THE COMPETITIVE ENVIRONMENT OF THE EUROPEAN ELECTRICITY SECTOR IN THE POST-KYOTO SCENARIOS[1]

IE Working Paper WP06-26 14-12-2006

Dr. Javier Carrillo * Dr. Pablo del Río** Dr. Totti Könnölä* Dr. Carlos García*

Abstract

This paper shows how the uncertainty associated to the absence of a post-Kyoto regime regarding Greenhouse Gas mitigation is affecting investments in mitigation activities in the EU electricity sector and, thus, future emissions levels. Based on a wide survey of EU power companies, the paper identifies the most likely post-Kyoto scenarios considered by these firms and how they are coping with such uncertainty in their current investment decisions. The major conclusion is that the non-existence of a post-Kyoto regime is having a negative effect on current business investment decisions in mitigation activities, increasing risk premiums and financing costs. All in all, the companies surveyed foresee post-Kyoto compliance regimes with emissions trading systems that would guarantee the continuity of the value of the reductions made beforehand, although they differ in their perceptions of the form that a post-Kyoto regime could take.

Keywords

Post-Kyoto scenarios, EU electricity sector, investment decisions

* Centre for Eco-Intelligent Management. Instituto de Empresa Business School. C/ Castellón de la Plana 8. Madrid 28006, Spain. Tel: +0034 91 5689600. E-mail: Javier.Carrillo@ie.edu

** Department of Spanish and International Economics, Econometrics and Economic Institutions. Universidad de Castilla-La Mancha. C/ Cobertizo de S. Pedro Mártir s/n. Toledo 45071, Spain Tel: +0034 925 268800. E-mail: pablo.rio@uclm.es

[1] The authors are grateful to PricewaterhouseCoopers Spain for financial support to carry out this study.

1. INTRODUCTION

The regime for achievement in the period after the first Kyoto Protocol period ("post-Kyoto") is currently under discussion. The protocol itself established that the negotiations over the commitments after 2012 should have been started at the very latest in 2005 and been finished in 2005.

Although, in principle, this question should have been clarified in the Conference of the Parties (COP) in Montreal at the end of last year, it was not possible to arrive at a generic agreement by the industrialised nations with respect to the need to "fix new commitments to limit emissions beyond 2012," as well as an express reference to the need to guarantee its continuation beyond 2012 (MINAM 2005).

However, the importance of knowing now and in better detail what the said future regime will be is paramount, not only for environmental reasons but also commercial. The stated generic and non-binding commitments do not go far enough to guarantee a favourable climate for investment in new technologies and in mitigation projects. The uncertainty over that regime already appears to be affecting the carbon market and the taking of investment decisions in cleaner technologies and projects. Investments in the electricity generation sector have a useful life of decades and, consequently, their pay-back period extends beyond 2012.

It is particularly important in this context to identify under what conditions and in what circumstances the Kyoto units coming from the projects for reducing emissions that may be carried out in other countries will have value after the year 2012. This question is highly relevant from the point of view of potential investors, as it directly affects the profitability of investments already made or to be made.

All this uncertainty has particularly negative effects in capital intensive sectors, as is the case in the electricity generation sector in which investments have to be made bearing in mind a time horizon of between 25 and 30 years. Consequently, these companies would have to take into account in their decisions whether there will be reduction objectives after 2012 and whether those objectives will be very ambitious. According to IETA (2005), 60% of the return on capital for an electricity generation plant started today will take place in the years following 2012.

The absence of defined objectives and of a post-Kyoto regime and, therefore, the absence of indications of price for the successful reduction of emissions after 2012 affects the financing of reduction projects, increases the provisions for risk and the costs of financing. Therefore, the investments need to be informed as to what post-Kyoto scenario is most likely that leads to a recognition of the market value of Kyoto units. In this sense, to identify which amongst the possible post-Kyoto regimes are compatible with the deposit of Kyoto units from the first to the second period provides essential information for potential investors in these projects.

All in all, it is relevant to set out what sort of post-Kyoto regime is most probable to result in being adopted. This report attempts to deal with this question, identifying which post-Kyoto scenarios are most plausible for the European electricity sector as well as the possible impact of those scenarios on investment decisions in this sector. The determination of these issues is made by an in-depth review of the literature on the subject as well as by a process of

survey and direct interviews of the principal companies in the sector at a European level.

This report is structured as follows. The following section identifies what could be the major threads of a regime for post-Kyoto commitment; in particular a series of probable scenarios is defined towards which this commitment regime could evolve. The third section presents the results of the empirical study. Finally the report closes with a conclusions section.

2. THE POST-KYOTO REGIME

In this section the major threads of development towards a post Kyoto regime are considered by means of the formulation of possible scenarios. However, it is convenient to begin analysing which decisions have been taken already with respect to the post Kyoto regime (section 2.1) in order to later clarify what still has to be decided (section 2.2). Which of those decisions are, in theory, more plausible is the subject of section 2.3, which establishes a series of possible post-Kyoto scenarios. After the post-Kyoto regime has been defined, a key question that concerns potential investors in measures and projects for reducing emissions is the question of whether the designated Kyoto units obtained by investments made before and after 2012 can be used in a post-Kyoto regime, in other words, if they will have market value[1]. Section 2.4 is dedicated to this question. Finally, on the assumption that the degree of involvement of companies in the CDM (Clean Development Mechanism) provides information about the opinion of the companies about the validity of the aforementioned Kyoto units in a post-Kyoto regime, section 2.5 is dedicated to the identification of the different possible degrees of involvement in the CDM.

2.1 What decisions have already been taken?

Two interrelated questions affect the profitability of investments in a post-Kyoto scenario. On the one hand, the very existence of a post-Kyoto regime, including the establishment of mitigation objectives. On the other hand the possibility that Kyoto units generated before 2012 may have value, which is to say, they could be used to meet possible reduction objectives after the year 2012. This section tackles the first of these questions.

The first steps to follow in order to define a post-Kyoto regime are established in the Kyoto Protocol itself. The Protocol itself establishes that the negotiations about the post 2012 commitments would have to start at the latest in 2005 and finish in 2005.

The protocol includes two fundamental articles that demand that the post-Kyoto regime discussions begin in 2005 (see Table 1). Article 3.9 requires that the developed countries begin to consider the possibility of modifying their objectives for the second commitment period. Article 9 requires that a complete review of the Protocol take place in the second Meeting of the Parties in 2006.

Table 1. What does the Protocol say about a post-Kyoto regime?

Art. 3.9. Commitments for subsequent periods for Parties included in Annex I shall be established in amendments to Annex B to this Protocol, which shall be adopted in accordance with the provisions of Article 21, paragraph 7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall initiate the consideration of such commitments at least seven years before the end of the first commitment period referred to in paragraph 1 above.
Art. 9.1. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall

[1] The Kyoto reduction units arising from the (KFM) Kyoto Flexible Mechanisms which can be interchanged are four: AAUs (Assigned Amount Units) initially assigned to each country in Appendix B; ERUs (Emission Reduction Units) arising from Joint Implementation projects; RMUs (Removal Units) arising from forestation or reforestation projects; and lastly CERs (Certified Emission Reductions) arising from CDM (Clean Development Mechanism) projects. All of these correspond to 1 metric tonne carbon equivalent.

periodically review this Protocol in the light of the best available scientific information and assessments on climate change and its impacts, as well as relevant technical, social and economic information. Such reviews shall be coordinated with pertinent reviews under the Convention, in particular those required by Article 4, paragraph 2 (d), and Article 7, paragraph 2 (a), of the Convention. Based on these reviews, the Conference of the Parties serving as the meeting of the Parties to this Protocol shall take appropriate action.
Art. 9.2. The first review shall take place at the second session of the Conference of the Parties serving as the meeting of the Parties to this Protocol. Further reviews shall take place at regular intervals and in a timely manner.

Although, in principle, this question would have to be clarified in the latest Conference of the Parties (first Conference of the Parties on the quality of Meeting of the Parties, COP-MOP 1) of the United Nations Framework Convention on Climate Change (UNFCCC) held in Montreal in December 2005 it was not possible to arrive at a generic agreement by the industrialised nations with respect to the need to "fix new commitments to limit emissions beyond 2012," as well as an express reference to the need to guarantee its continuation beyond 2012 (MINAM 2005). Table 2 summarises the two most relevant decisions in this context.

Table 2. Decisions of the Montreal Summit about the post-Kyoto regime.

According to Decision 11, "Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention", the Conference of the Parties:
1. Decides to become involved in talks (without prejudice to the holding of future negotiations, undertaking of commitments, processes, frameworks or mandates under the Convention) to exchange experiences and analyse strategic approaches to establish long term cooperation in dealing with the problem of climate change which includes, amongst others, the following areas:
(a) Advances in the establishment of sustainable objectives.
(b) Performing actions relating to adaptation.
(c) Obtaining maximum potential from technology.
(d) Obtaining maximum potential from market instruments.
2. Decides furthermore that the talks will have the form of an open and voluntary exchange of information and ideas to help the implementation of the Convention and will not open any negotiation that will lead to new commitments;
3. Agrees that the talks will be informed by the best scientific information available and the evaluation of climate change and its impacts performed by the Intergovernmental Panel on Climate Change, as well as by other sources of relevant scientific, technical, social and economic information;
4. Agrees moreover that the talks will have to allow the Parties to continue developing effective and suitable, national and international responses to climate change and to serve as a forum for identifying actions that promote research of, development of, distribution of and investment in the cleanest technologies and infrastructures;
5. Additionally agrees that the talks would have to identify approaches that will support and provide the conditions in order that developing countries may voluntarily take actions that promote local sustainable development and mitigate climate change in a manner appropriate to national circumstances, including specific actions for allowing the countries to adapt to climate change;
6. Agrees the talks explore ways and means to promote access by developing countries to the cleanest technologies, technologies for mitigation of climate change and for adaptation to the same by the creation of support programmes and specific actions;
7. Decides that:
(a) The talks will be conducted under the direction of the Conference of the Parties and will take place in up to four workshops (…), open to all Parties, and organised by the Secretariat.
(b) The talks will be led by two facilitators, one from a country included in Annex I to the Convention and the other from a country not included in Annex I;
(c) The two facilitators will report on the talks and on the diversity of the ideas presented by the Parties at the twelfth (November 2006) and thirteenth (December 2007) sessions of the

Conference of the Parties);
8. Invites the Parties to sent to the Secretariat, no later than the 15th April 2006, their initial ideas about the questions to be discussed in those talks and asks that the Secretariat should have these ideas available for the first workshop;
9. Notes that the organisation of the discussions will require additional resources in order to allow the participation of delegates from the Parties.

In Accordance with the Decision -/CMP.1. "Consideration of the commitments for subsequent periods for the Parties in Annex I of the Convention under article 3, paragraph 9, of the Kyoto Protocol," the Conference of the Parties:
1. Decides to initiate a process to consider additional commitments for the Parties included in Annex I for the period following 2012 in accordance with article 3, paragraph 9 of the Protocol;
2. Decides furthermore that the process will have to start without delay and will be conducted by a group of countries that are parties to the Protocol. This group will report back to each session of the Conference of the Parties that serves as a Meeting of the Parties about the state of this process;
3. Agrees that the group will have to try to complete its work and its results will be adopted by the Conference of the Parties that serves as a Meeting of the Parties to the Kyoto Protocol as soon as possible and in time to ensure that a hiatus will not exist between the first and second commitment periods;
4. Agrees moreover that this group will meet for the first time at the same time as the twenty fourth session of the subsidiary bodies (May 2006) and that the subsequent meeting will be organised in agreement with the timetable established by the group;
5. Invites the Parties to send to the Secretariat, on the 15th March, 2006, their ideas regarding article 3, paragraph 9, of the Protocol in order to make them available to the group before its first meeting.

The first result, called the Montreal Plan of Action (MPA), includes four stages for the commencement of discussions about the post 2012 period. The first two take place under the Protocol.

