

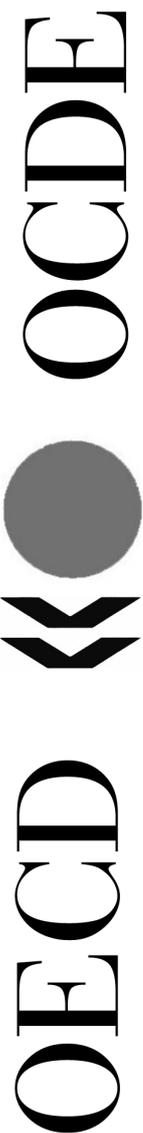


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OECD ENVIRONMENT DIRECTORATE  
AND  
INTERNATIONAL ENERGY AGENCY

**THE COMMITMENT PERIOD RESERVE**

INFORMATION PAPER



## FOREWORD

This document was prepared by the OECD and IEA Secretariats in October 2001 at the request of the Annex I Expert Group on the United Nations Framework Convention on Climate Change. The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document refer to those listed in Annex I to the UNFCCC (as amended at the 3<sup>rd</sup> Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Where this document refers to “countries” or “governments” it is also intended to include “regional economic organisations”, if appropriate.

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## Executive Summary

The Kyoto Protocol under the United Nations Framework Convention on Climate Change sets legally-binding quantified greenhouse gas emission commitments on industrialised country Parties listed in its Annex B. Article 17 of the Protocol allows these Parties to achieve their emission objectives – defined as assigned amounts or AA – through emission trading. Parties that emit less than their AA would be allowed to sell the surplus to other Parties that need them to cover emissions above their own AA. Emission trading would generate a market and a price for assigned amount units, equate the marginal cost of reducing GHG emissions among participants and reduce the overall cost of GHG reductions.

Emissions trading does not inherently ensure compliance. Parties can still emit above their assigned amount and not acquire assigned amount units (AAUs) to cover the excess emissions (“over-emitting” or “under-buying”). Or Parties could allow sales of assigned amount units (AAUs) that do not correspond to emission reductions below their AA and bring themselves into non-compliance (“overselling”), a risk that is introduced by the possibility to trade AAUs. At present, no financial penalty is proposed to deter overselling. The agreement reached in Bonn requires that Parties hold a share of their AA in a “commitment period reserve” in their registry to reduce such risk. This paper provides a description of how the reserve would operate and evaluates the reserve from the standpoint of overselling and potential market impacts.

Parties shall keep AAUs amounting to either – option (a) – 90% of their assigned amount or – option (b) – 5 times their latest reviewed inventory in reserve. A Party would be authorised to trade all AAUs above its reserve as soon as it is eligible to participate in emission trading. Ideally, the reserve under option (b) should be updated to reflect greenhouse gas inventories for years of the commitment period (2008 to 2012) as they become available, a point that is not reflected in Parties’ current proposals.

The stringency of the reserve is the most critical feature of its design. If the reserve is set too high, it will restrict trades and potentially postpone valid transactions until a new inventory shows that the Party can legitimately transfer AAUs. Too low, it will allow overselling. The efficiency loss triggered by an excessive stringency is difficult to assess. Modelling studies assume that restricted sales would be lost for the potential seller, whereas transactions could occur until after 2012. However, another analysis shows that postponed sales may be relatively small compared to the volumes transacted, which implies a limited impact on market efficiency. Furthermore, Parties could enter *forward* or *futures* contracts to secure later transfers, once the reserve allows them, and bring such information to the current market. Such transactions would carry an additional cost and may affect the efficiency of the market. Additional transaction costs may also come from the restricted access to the international market that could be imposed by the reserve. On the other hand, the market would be made liquid by the possibility given to all Parties to trade at least 10% of their assigned amount – essentially allowing a liquidity that is comparable with that of existing (and unrestricted) domestic emission trading regimes.

With the latest proposal, the maximum amount of overselling that could take place with the reserve is much lower than what could occur under a worst-case scenario in which Parties maximise their trading revenues – i.e., sell AAUs until demand is totally satisfied – and ignore the consequences in terms of non-compliance. But the reserve cannot completely eliminate the risk of overselling. Nor does it eliminate other potential causes of non-compliance.

## 1. Introduction

Emission trading as envisioned under Article 17 of the Kyoto Protocol seeks to establish a market price for GHG emission reductions among industrialised country Parties with commitments listed under its Annex B<sup>1</sup>. A Party that emits less than its assigned amount can sell the remainder to another Party that emits more than its assigned amount. With a number of Parties and legal entities under their jurisdiction engaged in emission trading, a market would emerge where any Party or entity could buy and sell assigned amount units (AAUs) from others, at a price determined by the cost of generating these additional reductions. Ideally, Parties would only sell what they would not need for compliance. Otherwise, AAU sales could bring the selling Party into non-compliance.

There are a number of different options to deter overselling. One option is to penalise overselling with a financial payment that is at least as large as the gains expected from the overselling itself. However, Parties have not come to a consensus to impose such a penalty. Alternatively, Parties could be asked to prove that they have achieved reductions beyond their needs before they can trade. This option too has drawbacks. For example, it would restrict the formation of a dynamic market during the commitment period, when it would be most useful for participants seeking to minimise compliance cost. Another alternative would be to require that buyers assume liability should they acquire AAUs from Parties that are in non-compliance. An earlier paper discussed several options to define liability in cases where trading would lead to non-compliance and alternatives to liability rules (Baron, 1999.a)<sup>2</sup>.

Parties have agreed on another option: the commitment period reserve. This rule minimises the risk of overselling by setting aside a portion of Parties' assigned amount in a reserve. All AAUs – and other units – *above* the reserve would be tradable during the commitment period. Once all inventories for the period have been gathered, Parties would be free to transfer any AAUs in excess of their emissions to those Parties that may need them for compliance with the period's commitments.

This paper describes and assesses the commitment period reserve as a rule to govern international emission trading from the standpoint of:

- How it helps limit overselling; and
- The potential effects of the reserve on the efficiency of the emission-trading system, including efficiency and market liquidity (addressed at both the level of Parties and entities).

The rule should meet the objective of limiting the risk of overselling while maintaining the efficiency of the emission trading regime.

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<sup>1</sup> These Parties are: Australia, Austria, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. The US indicated this year its intention to withdraw from the Kyoto Protocol.

<sup>2</sup> Haites and Missfeldt (2001.a) have found that among all proposed liability rules – with the exception of a financial penalty – the reserve would be most effective to reduce overselling and would not significantly add to the overall cost of compliance.

## 2. What is the commitment period reserve

### 2.1 Definition of a commitment period reserve

As introduced in FCCC/CP/2000/CRP.3, the reserve is an addition to a system based on “originating Party liability” – also known as “seller liability”. Parties that have sold AAUs to other Parties and turn out to be in non-compliance are liable for their non-compliance. Buyers can use the acquired AAUs for compliance.

The reserve is a quantity of a Party’s assigned amount units that would be set aside in the registry, prohibiting its transfer to another Party. It has been proposed to express this quantity either as a fixed percentage of the initial assigned amount or as a percentage of the Party’s latest official and reviewed GHG inventory. In earlier proposals, the percentages ranged between 70% and 100% in Parties’ proposals. This paper focuses on the numbers agreed by Parties at COP6-bis.

### 2.2 The COP6-bis agreement

In July 2001, Parties agreed on the details of the commitment period reserve:<sup>3</sup>

*“[...] each Party included in Annex I shall maintain, in its national registry, a commitment period reserve which should not drop below 90 per cent of the Party’s assigned amount [...] or 100 per cent of five times its most recently reviewed inventory, whichever is the lowest.”*

In what follows, option (a) refers to 90% of the Party’s assigned amount and option (b) to 100% of five times the last reviewed inventory.

