant and so on. In addition, an upstream system completely avoids threshold problems (of deciding where the threshold should be between large companies in the ETS and smaller ones outside it) by delivering complete coverage at a stroke. Finally much of the ‘crowded policy landscape’ (CCL, CCAs etc.) can be dismantled, or at the very least not extended.
- 6.3 Given that an ETS scheme is up and running, however, there will be a natural desire not to have to scrap it and start again. Fortunately, it is simple to construct an upstream system which dovetails with an ETS in an upstream/ETS hybrid system (see Appendix 4).
- 6.4 Why is this relevant to the personal direct emissions sector? There are two reasons. Firstly, unless there is complete coverage of the indirect sector, the overall PCA+ETS scheme does not have the complete coverage of the economy that is required.
- 6.5 Secondly, C&S shares out 100% of CO₂ emissions among the population, on the basis that emissions are caused by us all, whether directly in our own homes, or indirectly by companies providing goods and services on our behalf. Under PCAs only (around) 40% is shared among the population. This leaves the remaining 60% outside the public’s control. This is reflected in people’s frustration when trying to minimise their personal carbon footprints (of say 4 tonnes of CO₂ per year): they find they are only weakly able to affect their indirect footprint (another 6 tonnes).
- 6.6 Moreover, the 60% of the money in the ETS system is at present given to the ETS companies (who pass on embedded costs downstream to the consumer and pocket the windfall profits). Replacing the current system of grandfathering by an auction with proceeds recycled to the ETS companies would not alter this. If the proceeds went to the government instead, it would be seen as a tax. Only if the proceeds are returned to the population would the situation prior to the introduction of the ETS be restored. Since this would be part of the introduction of C&S, it would hugely add to the public attractiveness of C&S, and would also go a long way to alleviating concerns over fuel poverty.

7 **Equity and the global scene**

- 7.1 C&S is based on a robust equity of equal shares for all. Although everyone could claim to be a special case, this equality has a simple fairness that is hard to argue against, like the one-person-one-vote basis for democracy.
- 7.2 C&S can work at the UK level, EU level, or at global level, and as such a UK scheme can serve as a model for an EU scheme, and an EU scheme for a global one.
- 7.3 C&S arose as a way of implementing Contraction & Convergence (C&C), a framework for sharing global emissions between nations, developed by the Global Commons Institute (www.gci.org.uk). C&C proposes that national emissions converge to a global per capita average (during this process the total global level of emissions is also being reduced). C&C is itself based on the same robust equity, and a belief that anything more complicated is less likely to be agreed. Given a global emissions path (set by science), C&C can provide the corresponding UK emissions path, as mentioned in paragraph 2.3. C&S resonates strongly with C&C.
- 7.4 Climate change is a global problem, and any domestic scheme for the UK will be of limited use unless other countries adopt similar measures. However, the swift adoption of a UK cap would do two things: it would furnish operational experience with an effective domestic scheme, and possibly influence the shape of systems later adopted globally; and it would strengthen negotiators' efforts to bring in a global solution such as C&C. In the end, only with such a global agreement will our efforts in the UK be meaningful. C&S can deliver such a domestic scheme for the UK with the kind of speed that is urgently required.
- 7.5 In the interim, while global agreements are not yet in place, there will always be objections that adopting a scheme in advance of everyone else will lead to competitive disadvantage. This objection is reduced for the UK if C&S is adopted at an EU level. Nevertheless, there will still be border effects.
- 7.6 One particular issue is the inclusion of international aviation and shipping. Emissions from these activities must be included in the overall global cap (it has been pointed out that excluding them is tantamount to going on a diet, but not counting calories from chocolate) and an obvious way to do this is that, for each flight between two countries, half the flight's emissions are allocated to each of the two countries. For a downstream system, an obvious way of doing this is to count emissions only from departing aircraft and ships (analogous to the one-way tolls on the Severn Bridge). Under C&S, it is only necessary to classify incoming 'tankerage' (bringing in excess fuel) as importing fossil fuels and hence requiring permits. Otherwise, everything is taken care of automatically. (Aviation kerosene should be multiplied by 2.7 when calculating emission equivalents, to account for the particular effects of emissions at altitude).

