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Interactions Between Emission Trading Systems and Other Overlapping Policy Instruments

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FOREWORD

This paper discusses interactions that can occur when a cap-and-trade based emission trading system is combined with overlapping policy instruments (environmentally related taxes, subsidies, 'command-and-control regulations, information instruments, etc.), addressing emissions stemming from the same sources.

The paper is issued under the responsibility of the Secretary-General of the OECD.

INTERACTIONS BETWEEN EMISSION TRADING SYSTEMS AND OTHER OVERLAPPING POLICY INSTRUMENTS

1. Introduction[1]

1. The European Union introduced its cap-and-trade based Emission Trading System for CO_2 emissions (EU ETS) in 2005, New Zealand enacted such a trading system in July 2010,[2] and similar trading systems have been under serious political discussion in a number of other countries. Such trading systems can achieve important emission reductions in a cost-effective manner, and an important literature discusses their application.[3]

2. One of the characteristics of cap-and-trade systems, and environmentally related taxes, compared to most other instruments used for environmental policy is that they make the (marginal) costs of abating emissions explicit. While this in certain situations *might* be considered a disadvantage from a political point of view, it can also promote the formulation of environmental policies where the (marginal) costs and benefits balance reasonably well.[4]

3. However, parts of the literature in this area overlook the interactions that can take place between a cap-and-trade system and other policy instruments that address the same types of emissions from the same sources.[5] When a cap is binding, this will determine the environmental outcome of the instrument mix directly, as long as it remains unchanged. Under these circumstances, adding other policy instruments will not cause further emission reductions, but would instead create room under the cap for other sources of emissions. However, they could facilitate a reduction of the cap, thereby lowering overall emissions. These points will be elaborated more below.

4. A number of the examples given in this paper concern instruments applied in conjunction with the EU ETS. It is, however, emphasised that the intention is *not* to 'single-out' this instrument for 'criticism'. On the contrary, a market-based ETS is an economically efficient way to reduce emissions. Rather, this paper explores the effects of *other* instruments in the presence of such a scheme. The points

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1 Other recent papers discussing similar issues include Abrell and Weigt (2008); Böhringer, Koschel and Moslener (2008); Böhringer and Rosendahl (2009) and (2010); Congressional Budget Office (2009); De Jonghe *et al.* (2009); Duval (2008); Fischer and Preonas (2010); Johnstone (2003); Lehmann (2010); Levinson (2010); OECD (2009); Oikonomou and Jempa (2008); Pethig and Wittlich (2009); del Río González (2007); Sijm (2005); Sijm and van Dril (2003) and Unger and Ahlgren (2005).

2 See www.climatechange.govt.nz/emissions-trading-scheme/about/

3 See, for example, Weitzman (1974), Roberts and Spence (1976), Tietenberg (2006), OECD (2008) and Kaplow (2010).

4 This will of course also depend on the availability of estimates of the (marginal) damages caused by the emissions being addressed. Greenstone, Kopits and Wolverton (2011) describes recent estimates of the 'social costs of carbon' (SCC) elaborated by the Council of Economic Advisers and the Office of Management and Budget in the United States. For 2010, the central value of the SCC was found to be USD 21 per tonne of CO_2 emissions.

5 For further discussion of instrument mixes for environmental policy more generally, see OECD (2007) and Braathen (2007).

made here are generally valid when any instrument that places an effective 'cap' on the *total emissions* of certain types is in place – also instruments that could be significantly less cost-efficient than the EU ETS.[6] The reason for the focus given here to the EU ETS is simply that it is one of the most important and best-studied of the relevant instruments.[7]

5. It is emphasised that the focus here is on emission categories where the environmental impacts are only related to the total amounts of emissions (*e.g.* CO_2). If the environmental impacts *also* depend on *e.g. where* (some of) the emissions take place (as is the case for *e.g.* SO_2 and NO_x), a cap-and-trade system will generally have to be combined with additional instruments. Adding more instruments could increase total costs – but it could also (significantly) increase total benefits.[8]

6. The paper is organised as follows: Section 2 discusses impacts of overlapping instruments in the short term – with the overall 'cap' being unchanged. Section 3 discusses the impacts 'additional' instruments can have on future caps, in the medium to long term. Section 4 draws some conclusions.