### 2.3 Adjustments to the reserve

The reserve would put an absolute bound on how much can be transferred by a Party – until it has gathered all five 2008-2012 inventories, as they define the Party’s exact needs for units and therefore how much it can transfer or must acquire. But because option (b) implies adjustments following new information on the country’s emissions, the current negotiating text addresses the possibility that the Party’s holdings would be lower than the updated reserve under option (b):<sup>4</sup>

*“If calculations [under option (b)] raise the required level of the commitment period reserve above the Party’s holdings of ERUs, CERs and AAUs, the Party shall be notified by the secretariat and, within 30 days of this notification, bring its holdings to the required level.”*

Under option (b) computing the new reserve level would be straightforward, and adjustments would be made on the release of each inventory. Parties could also adjust their reserve level if they switch options, as illustrated in Table 1.

<sup>3</sup> Decision 5/CP.6, Implementation of the Buenos Aires Plan of Action, VI.4 paragraph 1.

<sup>4</sup> FCCC/CP/2001/CRP.11, page 47, paragraph 9.

Table 1: Adjustments to the reserve: an illustration

	Year 1	Year 2	Year 3
Initial Assigned Amount	500	Unchanged	unchanged
Inventory (MtCO <sub>2</sub> )	85	89	94
Reserve – Option (a)	450	450	450
Reserve – Option (b)	425	445	470
Option chosen and level	(b) 425	(b) 445	(a) 450

Notes: On Year 2, the reserve is adjusted to reflect the newest reviewed inventory, from 425 to 445 Mt CO<sub>2</sub>. On Year 3, option (a) becomes the lower of the two options, and the reserve is adjusted to 450 MtCO<sub>2</sub> against 470 under option (b).

Since option (a) is based on the initial assigned amount, it would not be adjusted during the commitment period. The cancellation of units resulting from net emissions in land-use and land-use change and forestry activities would not change the reserve, but would affect the total holdings of the Party, bringing the registry closer or below to the limit set by the reserve. The addition of AAUs from such activities would not change the reserve level, but add to the total Party's holdings in the registry.

### 2.3.1 A potential shortcoming

Option (b) seeks to track the Party's emission to assure that it holds enough units in reserve to cover its actual needs. If that is the logic, it seems important to reflect emission levels in 2008-2012 as soon as inventories for these years have been reviewed. Five times the latest inventory may *not* be the best available information. For example, if reviewed inventories were available for 2008, 2009 and 2010, the reserve could be set at the sum of these inventories plus twice the 2010 inventory, as opposed to five times the 2010 inventory, as specified by under option (b). The latest inventory (2010) may not be more representative of 2011 and 2012 emissions than 2008 and 2009 inventories. In addition, the reserve would be less subject to fluctuations in the later years of the commitment period if it were based on the sum of reviewed inventories for 2008-2012, rather than on the latest reviewed inventory multiplied by five.

## 2.4 Emission reduction units and the reserve

The latest negotiating text includes the possibility that transfers of certain emission reduction units (ERUs) based on projects under Article 6 be exempted from the reserve requirement:<sup>5</sup>

*“Any provisions relating to the commitment period reserve or other limitations to transfers under Article 17 shall not apply to transfers by a Party of ERUs issued into its national registry that were verified in accordance with the verification procedure under the Article 6 supervisory committee.”*

<sup>5</sup> FCCC/CP/2001/CRP.11, page 14, paragraph 38.

In other words, a Party that has launched projects under Article 6 and submitted them with success to the supervisory committee could transfer all emission reduction units certified under this process, regardless of whether its registry holds enough units to comply with the reserve requirement.

The Party would not need to be eligible to JI and emission trading to be able to transfer these ERUs. In particular, the prerequisite of a national system for the estimation of emissions and sinks would not apply.<sup>6</sup>

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<sup>6</sup> FCCC/CP/2001/CRP.11, page 11, paragraph 21, and page 10, paragraph 18 (a) to (c) and (e).

### 3. How would the reserve operate?

#### 3.1 Eligibility and reserve requirements

A Party that decides to engage in emission trading must first meet certain eligibility requirements. Among the proposed requirements, is the submission of the information necessary to compute the reserve level<sup>7</sup>:

- The definition of its assigned amount – if it wishes to use option (a);
- Its annual inventory.

A portion of the registry would contain the reserved units (the level would be set at the lower of the quantities: 90% of the initial assigned amount, or five times the most recent inventory). The amount to be held in reserve may vary, e.g. as inventories are produced and adjustments are made to the reserve level, under option (b). These units would be set aside and would not be available for international transactions. Two options can be envisioned:

- Units are labelled as reserve-units by governments themselves;
- Units are not labelled as reserve-units, but the registry simply forbids transactions that would bring it below the current level requirement, except for transfers related to Article 6 projects.

With the proposed rule to exclude certified ERUs from the reserve requirement, compliance with the reserve implies that the following relationship must hold:

$$(1) \text{ Total units in registry} + \text{ Certified ERUs transferred} \geq \text{ Reserve}$$

This also defines the total quantity of units that can be traded under emission trading in a Party's registry:

$$(2) \text{ Tradable amount} = \text{ Total units in registry} + \text{ Certified ERUs transferred} - \text{ Reserve}$$

This relationship holds until all five national inventories have been gathered. At that point a Party's tradable amount would be equal to its registry level less the sum of all five inventories. The reserve is a measure that only applies in the "interim" – Parties must comply with their assigned amount, in the end, and not with the reserve requirement. This implies that any barrier to valid transactions created by the reserve during the commitment period would only be *temporary*. This question is addressed in more depth in a discussion of market impacts.

#### 3.2 What can be traded during the commitment period under the reserve rule?

Let us consider two countries: one with a emission level significantly over its initial assigned amount (a potential buyer) and another a potential seller, as they become eligible to trade.

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<sup>7</sup> Under FCCC/CP/2001/2/Add.2, it is proposed that a Party is eligible to trade only 16 months after the Party has submitted the relevant information regarding its inventories and its assigned amount. The reserve can therefore be computed as soon as this information is reviewed under Art. 8 (and possible questions of implementation resolved), but the reserve would in any case only be operational once the Party is eligible to trade, that is 16 months after the submission of the inventory.

### 3.2.1 Tradable amount: illustration of a potential buyer

This Party's assigned amount is 500 MtCO<sub>2</sub> equivalent. The inventory submitted to become eligible for trading amounts to 110 MtCO<sub>2</sub>. Under the reserve rule, the Party is automatically allowed to transfer the following quantity under option (a) – see equation (2):

$$\begin{aligned}\text{Tradable amount} &= \text{Total units in registry} + \text{Transferred ERUs} - \text{Reserve} \\ &= 500 + 0 - 90\% \times 500 = 50 \text{ Mt CO}_2\end{aligned}$$

This amount is to be compared with the Party's recent annual emissions of 110 Mt CO<sub>2</sub>. Presuming that the Party needs to be, by 2012, a net buyer, it has an important quantity at its disposal for trading at any point in time, not far from half of its annual emissions.

The liquidity of the international market would come from the circulation of 10% of buying Parties' assigned amount that can be traded back and forth, instead of a market that is only supplied by countries that are net sellers.

Net buyers would be allowed to trade this amount, augmented by other units that they must purchase for their compliance, until the grace period, when they must hold enough units in registry to cover their total 2008-2012 emissions. Until then, the registry of the buyer in our example could remain at 450 Mt CO<sub>2</sub> and even lower, if it were to generate ERUs for transfer to other Parties<sup>8</sup>.

The possibility for buyers to sell up to 10% of their assigned amount does create some possibility for overselling.<sup>9</sup> There is a clear trade-off between this risk and the risk of dampening market liquidity and efficiency by only allowing sellers to transfer AAUs and ERUs.

