Report

Linking the Emissions Trading Systems in EU and California

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Mistra Indigo
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Summary

The EU vision of creating a transatlantic carbon market took an important step forward when commissioner on Climate Action, Connie Hedegaard, met with California's governor Jerry Brown in 2011 and confirmed plans to link the EU emission trading system (EU ETS) with California's emerging carbon market. The objective of this paper is to investigate the prospects of linking the EU ETS with the California ETS with regard to relevant design features of the two systems. We find that linking the EU ETS with the California scheme is not likely, at least not in the short term. Since the high level meeting between Hedegaard and Brown, California has moved its attention away from the EU and has announced plans to link with Quebec. In addition, a major obstacle to linking the EU ETS with the California scheme concerns the use of off-sets. California allows the use of forest credits and does not acknowledge off-sets from the Clean Development Mechanism, (CDM). In contrast, EU relies on CDM credits, and doesn't recognize forest credits. Both parties signal concerns that linking will lead to losing control of allowance price. Paradoxically, the difference in abatement costs, reflected in allowance price, is an important economic motive for linking two emission trading systems, but may also constitute a significant political barrier. There is however, some common ground that could facilitate future linking. Both parties are positive to creating a larger carbon market through off-set markets and linking. Both parties appear to have compatible levels of ambition with comparably stringent caps on emissions. California will adopt a price ceiling, which could be an obstacle since the EU directive only allows linkage with systems that have absolute caps on emissions. But the California price cap is limited in volume and would probably from an EU perspective not create an insurmountable problem. Regarding allocation, while free allocation is the main method to distribute allowances initially, both systems aim at using auction in the long-term. Finally, both systems provide mechanisms for overview and adjustment of the rules, which could help the calibration of critical features like off-sets, price management mechanisms and legislative differences. With political will, the current barriers to linking the EU ETS and the emerging California scheme could probably be solved.

Contents

1 Introduction

In the absence of an international agreement, significant efforts need to be initiated today on a regional, national and sub-national basis. These initiatives could be connected from the bottom-up to form a regime with growing global coverage. In this respect, the creation and linkage of carbon markets is considered key. Carbon markets are seen as a cost effective way to reduce GHG emissions. In addition, carbon markets can provide finance for mitigation and adaptation actions and provide support for technology deployment and innovation (CEPS 2012).

The EU emissions trading system (EU ETS), in operation since 2005 and covering about 6% of global CO_2 emissions, is by far the world's largest emissions trading system. The EU emission trading system was launched with the purpose of reaching the EU reduction target according to the Kyoto protocol in a cost-effective way and is now regarded by the EU as the main policy instrument to reach the 20% reduction target by the year 2020 (European Commission 2008a and 2011). The EU ETS applies to the 27 EU member states and Norway, Iceland and Lichtenstein. It covers some 11500 participating installations in the energy and industrial sectors which are collectively responsible for almost half of EU emissions of CO_2 and 40% of its total greenhouse gas emissions (European Commission, 2009). The EU ETS also provides demand and finance for emissions reductions in developing countries by supporting the Clean Development Mechanism (CDM). Together with the CDM, the EU ETS forms the basis for the most important global carbon market.

The EU is working towards creating a global carbon market, with a vision of having an OECD-wide market in operation by 2015. A stepping stone in this direction would be the establishment of a transatlantic carbon market by linking the EU ETS with emerging carbon markets in the US. Although the US has been unwilling to join the EU in the efforts to develop a global Kyoto style carbon market, there have been several proposals for a US federal emission trading system (Sterk et al 2009). However, climate policy in the USA has taken another direction. After the congress in July 2010 failed to pass comprehensive climate legislation, the prospects for establishing a nationwide emission trading system suffered a serious setback. Following the midterm elections in 2010, there has been a shift in power from Democrats to Republications. With the Republicans being strongly opposed to cap and trade, this change in the US political landscape and the financial crises climate policy and in particular emissions trading has lost support on the national level. Although the prospects of a federal emissions trading system seem far away, regional initiatives are emerging. This has been made possible due to the election outcomes on the North East and West coasts (Mehling et al 2011). Beginning in 2009, the Regional Greenhouse Gas Initiative (RGGI) sets a modest but binding cap on power plants in 9 Northeastern US states and California will launch a state wide cap and trade program in 2013. The California initiative builds on targets set in the Global Warming Solutions Act

from 2006 to reduce GHG emissions statewide to 1990 levels, about 432 million metric tons CO_2-equivalents ($MtCO_2e$) by 2020 corresponding to a reduction of roughly 80 $MtCO_2e$ below forecast business-as-usual levels (LAO 2012). The lion's share of these reductions is expected to be achieved by a number of regulatory standards and measures, including motor vehicle standards and renewable portfolio standards for power production. The residual reductions are left to the cap-and-trade program (Zetterberg et al 2012). Beginning in 2013, this ETS will first cover power production and energy intensive industry. From 2015 the system will expand its scope to cover approximately 340 $MtCO_2e$ or 80% of the state emissions by including distributors of transportation fuels, natural gas and other fuels (LAO 2012).