On the other hand, the Kyoto Protocol grants the Parties permission to use the AAUs (Assigned Amount Units) that are not used in the first commitment period during the second (article 3.13). This possibility is called "inter-period credit". Moreover the use of "intra-period credit" is allowed (that is to say the use of Kyoto units within different years in the same commitment period).

Therefore, as the Protocol allows inter-period credit, if a mitigation regime similar to the Protocol is put in place after 2012, then the Kyoto units issued before 2012 can be used to meet the objectives of the second commitment period. The existence of post-Kyoto objectives would immediately give value to these Kyoto units.

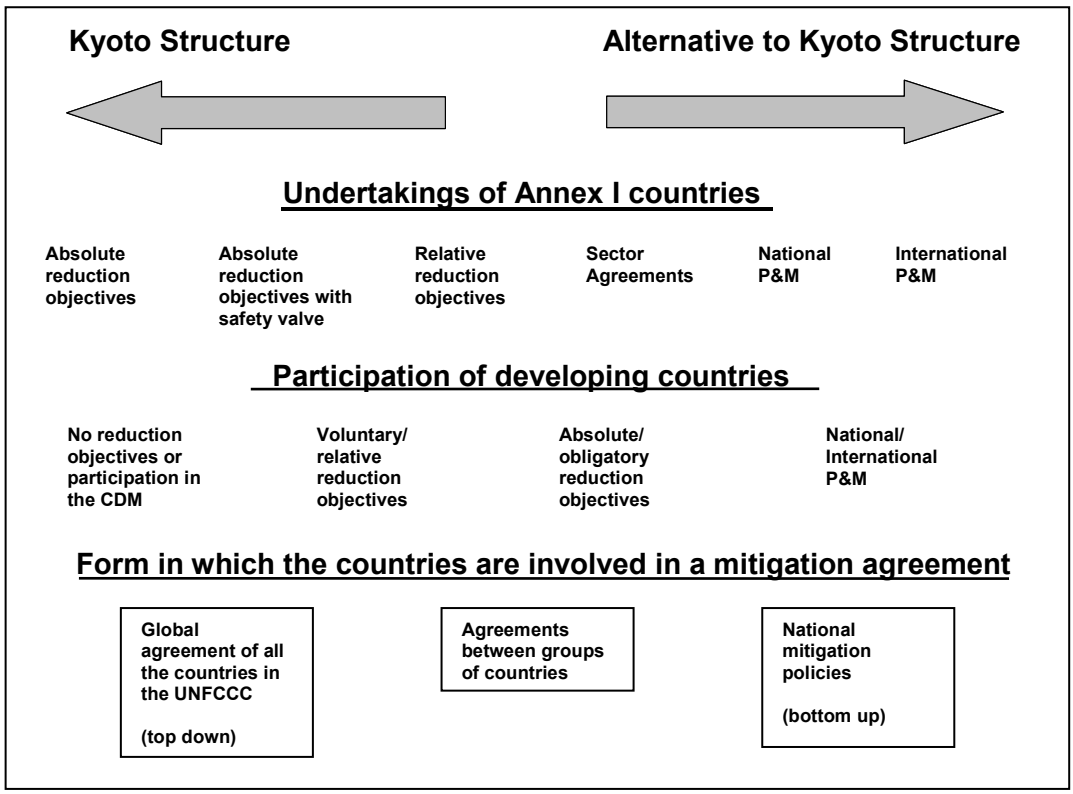
However, in the event that after 2012 there were to be a regime different from that of the Protocol, a significant uncertainty would exist over whether the Kyoto units issued before 2012 would have any market value and the units arising from CDM (Clean Development Mechanism) and JI (Joint Implementation) projects after 2012. This could occur if after the end of that period objectives didn't exist and an emissions trading system were not maintained. For example, the post Kyoto regime could be based on international technology agreements, or on national, not harmonised, policies and measures. In the event of these situations, the existence of market value for Kyoto units could not be guaranteed.

2.2. What must still be decided?

The previous section shows that fundamental decisions still have to be taken over the basic structure of the post-Kyoto regime. Just as with the current

Kyoto regime, the post-Kyoto regime will be defined by various elements or criteria and, within these, there will be various design alternatives. Agreement on the post-Kyoto regime will depend on a combination of decisions about key design elements of that regime. In this section we try to summarise the basic options with respect to these key variables. Many of these variables are interrelated, in the sense that the choice of one alternative in one category conditions the choice of another alternative in a different category[2]. Figure 1 summarises the basic current options, based on the criteria considered, as well as their remoteness or closeness to the alternatives chosen in the Kyoto Protocol context.

Figure 1. Classification of post-Kyoto alternatives.



We go on to analyse the design alternatives within each of the three elements:

A) Commitments of the developed countries (Annex I) and the possibility of trading emissions.

Within this criterion two extreme alternatives exist: absolute reduction objectives (and emissions trading) and agreements based on policies and measures (for example technology agreements) in which quantitative reduction objectives do not exist but only the commitment to adopt certain mitigation policies and measures.

[2] Aside from those mentioned, other design questions exist which have not been tackled in this study, by their nature excessively complex and uncertain at this point in the process. Amongst them is the question of differentiation of objectives and the allocation of objectives. Various alternatives exist in this sense (multi-stage approach, contraction and convergence, global triptych approach, equality *per capita*, Brazilian proposal and allocations based on costs). For more information see Philibert (2005).

European countries defend the need for objective quantitative mitigation objectives to be adopted. Once these objectives have been adopted, it is shown that these objectives are achieved in the cheapest possible way with a system for trading emissions (or with taxes, but this has more problems of political viability, as mentioned later). Therefore, the agreement and the establishment of reduction objectives results naturally in a system of trading emissions.

A fundamental question is the nature of these quantitative objectives. If the countries are agreed on adopting quantitative objectives by country, several options would exist, such as fixed and obligatory targets, dynamic objectives, obligatory objectives with a ceiling on the prices of the emission permits, sector objectives and mechanisms, action objectives, long term allowances and aid packages and permits. Some of these possibilities will be considered later in the definition of scenarios.

The alternative to quantitative approaches are qualitative approaches. As is stated in document IETA (2005), "non-quantitative" in this context means that a quantitative objective does not exist. In its place, there are different types of objectives, some of which could be considered to be of a quantitative nature, like taxes on carbon, or in percentage terms, like the distribution of a technology on a specific date. More specifically, the following are usually considered to be the main qualitative approaches: (1) trading without objectives; (2) policies and measures; (3) technology agreements; (4) carbon taxes.

These approaches are not necessarily compatible with a system of trading emissions. The U.S.A. and Australia defend an alternative qualitative approach. These countries reject the establishment of objectives that in any case would be "arbitrary", very costly for their countries and largely ineffective at reducing emissions if the system does not include the less-developed countries. For that reason they propose "technology agreements". Basically, this implies the creation of a fund financed by the developed countries to support the development and distribution of clean mitigation technologies both in the rich countries as in the poor. It includes the idea of the mitigation technology transference towards the poorest countries.

Also in this extreme there is the possibility that each country commits not to reduce emissions directly, but to adopt a national series of policies and measures to reduce emissions. The commitment in this case is not to reduce emissions, but to adopt those measures (objective in procedure and not final). Those policies could more or less be harmonized between countries, an option that clashes with the position of countries like the U.S.A., that support non-harmonization. This harmonization would therefore be the most unlikely option, due to the difficulty that such a system would ever be implemented.

To summarise, the design alternatives within this element would be:

Absolute reduction objectives. Objective reduction of the total emissions (tonnes of CO2e) are agreed. Each country can transfer the reduction obligation to its companies. A market of emission permits is established in which the companies fulfil their objectives at lowest cost, or they resort to the so called Kyoto Mechanisms (Clean Development Mechanism and Joint Implementation). This option would generate certainty as to reduction.

Absolute reduction objectives with safety valve. In the previous case, the certainty about reduction is achieved at the cost of uncertainty about the cost of reaching the reduction objective, since that cost depends on the level of the emission permit prices: the greater the price, the greater the cost. One could then

consider the introduction of a "safety valve" or "ceiling" to the emission permits. Whenever the market price surpasses the maximum price, companies could buy permits at that price. The money coming from those permits could be used in emission reduction projects or to support the transference of less polluting technologies to less-developed countries. The only problem with this alternative is that it would not allow the objective to be reached if the market price of the permit surpassed the maximum price given by the ceiling, as in that case companies would not have to comply by giving (buying) permits, but simply by paying the maximum price.

Relative reduction objectives. Some countries and companies have shown their concern about the fact that, with absolute objectives, the cost is excessive in a context in which less polluting technologies are adopted but an increase in production generates an increase in emissions that cancels out that technological effect. For that reason, they suggest the establishment of relative objectives, that is to say, emissions per unit of product. The problem with this option is that it does not create a guarantee of attaining a certain level of emissions.

Sector agreements. In this case, the possibility is considered of establishing emissions reduction objectives in terms of individual sectors, at an international level. Sector agreements have been proposed as a measure to avoid the distortions of international competition that can be produced when different countries deal differently in the same sector. Nevertheless, this deals with a relatively recent approach that has other problems and where work needs to be done on the details . It is not clear for example, to what extent this approach would be compatible with the emissions trading.

National policies and measures. In this case, countries unilaterally adopt mitigation policies and measures. The countries' commitment is to apply those policies, not to reach a certain objective of emissions reduction. Without the existence of reduction objectives, this approach is not compatible with emissions trading or with the Kyoto Flexible Mechanisms.

Harmonised policies and measures. Unlike the previous option, in this case certain policies are agreed at an international level. In principle, this approach is not compatible either with emissions trading, nor with the Kyoto Flexible Mechanisms.

B) Participation of developing and less developed countries.

One of the main stumbling blocks to the advance of the international agreement, behind the U.S.A.'s refusal to join the same, is that which results from the lack of reduction commitments on the part of the less developed countries, which predictably will experience a greater increase in emissions in the coming years. It's a question of a *cul- de-sac*: if the less developed countries do not accept reduction commitments, the U.S.A. will never accept a world-wide agreement; on the other hand, the poorest countries will never accept reduction objectives, since they consider that the problem has been created by the richest countries and that the main emitter at this time (U.S.A.) is not doing anything about it. This implies that a world-wide agreement will leave out the U.S.A. and will not envisage the commitment of less developed countries.

However, there could be an intermediate solution: that the poorest countries were to accept reduction commitments, but of voluntary performance. If they were to exceed their emission objectives (fixed at a level of emissions reflecting the *status quo*), then they would not have to incur penalties. But if their

emissions were below those objectives, they would receive as a result excess emission permits that they could sell in the international emissions market to the developed countries, obtaining in return extra income. This system of "carrot without a stick" could be attractive for less-developed countries and would help in mitigating the concerns of the U.S.A. and other advanced economies. In any case, it does not seem very likely that the U.S.A. would be prepared to ratify this "modified Kyoto" regime, to which we will return in the following section on the framework of scenario number 3, given its almost "philosophical" opposition to a regime of the Kyoto style and the efforts that it has made in the past to reject it.

C) Form in which the countries are involved in a mitigation agreement (top-down versus bottom-up).

Within this last criterion two extreme alternatives can be considered: either that there is not a post-Kyoto agreement (that is to say, only the EU and some other country has voluntary reduction objectives), or a world-wide agreement of all the countries within the framework of the UNFCCC (top-down). An intermediate alternative would consist of one where there is no global agreement, but a group of "environmentally conscious" countries (EU + Canada + Japan + New Zealand + Russia + some developing countries) carry out their own national mitigation policies and, possibly, they bind those policies to those adopted by other countries with reduction objectives and national systems of emissions trading (bottom-up). The participation of the U.S.A. and Australia is not foreseeable in either of these two last alternatives.