7.7 There is a final point on equity and competitiveness. Sometimes the claim is made that whoever moves first will be at a competitive disadvantage when it comes to negotiating the final agreement. This argument recalls the arts of haggling (if you are buying something in a market, it is better to start by getting the seller to declare a price than to start by making an offer yourself). However, when you move up to an obvious line (global equality) and invite others to join you, the very obviousness and fairness of the line chosen provides a natural focal point or 'attractor' and reduces this effect.

8 Operational considerations

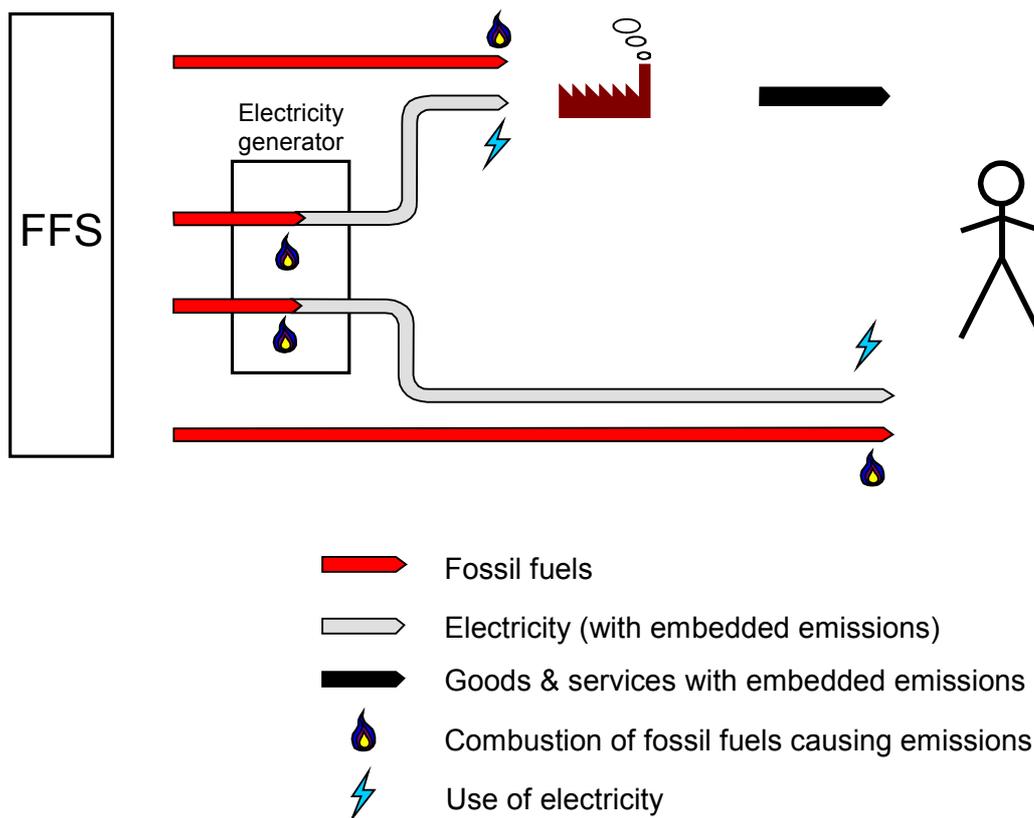
- 8.1 A decision would have to be made on whether a UK scheme or an EU scheme should be adopted. A UK scheme could easily trade with other schemes in the EU, and these could merge into an EU-wide scheme.
- 8.2 The cap should be set by an independent committee, along the lines of the Committee on Climate Change envisaged by the draft Climate Change Bill, according to the latest science and with regard to international agreements. (The committee would also produce CO₂ conversion rates for oil / gas / coal etc according to their emissions per tonne, and advise on the treatment of other greenhouse gases). The cap applies to fossil fuel extraction and imports. C&S would guarantee that the cap is met.
- 8.3 The cap provides a single lever (akin to the MPC setting interest rates), leaving other institutions such as markets to take decisions accordingly. A long term signal should be given by setting the cap at least 5-10 years ahead, with a firm indication of the direction beyond that timescale.
- 8.4 Certificates would be distributed annually (or maybe quarterly or monthly). There are arguments in favour of an annual distribution (lower distribution costs, annual excitement generated) and in favour of more frequent distribution (less worrying about when to cash in your certificates). A compromise might be to issue annually a book of monthly vouchers. In either case, futures markets are well suited to providing a service to smooth out end-of-year price fluctuations.
- 8.5 The distribution would be to adults (18 or over) only. People with large families will claim that this is unfair, but adjustments should be made through other targeted means, such as through Child Tax Credit. Making exceptions for everyone who claims that they are a special case in some way would undermine the simplicity and robust fairness of the scheme.
- 8.6 Fuel poverty is also an issue best addressed separately. Introducing C&S for the whole economy (rather than just to the personal direct emissions sector) would reduce this problem, but it remains an issue of concern, just as it does with PCAs.
- 8.7 A register would be based on the electoral roll. There would have to be detailed decisions on how to treat expatriates, resident foreigners, and so on.
- 8.8 Banks and other market makers would be encouraged to set up arrangements to buy certificates from the general public and broker them to the primary fossil fuel suppliers.
- 8.9 There would be more muted opportunities for developing domestic carbon markets than if all companies and individuals were indulging in carbon trading, but still scope for an international carbon market (between a UK or EU scheme and other reputable schemes around the world).