This progress on US state level has helped to keep the EU vision of a transatlantic carbon market alive. In April 2011 EU:s commissioner on Climate Action, Connie Hedegaard, met with California's governor Jerry Brown and confirmed plans to link the EU emission trading system with California's emerging carbon market (Guardian 2011). However, given the differences in the two systems regarding cost management, use of external off-sets and other design features, it is unclear whether the emerging carbon markets in California will be sufficiently compatible to allow a transatlantic link to the ETS already in place in the EU.

The objective of this paper is to investigate the prospects of linking the EU ETS with the California ETS with regard to relevant design features of the two systems. Chapter 2 presents implications of linking two emission trading systems in general, while chapter 3 analyses the specific case of linking the EU ETS with the California emission trading system. Finally chapter 4 presents conclusions and recommendations for facilitating linkage.

2 Implications of linking

Linking an emission trading system can in a general sense be seen as expanding the scope and coverage of the emission trading system in order to achieve efficiency gains. This can for instance be done by including new countries, sectors and gases or import emission reduction credits (off-sets). An emission trading system can also link with another emission trading system 'directly' in the sense that allowances from both systems are interchangeable and acknowledged by both jurisdictions for compliance. Linking can also be indirect, if two separated cap-and-trade programs accept and compete over the same offset credits. In this report, we limit our analysis to direct linking of two emission trading systems.

Economic theory suggests that linking two carbon markets will increase efficiency and lower the total costs for reaching the collective emission reduction target, since more reduction options are available in the larger system (Sterk and Kruger 2009). Linking is also

expected to increase liquidity and lower transaction costs. By equalizing carbon prices in the two markets, linking also addresses the issue of competitive distortions. Linking also signals international collaboration and a commitment to long-term climate policy and multilateralism. This may in turn provide larger predictability for investors in carbon intensive industries (Flachsland et al 2009).

2.1 Economic implications of linking

The economic benefits of linking two systems is graphically illustrated in figures 1, showing two separated emission trading systems, and figure 2, showing the effects of linking these two systems.

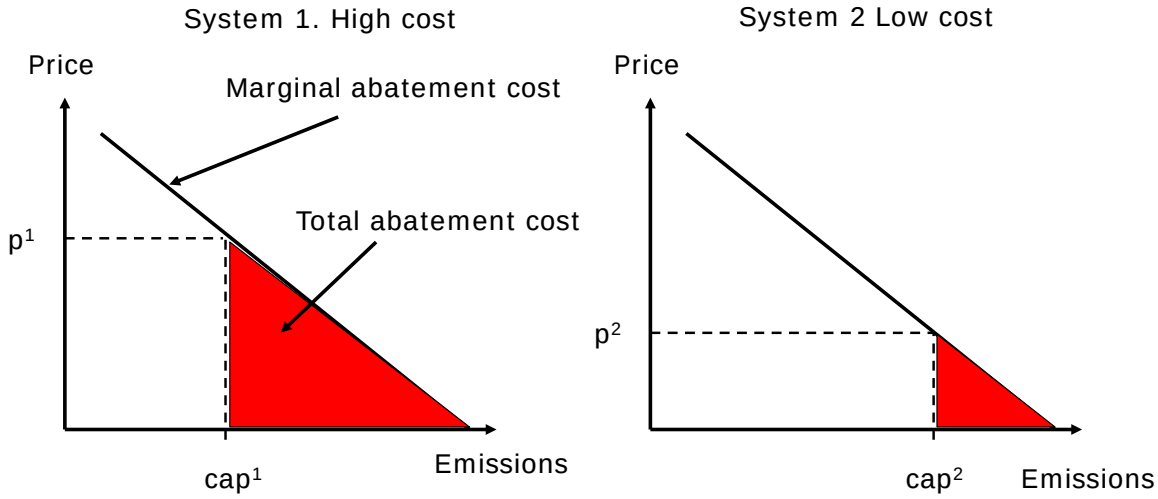

Figure 1. Two separated emission trading system with different allowance price**.**

Figure 1 shows the situation before linking. System 1 has a more ambitious reduction target and is referred to as the 'High cost system', while System 2 has a less ambitious reduction target and is referred to as the 'Low cost system'. The sloping line illustrates the Marginal Abatement Costs (MAC) as a function of emissions. We assume that when the ETS is introduced emissions are at the level where the MAC-curve crosses the x-axis, where the marginal abatement cost is zero. When emissions are capped, firms will need to reduce emissions down to the level of the cap. As emissions are reduced the marginal cost for abatement will increase. When emissions are reduced to the level of the cap, the price of allowances will equal the marginal cost for abatement. The total cost for reaching the emissions target is illustrated by the red triangle in the figure. A system with a more stringent cap (system 1) will have a higher allowance price and higher costs than a system with less ambitious cap (system 2).