2. Impacts in the short run; for a given cap

2.1 Impacts on CO_2 emissions

7. A natural starting point is to look more closely at the impact on CO_2 emissions of combining a CO_2-related cap-and-trade system with additional policy instruments that address such emissions from the same sources as the trading system. As already mentioned, doing so will not cause any extra emission reduction, as long as the cap of the trading system is binding[9] and remains unchanged.

8. The 'additional' instrument(s) would indeed cause further abatement efforts by *some* emission sources, but – given the 'logic' of a cap-based trading system – this would lead to a reduction in permit prices and *increased emissions from some other source(s)* included in the trading system.

9. This point has important implications for the environmental effectiveness and economic efficiency of many policy instruments applied in countries with a cap-and-trade system in place, such as in all member countries of the EU. For example, given that the EU ETS among other things covers electricity generation, additional policy instruments that address electricity use[10] or the CO_2 emissions caused by electricity generation[11] are unlikely to cut total CO_2 emissions on an EU-wide scale so long as the cap is binding and is not itself reduced. For example, the ban on incandescent light bulbs in EU countries will, itself, have a limited impact on EU-wide CO_2 emissions, in that the reduction in electricity consumption due to the higher energy efficiency of alternative lamps will trigger increased CO_2 emissions somewhere else within the system. Likewise, other instruments used to reduce CO_2 emissions in the industrial sources covered by the trading system will not cause overall EU CO_2 emissions to decrease.

6 In a so-called 'baseline-and-credits' trading system, total emissions are *not* decided in advance, and the points made in this paper are thus not generally valid.

7 The U.S. cap-and-trade system for SO_2 emission allowances is also important and well-studied. However, for SO_2, the environmental impacts depend not only on the *total* level of emissions, but also *i.a.* on *where* the emissions take place. Hence, a reduction in emissions in one place that is 'compensated' by increased emissions elsewhere *could* well lead to an improved net outcome for society.

8 See *e.g.* Johnstone (2003).

9 Section 2.5 addresses a situation where the 'cap' is not binding.

10 *E.g.* measures to increase the energy-efficiency of electrical appliances and taxes on electricity use.

11 *E.g.* subsidies to promote market penetration of renewable energy sources, feed-in tariffs for renewables, and standards for the renewables content in electricity generation.

10. For example, if country A spends EUR 100 million to subsidise the building of wind turbines to (partly) replace coal-fired power plants, this would certainly cause a reduction in CO_2 emissions related to electricity generation in that country. This decrease in emissions would lower the demand of emission allowances in the EU ETS, causing the prices of these allowances to decrease and making it feasible for *other* firms covered by the system to emit more CO_2. As long as the value of an emission allowance is positive, one or more of the other firms covered by the ETS will increase their emissions until the room under the cap is eliminated.

11. If country A really wanted to achieve a reduction in CO_2 emissions at an EU (or global) level, it would be more effective to spend the EUR 100 million buying up emission allowances in the market and then *never* use them. That would guarantee a decrease in total emissions because, in effect, the cap on total emissions would be reduced.[12]

12. Favourable feed-in tariffs and 'green certificates' are other policy measures EU countries (and others) use to promote the development of renewable sources electricity.[13] Again, such measures will not have an impact on EU-wide CO_2 emissions, as long as the cap remains unchanged. When discussing a joint green certificates scheme for Norway and Sweden, Bye and Hoel (2009) characterised such certificates as "expensive and pointless renewable fun" [for policy makers].

13. Indeed, imposing measures in addition to a binding cap-and-trade system can lead to surprising and arguably perverse outcomes. For example, Böhringer and Rosendahl (2010) analysed a combination of a CO_2 trading system (referred to as a 'black quota') and a green certificates system (referred to as a 'green quota'), and concluded that:

> "… although the green quota further decreases total black power production, the dirtiest technology will actually increase output. The reason is that the green quota reduces the shadow cost of the emission constraint, mainly benefiting the most emission-intensive technologies."