We move on next to going a little further into depth about the different "degrees" of involvement of countries within this third and last design criterion of the post-Kyoto framework, just as they will be included in the following section dedicated to the scenarios. A first option would be an agreement similar to the Kyoto one between almost all the countries of the world, except the U.S.A. and Australia (scenario 1). A second option would consist of those countries that have not ratified Kyoto (the U.S.A. and Australia) adopting those measures with which they seem to be more in agreement (technology agreements). A third, would be a small modification of Kyoto (scenario 3), by means of the establishment of price ceilings for emission permits, mitigating therefore the concern about a possible elevated total cost of performance. If the countries are not agreed and carry out their own national policies of mitigation, several possible modes would exist (scenarios 4 to 9). The countries which adopt a policy of mitigation with reduction objectives and national emissions trading (as this is the instrument that allows a cost-efficient achievement of the reduction objectives) could reach agreement and accept a possible link and coordination between their systems of national emissions trading. In any case, the process would be gradual. In a first instance only national instruments would be developed, with links between a very reduced group of countries. Later, other countries would join the agreement.

A key question in this sense is: what would it take for some countries to adopt objectives and national systems of emissions trading when other countries do not do it? For the leaders of some countries it can be difficult to justify that they are not doing anything to mitigate climate change, facing an electorate aware of the problematic environment. That electorate not only demands them to take measures, but to establish specific reduction objectives.

It is also appropriate to ask why those aware countries would apply a system of emissions trading and not another system. The reason is that it is widely accepted that this system is the most cost effective to obtain a certain reduction of emissions (alongside carbon taxes) and the countries do not want to incur more costs than necessary to reach those objectives (even more so if only a few countries have decided to adopt reduction commitments). With respect to taxes, freely issued emission permits have the advantage of being more attractive for the companies of the country, as they do not require a payment for all the company's emissions (as in the case of taxes), but only for those that surpass the allowed limit and the permits which they have. However, if the permits were given by means of auction, there would be practically no difference from a system based on taxes.

2.3 The main post-Kyoto scenarios.

The combination of criteria or elements set out in the previous section can give rise to a set of more or less reasonable scenarios. At the beginning of this research project, nine possible basic post-Kyoto scenarios were identified, as a result of the review of the literature on this question and the exchange of ideas with some experts on climate change[3]. The organisation of these scenarios has been made based on their distance from the present framework of the UNFCCC and the Kyoto Protocol:

1) Kyoto continued. This scenario implies the extrapolation of the characteristics of the present Kyoto regime to the post-Kyoto period. In this event, an agreement would exist with absolute reduction objectives by country and the possibility of meeting those objectives in a cost-effective way turning to international emissions trading in commitment periods of 5 years. This agreement would take place within the framework of the UNFCCC in an international negotiation between countries. In this scenario the banking of units of Kyoto from one commitment period to the following would be allowed and to the Kyoto Flexible Mechanisms, and in particular the CDM, would have automatic continuity post-Kyoto. This mechanism would have the same configuration as the present one, although its application could improve adopting more top-down methodologies.

Bearing in mind its head-on rejection of this scenario, the U.S.A. and Australia would continue to not participate in this regime, at least in the medium term (until 2030). The developing countries, as well as the less developed (PVD) would continue to not have objectives, although very lax objectives (such as the *status quo*) could be established for any developing non-Annex I country with relatively elevated levels of development and for developing countries with significant growth in emissions.

On the other hand, several alternative criteria exist for the future allocation of objectives to the countries of Annex I (the GDP per capita, emissions per capita, emissions per unit of GDP, population, historical responsibility - historical emissions, present absolute emissions, costs of emissions reduction - identifying cheap alternatives by sector and country), as well as several approaches in this allocation (multi-stage, contraction and convergence, global triptych, Brazilian proposal). Nevertheless we did not

[3] See the references at the end of this report.

consider these possible alternatives, in the interests of greater clarity in the questionnaire sent to the companies that are the subject of this study.

In general terms, this first scenario can be considered as the reference by which to compare all the others. It is the one supported by the majority of the literature about post-Kyoto, as well as by certain players on the international stage.

2) Kyoto Plus (Kyoto + technology agreements). This second scenario is a variation of the previous one, in the sense that the basic architecture of Kyoto would stay. Absolute mitigation objectives would continue to exist for the countries but, in addition, an agreement between the present Annex I countries would be adopted to finance the development, the innovation, the diffusion and the transfer of mitigation technologies[4]. The developed countries would contribute to this fund, including the U.S.A. and Australia, since both nations defend the adoption of technology agreements to involve the developing countries in the mitigation.

3) Modified Kyoto. In this scenario suitable elements of the present Protocol would stay, at the same time as fundamental aspects in the agreement would be renegotiated. In a framework of global international negotiation under the UNFCCC, it would be a question of explicitly correcting some of the problems observed in the present Protocol, such as the non-participation of the developing countries or the non-existence of a ceiling on the prices of emission permits, a circumstance that results in uncertainty as to the cost of applying the Protocol.

Instead of absolute objectives, the application of relative objectives (emissions per GDP unit) could be considered for example. If some absolute objectives were kept, a ceiling on the cost of emission permits could be fixed that would function as a type of "safety valve". This ceiling would have to be agreed internationally as, otherwise, international distortions between countries with different ceilings would be generated. This agreement would allow the companies in the Annex I countries to acquire emission permits at a determined price, an option to which they would resort if the market price permits exceeded this ceiling.

On the other hand, and in contrast to the previous scenarios, the developing countries could have absolute reduction objectives, albeit voluntary. That is to say, the developing countries would have voluntary emissions objectives, that in the event of being exceeded would not carry negative consequences for those countries, but that in the event of being exceeded would not allow the corresponding developing country to sell in the international carbon market the difference between its emissions and its objective, obtaining a benefit thereby. This scheme would allow the non Annex I countries to have a positive incentive (carrot) to control their emissions, at the same time as avoiding their distrust (and rejection) of accepting objectives, as there would be no penalty for breach. Another option that is usually considered is that of an allocation of

[4] These agreements can be of different types: agreements in technology standards, R&D and financing for technology distribution towards developing countries, or the creation of channels of cooperation in technology development. Standards of power efficiency could be especially interesting in the electrical sector.

objectives in relation to the developing countries that would reduce their concerns about the damage to their economic development processes that the application of absolute objectives could cause. A scenario could occur therefore with absolute objectives for the developed countries, relative ones for the developing countries or countries of average income, and voluntary objectives for the less developed countries. Nevertheless, we consider that the practical application of these objectives in relation to the developing countries would be very complex and we consider it as improbable, keeping to the alternatives of obligatory absolute objectives for the Annex I countries and voluntary ones for the countries outside of Annex I.

4) Parallel Kyoto. This scenario would assume the application of a regime similar to the Kyoto one for the Annex I countries that have currently ratified the Protocol within the framework of the UNFCCC, and a parallel agreement by those that reject the same (U.S.A. and Australia). In the light of certain initiatives recently adopted in this sense, this agreement would be made between these two last countries and some developing countries of Southeast Asia. This agreement, parallel to the one made by the other countries, would be fundamentally based on the negotiation of a technology agreement for the transfer of technology to those developing countries. This one would be the most probable option. Another possibility is that those countries agreed to assume gradual reduction objectives (modest at the outset) and to be able to meet them through international emissions trading. Initially, this recourse to emissions trading would take place between the countries that had signed the parallel agreement, but in the medium or long term it would not make sense to maintain two systems of emissions trading and both would be integrated to create a single market for emissions trading. This last alternative with reduction objectives for the countries in the parallel agreement is quite improbable, as it would give rise to a system similar to the Kyoto one, which has already been rejected by those nations.

5) Regional agreement. In this scenario, the application would be negotiated of communal reduction objectives, differentiated between a small group of countries, although not necessarily within the framework of the UNFCCC. Unlike the Protocol, it would be a bottom-up process, in that a global agreement would not exist. A certain number of 'environmentally aware' countries (EU, other European, Canada, Japan, New Zealand and some developing countries) would decide to adopt absolute reduction objectives just for them and to use emissions trading to meet those objectives. The possibility would be left open for other countries to join the agreement at a later date. The less developed countries and most of the developing countries would not have objectives.

6) National links. Like in the previous case, a global agreement would not exist, and not even an agreement between countries to adopt common objectives. This scenario would imply that the international negotiations about the post-Kyoto period fail. Nevertheless, some 'aware' countries would continue to be prepared to unilaterally adopting a national climate change policy, with reduction objectives and a system of national emissions trading to meet them in a cost-effective way. These countries could be some of the EU, other European, Canada, Japan or New Zealand, for example. This would give rise to the existence of a series of national systems of emissions trading. Some countries could be

interested in joining their national system to that of another country, since this could enable the meeting of its own objectives at a lower cost. For this, certain conditions of compatibility between the systems that are to be integrated would have to be met, such as equivalent penalties for breach, identical definition of emission permits, etc. This initial link between two countries could be extended to others, giving rise to an international system of emissions created by the sum of individual countries, again in a bottom-up process. Obviously, this process would be gradual. The link and coordination between national systems would be compatible with the creation of an international fund to promote the adoption of mitigation technologies and the involvement of the developing and less developed countries.

7) International sector agreement. Some sectors of activity, reach an agreement on international relative objectives. Two possibilities open up here: that emissions trading (based on emission credits over the baseline) only between the companies in the same sector at an international level (inefficient in costs, improbable) or, more probable, that the companies can exchange the created credits in an international emissions market (the companies whose emissions are over the baseline can buy permits from other sectors). This last option presents a problem in that it mixes different systems (cap-and-trade and credits based)[5]. It is particularly interesting to analyze whether this approach is attractive to the electricity sector in its two modes. Perhaps it makes more sense in other sectors (cement, steel, aluminium), although not as much in the electricity sector since the low level of electricity interconnections between countries makes international competition difficult, precisely the problem that international sector agreements try to correct. It would be necessary to consider whether the sector objectives are absolute or relative (AAUs or credits).

8) National policies and measures (P&M). This scenario assumes a radical change with respect to the present international system of fighting against the climate change, to the extent that it implies the non-existence of an international agreement, of quantitative objectives and, therefore, of an international system of emissions trading to facilitate the achievement of them. We would be dealing with a bottom-up process in which each country would only be committed to adopting certain measures (that could include, but not necessarily, a national emissions trading system) to control its emissions based on its national circumstances[6]. In this scenario the developing and less developed countries

[5] The systems of emissions trading can be cap-and-trade or based on credits, depending on whether what is exchanged are emission permits or emissions reduction credits, respectively. In the first, the emission permits are applied to all the emissions of the participants covered by the system, while the "ceiling" refers to the emissions limit allocated to these participants during a certain period. The permits are interchangeable between the participants and at the end of the period they must present permits corresponding to the emissions during that period. In a system of credits, these are granted for the achieved reductions of emissions below a previously defined reference line.

[6] Theoretically, however, it could be compatible with a framework like the Kyoto one. For example, the countries are committed to reduce emissions with a specific objective and those countries can not transfer those reduction objectives to the companies. They adopt national policies and measures and the government is completely responsible not only to meet the objectives, but to interchange emission permits with other countries and to buy CERs and ERUs. Nevertheless, we must exclude this possibility, as once they have established reduction objectives

could adopt, voluntarily, certain policies and measures that were advantageous to the control of the emissions and, at the same time, would contribute to the sustainable development of these countries (for example measures to facilitate rural electrification in isolated zones through systems of distributed generation). Also it would be compatible with agreements to promote technology transference to these countries.

9) International policies and measures (P&M). The previous scenario could evolve into the adoption of packages of national and international measures that the countries would agree to implement, like, for example, a carbon tax or international agreements of energy efficiency at the process level[7]. This one would be largely a top-down process, since it would require an international agreement. Like the previous scenario, it assumes a significant break from the present regime of mitigation, since quantitative reduction objectives would not exist, but only the commitment to apply certain policies at the international level and in a manner more or less harmonized between countries[8]. That is to say, in contrast to the previous one, it is a process in which multilaterally agreed commitments are set. This approach could be compatible with the fixing of some emissions objective (non-obligatory). In any case, the achievement would be evaluated not in terms of reaching that objective, but in terms of the possibility that the instituted P&M reach the objective. Although this approach may not seem very realistic because it is so different from the present approach, it was defended by the EU in Kyoto. It is very probable that this approach would also have an element of "funding for technology development and the transfer of mitigation technologies to developing countries" to which the more developed countries contribute, in a similar way to the technology agreements considered in the second scenario (Kyoto-Plus).