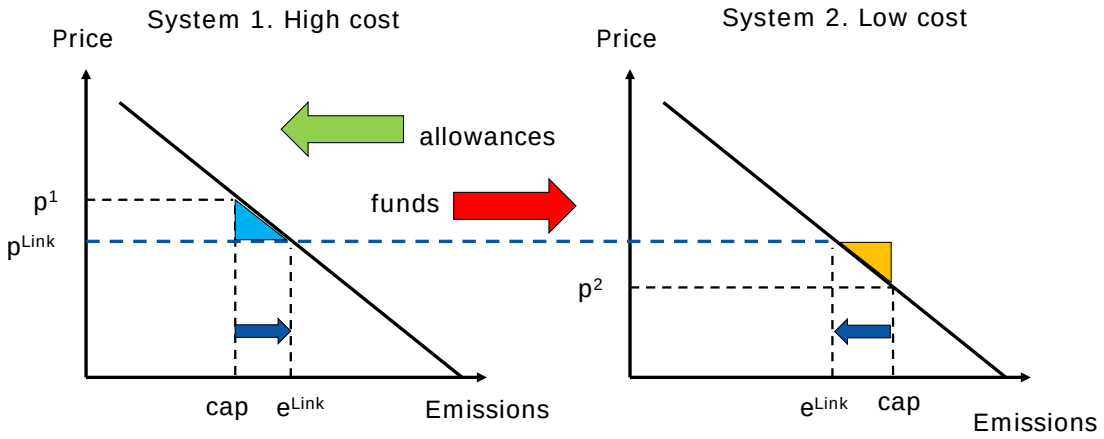

Figure 2. The effects of linking two emission trading system with different allowance price.

Figure 2 shows the effects of linking the two emission trading systems in figure 1. System 2 with a lower allowance price will perform additional emission reductions and sell the surplus allowances to system 1. This continues until allowance prices are equalized in the two systems at the new price level p^{Link}. In system 1 emissions increase from the cap level to a new level, e^{Link}. In system 2 emissions decrease from the cap level to a new level, e^{Link}. The high cost system pays the low cost system in return for allowances, while the total emissions in the two systems are unchanged. The cost savings in system 1 will be the reduction of abatement costs minus the costs for acquired allowances, illustrated by the blue triangle. The net revenues in system 2 will be the value of sold allowances minus the additional costs of abatement, illustrated by the yellow triangle. This graphical illustration shows that both systems benefit from linking and that the total costs are reduced by the sum of the yellow and blue triangles. Estimates show that the total cost savings from creating a global carbon market with trade across all countries and sectors as opposed to non-trade can be as high as 50 percent or more (Flachsland et al 2009). Although both systems, on aggregate, are better off from linking than before, there may be individual participants that are worse off from linking. For instance, sellers of allowances prior to linking may become buyers after linking (EPRI 2006).

In addition to the cost savings and effects on allowance price, there are other economic implications of linking. Linking carbon markets from different regions may equalize carbon prices and hereby reduce competitive distortions between the regions. With the creation of a larger carbon market, with more players and allowances, linking is likely to reduce transaction costs and increase market liquidity. Price variations and shocks within one system can be absorbed and cushioned within a larger overall market. Hereby, linking may enhance price stability which improves certainty for investors. However, on the downside, from a single system's point of view, volatility from the other system might be imported (Flachsland et al 2009). There are concerns that linking could introduce a perverse incentive for allowance sellers to relax their cap in order to sell more allowances, and as a result increase their revenues.

2.2 Political implications of linking

In addition to the strict economic implications from linking, there are also political consequences from linking. Although this paper mainly focusses on the technical implications of linking, a few points on political implications are worth mentioning. According to Flachsland et al (2009), linking signals political collaboration which may enhance further cooperation between parties and provide an example to follow. In fact, the authors argue that this is the most tangible benefit of a transatlantic linkage. Secondly, as mentioned previously, linking can equalize carbon prices and address the issue of competitive distortions, and this effect also holds a political dimension. Linking can facilitate the acceptance of climate policy among business actors and the general public. The relevance of this point is manifested in business community calls to 'level the playing field' by harmonizing carbon prices globally within a sector. Third, linking is a way for one party to signal approval towards other systems. Conversely, a linking offer could be declined despite the efficiency gains, if the potential partner's efforts are perceived to be unacceptably low. The authors take the example of linking the EU ETS with the US RGGI system. Even though cost savings would be expected, the EU would most likely be reluctant to link to a system that would sell 'hot air' allowances to the EU ETS. A problem of linking two systems with different political objectives may be the loss of control and compromising of the original policy priorities in each system. With linking, the scope for regulatory interventions of the single system is reduced.