### 3.2.2 Tradable amount: a potential seller

Let's assume a potential seller with an assigned amount of 500 MtCO<sub>2</sub> and a most recent inventory of 80 MtCO<sub>2</sub>. At the outset, the Party's tradable amount under option (b) would be equal to:

$$\begin{aligned}\text{Tradable amount} &= \text{Total units in registry} + \text{Transferred ERUs} - \text{Reserve} \\ &= 500 + 0 - 5 \times 80 = 100 \text{ Mt CO}_2\end{aligned}$$

<sup>8</sup> The current text on Article 6 project-based transfers does not specify whether only Parties that are in a net buying position would be eligible for projects under the Article.

<sup>9</sup> Although the total overselling would not amount to 10% of all buying Parties' assigned amount, since there would be nobody left to buy in a market where all buyers decide to sell!

The tradable amount could increase in time if the Party's emissions are lower in the next year than they currently are. With the reserve, the tradable amount may therefore turn out to be *temporarily* lower than what the Party would ultimately be allowed to sell. It may have to wait for its last inventory (2012) to be reviewed before all of its available units can be transferred to other Parties – although futures contracts could be used to arrange transactions earlier. However, one should note that even without a reserve, Parties may wish to be sure that reductions had occurred before they commit to their transfer. The delay in the possible transaction caused by the reserve would then come from the time taken to review selling Parties' latest inventories.

The tradable amount could also decrease, if the Party's emissions are on the rise: the latest inventory would give an overly optimistic idea of the quantity that a Party can eventually transfer. The review of a new inventory would lead to an upward adjustment of the reserve, and the Party would be responsible for bringing its registry up to that level after 30 days of notification by the Secretariat (see Section Adjustments to the reserve).

### **3.3 Managing the reserve**

The reserve would block a pre-determined amount of a Party's AAUs (and other units) in the registry. How would governments manage their transferable amounts?

This is a straightforward question for a country where no domestic emission trading system is in place. Transactions would all be undertaken by the government, and in the case of specific projects (joint implementation, or unilateral), the government would check the validity of transactions before they can go forward.

Governments that have devolved assigned amount units to domestic entities would presumably be inclined to allow entities to trade (buy and sell) on the international market to minimise compliance cost. Either one of two scenarios could unfold:

- Entities' trading activity never brings the registry close to reserve level. In cases where the devolved assigned amount is not a significant share of the Party's total assigned amount – this is a probable scenario, as shown in illustrations of Section 5.3.2;
- Entities' trading activity is likely to bring the registry to its reserve level; the reserve would then impede certain transactions that the government may otherwise authorise. If this were the case, it would presumably be the government's responsibility to offset the sales of its entities, as the government is responsible for compliance with the reserve and with the Party's Article 3 commitment. On the other hand, the entities transfers may only be temporary and it would be cumbersome for the government to buy AAUs from the market every time an entity's transfer brings the registry below the reserve level.

In any case, governments should think about how they would grant their authorised entities the access to the international market – especially to those that wish to transfer AAUs. Several options can be envisioned:

- The government labels certain units as "reserve" units and allocate all of the remainder to entities that have been devolved assigned amounts – i.e. are responsible for domestic targets and can rely on trading to do so. Entities would need to keep their reserve in their registry and would be free to trade all other units provided that they comply with their domestic objectives. The allocation of these internationally tradable units could be done as a fixed percentage of the devolved assigned amount to each entity.

- The government could design other rules to grant access only once the registry has hit the reserve level – e.g. on a first-come first-served basis, or based on the entities' holdings of AAUs over and above what they need to comply. Unless there is sufficient margin for entities to trade above the reserve level, this may not be equitable, as some would be free to transfer without constraints and others would have limited access.

The issue of whether the reserve could constrain entities' transactions is discussed in Section 5.3.2. Option (a), at least, seems to provide a significant margin for Parties – and entities – seeking to participate in trading even if they are to be net buyers at the end of the commitment period.

## 4. Limiting overselling

It must be stressed at the outset that overselling is not the only means by which Parties may turn out to be in non-compliance with their Kyoto commitments. Parties may also not implement the right policies to reduce emissions, or fail to buy AAUs to cover their emissions in excess of their assigned amount. The reserve is not meant to solve all causes of non-compliance, but rather to avoid that emission trading results in putting a Party's into non-compliance. It may happen that entities transfer AAUs when their emissions are lower than their devolved assigned amount, whereas other sectors over-emit, bringing the country in non-compliance. Overselling would not be deliberate in this case, but the government would remain responsible for having allowed net transfers or, rather, for not having bought AAUs on the market to restore compliance. At the end of the day, the government is still responsible for having allowed net transfers when it needed, instead, to buy ERUs, CERs or AAUs to be in compliance. The term "overselling" used in this report seeks to cover all these possibilities, without prejudging the causes of such non-compliance.

Would the reserve proposal, as it stands, effectively reduce the risk of overselling? If one considers the possibility of a rogue, in this case a Party that would seek to maximise revenues from AAU sales with no consideration for compliance, the answer is clearly "yes". Without such rule, any Party – potential buyer or seller – can transfer a significant share of its assigned amount as soon as it becomes eligible to trade and never buy it back to comply with its AA. With the reserve, it would at least retain 90% of its assigned amount, or an amount of AAUs that is reasonably close to its actual emissions over the period, under option (b). The following section explains how the reserve would function and circumstances in which it may not be totally effective. The last section offers a quantification of potential overselling under the reserve with the last set of proposed percentages.

### 4.1 Would the reserve eliminate overselling?

Because option (a) is based on an arbitrary percentage of the *initial* assigned amount – 90% – it bears only limited relationship with selling Parties' emissions. To prevent overselling, the reserve should try to follow more or less closely the Party's inventory. Basing the reserve on the initial assigned amount is an imperfect solution from that standpoint. On the other hand, seeking to adjust now the percentage to reflect selling Parties' projected emissions is not completely satisfactory, since potential sellers have different projected gaps between their emissions and assigned amount. Clearly, the possibility for buyers to sell 10% of their assigned amount under option (a) addresses another concern: the ability of buying Parties to add to market liquidity (see Section 5.3 on market liquidity).

Option (b) – five times the latest reviewed inventory – seeks to adjust the reserve to reflect latest available information on the Party's emissions, so as to ensure that it holds enough AAUs in its registry to cover its emissions. *A priori*, too low a percentage would not effectively protect the trading system from overselling. Too high a percentage would run into the symmetrical risk of "underselling" until before the grace period, and a potentially less efficient market.