14. Fischer and Preonas (2010) addressed instrument mixes involving measures to promote renewable energy sources. They concluded that

> "With overlapping policies (particularly inefficient ones), one can no longer point to allowance prices as an accurate reflection of marginal abatement costs. Nor are the benefits of other RES-E [Electricity from renewable energy sources] policies transparent. Consequently, as more tradable quota mechanisms are adopted, other pre-existing policies should be re-evaluated to ensure that taxpayers and consumers are still getting their money's worth of the renewable energy they wish to support."

15. In discussing the benefits of combining a cap-and-trade system with 'command-and-control' regulations, Levinson (2010) found that the

> "… answer depends on whether the price of the tradable GHG emissions permits, and hence the marginal cost of compliance with the cap-and-trade legislation, is higher or lower than the marginal cost of compliance with the traditional regulatory standard. Intuitively, if the permit

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12 However, by contributing to higher permit prices, this *could* have a negative impact on the setting of future 'caps', cf. the discussion below.

13 The (partly hidden) costs of some such estimates can be considerable. An OECD estimate indicates that *if*, with the feed-in tariffs applied until recently for photovoltaics in Italy, solar power were to achieve a market share of 5% of total electricity generation, then the average electricity bill would have to rise by some 30-35%.

price exceeds a firm's regulatory compliance costs, that firm would abate beyond the regulatory standard anyway, in response to the cap-and- trade incentives, and the regulatory standard would be irrelevant for that firm. By contrast, if the permit price falls below the regulatory compliance costs for a firm, the firm would meet the regulatory standard exactly and either sell excess permits or buy fewer than it would under cap-and-trade alone. The regulatory standard raises the firm's cost of abating emissions without any resulting increase in overall abatement."

16. The US Congressional Budget Office (2009) wrote that

"If regulatory standards are applied [next to a cap-and-trade system], however, a different mix of technologies and products could occur than a cap-and-trade program would produce, especially if standards are relatively more stringent and more narrowly defined. Because the total reduction in emissions would be determined by the cap, the emissions would be the same as they would be without the standards. More of the reduction would be attributable to the standards, less would be achieved through the cap-and-trade program, and allowance prices would be lower."

17. In December 2009, the French Constitutional Court invalidated a "carbon tax" that the Parliament had adopted a few weeks earlier – in part because the tax would exempt firms that are covered by the EU ETS. Unfortunately, the Court does not seem to have understood that taxing those firms, while contributing to a reduction in *their* emissions, also would contribute to lowering the prices on emission allowances and increasing CO_2 emissions elsewhere by a similar amount. Hence, a relatively well-designed "carbon tax" may have been scrapped, at least in part, owing to a misunderstanding of the economic effects of the measure on the part of the Constitutional Court.

18. A number of local and regional authorities have in recent years set their own CO_2 emission reduction targets. For instance, the "Climate Change Action Plan" of London, established in March 2007, calls for a 60% emission reduction from 1990 to 2025; New York's "A Greener, Greater New York" campaign, set up in April 2007, aims for a 30% reduction from 2005 to 2030, and Tokyo's "Climate Change Strategy", established in June 2007, seeks to achieve a 25% reduction from 2000 to 2020 (Corfee-Morlot *et al.*, 2009). While no binding nationwide CO_2 emission reduction cap is covering New York and Tokyo at present, London is covered by the EU ETS. Hence, measures that London puts in place to reduce CO_2 emissions in the sectors covered by the EU ETS would not lead to a reduction in EU-wide emissions, but would – like in the previous examples – be 'compensated' by increased emissions somewhere else in the EU.

19. Goulder and Stavins (2010) also addressed a similar issue and found that

"When the federal policy sets limits on aggregate emissions quantities, or allows manufacturers or facilities to average performance across states, the emission reductions accomplished by a subset of U.S. states may reduce pressure on the constraints posed by the federal policy, thereby freeing facilities or manufacturers to increase emissions in other states. This leads to serious "emissions leakage" and a loss of cost-effectiveness at the national level. … "

20. The arguments above do *not* rest on an assumption that "all markets always work perfectly" – which obviously would not have been realistic. There are certainly 'failures' in many of the markets covered by *e.g.* the EU ETS (imperfect competition, information failures, split incentives between landlords and tenants, etc.). But if the cap is binding,[14] the workings of a trading system will 'automatically' lead to emission reductions in one place being countered by increased emissions from

[14] Which a strictly positive price on emission allowances indicates currently is the case.

someone else covered by the system. A number of arguments that nevertheless can give a role for additional policy instruments are mentioned in Section 2.4.