- 8.10 Primary fossil fuel suppliers would have to buy certificates to cover the CO₂ emissions produced by burning the fossil fuels they introduce into the economy. Certificates are denominated in tonnes of CO₂, so the number of certificates required would depend on the CO₂ emissions per unit burnt of the fossil fuel in question.
- 8.11 Individual citizens would be allowed to sell, keep, retire or hold back (save) their certificates. Fossil fuel suppliers would be allowed to hold over their certificates for a limited time, but not to borrow against future emissions.
- 8.12 The simplest method for dealing with other greenhouse gases would be to include them in the cap on the basis of their global warming potential (GWP) relative to CO₂. However it may be preferable to maintain separate schemes (or regulation) for separate gases (as some are restricted to specialised industrial sectors).
- 8.13 Policing is only required of the primary fossil fuel suppliers (and companies within an ETS). No compliance is required by other companies, or by individuals. The regulatory authorities would have to be vigorous in looking for anti-competitive behaviour among the fossil fuel suppliers, but this process would take place in the full glare of public interest and scrutiny.
- 8.14 The inclusion or not of personal public transport (a question debated among supporters of PCAs and TEQs) is irrelevant to C&S.
- 8.15 Very few conditions are needed as prerequisites for the introduction of C&S. A scheme could be running in the space of a single parliamentary session. The main research questions relate to public attitudes and to acceptability of the scheme. Pilots and trials might iron out wrinkles in the administration of the scheme, but are probably best carried out by panels and role-play simulation than live regional pilots. However, there is an opportunity to pilot the scheme by introducing it at a sectoral level. Transport is a suitable case, being considered by the Irish government at the present time.
- 8.16 In all this it is vital to address the urgency of the issue. Governments must get to grips with the urgent, scientifically-grounded need for action. If action had been taken 15 years ago the situation today would be less serious than it is; similarly, a delay of a further 10 years before any effective scheme is implemented will lead to a critical state requiring draconian measures. We have no time to waste before getting started.