Overselling could occur in spite of the proposed rule:

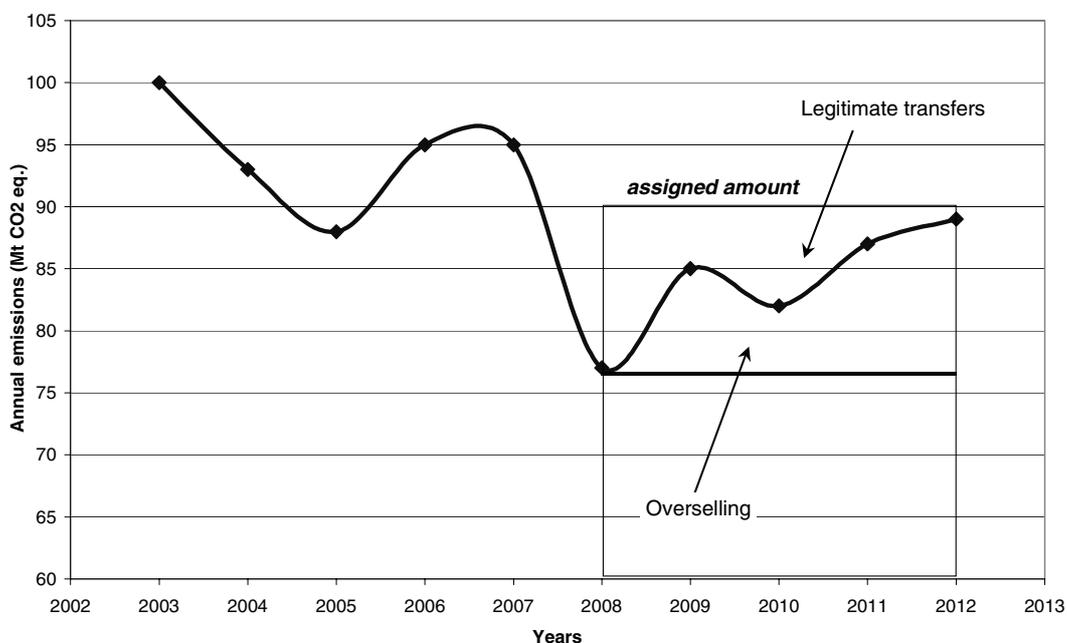
- A Party's emissions are higher than 90% of its assigned amount, yet it decides to sell the tradable amount, i.e. 10%, as allowed under option (a). The risk of having all potential buyers do so is limited, as there would be nobody in the market to buy from them;
- Under option (b), a Party decides to transfer the entirety of its *tradable amount* when one annual inventory is exceptionally low and emissions will remain largely above that level during the

commitment period (see Figure 1). Under the latest proposal, the Party “shall [...] bring its holdings to the required level” once a new inventory indicates that the reserve has been too low. The Party may not abide by this notification;

- The supervisory committee under Article 6 authorises the transfer of ERUs certified additional on a *project basis* while the Party’s emissions are higher than its assigned amount<sup>10</sup>. (Under the current proposal, the Party need not have an information system to estimate its emissions to be eligible to transfer these ERUs, so the supervisory committee may be unaware of the Party’s overall emission level.) The Party is in compliance with the reserve rule, but holds too few AAUs to cover its 2008-2012 emissions. While possible in theory, it is unlikely in practice: there are other sources of information from which the committee would have data on the Party’s greenhouse gas emissions. It could gauge the relevance of the ERU transfers in light of such information.

The effectiveness of the reserve vis-à-vis overselling is discussed in the next section.

Figure 1: Illustration of potential overselling under reserve – option (b)



Note: Based on its 2008 inventory, the Party is allowed to transfer, at a maximum, AAUs corresponding to the rectangle bound by its assigned amount and that level of emissions, whereas its later inventories show that it should have kept some of its assigned amount to cover rising emissions after 2008. The area under the emission curve corresponds to maximum overselling in this particular case. Overselling could also occur earlier if the Party had had low emissions in years prior to the commitment period and was eligible to trade then.

<sup>10</sup> Under this procedure an accredited entity would quantify reductions achieved by the JI project, based on a submitted baseline. The rules relating to the project baseline are not specified in the current proposal, so it is not clear how they would relate to the Party’s overall compliance situation.

## 4.2 Quantifying extreme overselling with and without the reserve

### 4.2.1 *Caveat*

There is no fully satisfactory method to evaluate the risk of overselling. Overselling may be accidental or deliberate: a proper assessment would require making arbitrary assumptions about which Parties are more likely to oversell and to what extent. On the one hand, all Parties should behave to guarantee compliance with their assigned amounts – overselling would never occur in that scenario. On the other, creating a market price for AAUs without a high financial penalty for non-compliance could trigger invalid transactions – emission trading takes place without consideration for the market “fundamentals”, i.e. underlying emission levels, and overselling can lead to non-compliance. The first view of the world makes the reserve unnecessary. The risk presented by the second view seems to be the justification for a commitment period reserve.

For lack of a better method and fully recognising this shortcoming, the paper considers a worst-case scenario: Parties seek to maximise their revenues by exploiting the possibility to sell AAUs, whether these sales are legitimate or not. In this scenario, buyers do not care about the sellers’ compliance prospects and seeks to comply at minimum cost.

### 4.2.2 *Estimates*

Without the reserve, the absolute *maximum* amount of overselling is determined by:

- The gap between all buyers’ emissions and their assigned amount, i.e., what they need to acquire collectively to comply, assuming they would not seek to reduce their emissions domestically;
- The gap between all the sellers’ emissions and their assigned amount, i.e., what they can legitimately sell collectively. They could also undertake measures to reduce their emissions to supply additional “legitimate” AAUs to the market.

Assuming widespread overselling, the sellers would transfer the totality of their legitimate AAUs, and then oversell AAUs, i.e. transfer AAUs that in fact they would need to retain in their registry to cover their emissions. They would transfer these non-surplus AAUs to buyers up to the point where buyers have covered their entire need, i.e. their emission gaps. In this worst-case scenario, the maximum overselling that could occur would thus be equal to:

$$(\text{sum of buyers' emission gaps})^{11} - (\text{sum of sellers' surplus AAUs})$$

Once the gap of buying Parties has been filled with AAUs – partly legitimate, partly oversold – no more transactions would be needed. Table 2 provides estimates based on business-as-usual projections of emissions in Annex I Parties with commitments under the Protocol, based on a recent paper by Haites and Missfeldt (2001.b). Their work assumes the participation of the US in the international emission trading regime.

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<sup>11</sup> Of course, as a market price emerges, buyers should start reducing their own emissions, so the buyers’ emission gap is unlikely to remain at its initial level. Again, these are extreme upper estimates of the potential for overselling.

**Table 2: Overselling without the reserve: an extreme scenario**  
(in MtCO<sub>2</sub> equivalent)

1.	Assigned amount of Annex II Parties (2008-2012)	59,161
2.	Annex II Parties “business-as-usual” emissions (2008-2012)*	69,313
A.	Emission gap for Annex II Parties (2 – 1)	10,152
3.	Assigned amount of Rest of Annex B	25,846
4.	Rest of Annex B emissions (2008-2012)	25,141
4’.	Rest of Annex B emissions (2008-2012) – <i>low estimate</i> **	19,966
B.	Rest of Annex B emission gap or legitimate transfers without any additional reductions (4 – 3)	705
B’.	Rest of Annex B emission gap or legitimate transfers without any additional reductions (4’–3) – <i>low estimate</i>	5,880
	<b>Maximum overselling (A – B)</b>	<b>9,447</b>
	<b>Maximum overselling – low estimate (A – B’)</b>	<b>4,272</b>
	<b>Total assigned amount of Annex B Parties</b>	<b>85,007</b>

**Notes:** \* 2010 emission levels are used as an average of emission levels for the commitment period (Haïtes and Missfeldt, 2001.b). \*\* The low estimate reflects an alternative emission scenario for the Russian Federation only (1,877 GtCO<sub>2</sub> in 2010, instead of 2,912 in the higher estimate). Haïtes and Missfeldt envision 500 different alternative scenarios to the one above, in which emissions vary randomly from one year to the next, before and during the commitment period.

The above range is clearly an extreme upper bound: it assumes that neither buyers nor sellers would undertake any mitigation action at home – whereas buyers would pay to acquire AAUs, which should trigger some reductions – and that no action would be taken to counter overselling during the commitment period... In addition, Annex I Parties could also rely on certified emission reductions from the CDM to comply with their objectives, which is not considered in the above analysis. Each CER imported in the registry would reduce overselling by Annex I Parties.