21. There is a 'reverse side to the coin' presented above: Instruments that effectively bring new emissions in under the cap can contribute to net 'global' emission reductions.

22. For example, promoting the replacement of petrol- or diesel-driven vehicles by electric vehicles *would* lead to a net reduction in EU-wide CO_2 emissions, regardless of the 'marginal' source of electricity within the EU. Because transport emissions are not presently covered by the ETS, measures to encourage their reduction could contribute to a reduction in EU-wide CO_2 emissions. It is sometimes claimed that one needs to take into account the CO_2 emissions caused in the generation of the electricity used by the electrical vehicles, but – as long as the total cap of the EU ETS is not increased – this is *not* correct. Such promotion would in fact cause emission reductions equal to the emissions the petrol- or diesel-driven vehicles would have caused – without any 'correction' related to CO_2 emissions stemming from the necessary electricity generation.[15] [16]

23. Similarly, a small but increasing number of ports are providing electricity to ships at berth, so that the ships can avoid using their auxiliary motors to produce electricity.[17] This can contribute to reductions in emissions of SO_2, NO_x and particles, and in noise levels. In EU countries, providing shore-side electricity would *also* with certainty lead to a reduction in CO_2 emissions – as long as the EU ETS cap remains unchanged – as otherwise unregulated emissions from the ships effectively would be brought in under the cap.[18]

2.2 Impacts on energy security

24. Even if the limited efficacy in relation to CO_2 emissions of adding other policy instruments to a cap-and-trade system is accepted, it is sometimes contended that such measures are desirable on the basis that they improve the 'energy security' of a country or the wider region. For example, building wind turbines in EU countries is said to reduce the country's and the region's dependence on fossil fuel imports.

25. At first sight, this could seem correct. Wind turbines are driven by wind – not by coal, natural gas or fuel oil. However, interactions with the 'cap-and-trade' system again come into play. As explained above, replacing a coal- or gas-fired power plant with a wind turbine will necessarily *increase* CO_2 emissions from some other source(s) covered by the trading scheme. And these CO_2 emission-increases can only stem from increased *use of fossil fuels* among these 'other' sources. This could either be due to an increase in 'activity levels',[19] or to an increase in the average CO_2 intensity of a given activity level[20] – or a

15 There are hence arguments for putting in place *some* policy instruments aiming to promote the *replacement* of petrol- and diesel-driven vehicles by electric vehicles. However, the measures applied for this purpose in some countries seem out of proportion to the benefits achieved. For example, ECON (2009) indicated that subsidies given to electrical vehicles in Norway exceed 2,500€ per tonne of CO_2 abated.

16 For individuals in the EU that would like to 'do something themselves for the climate', replacing a petrol- or diesel-driven car by an electric one could, hence, be an option. If the old car emitted 180 gram CO_2 per km, and it would be driven 200,000 km over its lifetime, 36 tonnes of CO_2 would thus be avoided. But, if the price of an emission allowance in the EU ETS is EUR 15, a similar environmental impact could be obtained for EUR 540, by buying and cancelling 36 emission allowances.

17 See, for example, OECD (2010b), (2010c) and (2011a).

18 Emissions from international shipping are, however, not covered by countries' obligations under the Kyoto Protocol.

19 *E.g.* more fossil fuel-based power plants.

combination of the two. Hence, 'overall fossil fuel use' (measured by the amount of CO_2 emitted) in the EU ETS region as a whole would not be affected – as long as the cap is unchanged.

26. A caveat is that the 'supply risks' related to different fossil fuels could be (considered to be) different. If, for example, the supply of natural gas is considered more unsecure than the supply of coal, one might want to *e.g.* replace natural gas use in the electricity sector by wind turbines, and accept an increase in coal use in other electricity plants, or in various industrial sectors, instead.