Appendix 1 : Treatment of electricity

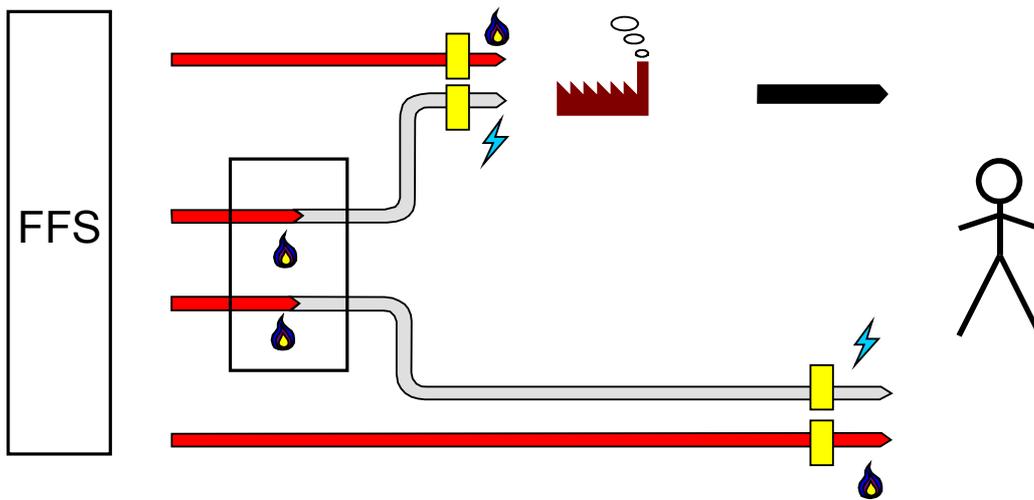
- A1.1 For clarity, in the main text I have ignored electricity. This appendix gives the full picture. Figures 1a, 2a and 3a below are the equivalents of Figures 1, 2 and 3 respectively in the main text, but treating electricity separately.
- A1.2 For PCAs, household electricity is usually lumped together with personal direct emissions. This is sensible, because the generation of electricity causes CO₂ emissions and we would therefore like consumers to focus on reducing their use of electricity; and also because there are tradeoffs between household electricity and domestic gas and other fuels.
- A1.3 Strictly speaking, electricity is a cause of personal indirect emissions (since the CO₂ is emitted at the power station), and the electricity supplied by the power generator contains ‘embedded’ carbon emissions. If we treat electricity generation separately, Figure 1 becomes Figure 1a.

Figure 1a



- A1.4 In a downstream system, electricity is capped at the point of use of the electrical power, as shown in Figure 2a. Thus household electricity is included in PCAs (likewise, electricity use by large companies is included in an ETS - see Appendix 4).

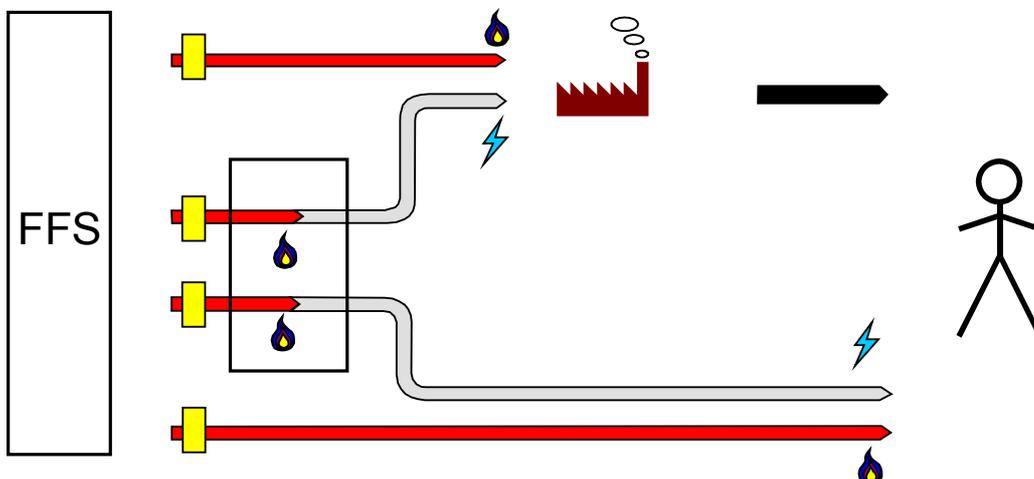
Figure 2a



A1.5 Conversion factors apply; a tonne of CO₂ as part of a PCA is equivalent to a given number of kWh, depending on the generating method used. (Of course it would equate to a very large number of kWh for electricity generated from renewables).

A1.6 In an upstream system like C&S however, the generators are just like everybody else: they buy fossil fuels from the fossil fuel suppliers and produce their own direct emissions (Figure 3a). The fossil fuel price, of course, includes the price of the permits bought by the fossil fuel supplier, and the electricity generator passes on this cost, by means of an increased price for electricity. To the consumer, the price of permits is simply built in to the cost of electricity, just as it is into the price of all other goods and services, and there is no need for carbon budgeting for electricity use. Of course, there are strong economic effects of all this: an incentive for all companies and households to economise on electricity, and an incentive for generators to develop renewable sources.