2.3 Implications of differences in design features

Linking will generally lead to 'mixing' of design features (Tuerk et al 2009). Linking does not require all design features to be identical, however differences in certain design features may undermine the original objectives of the system and hereby constitute a barrier to linking. In this respect, the following design features are regarded as critical (Sterk and Kruger 2009, Mehling et al 2011):

- Relative stringency of targets
- Recognition of off-sets
- Price management, also referred to as 'cost containment'

2.3.1 Relative stringency of targets

As shown in figure 2, linking will raise the allowance price in the low cost system while reducing allowance price in the high cost system. On aggregate, money will flow from the high price system to the low price system. This effect can result in significant political pressure, especially if the price gap is large to begin with. Constituents in the high cost system may be very reluctant to pay for emissions reductions in the low cost system. On

the other hand, if allowance prices are very similar in the two systems, there will be little economic gain in linking. In fact, with a greater difference in pre-link allowance prices, the greater benefit from linking. Paradoxically, the difference in abatement costs, reflected in allowance price, is an important economic motive for linking two emission trading systems, but may also constitute a significant political barrier.

2.3.2 Recognition of off sets

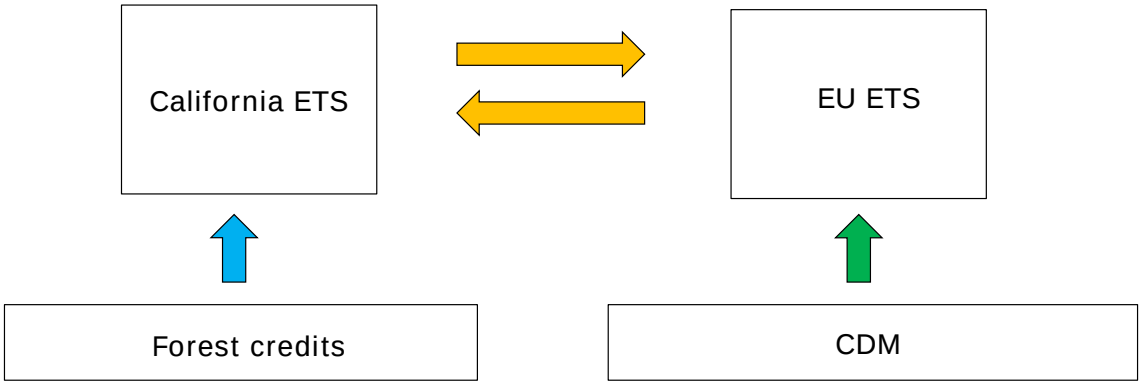

Figure 3. Off-sets available in one system are after linking available in the second system even if that system restricts its use.

This would free up regular domestic allowances in the first system that could be sold to the second system. It would be impossible for the second system to know the origin of the allowances. The combined system would therefore be using forest credits. This way the political decision in the second system to restrict the use of certain off-sets has been bypassed.

2.3.3 Price management mechanisms

The third design feature that may be a barrier to linking is the existence of price management mechanisms, also called cost containment mechanisms.

Emissions trading is a so called quantity based market mechanism. By defining an emissions cap, there is certainty about how high the emissions will be, but uncertainty about the price on allowances. In contrast, a price based policy, like a carbon tax provides certainty about the carbon price, but uncertainty about what the level of emissions will be. Before emissions trading was introduced, The EU investigated the possibility to implement a carbon tax. However, since this turned out to be politically impossible, they changed strategy and pursued the concept of emissions trading instead (Wråke et al 2012). In

addition, since the EU has committed to reduce emissions by 20% by the year 2020, emissions trading is regarded as an attractive policy instrument since it can provide certainty in reaching this objective.

The uncertainty of allowance price associated with emissions trading has led to concerns by both EU and US regulators. In the US, different emission trading scheme proposals have involved different types of cost containment provisions, including off-sets and borrowing provisions. However, the option for cost containment that has been most commonly discussed is some sort of price ceiling, also referred to as price caps. This is due to the economic down turn and concerns about international competitiveness. The function of a price ceiling is illustrated in figure 4. If allowance price reach a pre-determined level, $p^{ceiling}$ extra allowances are provided by the regulator at a fix price. As long as the allowance price is below the price ceiling, the scheme functions like a quantity based policy with certainty of total emissions, but not price. If the price ceiling is reached, the system turns into a price based policy (like a carbon tax). As additional allowances are injected into the market, emissions increase. This provides certainty about the maximum carbon price, but not the emissions volume.