Haïtes and Missfeldt have tested 500 alternative scenarios for emission trends in Annex I Parties to determine a range of estimates for possible non-compliance, as well as restricted sales under the reserve rule. With the commitment period reserve agreed in Bonn, on the basis of a high central estimate for emissions in the Russian Federation, they find that selling countries could, at the most, oversell between 369 Mt CO<sub>2</sub> and 3,865 Mt CO<sub>2</sub>, with an average of 1,776 Mt CO<sub>2</sub> over the 500 scenarios tested.<sup>12</sup>

<sup>12</sup> Source: Haïtes and Missfeldt (2001.b), Section 3.4, “Possible non-compliance and restricted sales of surplus quota for Annex B as a whole”.

This average estimate represents an 80% reduction in the amount that would be oversold in the scenario of Table 2. With a low central estimate for the Russian Federation's emissions, overselling would amount to 1,075 Mt CO<sub>2</sub> on average, a 75% reduction from the "without reserve" scenario shown above, in which overselling could reach 4,272 Mt CO<sub>2</sub>.<sup>13</sup> These estimates confirm the mechanical effect of the reserve: by restricting the total AAUs that can leave Parties' registries, it would prevent rogue traders from selling up to 100% of their assigned amount. The "without reserve" scenario is extreme as it supposes that Parties would sell AAUs without regards for compliance. But so is the "with reserve" scenario, under which Parties able to oversell would exploit this possibility to its maximum.

In all and with the above caveat in mind, the latest proposal would effectively limit the risk of overselling, but not eliminate it. Higher percentages assigned to options (a) and (b) would of course further reduce the risk, but this would probably come at the expense of market liquidity and efficiency. Section 5 looks into the market impacts of the reserve.

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<sup>13</sup> Source: Table C-5, Haites and Missfeldt (2001.b)

## 5. Market impacts of the commitment period reserve

The previous section discussed how the reserve would limit overselling. But the reserve sets a limit based on *estimates* of Parties' ability to sell. There is therefore a risk that the reserve limits transactions that would be valid, i.e., transactions that would *not* cause non-compliance. Preventing valid transactions could lower the economic efficiency of the system in two ways:

- Potential buyers would need to take more costly measures than what would otherwise be available on the market, absent the reserve. The potentially limited access to the international market under the reserve could also add transaction costs and lead to a lower efficiency of the trading regime. It remains difficult to assess such impact without knowing how such access would be granted and whether the reserve would severely constrain market access.
- The market would not be liquid enough to satisfy the needs of potential buyers – Parties or entities – at best possible prices.

How significant would these effects be? Answering this question requires a view of how emission trading might develop without a reserve, over the first commitment period. The next section proposes a view of emission trading under the Kyoto Protocol in unfettered market conditions – excluding rogue behaviour or overselling – which is used in later sections as a baseline for comparison.

### 5.1 A baseline scenario: the “unrestricted market”

In standard macro-economic modelling, emission trading is a simple market mechanism: supply and demand of assigned amount units are confronted once in the marketplace. Buyers and sellers indicate acceptable prices based on the assessment of their marginal cost of reduction. This would lead to the emergence of a price. Once the price is agreed by all, it sets the appropriate level of effort – domestic reductions – for all participants. They will not undertake reductions that cost more than the market price for AAUs. All participants involved in trading conduct a single transaction each, whereby they acquire (transfer) exactly what they (do not) need to comply, at a unique price. This also assumes that emission trajectories are known with full certainty. Under such conditions, all participants comply with their commitments at the lowest possible cost and the system is driven to its optimum. All of the above steps take place simultaneously.

Market experiments that include a time dimension have shown that uncertainties over future emission levels and inertia in participant's mitigation choices trigger behaviours that differ from the picture given by modelling scenarios (Eurelectric et al, 1999 and 2000; Baron, 2000). First, AAU prices are likely to vary, Parties may buy or sell more than they should and conduct opposite transactions later on. Parties would need to adjust their trading and domestic strategies to reflect what they know about their compliance needs, based on most up-to-date information – their national inventories in the 2008-2012 period.

Here is a scenario of how trading could develop under such conditions. Parties start trading as soon as they are eligible:

- Parties are equipped to monitor their GHG emissions and to produce a reliable emission inventory, at least a year after the year of emissions has passed;
- A proper registry system would have to be in place to track transactions from and to a Party, and to record additions to the assigned amount and subtraction through the cancellation of units.

- Some Parties would devolve parts of their assigned amounts to domestic entities and allow them to trade on the international market. Such access may or may not be restricted, when it comes to the right to transfer AAUs from the Party's registry to another Party's;
- Instruments to hedge against various risks, arbitraging and speculation would emerge. Transactions could take place on the so-called "spot" market: a Party or entity acquires now a set quantity of AAUs at a set price from another participant. Or they could agree on a future transaction – through *forward* or *futures* contracts – if the buyer were not in a position to transfer AAUs immediately but were confident that it could do so at a future date.<sup>14</sup>
- Governments themselves would engage in trading, as it may not be practical to devolve the totality of the assigned amount to domestic sources;

Parties' 2008-2012 inventories cannot be known in advance with full certainty. The 2012 and possibly the 2011 inventories may not be finalised before after 1 January 2013. Some transactions will therefore occur beyond 2012, until the true-up period. Potential sellers worried about compliance would wait to have more firm information before they trade their potential surplus after 2012: any sale may be definitive, as buyers need AAUs to comply with their 2008-2012 commitments.

In brief, the business-as-usual emission trading system would have the following features:

- Both governments and entities would trade, although governments remain responsible for compliance and for their countries' overall trading positions;
- Future emissions cannot be known with full certainty; inventories take at least a year and a half to complete. Trading of AAUs for compliance with the first period's commitment will continue after 2012, until the true-up period, even though a large share of the total amount tradable could be transferred before.

In what follows, this scenario is referred to as the "unrestricted market".

## 5.2 Assessing market impacts

### 5.2.1 Results from a global macro-economic analysis

A few studies have tried to evaluate the impacts of the reserve on the market. The first one (Tulpulé and ABARE, 2001) is based on a global general equilibrium model, which assumes a perfectly competitive market with full knowledge of marginal costs and future emissions. This is the modelling approach described in the beginning of Section 5.1.

The scenario is based on a reserve that would restrict transfers from selling countries to either 98% of their assigned amount or 98% of their latest available inventory – slightly more favourable to sellers but less to buyers than the current proposal. According to this analysis, the result would be a significant loss in economic terms from what would be delivered by a market without the reserve. The reserve as implemented in this study would result in an increase in price of traded AAUs from USD 19 per tonne of CO<sub>2</sub> to USD 42, reflected in a much smaller volume traded across countries: 1,426 MtCO<sub>2</sub> against 2,175

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<sup>14</sup> This could happen if the seller has to prove that it met its domestic annual objective before being allowed to transfer AAUs to another Party.

MtCO<sub>2</sub> in the without-reserve scenario (in 2010). Fewer trades at a higher price imply increased compliance cost for all participants and important efficiency losses from an unfettered-market scenario.

However, the robustness of the results is limited by two key assumptions used to fit the model's behaviour:

- The tradable amount of sellers is based on their 2007 emission inventory in the business-as-usual scenario, whereas the reserve would be updated every year to reflect changes in emission levels. If emissions were going down after 2007, the tradable amount would be increased accordingly;
- Using a business-as-usual (i.e. no mitigation) scenario as the basis for the reserve implies that selling Parties would not undertake any reduction policies to bring their emissions down during the commitment period.<sup>15</sup> In fact, they have a clear incentive to do so since they can transfer their surplus. This hypothesis would only work if Parties had no opportunity to transfer surplus AAUs because of the reserve; in that case, reducing emissions would be a costly undertaking with no economic reward. But this last hypothesis is largely contradicted by the rules proposed for trading. If a Party were not allowed to transfer valid reductions during the period as a result of the reserve, it could still transfer them during the true-up period or in the second commitment period. The economic benefits could be delayed by a few years, but not cancelled. As shown above, under the "unrestricted market" scenario, some trades would take place after 2012, with or without the reserve. The model used here does not allow for such transactions and therefore overestimates the negative effects of the reserve on the market.