Figure 3a



Appendix 2 : A numerical worked example

- A2.1 This example (referred to in Section 3) illustrates how Cap & Share works, and how it achieves the same results as personal carbon trading using PCAs. In this simplified example we suppose petrol is the only fossil fuel and that the country only has two people, A (for Affluent) and B (for Basic).
- A2.2 Suppose that last year petrol was 90p per litre, and that A used 100 litres per week and B used 20 litres per week, so that their total consumption was 120 litres. Now suppose that this year we wish to achieve a cap on emissions that equates to 110 litres per week. Let's see how this works out both in "C&S-world" and in PCA-world".
- A2.3 In C&S-world, we issue certificates totalling 110 litres (the certificates are actually denominated in tonnes of CO₂, but since in this example petrol is the only fossil fuel, I have converted all amounts to litres of petrol for simplicity). The fossil fuel suppliers have to acquire these certificates, and are thus limited to supplying 110 litres of petrol into the system. But A and B are used to consuming 120 litres between them, so there is more demand than supply. This means that the petrol price goes up.
- A2.4 As the price goes up, A and B reconsider their use of petrol, and start to use slightly less. The more the price goes up, the less they will use. Suppose that by the time they have reduced to 110 litres between them, the price has gone up to £1.20 per litre. We might have A using 92 litres (down by 8%) and B using 18 litres (down by 10%).
- A2.5 Meanwhile let's look at the fossil fuel suppliers. Suppose they are used to making 22p per litre profit. They are now only selling 110 litres instead of 120 litres, so they increase their margin by 2p per litre to make the same amount of profit overall (since $120 \times 22p = 110 \times 24p$). They are charging 30p more for petrol (it is now £1.20, up from 90p), and so can afford to pay up to 28p per litre for the certificates. So (in a competitive market) the certificate price will be 28p.
- A2.6 Under C&S, A and B get certificates for 55 litres each, and they sell these certificates at the bank, getting 28p each for them. So A and B fare as follows in C&S-world:

		A	B
Petrol cost	£110.40	£21.60	at £1.20 per litre
Income from certificates	-£15.40	-£15.40	55 x 28p
Total cost	£95.00	£6.20	
Total cost last year	£90.00	£18.00	
Better / worse off by	-£5.00	£11.80	

- A2.7 Next, let's look at the same scenario in PCA-world. We start with the same situation last year: petrol at 90p per litre, A using 100 litres per week and B using 20 litres per week, giving a total consumption of 120 litres.
- A2.8 Suppose once again that this year we have a cap of 110 litres. This time we issue A and B with a quota of permits for 55 litres each. These permits are needed to buy petrol.
- A2.9 In PCA-world the fossil fuel suppliers aren't involved. But, as in C&S-world, they can only sell 110 litres instead of 120 litres, so they increase their margin by 2p per litre to make the same amount of overall profit, and the pump price rises to 92p per litre.
- A2.10 A is used to consuming 100 litres, so wants 45 more than his allocation of 55; and B is used to consuming 20 litres, so his allocation of 55 is 35 more than he needs. So A wants more permits than B has available to sell, and the price of permits goes up.
- A2.11 As the price goes up, A and B reconsider their use of petrol, and start to use slightly less. The more the price of permits goes up, the more A has to pay for each permit, and the more B can get for any unused permits. The price of petrol is effectively the inclusive price (of the pump price plus the going rate for a permit – under PCAs people would be allowed to buy permits while buying petrol, thus paying this inclusive price). The more this inclusive petrol price goes up, the less petrol A and B will use. Assuming the same reactions to price rises apply in PCA-world as in C&S-world, A and B will behave exactly as they did in C&S-world. This means that by the time they reduce to using 110 litres, the effective price has gone up £1.20 per litre. At this point the going rate for permits will be $£1.20 - 92p = 28p$.
- A2.12 As in C&S-world, we will have A using 92 litres and B using 18 litres. This is achieved by B selling 37 permits to A. So A and B fare as follows in PCA-world:

	A	B
Petrol cost	£84.64	£16.56
Buying/ selling permits	£10.36	-£10.36
Total cost	£95.00	£6.20
		at 92p per litre
		37 x 28p
Total cost last year	£90.00	£18.00
Better / worse off by	-£5.00	£11.80

- A2.13 Notice that the total cost is exactly the same in both worlds; so is the amount of petrol bought.