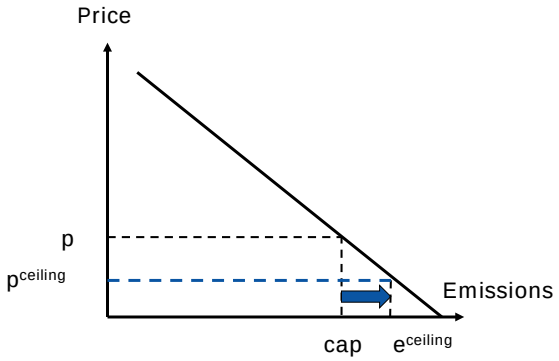

Figure 4. Schematic description of how a price ceiling functions

Price ceilings have important implications on linking. Mehling et al (2011) and EPRI (2006) show that if this type of provisions are available in one system, they will after linking become available in the other system too, regardless if the other system acknowledges them or not. This mechanism is described in figure 5. Assume that system 2 has a price ceiling that has been activated, i.e. allowance price has increased to the price ceiling level, which has triggered the release of extra allowances until the marginal abatement costs correspond to the price ceiling. After linking the participants in system 1 (without a price ceiling) will be able to buy allowances from system 2 at the price ceiling level. Emissions will increase also in system 1 until marginal costs of abatement equals the price ceiling level. As shown by the graphics, emissions could increase considerably in system 1.

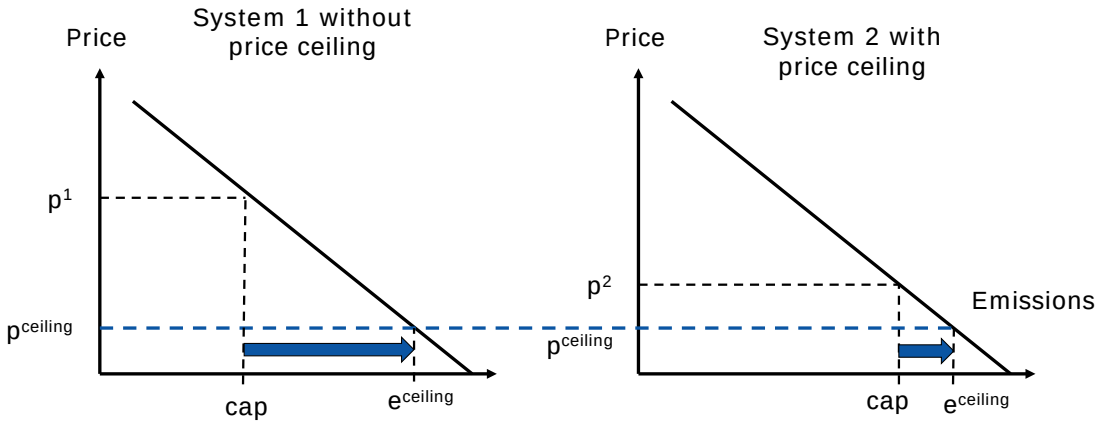

Figure 5. Linking an emission trading system without a price ceiling with another system with a price ceiling.

This example illustrates one possible case, when the price ceiling is activated both before and after linking. Other cases include:

- The price ceiling is not activated before nor after linking
- The price ceiling is activated only after linking
- The price ceiling is activated before linking, but not after

These alternative cases are described in EPRI (2006).

The EU commission has also been concerned about carbon price, but now discussions mainly focus on a too low allowance price. With a too low carbon price, the development of necessary carbon efficient technologies will be delayed. In the first phase of the EU ETS, allowance price was volatile and reached €34 per ton before plummeting to almost zero (Wråke et al 2012). Following the revision of the directive, starting in phase two (2008-2012) limited price management has been provided by off-sets provisions, limited borrowing and adjusting the cap. In phase two, allowance price has been relatively stable around €15, but since the end of 2011 allowance price has fallen to a level below €7 (May 2012). This recent development has opened for new EU discussions of increasing carbon price through cap adjustments.

3 Analysis of linking EU ETS with the emerging California ETS

In this chapter we analyze the prospects for linking EU ETS with a Californian scheme with regard to the following aspects:

- General position on linking

- Relative stringency of targets
- Recognition of off-sets
- Price management
- Sector coverage
- Distribution of allowances

Table 1. European and Californian carbon markets – the basics

	EU ETS	California
Cap, number of allowances (million ton CO_2-equiv.)	1900 (year 2013)	340 (year 2015)
Coverage of Emissions (percent)	40%	85%
Reduction targets	- 21% to 2020 compared to 2005	-9% compared to 2005 (0% compared to 1990 levels)

3.1 EU's and California's position on linking

The EU sees its emission trading system as an important building block for the development of a global network of emission trading systems[1]. By linking other national or regional cap-and-trade emissions trading systems to the EU ETS a bigger market can be created, thus potentially lowering the aggregate cost of reducing greenhouse gas emissions, increasing liquidity and reducing price volatility. The EU points out that it is keen to work with the US to build a transatlantic carbon market which can act as the engine of a concerted international push to combat climate change. While the original Directive only allowed for linking the EU ETS with other countries that have ratified the Kyoto Protocol, the new rules (EC 2008b) allow for linking with any country or administrative entity (such as a state or group of states under a federal system). A requirement for linking is that the other country establishes a compatible mandatory cap-and-trade system whose design elements would not undermine the environmental integrity of the EU ETS, meaning that there must be an absolute cap on emissions.