27. The EU has decided that 20% of total energy consumption is to come from renewable resources by 2020 – in part with the objective of enhancing the energy security of the region. However, due to the operation of the CO_2 cap under the ETS, this represents a moving target, which could prove to be very difficult and costly to meet. When *one* country takes action to comply with the obligation, the *same* country, or one of the *other* countries covered by the EU ETS, will automatically find it more difficult to reach the renewables target. This is because the fossil fuel replaced by a renewable energy source in one firm will largely be used somewhere else, within the ETS, as explained above. Hence, replacing *e.g.* a coal-fired power plant by a wind turbine park, or replacing fuel oil used in a paper mill by forest-based waste products, will free up CO_2 allowances under the ETS cap, reducing their prices. The allowances will be used somewhere else – entailing increased fossil fuel use there. The total share of *renewables* in the energy mix – at the EU level – will thus not be *much* altered (and *total* energy use could in principle increase). A given country may reduce its dependence on imported fossil fuels by such measures – but this would largely be at the 'expense' of some other country.

28. Hence, there are environmental and economic reasons for EU authorities to review the relationship of the current renewables target to the CO_2 cap.

2.3 Impacts on other types of emissions / externalities

29. Still another argument used to 'defend' the use of 'additional' instruments on top of a cap-and-trade scheme for CO_2 emissions is that those instruments would *also* affect other types of emissions (*e.g.* emissions of SO_2, NO_x and particulate matter) stemming from the CO_2 emission sources. At first sight, this seems probable, but closer analysis casts some doubts.

30. One point to make is that it would most likely be more effective and efficient to address such *other* emissions through policy instruments specially designed for that purpose, than to rely on ancillary benefits from instruments primarily designed to address CO_2 emissions.[21]

31. More important in the present context is, however, that it is not given that there would be any *net* co-benefits stemming from the 'additional' instruments, when they are used on top of a cap-and-trade scheme. The reason is similar to the points made in the two preceding sub-sections: the 'additional' instruments would cause increased use of fossil fuels 'elsewhere' among the sources covered by the trading system. The net impact on *e.g.* SO_2, NO_x and particle emissions will, hence, depend on the *relative emission intensities* of the sources that reduce and the sources that increase their CO_2 emissions.

32. Transport fuels are not covered by the EU ETS, but, in principle, one could include such fuels in a cap-and-trade system, *for example* by obliging petroleum refineries (and similar) to hold emission allowances covering the CO_2 emissions that will be caused by the combustion of the fuels they sell. If this were the case, there would certainly be good reasons to apply additional instruments to address other

[20] *E.g.* substitution of a coal-fired power plant for a gas-fired one.

[21] This being said, co-benefits of climate change mitigation policies in general can certainly be important, cf. *e.g.* Bollen *et al.* (2009).

externalities related to vehicle use (local air pollution, accidents, congestion, etc.) – but, as mentioned above, those instruments should primarily be designed with the intention of addressing the ‘other’ externalities, not come about as side-benefits of instruments primarily designed to address CO_2 emissions.

2.4 Impacts on economic efficiency

33. In spite of the arguments presented in the preceding sub-sections, there *are* economic efficiency arguments for applying additional instruments on top of a ‘cap-and-trade’ system if they effectively address relevant market failures, such as information barriers, market power in relevant markets, split incentives between landlords and tenants, etc. Energy-labelling can reduce information barriers, stricter building codes can address split incentives between landlords and tenants, active competition policy and various regulations can limit market power, etc.

34. The Congressional Budget Office (2009) states that

> “Although cap-and-trade programs by themselves are more cost-effective in general, combining regulatory standards with cap-and-trade programs can yield lower costs under some circumstances. Standards could contribute to a lower economy -wide cost of achieving a cap on emissions if the higher energy prices caused by the cap did not create sufficient incentives for businesses or consumers to reduce emissions cost-effectively.”

35. However, the additional instruments should (like any other policy instrument) be subject to a careful cost-benefit analysis, where (almost) no benefits should be assumed to stem from reduced emissions of CO_2 or local air pollutants, or as regards an increase in energy security.