2.4. Compatibility of allowances between the first and second commitment period of the Kyoto Protocol.[9]

As was mentioned in the introduction, a key question for potential investors is whether the banking is possible of Kyoto units (AAUs, CERs and ERUs) from the first commitment period of the Kyoto Protocol to a post-Kyoto regime. In the case of a post-Kyoto regime that is really very similar to the Kyoto one, this question is not considered, as the Protocol itself explicitly allows that

---

and the country has agreed to accept them, it has been demonstrated that the most cost-efficient form to reach them is by trading between companies, not between governments.

[7] The technology agreements considered above could also complement this P&M approach. In fact, technology agreements can form part of almost any post-Kyoto regime. Carbon taxes are not very viable in practice due to their low acceptability on the part of the countries in the international community, both developed and developing. Which is to say, this is a very unrealistic alternative.

[8] The concept of obligatory P&M has received little attention in the literature. It is therefore more appropriate to consider voluntary P&M. However, although voluntary in nature, the P&M can be subject to commitments, with the advantage that governments will know perfectly what they are committing themselves to. It can be difficult for governments to commit themselves to ambitious national P&M if the rest of the countries do not adopt equally ambitious policies and, for that reason, perhaps it makes more sense to engage in international P&M.

[9] This section is based on the following paper, submitted to Climate Policy: Del Río, P. "Will there be value for Kyoto units in a post-Kyoto regime?".

banking. Therefore, this question of credit must be approached supposing a commitment regime different from the one in the Protocol.

In this context, it is necessary to discuss two possibilities: (1) the possibility of using the Kyoto units created in the first period of Kyoto in the second period; (2) the possibility of using in the second period of commitment Kyoto units issued in CDM and AC projects post 2008-2012, but which are the result of projects registered in 2008-2012.

A) Will it be possible to use in the second period the Kyoto units created in the first period?

In table 3 the possibilities of banking the mentioned credit are summarized, considering the scenarios raised in the previous section. After the table this question is considered briefly for each scenario.

Table 3. Possibility of using Kyoto units created in the first period during the second

Scenario	**Possibility of international emissions trading**	**Compatibility with the banking of Kyoto units from the first period to the second**		
		AAUs	**CERs**	**ERUs**
1) Kyoto continued	YES	YES	YES	YES
2) Kyoto Plus	YES	YES	YES	YES
3) Modified Kyoto	YES	YES (difficulty if relative objectives)	YES (difficulty if relative objectives)	YES (difficulty if relative objectives)
4) Parallel Kyoto	YES	YES (not for non-parallel Kyoto signatory countries unless they decide)	YES (not for non-parallel Kyoto signatory countries unless they decide)	YES (not for non-parallel Kyoto signatory countries unless they decide)
5) Regional agreement	YES	YES (not for countries not signed to the agreement unless they decide)	YES (not for countries not signed to the agreement unless they decide)	YES (not for countries not signed to the agreement unless they decide)
6) National links	YES (depends on link between countries)	YES (depends on the decision of each country accepting it and on bilateral agreements of reciprocity between the countries)	YES (depends on the decision of each Annex I country accepting it)	YES (depends on the decision of each Annex I country accepting it)
7) International sector agreement	YES	YES. More difficult in the case of "strict" sector objectives (Kyoto units of companies in the same sector for commitment intentions) and in the case of "relative" sector objectives.	YES. More difficult in the case of "strict" sector objectives (Kyoto units of companies in the same sector for commitment intentions) and in the case of "relative" sector objectives.*	YES. More difficult in the case of "strict" sector objectives (Kyoto units of companies in the same sector for commitment intentions) and in the case of "relative" sector objectives.*
8) National P&M	NO (except by decision of the country)	NO (except by decision of the country and difficult adjustments)	NO (except by decision of the country and difficult adjustments)	NO (except by decision of the country and difficult adjustments)

9) International P&M	NO if reduction objectives do not exist (national or international)**	NO if reduction objectives do not exist (national or international)	NO if reduction objectives do not exist (national or international)	NO if reduction objectives do not exist (national or international)

* In this case a decision must be taken whether to accept or not CERs and ERUs bought from companies in other sectors.

** It is possible to consider whether to introduce some element of trading in this approach. The unit to trade would be directly related to the P&M in question. Meeting the objective with some type of Carbon trading unit may be allowed. Only in the very hypothetical case that some type of emissions trading were allowed could the banking of Kyoto units be accepted.

In scenario 1, being the continuation of Kyoto, inter-period banking is explicitly allowed.

In scenario 2, the volume of trade would be less than in scenario 1 because the emissions themselves are reduced by the technology agreements. The technology agreements can be installed as complementary to a regime of emissions trading with reduction objectives. In the event of replacing a system of emissions trading by a technology agreement, the banking of first period units would be incompatible with this technology agreement. In other words, the compatibility depends on how the system is designed. This conclusion may be more general and applicable to other scenarios.

In scenario 3, one has to contemplate the possible difficulty of making the use of AAUs, CERs and ERUs (that are units of reduction of absolute emissions, although in the last two cases in relation to a baseline) compatible with the existence of relative objectives (emissions by unit of product).

In scenario 4, the banking is technically viable and desirable for the countries in the parallel regime. The countries outside this regime can also decide to accept Kyoto units from the first commitment period to meet national objectives (if they exist), but this depends on which mitigation measures these countries apply and which emissions reduction objectives they adopt.

Similarly, in scenario 5 countries can decide if they will allow the use of Kyoto units from the first commitment period to meet the objectives in the regional agreement. Also countries outside this agreement can unilaterally decide whether to accept those Kyoto units.

In scenario 6 each country can, unilaterally, decide whether it accepts Kyoto units from the first commitment period of its own companies to meet the national emission reduction objectives. To accept the Kyoto units of companies from other countries depends on the decision to link the systems of two or more countries and on the decision to accept those Kyoto units (bilateral reciprocity agreement between countries).

The case of sector agreements, scenario 7, is somewhat more complex. In this case we must distinguish two situations. On the one hand, there is no problem in accepting the banking of the Kyoto units in the case in which objectives exist for the sector and the companies of a sector can meet their sector objectives by acquiring the Kyoto units of companies of other sectors. Nevertheless, the situation is more problematic in "the strict" case, that is to say, when sector objectives exist but it is not possible for the companies of a sector to meet those objectives by acquiring Kyoto units from companies in other sectors. In this case, the AAUs of the first commitment period coming from companies in the same sector could be accepted to meet objectives after 2012, but not therefore the AAUs from companies in other sectors. With respect to the other Kyoto units, CERs and ERUs, a decision would have to be taken on whether only the CERs

and ERUs of the companies of the sector of the first commitment period would have to be accepted or if also the CERs and ERUs, of companies of other sectors can be accepted. In both cases, to use the Kyoto units to meet the sector objectives can be difficult if the latter are set in relative terms (that is to say, emissions by unit of product).

As the scenarios 8 and 9 of policies and measures are not entirely incompatible with the use of Kyoto units to meet the obligations derived from those policies and measures, they could hypothetically, and based on the necessary adjustments, be compatible with inter-period banking. In addition, those P&M are compatible with the creation of a fund financed by Annex I countries or developed countries to carry out emission reduction projects in developing countries that generate emission reduction credits that can be used somehow in the developed countries.

In general, it can be asserted that the closer the new international mitigation architecture is to a regime like that of Kyoto, the fewer difficulties will exist in allowing the banking. The existence of a system of international permits trading of the cap-and-trade type and/ or of emissions reduction objectives by country without a doubt makes the possibility of banking easier. To put it another way, the less the mitigation policies are based on absolute reduction objectives (for example, in technology agreements) and the less international the post-Kyoto mitigation regime is (that is to say, the fewer participants it has), the lower the probability that the first period Kyoto units will have market value and, in any case, the greater the uncertainty as to that value.

B) Will it be possible to use Kyoto units from CDM and JI projects arising after 2008-2012, but which are the result of projects registered during 2008-2012 in the second period?

A somewhat different question from the previous one but equally relevant for investing companies is whether it will be possible to use the credits based on projects from the Kyoto Flexible Mechanisms (CDM and JI) in a post-Kyoto regime that have been registered in the first commitment period (or before the decision about a post-Kyoto regime) and whose periods of accreditation extend beyond 2012. That is to say, if the CERs and ERUs issued after 2012 will have a market value then. Table 4 summarizes the options and possibilities in this case.

Table 4. Possibility of using Kyoto units issued on CDM and JI projects after the period 2008-2012 in the second commitment period.

Scenario	**Possibility of using CERs issued after 2012**	**Possibility of using ERUs after 2012**
1) Kyoto as usual	YES	YES
2) Kyoto Plus	YES	YES
3) Modified Kyoto	YES (difficulty if relative objectives and voluntary objectives for non Annex I countries *)	YES (difficulty if relative objectives)
4) Parallel Kyoto	YES (not for countries not signing the agreement except by decision of these)	YES (not for countries not signing the agreement except by decision of these)
5) Regional agreement	YES (depends on the decision of each country to accept it)	YES (depends on the decision of each country to accept it)
6) National links	YES	YES (depends on the decision of

		the involved countries to accept it)
7) International sector agreement	YES (difficulty if relative objectives)	YES (difficulty if relative objectives)
8) National P&M	NO if no reduction objectives exist	NO if no reduction objectives exist
9) International P&M	NO if no reduction objectives exist (national or international)	NO if no reduction objectives exist (national or international)

*In this case emission reductions could give rise to double accounting.

In the event that reduction objectives (policies and measures) did not exist, the issue of CERs and ERUs would only be certain if the countries were agreed on creating a fund that was intended for the acquisition of these Kyoto units.

A technical complication can arise if it is tried to use Kyoto units to meet relative objectives. In this event, necessary and pertinent adjustments would have to be made

To assure a value for the credits, emission permits or allowances depends on the existence of clear signals on the future of the climate change regime. Considering that the international carbon market influences the decisions of investment in less intensive carbon technologies, it is essential that a long term incentive exists to carry out these investments, especially those that require long periods for pay-back, like most of those that are carried out in the energy sector. The possibility of using Kyoto units generated in a period to meet reduction commitments in later periods forms part of this incentive. In addition, uncertainty also arises as to the possibility itself of using the Kyoto units generated in emission reduction projects (CDM and JI) after 2012 to meet future commitments. In this sense, the present lack of definition of a post-Kyoto regime generates uncertainty about whether those units will have a market value and this is already affecting the execution of those projects[10]. Therefore, it is crucial for companies to ensure that the emissions reductions after 2012 will have a value. Governments have a fundamental role to play in this sense, as the existence of that value depends on the existence of reduction objectives and, therefore, of commitments and political negotiations.

Obviously the closer the new design to the architecture of the original Kyoto, intra-period banking will be the more probable and compatible. In other words, in a post-Kyoto regime in which reduction objectives are established, compatibility with the banking of Kyoto units is immediate, as those objectives act as a demand of Kyoto units. Those scenarios in which a system of emissions trading is established are most probable, as a consensus exists (even in the countries that have not ratified the Protocol) that the international trade of emissions is a very attractive instrument for obtaining a certain objective of reduction to a lower cost, when equalising the marginal costs between polluting sources.

To put it another way, the closer the new model is to one of policies and measures without reduction objectives, the lower will be the possibility of using those Kyoto units.