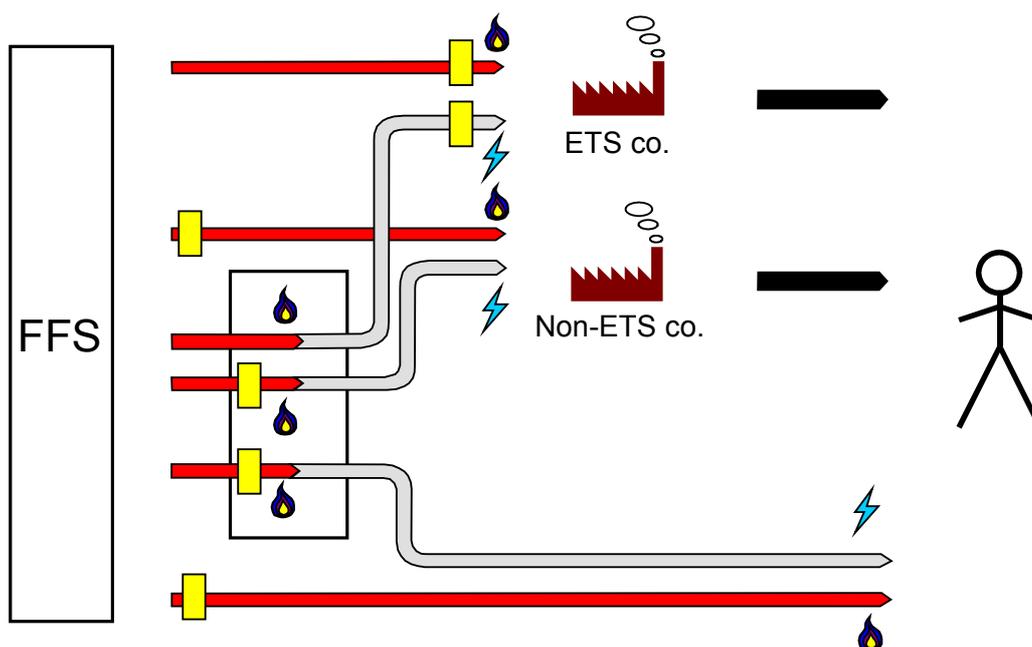
Appendix 3 : Upstream auctions and carbon taxes

- A3.1 This appendix compares C&S with two other schemes: upstream auctions and carbon taxes.
- A3.2 An upstream auction of emission permits would be a practical solution to capping emissions levels. Primary fossil fuel suppliers would bid for emissions permits, which would then allow them to introduce fossil fuels into the economy. The number of permits to be auctioned would be set by the cap. The major question is who gets the proceeds of the auction. If this is the government, the auction is likely to be seen as a carbon tax (see below).
- A3.3 In the current discussion about reform of the EU ETS, there are proposals to replace grandfathering (allocating permits free to polluting companies, who then reap windfall profits) with auctioning and recycling of the proceeds. However, when companies advocate recycling of the auction proceeds, they tend to mean recycling of the proceeds to the companies participating in the ETS (in effect, perpetuating the windfall profits), rather than recycling the proceeds to the general population (see Appendix 4).
- A3.4 The Sky Trust proposal (www.usskytrust.org) calls for an upstream auction of emissions permits, conducted by an organisation called the Sky Trust, which would then distribute the auction proceeds equally to all (adult) members of the population. This is very similar to C&S, and the distinction is a fine one. In C&S I get an emissions entitlement and sell it; under Sky Trust I get the money. The advantage of C&S is the public engagement and feeling of empowerment and control from having the emissions entitlement as a right. For example, under C&S, if I feel passionately about climate change I can decide to 'retire' (tear up) a few of my certificates, which would have the effect of reducing the country's carbon emissions by a small but finite amount. Under Sky Trust, I do not have this option. This is a subtle point, but possibly an important one, given that this note has emphasised the importance of psychology to public acceptability. Set against this, C&S does incur transaction costs (when selling the certificates), which the Sky Trust scheme does not.
- A3.5 A carbon tax is more problematic. C&S is *functionally* equivalent to a carbon tax set at a sufficiently high level (with recycling of the tax revenue to the adult population on an equal per capita basis), and hence delivers the same (economic efficiency) advantages. But it is hardly *psychologically* or *politically* equivalent. Recent experience with fuel duty suggests that it would be politically impossible for even a courageous government to impose a carbon tax at a level where it significantly affected demand. There would also be the suspicion that revenues would at some point disappear into general taxation. Fiscal instruments may help to effect mild changes in behaviour, but are unsuited to the more substantial changes necessary to tackle climate change effectively.