36. It is also well-known that there are positive externalities related to R&D and technological innovation. Potential innovators will not be able to capture all the benefits of innovation for themselves, and in an unregulated economy, too few resources would hence be devoted to such activities.[22] There are, hence, valid economic efficiency arguments for applying instruments to promote new technologies that help abate CO_2 emissions, on top of a cap-and-trade system – *also* while the cap remains unchanged – if the expected benefits exceed the expected costs.

37. The conclusion of Abrell and Weigt (2008) quoted to above continues as follows:

> “Learning effects are the standard justification of renewable energy support. Generally, it is agreed that there are learning effects for renewable generation technologies. Therefore, a uniform support scheme for renewable energies points into the right direction. However, differentiating such a system by technologies needs to be justified by different learning rates. However, these rates are generally unknown and hard to estimate. Therefore, an efficient differentiation seems to be impossible. Furthermore, if renewable support schemes are justified on the base of learning effects, then the same argument applies for other emerging technologies which are not renewable but supposed to have learning effects, like CCS technologies.”

38. Duval (2008) pointed to a particular market failure in relation to climate-related innovation: Given the potentially very large welfare consequences of any major breakthrough in technological progress, *e.g.* in the area of electricity production, [even] a strong protection of intellectual property rights may be insufficiently credible to private investors, who may expect governments to deprive them of any major innovation rent *a posteriori*. This is an additional argument for public support for research in areas where one *might* see breakthrough climate-related innovations.

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22 See OECD (2010a) (2010d) and (2011b) for in-depth discussions.

2.5 Impacts if the 'cap' is not binding

39. As for any other policy instruments, there is a possibility that the 'cap' set for a cap-and-trade system will not be binding – meaning that it would be exceeded in practice, *e.g.* due to a lack of appropriate monitoring and enforcement. Another explanation for an un-binding cap could be that it is set so undemanding that already-under-way technical progress will ensure it is met anyway. Many of the interactions with overlapping instruments discussed above would in such cases not take place, as the emission reductions triggered by the 'additional' policy instruments would no longer automatically be 'compensated' by increased emissions somewhere else under the cap.

40. In such situations, overlapping instruments could in practice contribute to reduce overall emissions – acting as some sort of 'additional barriers' on the emissions.

41. However, in relation to the EU ETS in particular, 'cheating' in relation to the targets does *not* seem to have been a significant issue. This could in part be because the penalty for not holding allowances for all emissions is very high (EUR 100 – compared to an allowance price of about EUR 15 at present). The quite generous initial allocation of permits can also have contributed. In addition, the firms covered by schemes are *relatively* few, and relatively easy to monitor. The role of overlapping instruments hence seems more limited in this case.

3. Impacts on future caps; in the medium to long term

42. Having so far discussed the impacts of 'additional' instruments next to a given cap on CO_2 emissions, it is also important to address the possible impacts of these instruments on the level of 'strictness' of the total cap in the future. Additional instruments certainly *can* create the conditions to tighten the cap in the future, but whether this actually occurs will depend on a range of factors, including the political economy conditions surrounding energy and climate policy in the medium to longer term.

43. A first case to consider is instruments meant to stimulate technological development, which also have an impact on current emission levels.[23] Examples include feed-in tariffs for renewables, green certificates and emission standards for electrical appliances. Part of the rationale given for their use in conjunction with cap-and-trade schemes is that they could make it possible to set a stricter cap in the future. As explained above, such instruments will in the short to medium term reduce emissions from some of the capped sources, free up emission allowances, causing allowance prices to decrease and emissions to increase elsewhere within the capped system. The reduced allowance prices will (marginally) reduce the *incentives* for all other sources to develop new abatement technologies – the profitability of spending time and resources to develop such technologies will (marginally) be reduced.

44. The increase in emissions elsewhere will also mean that fewer abatement measures may be applied there in the short to medium term. Hence, among these other emission sources, there *may* be less "learning by doing", hence (marginally) reducing their *ability* to innovate.

45. However, returning to 'additional' instruments more broadly – it is important how they can be expected to affect current and future allowance prices.[24] The caps under EU's 20-20-20 decision were the

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[23] The points made here are *not* relevant for instruments that can cause technology development, *without* having a (significant) impact on current CO_2 emissions, such as *e.g.* public subsidies for research in break-through technologies. If an instrument does not free up allowances in the short term, the "perverse" counter-effects mentioned in this paper will not materialise.