Nevertheless, only in a very extreme case of applying policies and measures is banking difficult. But even in this case of policies and measures it is

[10] The exception is the EU ETS (European Union Emissions Trading System), as the EU has decided that the system will continue after 2012.

possible to establish a system of emissions trading. For example, if the countries establish national measures of emissions reduction, nothing prevents the instrument in use from being a national system of emissions trading. And the country can accept their companies using Kyoto units from the previous period in order to meet the commitment of the national system of emissions trading. Also it could agree to the CDM and JI project credits that are being generated in the post-Kyoto period being able to be used for the same purpose. For their part, if several countries adopt a national system of emissions trading and decide to link their systems, a regime similar to the Kyoto one could come about (bottom-up process), the use of Kyoto units throughout the bubble of those countries being possible.

Therefore, the most probable is that some type of agreement that makes the banking of Kyoto units possible will exist. This would allow the reduction of the cost of compliance with the objectives of the second period because banking favours efficiency over time in allowing companies to decide when is better for them to use those Kyoto units to meet their obligations. For example, the market value of CERs is relatively low today and it is probable that it will remain at a low level, although it may increase in 2008-2012. If countries agree more demanding reduction objectives for later periods, it could be profitable for companies not to use those CERs today and to postpone their use for a future date.

On the one hand, technical difficulties do not exist, in general, in order for banking to take place in most of the scenarios. On the other hand, given the assessment that is very probable that some type of modality of emissions trading will exist in the post-Kyoto regime, such banking is more probable. This depends on an international decision of the participant countries in the post-Kyoto agreement. As Kyoto units have a possible post-Kyoto value and some people have decided to make investments and incur costs in advance, it is feasible that there will be a recognition of these units post-Kyoto, the pressure of investing companies being a fundamental element for recognition to happen.

2.5. Degrees of Involvement in the CDM

In the later empirical study we will try to identify what is the strategic positioning of the European electricity companies with respect to the possible regimes of post-Kyoto commitment. Without a doubt, certain decisions that already are being taken can provide indications in this sense, indicating which of the previous scenarios is more plausible for companies in this sector. Some of those indications can be derived from the degree of involvement of the companies in CDM. It is reasonable to assume that the greater the degree of involvement in those investments, the greater is the confidence of the company in the existence of a post-Kyoto regime in which the use of Kyoto units is allowed.

In this sense, in this study we considered the following degrees of involvement, in the order of increasing degree:

(i) Payment on delivery. Simple agreement on the delivery of the CERs without financing of the project on the part of the buyer. That is to say, the buyer is solely committed to buy the CERs, but not to contribute financing to the project.
(ii) Involvement in Carbon Funds. Simple involvement in the financing of a Carbon Fund.

(iii) Financing of projects. Involvement in the financing of the project on the part of the investor and agreement on the delivery of CERs, but without involvement in the management of the project.
(iv) Project management. Actual involvement in the management of the project by the investor. That is to say, the investor is in charge of the accomplishment of the project. He contributes not only financial resources, but also human and technical.

Our assumption is that a smaller involvement can reflect a greater concern about the existence of a post-Kyoto regime (as well as the existence of political risks in the host country). Obviously, some alternatives may not be mutually exclusive (specifically, i and ii).

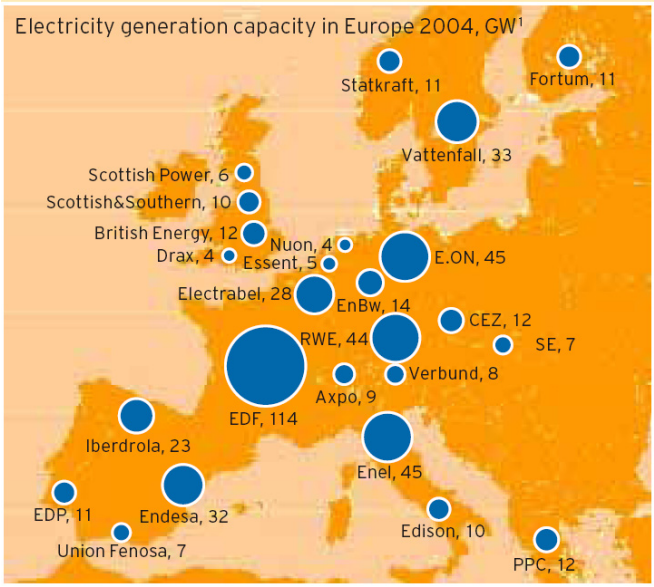
3. EMPIRICAL STUDY.

The main object of the empirical study consists of identifying those scenarios that are more reasonable from the perspective of the European electricity sector at the time of making its investment decisions and to measure the influence of those scenarios on these decisions. For this a survey and interviews with the principal companies in the sector at the European level were performed.

3.1. Design of the sample and participating companies

The European companies chosen for the survey were considered to be important for the building of the Spanish companies' strategies. Furthermore several additional points were taken into consideration for the design of the sample such as the size of the companies in terms of generation capacity (see figure 2). In the first place, obviously the most important Spanish companies were included. Secondly, the most important companies of Germany, Italy, Belgium and of the Netherlands were considered fundamental due to their influence in the European market. Thirdly, the companies in the market of United Kingdom and Nordic countries were identified as interesting because of the political context. France was not considered being least important in the Spanish context due to its concentration on nuclear energy.

Figure 2. Capacity of Electricity Generation in the Whole of Europe, 2004



Source: *Vattenfall Annual Report* 2005, p. 17

Starting from these considerations, the following list of 18 subject companies for the survey was finalised. Altogether, they represent 53% of European generation capacity.

Table 5. Companies invited to participate in the survey

Country	Company	Generating capacity (GW) in Europe, 2004
Spain	IBERDROLA	23
Spain	ENDESA	32
Spain	HC ENERGÍA	3
Spain	UNION FENOSA	7
Germany	RWE	44
Germany	E.oN	45
Germany	EnBW AG	14
Belgium	ELECTRABEL	28
Italy	ENEL SPA	45
Italy	ENI SPA	3
Netherlands	ESSENT	5
Netherlands	NUON	4
Norway	STATKRAFT	11
United Kingdom	BRITISH ENERGY	12
United Kingdom	SCOTTISH & SOUTHERN	10
United Kingdom	SCOTTISH POWER	6
United Kingdom	DRAX POWER LIMITED	4

Sweden	VATTENFALL AB	33
European generating capacity represented (GW and %)		**329 (53 %*)**

* The total generating capacity in EU15 was 626 GW in 2004.
(Source: Eurostat, 2006. Energy: Yearly statistics, Data 2004)

After a complicated process of identification of the most appropriate spokesperson within each organization for the survey[11], the representatives of the companies were then invited via e-mail to participate in the study (see appendix 1). In this mail the objective of the survey was explained to the participants and they were invited to complete the questionnaire online (see appendix 2) and to propose an appropriate date for a personal interview by telephone. Also the confidentiality of the survey was stressed and the possibility that they could receive the results of the study later.

Once the invitations to participate in the study were delivered, the first spontaneous answers on the part of some participant companies were received and an intensive follow-up was conducted with the rest of the companies to assure a greater number of answers. This process began in the month of June and finished in October. The process was extended partly due to the coincidence with European holidays, but also due to the difficulty in finding suitable contacts within the organizations and, of course, to the complicated diaries of the spokespersons. Each answer received required between 5 and 25 calls and numerous e-mails.

After the receipt of each completed questionnaire, a telephone interview was then conducted with the spokesperson of the company, in order to clarify the answers received and to offer to the company the possibility of expanding on its answers verbally. The interviews were recorded and reports of the most important aspects were compiled. In some cases, the companies preferred to hold the interview without sending the questionnaire beforehand. In all the cases, the questionnaire was used as a guide to structure the later interview. The interviews lasted between 15 and 50 minutes, depending on the time available to the interviewee. In the third week of October, we decided to bring this process to an end by proceeding to write up the results of the empirical part of the study. From amongst the 18 companies identified in the sample, complete answers (questionnaire and interview) were obtained from 11 companies (see table 6, highlighted in bold), which represents 40% of the European generating capacity.

Table 6. Companies participating in the survey

Country	Company	Date of interview
Spain	**IBERDROLA**	**19/07/06**
Spain	**ENDESA**	**27/10/06**
Spain	HC ENERGÍA	-
Spain	**UNION FENOSA**	**05/10/06**

[11] In most of the cases the person responsible for the environment or for sustainability dealt with us; in others, it was the strategy, project development, or institutional relations manager.

Germany	**RWE**	**13/09/06**
Germany	**E.oN**	**21/07/06**
Germany	EnBW AG	-
Belgium	**ELECTRABEL**	**26/09/06**
Italy	**ENEL SPA**	**17/10/06**
Italy	**ENI SPA**	**22/09/06**
Netherlands	**ESSENT**	**25/09/06**
Netherlands	NUON	-
Norway	**STATKRAFT**	**06/09/06**
United Kingdom	BRITISH ENERGY	-
United Kingdom	SCOTTISH & SOUTHERN	-
United Kingdom	**SCOTTISH POWER**	**29/08/06**
United Kingdom	DRAX POWER LIMITED	-
Sweden	VATTENFALL AB	-
European generating capacity represented (GW and %)		**249 (40%)**

3.2. Design of questionnaire

Appendix 2 shows the electronic questionnaire that the participant companies in the survey responded to and that served as guide to structure the later interviews. Given the abundance of questionnaires that these companies receive every day and the profile of the spokespeople, a brief and simple questionnaire was decided upon, with the primary objective of guaranteeing the greatest possible response rate. The later interview guaranteed the opportunity to expand the data obtained from each company.

The questionnaire, semi-structured, is made up of three sections, corresponding to three information requirements, within which the six questions that we considered fundamental are distributed.

A) Questions 1 and 2 (multiple answer) try to determine the importance given by the surveyed company to the Kyoto and post-Kyoto processes as a determining factor in their competitive strategy and their immediate investment decisions (generation mix until 2015) and in the medium and long term (between 2015 and 2025).

B) Question 3 (open) tries to determine under what post-Kyoto scenarios the surveyed company is planning its competitive strategy. Although previously in this report nine possible scenarios were considered, finally it was decided to suggest to the interviewees the following six more probable scenarios, following the numeration used in section 2.4.: (1) Kyoto continued; (3) modified Kyoto; (4) parallel Kyoto; (6) national links; (8) national policies and measures; (9) international policies and

measures. This decision was taken in favour of a simpler survey, and to guarantee a better response rate.

C) Question 4 (multiple answer) tries to determine the degree of involvement of the surveyed company in CDM and JI projects. As we indicated previously in section 2.5, it is reasonable to assume that the greater degree of involvement in those investments, the greater the confidence of the company on the existence of a post-Kyoto regime in which the use of Kyoto units is allowed. Question 5 (open) enables confirmation of whether this assumption is correct in the case of the surveyed company and to what extent their decisions of investment in these projects are being affected by that uncertainty.

Finally, question 6 leaves the possibility open for the interviewed company to volunteer additional information on other aspects in which the post-Kyoto process may be affecting its management decisions.

The remainder of this section describes the principle results obtained from the survey.

3.3. Results obtained.

Table 7 summarises the quantitative results from the survey. The first column includes the value of the response. The second column indicates frequency, that is to say, the number of companies that chose that value. The last column reports on the range of values used as a response.

Table 7. Principle quantitative results from the survey.