When developing the cap-and-trade regulation, the California Air Resources Board indicated that linking with other jurisdictions' cap-and-trade programs is interesting as it could serve to contain aggregate program costs by providing more opportunities for low cost emission reductions. However, legal questions have been raised regarding California's ability to enter into an agreement with a province of another country. In addition to legal

[1] [1] In late August 2012, when this report where about to be finalized, the European Commission and the government of Australia declared their intention to link their respective carbon markets not later than 2018

concerns, California points out that it is important that covered entities in both jurisdictions are harmonized and subject to equally stringent rules for compliance. Otherwise, unintended adverse economic impacts may result. For instance, offset protocols should be harmonized. Moreover, the California Air Resources Board raises concerns that if the linked jurisdiction has a more stringent target than California, this may lead to a scarcity of allowances which may increase overall allowance prices and increase compliance costs for California's covered entities (LAO 2012).

Regarding potential candidates for linking, California specifically mentions the Western Climate Initiative (WCI) –a consortium of Western US states, Canadian provinces and Mexican states. While many of the WCI members have either postponed or are further behind the regulatory development process, Quebec is seen by the Air Resources Board as being on track to link with California. Consequently, in May 2012 the California Air Resources Board announced plans to link with Quebec (CARB 2012). Linking with EU ETS is not explicitly mentioned.

3.2 Relative stringency of targets

Significant differences in the stringency of targets may lead to large differences in pre-link prices in the two systems. If this is the case of EU and California, linking may lead to significant changes in allowance price (compared to not linking) and a significant net flow of funds from one system to the other. In the EU, the target is to reduce GHG emissions by 20% in 2020 as compared to 2005. The EU leaders also offered to strengthen the EU's emissions reduction target to -30%, on condition that other major emitting countries in the developed and developing world commit to do their fair share under a global climate agreement (EC 2012a). For sectors participating in the EU ETS the target is currently 21% below 2005 year levels by the year 2020, while other sectors, mainly transports and housing have a lower reduction target. The reason for this differentiation is that the trading sectors are estimated to have cheaper mitigation options available. California's target is that emissions in 2020 shall be at the same level as in 1990. Comparing these targets is not just a matter of percentages, but need to consider several other aspects such population growth, economic growth and available abatement options.

Allowance price can be used as proxy for describing the stringency of the policy since it reflects the costs incurred by the policy. In the EU, from April to December 2011, allowances were sold at US$9 - US$23. EU allowance futures for the year 2020 have been sold at US$17 - US$37 during the same period (co2prices 2012). For California, futures for 2013, 2014 and 2015 were in May 2012 sold at US$15, US$15.75 and US$16.75 respectively (GreenTex 2012). For the year 2020, according to California Air Resources Board, allowance price is estimated to lie between US$15 and US$75 (LAO 2012). Based on these figures, it is difficult to conclude which system will have the highest allowance price over

the period 2013-2020 and therefore be the net buyer of allowances. Variations in price over time may lead to trade in both directions.

3.3 Recognition of off-sets

In the EU ETS, the overall use of credits is limited to 50% of the EU-wide reductions over the period 2008-2020. In practice, this means that existing operators will be able to use credits up to a maximum of 11% of their allocation during the period 2008-2012. EU only recognizes offsets produced under the Kyoto Protocol's Joint Implementation (JI) mechanism (covering projects carried out in countries with an emissions reduction target under the Protocol) or Clean Development Mechanism (CDM) (for projects undertaken in developing countries) (EC 2012b). For the third phase of EU ETS, beginning in 2013, the use of CDM-credits is restricted so that any credits used for compliance need to be either from projects registered before the end of 2012 or from projects in so called least developing countries. Unused CDM-credits from the period of 2008-2012 may be carried over to phase III, but will have to be swapped for EU allowances before 2015. In addition, EU has from 2013 also banned the use of CDM-credits from projects destroying HFC-gases. Any future decision on the use of offsets from flexible mechanisms is closely linked to developments in the UNFCCC-negotiations, both in regards to CDM and a possible new market mechanism.

In the California emission trading system, the regulation allows no more than 8 % of a covered entity's compliance obligation to be met with offset credits, while the remainder must be met with allowances. As of January 2012, only offset projects in the US were allowed and only from the following four areas: forestry, urban forestry, dairy methane digesters and prevention of the release of ozone-depleting substances (LAO 2012).

As noted previously, when two systems are linked, off-sets that are recognized in one system will become available in the other. If off-sets from one system are not allowed in the other, these off-sets will still have an indirect impact on the other system, since allowances and off-sets are interchangeable. When it comes to recognition of offsets, Europe and California are currently far apart. While the EU only allows CDM projects, these Kyoto Protocol project based off-sets are regarded with a high degree of skepticism in some US quarters (Sterk and Kruger, 2009). Moreover, the EU does not recognize the use of forest off-sets, due to questions about monitoring and reporting, but also due to uncertainties about the permanence of these reductions (EC 2008b).