It is therefore unlikely that the effect of the reserve on the market would be as severe as those found in this study – be it only because the percentages agreed in Bonn differ from those used by ABARE. Both the mechanics of the reserve and the mitigation strategies of Parties in a trading regime would significantly increase supply of AAUs over that modelled.

### **5.2.2 Other estimates of sales restrictions**

Because it is based on proxies of 2008-2012 emissions, the reserve may not eliminate the risk of overselling. For the same reason, it may restrict the transfer of AAUs that turn out to be valid once the Party's inventory has been reviewed, but must remain in the Party's registry until that moment.

At present, Annex I Parties have up to 16 months to produce their emissions inventories; the review of such information could take 12 months, while 4 months could be added for compliance proceeding, in a worst-case scenario. Under this time frame, the review of the emission inventory for the year 2008 may only be completed by April-August 2011. At the end of the commitment period, the reserve would be set on the basis of 2009 and preceding years' inventories, for those countries that rely on option (b). With the reserve, there is therefore a risk that the emission trading market may not operate in synchronicity with commitment period's emission levels because *sellers* would potentially be constrained by a reserve that is based on a three-year old inventory. Parties are seeking to reduce the period of time to produce and review inventories, but a lag is still to be expected between the end of the calendar year and the completion of the official review under Article 8.

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<sup>15</sup> Parties or entities that intend to lower their emissions for the purpose of transactions in the commitment period would take actions much earlier than 2007, as this would be a less costly approach to reduce emissions. In the IEA's World Energy Outlook, three approaches were tested to reduce energy-related CO<sub>2</sub> emissions policies under the Kyoto time frame. A progressive approach proves to be the less costly in overall economic terms, whereas a "late action" approach forces abrupt changes in the energy production and consumption structure and therefore high economic cost (see IEA, 2000, Table 10.4).

If a potential seller were to be prohibited from transferring “valid” AAUs, potential buyers would either acquire AAUs at a higher price due to limited supply, or undertake domestic reductions at a higher cost. Both imply a loss of economic efficiency. Alternatively, if a buyer were to plan to purchase AAUs during the true-up period, it would run the risk of not finding the needed quantity. It could also be forced to accept a higher price because it would no longer have the opportunity to reduce its 2008-2012 emissions.

However, what precedes must not be taken as an indication that trading would only start in 2011: as soon as Parties are eligible to trade, they are allowed to transfer a tradable amount that covers the five-year commitment period. If drastic reductions take place in the commitment period, it is only the transfer of marginal reductions achieved in the last three years that would be temporarily restricted.

Haites and Missfeldt (2001.b) evaluate the magnitude of these restrictions under the reserve rule agreed in Bonn, assuming that a reviewed inventory would be produced within two years. The reserve is adjusted annually, as new inventories become available. Looking at 500 different emission scenarios for Annex I Parties, the range of restricted sales is 0 to 1,080 MtCO<sub>2</sub>, with a 68 MtCO<sub>2</sub> average over all scenarios. The difference between the average and the maximum shows that the latter is fairly extreme and not representative of the typical outcome in the 500 scenarios tested.

Under the central scenario for Annex I Parties, the existing surplus of the selling Parties would amount to 705 MtCO<sub>2</sub> before they have made any effort to further reduce emissions. With the incentive provided by trading, they would eventually reduce and transfer 1,830 MtCO<sub>2</sub>. The *temporary* restriction would amount to 3.7% of all transferred AAUs<sup>16</sup>. As such, it would be unlikely to affect the efficiency of the market to any great extent. But this result cannot be taken as a definitive forecast. Unfortunately, there is no data on the extreme scenario resulting in the maximum of 1,080 MtCO<sub>2</sub> so it is not possible to evaluate how much of a restriction this would represent compared with a full-trading scenario.

A few caveats apply to the results of the study discussed above:

- All restricted sales are only temporary and therefore do not affect the system’s efficiency to the extent that they would if they were permanently prohibited;
- Under our “unrestricted market” scenario without a reserve, some transactions would still take place after 2012 – but would not result from a restriction of any kind. For this reason, the above estimates are rather pessimistic;
- Furthermore, buyers and sellers could anticipate future adjustments in the reserve with forward or futures contracts. A Party that has enough unofficial information to assure others about its ability to transfer legitimate units once the reserve is updated could do so through such contracts (see next section for a discussion of these trading instruments);
- The time taken to complete the review of inventories could extend beyond 2 years, potentially resulting in more restrictions of sales during the commitment period.

It is important to recall that without the reserve, Parties worried about non-compliance may hesitate to transfer AAUs until they have received complete information about their inventories, i.e., after 2012 for the years 2010 and 2011. The reserve adds to the delay in transactions because it requires the official review of Parties’ inventories before the reserve is adjusted.

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<sup>16</sup> That is, 68 Mt CO<sub>2</sub> of restricted sales out of a total traded volume of 1,830 Mt CO<sub>2</sub>.

### 5.2.3 Hedging economic costs

The last section mentioned the possibility to secure transactions that may be temporarily restricted by the reserve through the use of hedging tools. Commodity, currency and stock markets have developed an array of hedging tools that help market players to minimise their financial risk. *Forward* and *futures* are basic elements in the tool kit of such mechanisms. A *forward* contract is an agreement between two participants to exchange AAUs – or other units – at a set price at the end of a designated period of time. *Futures* work essentially the same way except that they involve an established exchange or its clearinghouse.

Under the “unrestricted market” Parties or entities may propose futures or forward contracts if they expect to have excess units later in the future. This could be useful for entities that seek to secure a price for AAUs in the second commitment period, which would help guide their investment decisions earlier on. The banking provision of the Protocol makes it also possible for Parties to acquire units that they don’t currently need and use them in the future. The spot markets (immediate delivery of the commodity) would therefore directly compete with the futures transactions.

A seller of a futures that does not have the agreed quantity at the delivery date can either turn to the spot market, buy the units and pass them on to the buyer of the futures contract, or face the sanctions specified by the exchange or clearinghouse. Other legal arrangements would apply in a forward contract.

Futures and forward would help alleviate the market impacts of the reserve: A Party may know before the completion of the review of its inventory that its reserve will be adjusted downward, and may sell a futures contract corresponding to that amount *before* the reserve allows the transaction. In that sense, the reserve encourages the development of such transactions. Futures and forward contracts would provide useful information about the expected supply of AAUs in later years of the commitment period, and guide the international price to a level that reflects more accurately overall supply and demand over the five years.

Such tools, however, are likely to carry a transaction cost, the magnitude of which depends on whether they are well developed or rather rare, standardised or unique in design. The overall impact of such transaction costs on the efficiency of the market really depends on the number of such transactions, in addition to what would happen in an unrestricted scenario to secure transactions during the true-up period.

## 5.3 Market liquidity under the reserve

Under an “unrestricted market”, AAUs would be traded several times before they are used for compliance. After the commitment period, the final compliance process will require entities to redeem AAUs to cover their emissions, and Parties to surrender units corresponding to their cumulative 2008-2012 emissions. Until then, the trading activity would contribute to the so-called liquidity of the market. A market is liquid when any buyer or seller can find another party for a transaction at the market price. It can be characterised by a small difference (small “spread”) between the prices asked by sellers and offered by buyers, and large quantities available at those prices (market depth).