	Value	Frequency	Range
Question #1. Changes in the generation mix now-2015 (-3 strong reduction / +3 strong growth)			
Nuclear	1	1	-1 to 1
	0	7	
	-1	3	
Hydro	2	1	0 to 2
	1	4	
	0	6	
Gas	3	3	1 to 3
	2	2	
	1	6	
Coal and fuel-oil	3	1	-3 to 3
	2	1	
	1	2	
	0	3	
	-1	1	
	-2	1	
	-3	1	
Renewables (except Hydro)	3	6	1 to 3
	2	2	
	1	3	
Changes in generation mix 2015-2025			
Nuclear	3	1	-3 to 3
	2	2	

	1	2	
	0	3	
	-3	1	
Hydro	3	1	0 to 3
	1	2	
	0	7	
Gas	3	2	1 to 3
	2	3	
	1	5	
Coal and fuel-oil	2	2	-1 to 2
	1	5	
	0	1	
	-1	1	
Renewables (except Hydro)	3	4	0 to 3
	2	1	
	1	4	
	0	1	

Question #2. Post-Kyoto Ranking in importance as the determining factor in strategic competition	1st	4	1st to 7th
	2nd	1	
	3rd	0	
	4th	3	
	5th	1	
	6th	1	
	7th	1	

Question #3. Company vision of the scenario post-Kyoto	A	1	A to D
	B	1	
	C	6	
	D	5	
	E	0	
	F	0	
	Various	2	

Question #4. Involvement in CDM (principle factor)	Payment on delivery	6	All alternatives
	Carbon funds	4	
	Financing the project	3	
	Project management	3	

Note: In some cases companies have responded with more than one alternative to a specific question, or have preferred not to answer some questions.

Table 7 (question #1) shows the changes in the generation mix anticipated in the first period (now-2015) and in the second period (2015-2025), making the analysis by Technologies. The results show that the vast majority of companies expect that nuclear generation remains constant in the first period. Nevertheless, a significant number of them (more than half) hope for significant growth in nuclear generation in the period 2015-2025.

With regard to hydro generation, the responses are practically uniform for the two periods, pointing in the direction of a generation remaining the same. The fact that a large proportion of the generation potential in this technology has already been exploited undoubtedly contributes to this view.

According to those surveyed, two technologies will experience significant growth. These are renewables and gas. The attraction of investment derived from the policies for the promotion of renewables and the anticipated profitability from generation with gas are without a doubt behind these answers.

Finally, an intermediate case is that of carbon and fuel-oil, which is typified by the wide range of responses, especially in the first period. In this period, whilst 4 of the companies forecast a growth in generation with these sources, 3 of them consider that a reduction is most likely, and another 3 anticipate that generation will remain the same. In the second period, the majority opinion is for growth in generation, maybe due to the potential that technologies called clean coal can demonstrate.

As regards question #2, table 7 clearly shows that companies have very heterogeneous opinions with regard to perception of the importance that the Kyoto and post-Kyoto processes have as a determining factor for their strategic competition and in their investment decisions. Nevertheless, for the majority of companies surveyed, that factor has a significant influence: 5 rate it very highly (1^{st} and 2^{nd} position); 3 give it average importance, (4^{th} position); and the remaining 3 place this factor at the end amongst the determining factors for their investment decisions.

With regard to the range of probable post-Kyoto scenarios (question #3), the heterogeneity is less, as there is a concentration of answers in scenarios C and D, which indicates that the companies anticipate the continuance of restrictions on carbon emissions, whether in the form of a system similar to Kyoto for countries that have actually ratified the Protocol (scenario C), or in the form of links between the European and other national systems on emission laws, but without a global mitigation agreement (scenario D).

Finally, it is appropriate to highlight that the different perception of the importance of a post-Kyoto regime and the possible Post-Kyoto scenarios translates into an involvement that is quite heterogeneous in the Clean Development Mechanism (question #4). Companies state that they do take part in its different modes, although for the most part in the forms which require less involvement by the company in that procedure ("payment on delivery" and "carbon funds"). As we previously justified in this report, this result may be considered as an indication of the uncertainty that companies feel about the availability of a post-Kyoto regime in which the use of Kyoto units is permitted.

Nevertheless, the added information provided by table 7 does not allow one to draw conclusions about what the relationships are between the different categories in company terms and therefore, they conceal what the companies' strategies are with regard to a post-Kyoto compliance system in response to their perception of such a system. From the responses received to the survey, the basic question is, whether it is possible to find guidelines in company terms that allow perception to be related to the importance of the Kyoto and post-Kyoto systems, as well as to the most plausible post-Kyoto scenarios, with the actions suggested to reduce emissions in an investor context typified by the uncertainty about the post-Kyoto system itself.

With this aim, it is useful to consider two basic variables:

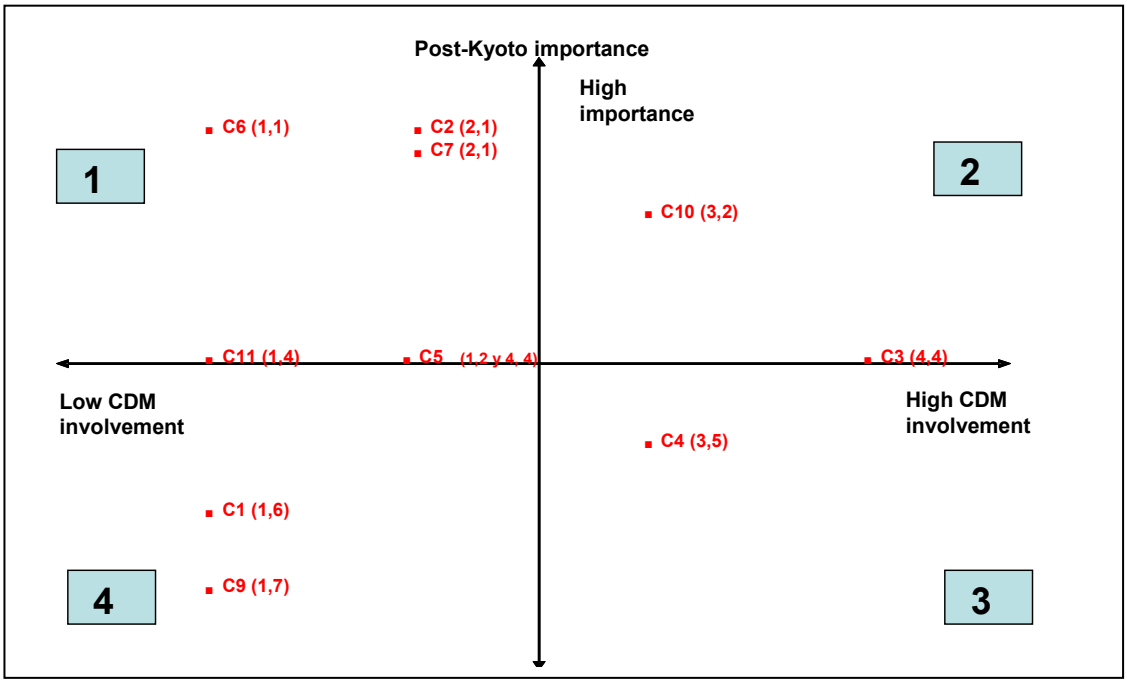
(i) Degree of importance allocated to Kyoto and to post-Kyoto as a competitive factor affecting the company's investment decisions (question #2). One can make a distinction here between two extremes: those companies that accord

high importance to this element in relation to the rest of the aspects considered and those companies that consider this factor has little relevance.

(ii)Type of answer in terms of company strategy in the light of the challenge/uncertainty that post-Kyoto supposes. In this case we can distinguish between those companies that consider a post-Kyoto system with emission reduction objectives and emissions trading will be a reality and therefore, they could be taking up positions in that market carrying out mitigation actions (including full involvement in CDM projects) and those that consider the uncertainties and risks that may arise from it justify adopting a more cautious investment policy.

To identify possible post-Kyoto business patterns of action, it is interesting to analyse up to what point the two variables are related. To analyse this question we have prepared a chart (figure 3) where we place in the ordinate axis the importance accorded to Kyoto/post-Kyoto as the competitive factor affecting company investment decisions, according to the ranking established by the companies themselves in question #2, whilst in the abscissa axis taking up a position with regard to post-Kyoto, measured by the type of involvement in the CDM (question #4)

Figure 3. Relation between the importance allocated to Kyoto/post-Kyoto and degree of involvement in CDM.



*One company was not able to provide an exact ranking in any of the two categories under consideration, although based on the replies given, it could be placed between box 1 and 2.

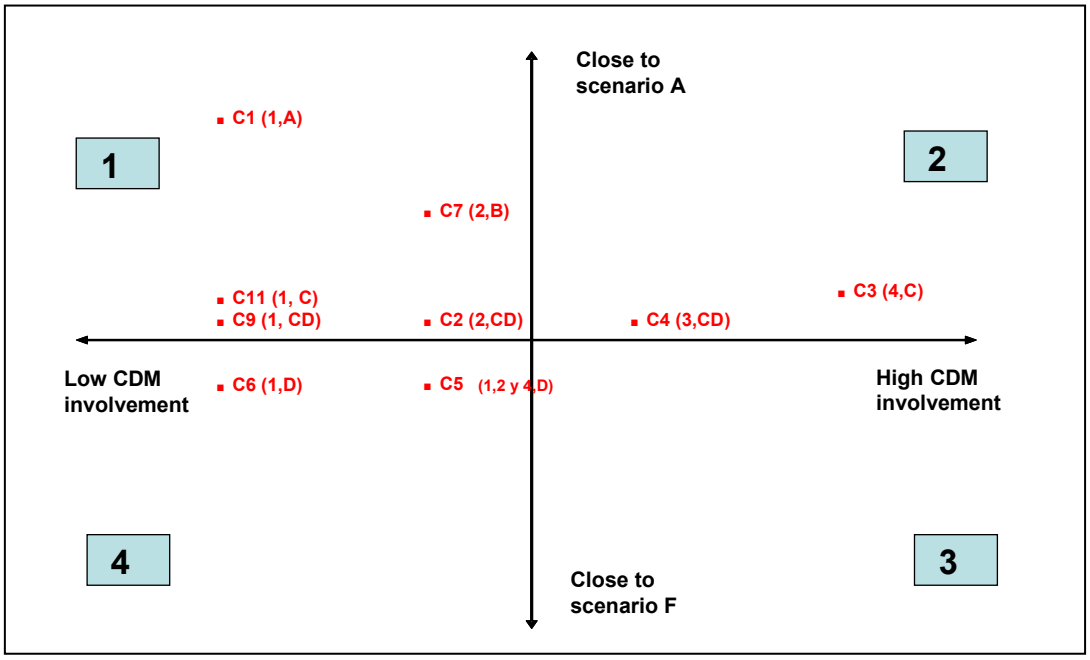
We place the companies in the space created by the two axes. In order to preserve confidentiality of the data provided by the companies surveyed, we have replaced the name of the company by a number[12].

The graphic shows that there is no homogenous pattern of perception and behaviour that allows the two variables to be linked. A positioning through an imaginary diagonal could therefore be expected that would cross the graphic from the southwest box (4) to the northwest box (2). Nevertheless, it is possible to appreciate a certain concentration in boxes 1 and 4 (7 of the 10 companies), which indicates a relatively low involvement in CDM investments, and therefore, the considerable uncertain effect that post-Kyoto may be playing in this sense. In the same way, a similar concentration in boxes 1 and 2 (7 of the 10 companies) is noted, showing graphically that the majority of the companies give plenty of importance to Kyoto/post-Kyoto as an influencing factor in their investment decisions. Therefore, it is appropriate to conclude that each company is a separate case and takes their decisions to involve themselves in CDM based on many variables, Kyoto/post-Kyoto being only one more amongst them.

We can also analyse the companies' post-Kyoto (CDM) degree of involvement in the light of their perception of possible post-Kyoto scenarios. In this sense, it could be worth making the hypothesis that the greater probability given to a scenario close to the current Kyoto system (that is to say, closest to scenario A), the greater involvement can be anticipated in the CDM. That is to say, a more proactive attitude could be anticipated facing post-Kyoto, given that there could be more possibilities that investments made in emissions reduction activities could have value in the future, by generating credits that could be used to meet the emission reduction objectives and with a system for emissions trading after 2012. Therefore, we have placed the companies in a double dimension, bearing both variables in mind (figure 4).

Figure 4. Link between the perception of the post-Kyoto system and degree of involvement in CDM.

[12] We consider that the use of this information maintains the anonymity promised to companies taking part, at the same time that it allows them to recognise themselves on the plan and compare themselves with other companies, which will no doubt be useful to them.