3.4 Price management

The price management features mostly discussed in emission trading schemes include off-sets, borrowing and banking provisions and price ceilings. The recognition of off-sets has

been previously discussed. The EU ETS didn't allow banking between phase 1 (2005-2007) and phase 2 (2008-2012), but banking will be possible between phase 2 and phase 3 (2013-2020). The EU ETS also allows for limited borrowing between years. In February allowances are issued for the current year and in April allowances for the previous year need to be surrendered. This means that allowances corresponding to two years allocation are available at the time of compliance. This opportunity will be reduced as free allocation is phased out.

In the EU, a new provision will apply as of 2013 in case of excessive price fluctuations in the allowance market. If, for more than six consecutive months, the allowance price is more than three times the average price of allowances during the two preceding years, the Commission may (after a meeting with the Member States) either allow Member States to auction a part of future quantities, or allow them to auction up to 25% of the remaining allowances in the new entrant reserve (EC 2012a). This provision is similar to a price ceiling, but with a limit for how many allowances can be used.

The economic recession in combination with new EU policies to increase energy efficiency and use of renewables has led to a collapse in EU allowance price (Grubb 2012). This has fueled discussions of how to *increase* allowance price in order to create better incentives for emissions reductions. One of the options involves a tightening of the overall EU emissions targets 2020 from -20% to -30% compared to 2005 levels. The EU commission also considers setting aside a number of allowances (Reuters 2012). Another short term option being addressed involves reviewing the 'auctioning profile'. This measure would not affect the total amount of allowances being auctioned in 2013 to 2020, but rather addresses the schedule when these allowances are auctioned (Businessweek 2012).

California will allow for limited banking of allowances, with a basic holding limit of 2.5% of the number of allowances issued by the regulator (auctioned and free allocation). California has also adopted a price ceiling mechanism. An allowance set-aside will be sold at US$40, US$45 and US$50 per ton CO_2e. These prices are valid for 2013 and will grow at 5% per year plus inflation. The total amount of allowances that can be released through the price ceiling mechanism is limited to an allowance reserve corresponding to 4% of the total allowance volume. This reserve is populated by allowances from the cap over the entire period 2013-2020, so effectively it enables borrowing from future years but still under the prescribed cap. This arrangement is not unalike the measures discussed in the EU. This design functions as a hybrid of a price and quantity system, since total emissions are limited, while there is some certainty of allowance price. An important feature of this hybrid system is that the allowance reserve limits the amount of allowances that can be sold at the price ceiling. If this reserve is exhausted, there is no longer certainty of price. However, the California Air Resources Board estimates that the reserve is sufficient to contain the allowance price while holding the total emissions within a prescribed cap.

California will also adopt a price floor on allowances, corresponding to US$10 per ton CO2e (LAO 2012).

According to the EU directive, article 25, EU only recognizes allowances from emission trading systems with absolute caps (EC 2009). In general, systems with price ceilings would therefore not be compatible with the EU, since emissions may increase and the environmental integrity of the system would be reduced. Since California adopts a price ceiling, linking with EU could be problematic. However, in California there will only be a limited number of allowances available if allowance price reaches the price ceiling levels. This price ceiling reserve works like a de-facto cap on emissions, which would facilitate linking with the EU ETS. Moreover, as described previously in this section, the EU will apply a similar provision, releasing extra allowances from a reserve in the case of excessive price increase.

3.5 Sector coverage

The California system will at its start in 2013 will have very similar sector coverage including power production and carbon intensive industries as the EU ETS. However, from 2015 California will also include transport fuels. The inclusion of transports in the California system is likely to increase allowance price in California (Holmgren et al 2006), but since the California system is significantly smaller than EU ETS, the impact on allowance price from including California transports in a linked EU-California system will be reduced. There are differences regarding which entity is obliged to surrender allowances for compliance.

3.6 Distribution of allowances

In the EU ETS phases 1 and 2 allowances were to a large extent allocated free of charge and based on historic emissions, a method often referred to as grandfathering. In phase 3, from 2013 and onwards, the main principle for allocation will be auction. However, an exception from this rule will be made for carbon intensive industries exposed to international competition. In practice, full auctioning will only be applied in the electricity sector. For other sectors, a 'transitional free allocation' based on EU-wide sector specific benchmarks will be used. At least 60% of allowances will be auctioned in 2013, with a target of reaching 70% in 2020.

In California, the long term aim is to use auctions for the distribution of allowances. Initially, most allowances will be distributed for free. Industrial sources will receive most allowances from the start in order to reduce the competitive disadvantage and avoid relocation outside California – so called carbon leakage. Electric utilities will receive allowances on behalf of their retail customers in order to reduce the burden on electricity

users. Auctioning will then gradually be phased-in and during the period 2012-2020, with 100% being allocated for free in the first compliance period 2013-2014, 50% being auctioned in compliance period 2015-2017, and 70% being auctioned in 2018-2020 (World Bank 2012).