Appendix 4 : The EU ETS, hybrids and transitional arrangements

- A4.1 The EU ETS has been criticised on several fronts: caps have been set ineffectively; it has given large windfall profits to participating companies at the expense of the consumer; the scheme is only partial, yet the bureaucracy would be daunting if the scheme were extended to smaller companies. The first of these criticisms has to be addressed at the political level, while the second can be tackled by moving from grandfathering toward auctions. The third is a structural problem. Nevertheless, the experience gained has been valuable, and building on the ETS would be preferable to scrapping it.
- A4.2 The current move to extend the ETS to more companies, by reducing the size thresholds, would make the problems worse without addressing the criticisms. More and more companies would be involved in the red tape of carbon trading; yet the scheme would still leave many small companies outside the scheme, so would still be incomplete.
- A4.3 The alternative is to move in the upstream direction. Hybrid upstream/ETS systems have been proposed which could immediately give complete coverage of the economy, yet leave the existing ETS untouched. (See the submission by Steve Sorrell to the Efracom Inquiry into 'Climate Change: the citizen's agenda', August 2006).
- A4.4 C&S can work with an ETS in a similar hybrid scheme, and this is illustrated in Figure 4. We now have two types of company: one trading in the ETS and another outside the ETS. In looking in turn at each part of this diagram, the point to look for is that each energy flow in the diagram is captured (by having an emissions permit straddling it).

Figure 4



- A4.5 Certificates are issued to the population as under 'pure' C&S but now, instead of all of these being bought by the primary fossil fuel suppliers, some are bought instead by the ETS companies.
- A4.6 For an ETS company, emissions and electricity are traded in the ETS (as depicted by the permits shown next to the ETS company in Figure 4). Each company need only look at its own direct emissions (and electricity use); embedded CO₂ from other goods and services upstream is simply included in the prices paid for these, and is passed on downstream.
- A4.7 For the non-ETS company, its direct emissions and its electricity use are both captured upstream. It just pays a higher rate for fuel and electricity to cover the embedded emissions, as in any upstream system. The non-ETS company therefore has no bureaucracy to deal with at all.
- A4.8 The individual consumer is treated exactly as under 'pure' C&S, with no need for carbon trading.
- A4.9 The fossil fuel supplier must acquire and surrender certificates to supply fossil fuel, except that fossil fuels supplied to ETS companies are exempt. In Figure 4 the electricity generator is assumed to be in the ETS.
- A4.10 The electricity generator is required to acquire certificates to cover its own direct emissions, and passes on the cost of these certificates downstream in the form of a higher electricity price. There is an exception for electricity supplied to an ETS company, which is exempt (so does not require certificates, and can thus be sold on without attracting a markup for a certificate price). This exception is necessary to avoid double-counting of the electricity used by the ETS company, as can be seen by referring to Figure 4.
- A4.11 This system captures the emissions from non-ETS companies at a stroke, without the need to extend the ETS; however the existing ETS can carry on virtually unchanged.
- A4.12 The only change to the ETS is that certificates are no longer awarded free to participating companies. The effect on these companies is exactly the same as if certificates were now to be auctioned with the proceeds given to the population. If this is deemed to be too abrupt a withdrawal of windfall profits, it is easy to conceive of transitional arrangements whereby certificates start off in an ETS auction (with the proceeds recycled to the ETS companies), and then over the course of (say) 5 years are transferred over to the C&S scheme.

[Document ends]