*Two companies have not been included in this graphic. One of them was not able to establish a ranking in at least two of the questions. The other, in spite of giving a ranking to their post-Kyoto involvement (third place) was not able to give a ranking to the various scenarios confirming that "they are considering several scenarios, with the inclusion of aspects from the other scenarios."

The results do not allow an unequivocal or generalised link to be made between both variables, although unlike the previous case, companies placed in box 1 predominate (more than half). This indicates to us that in spite of the fact that companies consider that the most likely will be that they adopt a post-Kyoto system similar (with more or less variations) to Kyoto, in which they may use the credits for reduction of emissions, that does not lead to decisive action to position themselves in the market. This confirms to us that in spite of that perception, the uncertainties and risks associated with the ignorance about the specific system to be adopted post-Kyoto are weighing heavily on investment decisions with regard to the specific elements of design that this system will have. The absence of companies in box 3 also warrants comment. This supports the validity of the results, confirming that there is not one single company that considers the post-Kyoto agreement will be very different from the Kyoto (without an emissions trading system) and that is making heavy investments.

Taking account of the above conclusions regarding the impossibility of identifying uniform patterns of perception and behaviour amongst companies, we consider it is necessary to analyse in further depth the specific circumstances of each company in order to identify the factors that are behind their positioning in the graphic. Nevertheless, this analysis can be done company by company in parallel with a classification exercise of the companies based on the three criteria considered (importance given to Kyoto/post-Kyoto, involvement post-Kyoto and perception of the most probable post-Kyoto scenario). The following four categories coincide with the boxes in the first graphic.

1) High importance given to post-Kyoto, and low level of involvement in CDM.

This is the most frequent case amongst the companies surveyed. Five companies are in this situation, specifically companies 2, 6, 7, 5 and 11. We give

attention below to the specific features of each company, through the information obtained in the interviews, since they may provide an explanation of their behaviour and positioning in the above graphics and in this classification.

Company 2. This company has high participation in renewable energies in its generation mix and considers that environmental regulation is the principle determining factor for future energy policies. Its perception is that the principle features of Kyoto (such as the existence of quantitative objectives for the countries, emissions trading system, *cap-and-trade* and an extension to other countries of the responsibility for reduction of emissions) will be considered in the future, and considers that the most probable is a C or D scenario. It also considers that the evolution of post-Kyoto will be a crucial landmark for the development of its business. However, one thing is that the company considers that what happens after 2012 with regard to a mitigation system is important for its business, and another is that there is a sufficiently clear and stable regulatory framework for it to make decisive and drastic investments in mitigation measures. In this sense, company 2 considers that to face any challenge and take decisions in a post-Kyoto future, a clear and predictable regulation framework is necessary. Therefore, there is no contradiction in its positioning.

Company 6. Although the existence of a mitigation system is important for this company in making its investment decisions, it shows doubts that Kyoto is going to be "successful", that is to say, it shows doubts regarding its continuity. Nevertheless, it does consider that the EU ETS will continue, its most likely scenario being D. The weight of uncertainty on the decision of investing in mitigation activities is serious for this company and refers both to the Kyoto period and that subsequent to Kyoto. With regard to the post-Kyoto process, the uncertainties are greater than with the Kyoto system, since there is no information about the reduction objectives and on the continuity of the mechanisms in general (international system for emissions trading, CDM…). That is to say, it is not known if they may be able to use the credits in order to comply with some hypothetical emissions ceilings. It is not known what the price of carbon will be, and the uncertainty about factors that will affect that price is worrying (emissions objectives, procedures for compliance with those objectives, supply and demand of emission allowances). All the foregoing gives rise to a negative impact on investment decisions. As the company confirms, a regulatory framework that it is not even predictable and the absence of a stable regulation environment creates conditions in which investments are delayed. The absence of stable indicators has a very negative effect on investment. Nevertheless, company 6 considers that, in spite of that, it is necessary to maintain a certain level of investment in CDM "for what may happen". That is to say, the uncertainty Works both ways: it is not a question of not getting involved in those projects, but rather of keeping some options open. This flexibility leads them to get involved in CDM in the form of "payment on delivery".

Company 7. This is a similar case to the previous once as it also considers that Kyoto and post-Kyoto will have an important effect on the company's investment decisions, but observes an elevated level of uncertainty in the process which leads them to adopt a cautious attitude. In fact, although the company considers that there will be a "Kyoto 2", (in the form of scenario B), it feels that the lack of knowledge about the future price of CO2 and its impact on the price of electricity (the company does not have CO2 emissions for the time being) makes them decide on maintaining low level exposure to the risk, investing in CDM only in

the form of "payment on delivery", without any great involvement in that mechanism. It is important to say that the absence of emissions in this company makes them perceive Kyoto in a different way from the others. It has an "opportunist" view of what Kyoto and post-Kyoto may produce for them in the form of higher income without affecting their costs, in so far as they are not obliged to reduce emissions for the time being.

Company 5. This company is somewhat different from the other three in this category given that it gives less importance to Kyoto (fourth place) and, nevertheless, its involvement in CDM is at a higher level, with activities in the categories "payment on delivery" carbon funds and project management. Other aspects (changes in nuclear policy, deregulation process and prices of petroleum, in this order) are more important for this company in terms of influence in its investment decisions. This positioning of company 5 may be due to it working with various future scenarios, in a wide range that goes from the existence of ambitious reduction objectives to the non-existence of a post-Kyoto system. Therefore, its strategy consists of diversifying its investments in CDM, as already mentioned, bearing in mind that different scenarios are possible.

Therefore, like the other companies in this category, it is also a victim of the negative effect of uncertainty about mitigation activities. In spite of its greater involvement, its response to this uncertainty is to delay heavy investments to subsequent periods and making short-term investments.

Company 11. The same as with the previous company, this places the Kyoto/post-Kyoto process at a medium level of importance, (fourth place) and, as a result of the uncertainties about post-Kyoto, its level of involvement in the CDM is low[13]. It perceives scenario C as the most likely. The company considers that "the situation after 2012 will be rather similar to that of 2008-2012. The countries in Annex I that have ratified the Kyoto Protocol will continue to have quantifiable emissions reduction objectives and the basic instrument to achieve the reductions proposed will be emissions trading. Just as now, there will be various regional systems for emissions trading that will be interconnected. (…). The United States and Australia will continue to focus the fight against climate change towards improved technology within the heart of the *Asia Pacific Partnership.* It is unlikely that developing countries are going to accept the undertakings for emissions reductions." They feel that the uncertainties relative to the lack of definition of the post-Kyoto system (level of emissions reduction, methods of allocation, limit on the use of CDM-JI credits, price of CO2, etc) have an important influence on business decisions. The greatest uncertainty in this company's opinion is the acknowledgement of CDM-JI project credits after 2012. This uncertainty becomes a reality to a large extent in the backing of the "payment on delivery" method, in carbon funds and a lesser commitment to financing and project management. In general terms, the post-Kyoto uncertainty may be holding up the definition of an investment strategy beyond 2012. As the company confirms, "nevertheless, if the situation is clarified and the level of risk drops, it is likely that it will change the order of priority of these actions."

[13] In the opinion of company 11, "post-Kyoto is one of several variables influencing the company's strategy and decisions. Other factors, such as the price of fuel, nuclear policy and renewables are just as important if not more so than Kyoto in decision making. It also has to be pointed out that these variables are in turn interconnected with that happens post-Kyoto".

2) High importance given to post-Kyoto and elevated level of CDM involvement.
Company 10. This company is not very far away from companies in category 1. The same as them, it gives high importance to post-Kyoto (after evolution of petroleum prices), but it appears to go one step further in the degree of involvement in CDM, with financing CDM projects as its priority activity, although it also operates the "payment on delivery" method. They consider a wide range of scenarios, but under the basic hypothesis that there will be restrictions on carbon emissions post-2012, with the possibility that the USA joins the process at a later date. Nevertheless, the same as the previous companies, it is very concerned about the post-Kyoto uncertainty when it comes to making investments, bearing in mind that the company is looking at time horizons of 40 years. The uncertainty about CDM potential stands out in terms of the volume of possible CO2 reductions, time scale and costs of reductions. Furthermore, they mention the uncertainty about the effect of higher prices in different areas of the business. Currently the company is reviewing its strategy "that will be seen to be significantly influenced by the post-2012 uncertainty." The company underlines the importance not only of a post-Kyoto system, but also of the national policies to be adopted in that period with regard to an international mitigation system.
Company 8. As a result of the absence of a quantitative answer from this company to several of the questions raised in the survey, difficulties exist in placing it in any of the established quadrants. Nevertheless, it certainly is possible to draw certain conclusions on its perception and activities from the interview performed. In this sense, we could place it between quadrants 1 and 2. We can deduce that it gives a high importance to Kyoto/post-Kyoto (as a result of the importance it attaches to the fact that "Europe continues to be an international leader in the fight against climate change") and hopes for that reason that the restrictions on carbon emissions will continue. However, as it admits an important uncertainty about what will happen after 2012 ("what happens after Kyoto is an open question") and considers various possible scenarios, it is trying to diversify risks being active in four types of CDM involvement.

3) Moderate importance given to post-Kyoto and high degree of involvement in CDM.
Company 4. The company considers that there are several more important factors than Kyoto in their investment decisions. In particular, the possible changes that may take place in renewable energies policy, in regulated prices and the price of petroleum, considering that the business of the company is oriented fundamentally towards renewables and gas. In addition, they emphasize that the preparation of a ranking is difficult, given that the competitive environment is formed by a combination of and interrelation between various factors. Although they foresee the existence of a post-Kyoto regime parallel to Kyoto (scenario B) or, in the worst case scenario, a link between the EU ETS and other national systems, they consider that the Kyoto process is fragile and subject to uncertainties that can end in unexpected results (like the existence of benchmarks or technology objectives like those of scenario F). But, in any case, they consider that there will be restrictions on carbon emissions even in the absence of a post-Kyoto mitigation regime, since the EU (or even its own country) will maintain restrictions on carbon that will make renewables necessary (the main activity of the company).

Once again, the uncertainty provokes a diversified strategy of participation in CDM (in the form of financing of projects and "payment on delivery") although, perhaps, something more daring than the companies in categories 1 and 4. The main reason behind this more daring strategy is the effect on its investment decisions resulting from the national mitigation policy that the company expects to see even in absence of an international mitigation policy. The opinion of the company is that the international climate change policy creates the framework for a public policy for national activities.

Company 3. This company, which gives moderate importance to Kyoto (behind the deregulation process, changes in the environmental policy of renewable energies and other regulations, but considerably ahead of all other factors), is placed halfway between quadrants 2 and 3 and it displays a significant involvement in CDM in the form of management and financing of projects. Although the company gives moderate importance to Kyoto, they are working on the assumption of continuity of the Kyoto regime after 2012 and they even state that "the continuity of Kyoto is necessary". The high degree of involvement in CDM is because the country in which the company's activities are located is far from fulfilling its objectives (that is to say, they are still more influenced by Kyoto than by post-Kyoto). The expected shortage of permits as a result of a very restricted national allocation, forces company 3 to search for allowances and credits from outside its borders. Thus they consider "payment on delivery" is excessively simple and that the company needs to involve itself more actively (a more proactive attitude), looking for countries in which to invest in CDM, controlling the product (which does not happen with "payment on delivery" and carbon funds).

Curiously, the company does not consider that there will be great economic risk in involving itself in the flexible mechanisms. Although different perspectives exist within the company, the internalisation of the value of CO2 is a reality and has caused a gradual change in the strategy of the company in this sense.

4) Low importance given to post-Kyoto and low degree of involvement in CDM.

Company 1. Post-Kyoto and Kyoto occupy a position of little importance in influencing the investment decisions of the company, higher only than the influence of the deregulation process. Nevertheless, they consider that "there is no going back" with respect to the existence of carbon emissions restrictions. In its opinion, the most probable scenario is A but, even if there isn't a global mitigation regime, the EU certainly will have its own limits and will use a system of emissions trading to achieve them, since it is the cheapest way of doing so.