Haites and Missfeldt (2001.b) note that there is not a universal definition of market liquidity. They note that liquidity “does not change the total supply of allowances and so does not make compliance easier (or more difficult) for entities participating in an emissions trading program. Liquidity does make it easier for an entity to buy (sell) the desired quantity quickly [...] To the extent that increased confidence [in the market] enhances the use of emissions trading for compliance, liquidity helps reduce compliance costs.” As time goes by in the commitment period, the market may be less liquid as Parties and entities have started to retire some of their AAUs for compliance. This is a likely scenario under the unrestricted market. In other words, liquidity would probably change with time, which complicates analysis further. The next section offers a simpler approach to market liquidity, based on tradable amounts under the reserve.

### 5.3.1 An aggregate indicator of liquidity

Looking at annual trade data for various emission-trading programmes provides a useful basis to think about market liquidity issues under the reserve. These programmes have shown that allowances can be traded several times before they are used for compliance. As companies are equipped to manage their environmental compliance with such mechanisms, they also engage in trading to generate profits, and seek to obtain the lowest possible price, which requires buying and selling several times before they acquire (transfer) the amount required (or not required) for compliance.

Table 3 shows the total traded volumes for key domestic emission trading programmes – the net *transfers* among participating entities are significantly smaller. The parallel with GHG trading is not straightforward as these data cover the equivalent of several “commitment periods”, including allowances that are banked and carried over from one period to the next. This could explain, for instance, the large volumes of SO<sub>2</sub> allowances traded compared to annual emissions, as emissions were very much lower than total allowances in the first few years of the programme – and many units could therefore be banked and traded in future periods.<sup>17</sup>

**Table 3: Aggregate indicators of liquidity for emissions trading programmes**

Programme	Allowances traded – including banked units – as % of annual <i>allocation</i>	Allowances traded – including banked units – as % of annual <i>emissions</i>
Ozone depleting substances, United States		30% to 110%
SO <sub>2</sub> allowances under the US Acid Rain programme	20% to 70%	40% to 180%
RECLAIM NO <sub>x</sub> programme, 1994 through 1999	15% to 45%	20% to 50%
RECLAIM SO <sub>x</sub> programme, 1994 through 1999	20% to 60%	20% to 80%

Note: The above numbers should be read with caution: some of the reported trades were transactions at no cost, across facilities within a single entity. They do not, in that sense, contribute to market liquidity.

Source: Haites and Missfeldt (2001.b)

More precisely, during the first years, or first “commitment periods” of the SO<sub>2</sub>, RECLAIM SO<sub>x</sub>, and NO<sub>x</sub> programmes in the United States, allowances traded amounted respectively to 22%, 31% and 31% of all issued allowances. The first years are more suited for comparison with emission trading under the first commitment period, as the trading activity in the following years, at least under the SO<sub>2</sub> programme, benefited from the trading of units banked in the previous years.

Can a similar indicator be quantified for emission trading under the Kyoto Protocol, given the requirements set by the reserve? How would it compare with other emission trading markets that did not operate under such constraint?

First, option (a) under the reserve seems to answer to the need for liquidity in the market. It explicitly allows potential buyers to trade 10% of their assigned amount: this percentage can be sold immediately, under the assumption that it would be brought back later as these Parties need it to comply. Information

<sup>17</sup> This is reflected in the maximum volume of trades amounting to 180% of annual SO<sub>2</sub> emissions, which corresponds to the third year of the programme; in the first year – the first “commitment period” – the ratio was 36%.

about Annex I Parties' assigned amount – and in particular about Annex II Parties, the likely buyers – indicate that these 10% amount to a total of 5,916 MtCO<sub>2</sub> that could be used for trading purposes until final compliance is assessed.<sup>18</sup>

On the selling side, countries will also issue AAUs on the market, which will eventually be acquired for compliance purposes. Their tradable amount would range between 705 and 5,880 Mt CO<sub>2</sub> in a “business-as-usual” case, and would be increased if these countries undertook measures to further reduce their emissions (see Table 2).

Net buyers, as a block, would eventually need to buy back the allowed 10% of their assigned amount. If buying Parties had allowed the transfer of this amount, it would in effect have been traded at least twice: once sold, once bought. Buyers would also need to acquire the totality of the tradable amount of countries in transition to comply. Under this assumption, the total volume traded could at least amount to:

$$2 * 5,916 + [705] [5,880] = [12,537] [17,712]$$

That is, between 15 and 21% of the total assigned amount for Annex B (85,007 MtCO<sub>2</sub>), with no account taken of additional reductions that countries in transition would issue in response to a price signal, nor of the certified emission reduction units from CDM projects. The tradable quantity under the reserve would therefore reach an order of magnitude similar to what was observed in the first “commitment periods” of existing emission trading regimes (22% to 31%). This number could be considerably increased if the tradable amounts of Annex II Parties and transition economies were traded more than once. This is quite realistic given the long time period available for such transactions, the potential price variations over these years and the resulting opportunities to benefit from trading.

As time nears the end of the commitment period and entities may need to retire AAUs for compliance, the total tradable amount would diminish, especially if governments require that entities retire AAUs annually. The reserve requirement would be neutral in that respect, unless it were to restrict earlier transactions and allow them later in the period, which would improve liquidity in the final years – but would have affected market efficiency earlier on.

What would be the value of this indicator without the US? Answering this question is not straightforward. The 10% of buyers' assigned amount would shrink to 3,127 Mt CO<sub>2</sub>, and the total assigned amount to 57,115 Mt CO<sub>2</sub>. The emission gap for the remaining buyers would be 2,374 Mt CO<sub>2</sub>. Under the high emission scenario, total traded volumes could be, at minimum equal to:

$$2 * 3,127 + 705 = 6,959$$

That is 12% of the total assigned amount. Under the lower emission scenario, there would be more than enough AAUs for sale to cover buyers' emission gap (5,880 Mt CO<sub>2</sub> in excess in countries in transition, against a gap 3,127 Mt CO<sub>2</sub> on the buyers' side).

This analysis, albeit at an aggregate level, suggests that there may be no shortage of AAUs for trade, as soon as governments in Annex II Parties are comfortable with letting their entities access the market with the 10% of the assigned amount allowed by option (a). We note that the above estimates do not take into account transactions inside countries, whereas our basis of comparison, the results of the US programmes shown above, includes transactions inside firms.

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<sup>18</sup> Based on Haites and Missfeldt (2001.b). 5,916 is 10% of buyers' assigned amounts (see the first line of Table 2 above).

The 90% of assigned amount under option (a), while creating a potential for overselling, assures that the market would be liquid enough so as to make trading an attractive option for Parties seeking to comply with their Kyoto commitments.

### **5.3.2 Implications for entities**

What kind of constraint would the reserve create for entities in their attempt to best use the trading mechanism? Private domestic sources (entities) are more likely to rely on the international trading market to hedge their positions than governments. In the following examples, 40-60% of a Party's assigned amount are covered by a domestic emission trading system, with access to the international market. Table 4 provides more detailed assumptions and looks at the implication of option (a) with 90% under three scenarios:

- Under the first scenario, the Party's emissions in 2008-2012 are 10% higher than their initial level, whereas entities' emissions are growing by 15%;
- Under the second scenario, the country's emissions rise less rapidly (3% higher), while entities emissions grow more rapidly (20% higher);
- Under the third scenario, all of the increase in the Party's emissions is caused by entities' growth in emissions; entities represent some 60% of the total inventory.

In these examples, entities could transfer 10 units as soon as the Party is eligible for international trading, about 14-22% of their total emissions in the period, or about 100% of these entities' emission gap over the 5-year period.

Under the less favourable scenario 3, the entities are entirely responsible for excess emissions above the Party's initial assigned amount and have a lower margin to transfer AAUs if they wish to do so during the commitment period. For countries in which entities' emissions grow more slowly than the Party's overall emissions, the reserve would apply less of a constraint on entities trading than in the above three scenarios.