Differences in allocation may have impacts on the compliance costs for the participating entities but should not affect competitiveness unless allocations are updated in ways that distort product prices (Jaffe and Stavins 2008).

Table 2. Comparison of EU ETS and California ETS regarding critical design features and what implications this may have on linking.

Design feature	**EU ETS**	**California ETS**	**Implications on linking**
General position on linking	Positive since costs are lowered. Vision of creating transatlantic and later on a global carbon market. EU commissioner Hedegaard has met with California governor Brown to discuss linking.	Positive in order to lower total costs. Requirement that both systems apply equally stringent compliance rules. Has announced plans to link with Quebec.	Both parties positive to creating a larger carbon market through off-sets and linking. However, in the short term California appears to have moved its attention away from EU.
Stringency of targets	Allowances for the year 2020 are sold at US$17 - US$37	Allowance price for the year 2020 is estimated to lie between US$15 and US$75	Both parties appear to have comparable stringent caps on emissions. It's difficult to predict if funds will flow from EU to California or vice versa.
Recognition of off-sets	EU relies on credits from the Clean development Mechanism (CDM) and does not recognize forest credits	California allows the use of (domestic) forest credits and does not acknowledge off-sets from CDM	Differences in which off-sets are recognized will be a major obstacle to linking since off-sets in one system will become indirectly available in the other. Future developments in international negotiations on flexible mechanism will be critical.
Price management	Use of off-sets, limited banking and adjustments of the scheduling for allowances release. EU only recognize allowances from emission trading systems with absolute caps	Use of off-sets and limited banking. A price cap which is limited to a prescribed allowance reserve.	The price cap in California should not pose a major problem for the EU since it is limited in volume.
Sector coverage	Electricity and heat production, refineries, metal and mineral production,	Similar coverage as EU plus transport fuels.	The inclusion of transport fuels in California may drive California allowance price up. But since

	forestry		EU ETS is much larger than the California ETS the price impact on the linked system from including California transports will be reduced.
Distribution of allowances	Up until 2012, most allowances have been distributed for free. From 2013 free allocation will be phased out and replaced by auction	Initially in 2013, allowances will be distributed for free, but the long term aim is to use auctions.	Should not pose a major problem for linking

4 Conclusions

Both California and the EU are generally positive to linking their cap-and-trade systems to other carbon markets, either through off-sets or direct linking. EU specifically mentions the creation of a transatlantic carbon market, by linking to the emerging systems in Northern America. This vision received further traction when EU commissioner Hedegaard met with California Governor Brown in 2011 to discuss linking between the emissions trading systems in EU and California. However, since then California has announced plans to link with Quebec, and Europe declared that it will link up with Australia. This could either be viewed as evidence that there is a political appetite for linking and that Europe and California could link at a later stage or that both parties have found other partners considered to be more suitable for linking. In addition, a major obstacle to linking is differences in which type of off-sets that are acknowledged. California allows the use of forest credits and does not acknowledge off-sets from the Clean Development Mechanism (CDM). In contrast, EU relies on CDM credits, and doesn't recognize forest credits.

There exist other differences in design features of the two systems, but these are probably less challenging to resolve:

- California will adopt a price ceiling. In contrast, the EU only allows linkage with systems that have absolute caps on emissions and therefore see price caps as a major complication to linking. However, the California price cap is limited to a prescribed number of allowances. This should, from an EU perspective, facilitate linkage.
- Both parties signal concerns that linking will lead to losing control of allowance price. Paradoxically, the difference in abatement costs, reflected in allowance price, is an important economic motive for linking two emission trading systems, but may also constitute a significant political barrier.
- Legal questions have been raised regarding California's ability to enter into an agreement with another country.

- Flow of funds from EU to California or vice versa may be a political complication although it is difficult to predict which system will be the net buyer of allowances.
- The inclusion of transport fuels in California could lead to an increase in allowance.

In summary, given the recent Californian plans to link with Quebec and due to different views on off-sets, linking the EU ETS with the emerging California scheme is not likely, at least not in the short term. There is however, some common ground that are of interest for further consideration. Both parties are positive to creating a larger carbon market through off-set markets and linking. Both parties appear to have compatible levels of ambition with comparably stringent caps on emissions. Although California has adopted a price cap, its use is limited to an allowance reserve and would probably from an EU perspective not create an insurmountable problem. Regarding allocation rules, both systems aim at using auction in the long term. Finally, both systems provide mechanisms for overview and adjustment of the rules, which could help the calibration of critical features like off-sets, price management mechanisms and legislative differences. With political will, the current barriers to linking the EU ETS and the emerging California scheme could probably be solved.

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