[24] As Roberts and Spence (1976) pointed out, there *are* arguments for combining a trading system with a set of 'taxes'. If allowance prices were 'very low', a 'tax' could act as a floor on the 'carbon price'– providing a continued incentive to innovate. A guaranteed minimum carbon price – like recently proposed by the UK

result of a *political* process,[25] rather than being necessarily based on a detailed estimation of the related costs. However, it is quite possible that future caps will be ‘endogenous’, meaning that a new political deal at least partly will be based on assessments of the expected costs of achieving the respective targets.

46. An example of an emission cap having proven to be endogenous in practice can be found regarding the US SO_2 allowance trading system. There, the total number of allowances was significantly reduced in response to lower-than-expected allowance prices, cf. *e.g.* Ellerman (2002).

47. *If* an additional policy instrument, on top of a trading system, effectively contributes to lowering current and/or expected future allowance prices, by helping to overcome current market failures in an efficient way, and/or by cost-effectively stimulating development of new abatement technologies, it could in fact contribute to the setting of a stricter cap for future years. If not, it would pull in the opposite direction.

48. From a political economy perspective, policy makers have not felt it feasible to tighten the cap of the EU ETS enough to raise the price of carbon emissions to the level that would cause technological change on the scale needed to address the threat of major climate changes.[26] In such a situation, it can make sense to try to facilitate the setting of a stricter cap in the future by applying ‘additional’ instruments on top of the ETS – but it is important to assess both *ex ante* and *ex post* whether the additional instruments *in practice* can be expected to lower the cost of reducing the capped emissions (or in fact have done so).

4. Conclusions

49. To conclude: well designed emission trading systems are environmentally effective and economically efficient[27] instruments to address emissions of CO_2 and other greenhouse gases. The purpose of this note is not to question their usefulness. Once a ‘cap-and-trade’ system has been put in place, further emission reductions are, however, unlikely to be obtained by applying additional policy instruments to the same emissions from the same sources, as long as the cap is unchanged. If an additional instrument *in practice* contributes to reducing the costs of complying with the cap, it *could*, however, contribute to a

Government – can significantly reduce price-related uncertainty for potential investors that often have to plan large investments many years in advance. This could make it easier to realise investments needed to put countries on track for a low-carbon future. If instead allowance prices were ‘very high’, those obliged to hold emission allowances could have the option of instead paying a pre-determined ‘tax’ that would act as a ceiling on the allowance prices. (A ‘reserve’ of additional emission allowances that can be sold if prices increase too much could to some extent serve a similar function. This would limit the environmental uncertainty related to the provision, but increase the price uncertainty, as public authorities could run out of permits in the ‘reserve’.) This ‘tax’ would, however, not be paid for emissions for which the emitter holds an allowance. However, ‘capping’ the allowance prices over a long period of time by putting in place a price “ceiling” could be inconsistent with the targeted emission reductions. See also Jacoby and Ellerman (2004), Strandlund (2009) and Burtraw, Palmer & Kahn (2010).

25 In March 2007, the EU Heads of State and Government agreed a series of climate and energy targets to be met by 2020, known as the “20-20-20” targets. These are:

- A reduction in EU greenhouse gas emissions of at least 20% below 1990 levels;
- 20% of EU energy consumption to come from renewable resources;
- A 20% reduction in primary energy use compared with projected levels, to be achieved by improving energy efficiency.

See http://ec.europa.eu/clima/policies/package/index_en.htm for further information.

26 The same comment could certainly be made regarding policy makers in other countries as well.

27 This is particularly the case if the permits are auctioned, and not handed out for free, cf. OECD (2008).

stricter cap being set in the future – on the assumption that such considerations are taken into account when future 'caps' are set.[28]

50. Policy makers in countries with a 'cap-and-trade' system in place should consider carefully the actual contributions of any other policy instrument(s) they apply to address emissions from sources already covered by a binding 'cap'. There is a danger that some of them increase the total cost of reaching a given (environmental) outcome without making future reductions in the 'cap' more likely.

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