These illustrations of tradable amounts do *not* take into account additions to the Party's assigned amount during the commitment period, which would add to the tradable amounts of entities. But they show that governments would have a reasonable margin to allow their entities to trade on the international market with the tradable amount allowed by the reserve. Of course, a large number of entities asking to sell the totality of their devolved assigned amounts – with the intention to buy them back later at a profit – could pose a problem for compliance with the reserve. But the foreseen liquidity of international emission trading with the proposed reserve, as quantified above, indicates that this market would stand comparison with existing ones.

Table 4: Illustrations of the implications of the 90% reserve for entities

	Scenario 1	Scenario 2	Scenario 3
<b><u>Country's emission trend</u></b>	(+10%)	(+3%)	(+10%)
<b><u>Entities' emission trend</u></b>	(+15%)	(+20%)	(17%)
Party's assigned amount – 5 years	100	100	100
Party's current emissions – annual (5 years)	22 (110)	22 (110)	22 (110)
Current emissions by entities covered by domestic trading – annual (5 years)	8 (40)	8 (40)	12 (60)
AAUs allocated to entities – 5 years	37	37	60
2008-2012 emissions by entities – 5 years	46	48	70
Emission gap for entities – 5 years	9	11	10
<b>Amounts tradable on the international market</b>			
With a <b>90%</b> commitment period reserve:	10	10	10
- percentage of entities' emissions – 5 years	21.7%	20.8%	14.3%
- percentage of entities' gap – 5 years	111%	91%	100%

#### 5.4 Market power under the reserve

The risk of market power in international emission trading comes from structure of the foreseen market, with two potentially large sellers, the Russian Federation and Ukraine. An earlier paper provided an assessment of this issue in an unconstrained trading setting and argued that the risk existed in theory, but would be alleviated by the possibility to rely on the CDM and the implications for the negotiation of future commitments for these Parties (Baron, 1999.b).

Would the reserve exacerbate the risk of market power under the Kyoto Protocol? As illustrated above, the reserve would not indefinitely restrict sales, but may postpone certain transactions. Above results showed that these would amount to a relatively small share of total traded volumes. In addition forward and futures transactions could commit these Parties early to transfer AAUs after the end of the commitment period. In that sense, a very large share of the legitimate transactions could, in theory, be finalised during the commitment period. Those reductions that were not expected by sellers would take place afterwards, but this would not differ from what would happen in the “unrestricted market” scenario (described in section 5.1). The market behaviour of sellers at that point is independent from the reserve requirement.<sup>19</sup>

<sup>19</sup> In their assessment of various liability options, Haites and Missfeldt (2001.a) concluded that the commitment period reserve would be less sensitive to market power than other options: assuming sellers would exert

## 6. Concluding remarks

The commitment period reserve must be assessed from the viewpoints of the risk of overselling – its primary objective is to reduce such risk – and of its potentially negative impacts on the emission trading market and overall compliance cost. The value of the new rule depends on the trade-off between overselling and market efficiency, i.e., on how well the reserve balances the main interests of the international community to encourage compliance while keeping compliance costs low.

The reserve does reduce but not eliminate the risk of overselling, by assuring that selling Parties will have provided some information on their emission levels before they can proceed with transfers. The reserve blocks AAUs in the registry until information allows transactions and therefore does introduce the risk of *temporarily* restricting valid transactions – at the same time, it *temporarily* allows transfers that should eventually be more than offset by acquisitions in order to bring net buying countries in compliance. Analyses suggest that the quantity of restricted sales might be limited, when compared to the overall trading that would be allowed during the commitment period. In addition, trading tools such as forward and futures contracts could remedy this problem without increasing the risk of overselling – albeit with an additional cost related to this more complex type of transaction.

The maximum amount of overselling that could take place with the reserve is much lower than what could occur under a worst-case scenario in which Parties maximise their trading revenues and ignore the consequences of non-compliance. But even with the reserve as proposed, some Parties may still be net sellers of AAUs and turn out to be in non-compliance, whether deliberately or inadvertently.

Market liquidity is a less straightforward matter for analysis as this is an emerging market for which no data currently exist. Option (a) under the reserve allows Parties that are supposed to buy from the market to sell as much as 10% of their assigned amount – to be bought back later, according to their compliance needs. This option would considerably add to market liquidity. The indicator of total traded volumes divided by the total of Parties' assigned amount is comparable with the experience of other emission permit trading regimes in which no reserve is implemented. One particular challenge for governments will be to design transparent rules to grant entities access to the international market under the reserve, without entailing excessive transaction costs and missed trading opportunities.

The reserve definition as it stands raises one possible concern: the reserve should reflect actual 2008-2012 emission inventories as soon as these become available. Option (b) – five times the last reviewed inventory – misses that point. As soon as reviewed inventories are available for 2008 onward, the reserve should be equal to the sum of the Party's emissions during each year of the commitment period – after review under Article 8 – plus the last reviewed inventory multiplied by the number of years in the period for which no inventory is available.

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monopolistic power, the outcome would be within 2% of the fully competitive outcome. They find that all other options to limit overselling (a penalty, buyer liability, annual retirement, Swiss proposal, compliance reserve, escrow accounts or the traffic light option) would be more sensitive to market power than the reserve.

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## Glossary

<b>AAUs</b>	Assigned amount units. Unit of international emission trading.
<b>Assigned amount</b>	Emission objectives of Annex I Parties for the commitment period 2008-2012, as defined by the Kyoto Protocol in its Annex B.
<b>CDM</b>	Clean development mechanism. The CDM enables reductions generated in non-Annex I Parties to be used by Annex I Parties for the purpose of meeting their emission objectives under Article 3.
<b>CERs</b>	Certified emission reductions. Tradable emission reductions generated by CDM projects in developing countries, to be certified in order to be transferable (Article 12 of the Kyoto Protocol).
<b>Commitment period</b>	The five-year period (2008-2012) over which greenhouse gas emission objectives must be reached by Parties legally-bound by the Kyoto Protocol.
<b>ERUs</b>	Emission reduction units. Tradable emission reductions generated by joint implementation projects (Article 6 of the Kyoto Protocol).
<b>Flexibility percentage</b>	Percentage points below 100% in the commitment period reserve (e.g. the flexibility percentage is 2% for a 98% reserve, 30% for a 70% reserve, etc.)
<b>GHG</b>	Greenhouse gases. Six gases targeted for reductions by the Kyoto Protocol.
<b>Issuer, issuing Party</b>	Party that allows a transfer of parts of its assigned amount (AAUs) to another Party. Interchangeable with “seller”.
<b>JI</b>	Joint implementation. Mechanism established by the Kyoto Protocol allowing transfers of project-based emission reductions units among Parties with emission objectives under the Protocol.
<b>Kyoto Protocol</b>	Protocol under the UNFCCC, which sets legally-binding greenhouse gas emission objectives for a number of Parties, and establishes international emissions trading.
<b>Liability rules</b>	Rules established to allocate responsibility in case a Party which has transferred parts of its assigned amount is found in non-compliance (e.g. buyer liability or issuer liability).
<b>Overselling</b>	A Party transferred AAUs that it needed to cover its emissions and is put in non-compliance. This could be the result of “over-emitting” by some sources combined with “under-buying”, but also of careless trading, or rogue behaviour.
<b>Reserve</b>	Commitment period reserve. A proposed rule for emission trading: selling Parties are responsible for AAUs they have issued on the international market; all Parties must hold in a reserve a quantity of AAUs, ERUs and CERs, based on their initial assigned amount or reviewed emission inventories.
<b>True-up period</b>	Period of time during which Parties can trade any remaining AAUs for a given commitment period, once all Parties’ inventories have been reviewed for that period. Also known as “grace period”.