Although for company 1 the process is irreversible, the continuity of the EU ETS is inevitable and it is going to be necessary to buy CERs (with or without Kyoto), the involvement in the Kyoto mechanisms is low profile. They allege that the validity of the CERs in the post-Kyoto period is very uncertain. They emphasize the difficulty of making long term investment decisions without knowing the future context of carbon emissions restrictions.

Company 9. This company puts the Kyoto and post-Kyoto processes at the bottom of the factors that influence the company's investment decision, stating that "emissions reductions will happen in any case". It considers that there will be continuity of carbon emissions restrictions, whether it be under a similar system to Kyoto (scenario C) or by means of linkages of the EU ETS with other national

systems. Nevertheless, the involvement in CDM projects is very low, only in the "payment on delivery" mode. They are not participating in nor have plans to do so in other categories. The fundamental reason in this case is not so much the possible uncertainty as to the existence and elements of a post-Kyoto regime (as is the case with most of the other companies) as the low importance given to this question in the company's competitiveness. In addition, they say that the CO2 market is highly regulated and "the political influence makes it difficult to manage."

4. STUDY CONCLUSIONS.

The non-existence of a post-Kyoto regime, and therefore the practical absence of sufficiently clear price indicators for emissions reductions achieved beyond 2012, is having a negative effect on current business investment decisions in mitigation activities, increasing risk premiums and financing costs.

As a result, the uncertainty about the post-Kyoto regime is causing a delay in carrying out these mitigation activities which, in turn, will inhibit more demanding emissions reduction commitments being accepted in the future. Alternatively, in the event that they are adopted, they will then require a greater reduction, that could ultimately imply higher costs for emissions reduction in comparison with those that would arise from a more gradual reduction of the same.[14]

Specifically, from the results of the surveys made in the context of this project, one can deduce that, on the one hand, meeting the Kyoto objectives (as well as those of a possible post-Kyoto regime) has in general a significant influence on the companies' investment decisions and that, on the other hand, the uncertainty about the Post-Kyoto regime may already be affecting investments in mitigation activities in the electricity sector.

The importance of knowing now, and in greater detail, what such a future regime will be, is a determining factor, not only for environmental reasons, but also from the business point of view. It is a priority for the post-Kyoto regime to be established as soon as possible, in order to ensure that there is continuity in the emissions reduction efforts.

In particular, investors need to be informed about what the most likely post-Kyoto scenario is that will give rise to a post 2012 recognition of the market value of Kyoto units coming from emissions reduction projects carried out in other countries. In this sense, the discussion in this study about which from amongst the possible post-Kyoto regimes is compatible with the banking of Kyoto units from the first to the second period provides relevant information to potential investors in these projects. The main conclusion reached in this sense is that it is most likely there will be value for these units in the medium term, even in the absence of a mitigation regime as a result of a global agreement. This is due to the existence of the European Emissions Trading System (EU ETS) and to its possible continuity in the medium term. The European electricity companies that were surveyed foresee post-Kyoto compliance regimes with emissions

[14] The existence of a stable mitigation regime has a favourable effect on carrying out mitigation activities. In its turn, the greater the investments in such activities, the more likely it will be that that regime will have continuity, as a result of the "pressure" effect prompted by the existence of investments already made in mitigation activities which, at least in the case of the electricity sector, have long-term returns.

trading systems that would guarantee the continuity of the value of the reductions made beforehand.

As it would be appropriate to expect, meeting Kyoto and post-Kyoto objectives has in general a significant influence on the investment decisions of the companies in the European electricity sector. Practically all of the surveyed companies expect a continuation of carbon emissions restrictions after 2012, although they differ in their perceptions of the form that a post-Kyoto regime could take. The vast majority consider the two following scenarios as the most likely: (1) that known as "Parallel Kyoto", a similar regime to Kyoto for the Annex I countries that have currently ratified the Protocol under the framework of the United Nations Framework Convention on Climate Change (UNFCCC), and a parallel agreement of those that reject the same (USA and Australia). In the light of certain recently adopted initiatives in this sense, this agreement would be made between the two latter countries and some developing countries in south East Asia. This parallel agreement to that of the other countries would be fundamentally based on the negotiation of a technical agreement for technology transfer to those developing countries; (2) a "regional agreements" scenario in which the application of common objectives for reduction differentiated between a small group of countries would be negotiated, although not necessarily in the UNFCCC framework. Unlike the current Protocol, it would be a bottom-up process, in which there would be no global agreement. A certain number of "environmentally aware" countries (EU, other European, Canada, Japan, New Zealand and some developing countries) would decide to adopt some absolute reduction objectives, solely for them, and to use emissions trading to meet those objectives. It would leave the possibility open that other countries join the agreement at a later date. The less developed countries and the majority of developing countries would not have objectives.

In any event, many of the companies surveyed consider it a possibility that there will not be an international regime for post-Kyoto compliance, but, even in that case, they are aware that they would have to control their emissions due to the fact of being subject to the European Emissions Trading System (EU ETS). In this sense, the possible absence of the USA in a post-Kyoto mitigation regime does not seem to have very much influence over the European electricity companies' perception regarding the continuity of carbon emissions restrictions.

Nevertheless, the uncertainty about objectives and other elements of a mitigation regime affect the value itself of those reductions. Some demanding mitigation objectives would lead to a higher value of those Kyoto units that would make it more profitable to carry out mitigation activities whose financial feasibility is at the very threshold of profitability.

Therefore, significant progress has to be made in the definition of a post-Kyoto regime, at least in two respects. It is now urgent to define and agree at an international level not only the emissions reduction objectives, but also the mitigation instruments that will be accepted for their compliance, and in particular, it is necessary to guarantee the continuity of the international emissions trading system foreseen in the Protocol itself, as it is an instrument that facilitates the meeting of the mitigation objectives at a lower cost than other direct regulatory instruments.

In this sense, in environmental terms, but also in business terms, it is appropriate for the European Union, and Spain as part of it, to continue leading the negotiation process in order to arrive as quickly as possible at an international

post-Kyoto mitigation agreement within the framework of the United Nations Framework Convention on Climate Change (UNFCCC) that should contain those two fundamental elements: objectives and instruments.

In the event that a global planetary agreement is reached, or even an international agreement made up by a majority of developed countries (within Annex I), it would be necessary to at least ensure the continuity of the European (and national) mitigation policies, thereby guaranteeing the stability of the mitigation regime. Specifically, objectives should be established at the EU level at least up to 2020 and maintain the EU ETS in order to meet them. This instrument is actually more relevant when it comes to providing investors with an indication of the price of CO2.

Therefore, EU authorities must give an even more decisive signal about the long term continuity of this system, irrespective of the agreements reached at the international level within the heart of the UNFCCC. The Conference of the Parties (first Conference of the Parties serving as the Meeting of Parties COP/MOP 1) of the UNFCCC held in Montreal in December 2005, only reached a generic commitment undertaken by the industrialised countries to "set new emissions limitation commitments beyond 2012" and an express reference to the need to guarantee continuity beyond 2012. The Conference of the Parties held recently in Nairobi again only reached agreement that in 2008 a new review of the Kyoto Protocol will be held, that could lead (or not) to the construction of a post-Kyoto regime the following year. These generic and non-binding commitments are not favourable to ensuring an attractive context for investment in new technologies and in mitigation projects. It is necessary for them to establish objectives sufficiently far in advance that provide a long term indication regarding the price of carbon.

In this context of relative uncertainty, the predominating attitude amongst the European electricity companies seems to have been to diversify their activities of emissions control (including the purchase of European emission permits and involvement in Clean Development Mechanisms CDM) based on the costs of the different options, together with greater emphasis on profitable lines of business, irrespective of emissions mitigation, but to which mitigation provides an added motive for its realization (investment in combined cycle gas and in renewables). In this sense, the policies for promoting renewable energies seem to have continuity (at least in our country) and to ensure profitability levels that for the time being are not being provided by climate change policies.

Keeping the greatest number of options open seems to be a logical strategy in the context of uncertainty, that is to say, adapting to change. This intermediate strategy allows companies to respond to the different future mitigation scenarios, as of now still to be defined, without incurring elevated costs that could arise from opting for an "extreme" strategy, if the final mitigation scenario applied is in the end closer to the opposite extreme[15]. This pattern is

[15] This may happen in two different situations: Either the company carries out the mitigation activities now in a very decisive manner by investing heavily in measures, or decides not to do anything. In the first case, the "extreme" risk is in the final scenario being one typified by the absence of a mitigation regime, or by the existence of a mitigation regime with very lax objectives for emissions reduction. In the second case, the extreme risk consists of not having taken measures when the final scenario is one in which strong emissions reductions are required. The adoption of the intermediate strategy reduces the risk of falling into one of these two situations.

clearly reflected in the results of this study in the case of investment in CDM projects.

The importance that the Kyoto and post-Kyoto mitigation regimes seem to have in the investment decisions of companies in the sector, together with their conviction that there will be carbon emissions restrictions post 2012, would lead one to think that investment in emissions reduction activities should be a priority for companies, especially through greater involvement in CMD projects, either by direct management or financing of projects. However, the uncertainty about the existence of a post-Kyoto regime and the key elements of its design (objectives, possibility of emissions trading, distribution of emission permits) is clearly having a demotivating effect on carrying out mitigation activities that go beyond 2012. This, together with the costs themselves of the transaction[16] and associated risks of carrying out CMD projects, leads the majority of companies to not get overly involved in CMD projects, and to only do it in the form of "payment on delivery" or through participation in carbon funds. This less committed involvement allows companies to reduce their risk of non-compliance in the event that there will finally be a post-Kyoto regime and, in any event, allows them to comply in the cheapest way possible with the EU ETS. The post-Kyoto uncertainty is leading companies to diversify their involvement in the CDM, leaving doors open for any eventuality.

As it could not be done in any other way, the results of the study show that the special features of each company and of the country where it operates play an important role in its perception of the uncertainties and its position regarding a possible post-Kyoto regime, and therefore, to a greater or lesser extent, its inclination to carry out mitigation activities.

All in all, the absence of defined objects for a future post-Kyoto regime is affecting the financing of reduction projects, increasing risk premiums financing costs. If the intention is to achieve the objectives set in the current regime, then it is urgent and vital to send out clearer signals to investors about their continuity.

[16] Although efforts have recently been made by United Nations organisations to reduce the transaction costs of the CDM projects, more must be done in this sense, with measures leading to reduce the risk of these projects. There is no doubt that an international agreement on a post-Kyoto mitigation regime would contribute significantly to reducing part of the risks associated with the realization of these projects.

Appendix 1. Letter of invitation with access to the electronic survey form

If you are unable to read this mail, click here

Dear Sir / Madam:

We invite you to participate in our project that examines alternative post-Kyoto scenarios in view of the implications on the European electricity producers. The objective is to improve the understanding on upcoming changes in the competitive environment during the forthcoming Kyoto (2008-2012) and post-Kyoto (2012-) periods.

Therefore, we kindly ask you to have a quick look at the short questionnaire and respond to it at www.ie.edu/encuestas/encuestaKioto. In your response, please, suggest us a time in next two weeks for a short interview (max. 20 minutes) or simply wait our call. Alternatively you may choose to fill in the questionnaire attached to this email and respond to us by fax: +34 917454762 or by email: CEM@ie.edu. In case you consider another person in your company more suitable for the interview, we kindly ask you to forward this to the chosen person and provide us her/his contact details.

Your response will be considered confidential. The final report will be delivered to all the interviewed participants. It will summarise the results with no company specific details from interviews. The interviews with European electricity producers and regulators will provide bases to examine alternative post-Kyoto scenarios for European electricity producers.

The project is conducted by Instituto de Empresa (IE), during the Spring 2006. IE is a leading European business school, oriented to training entrepreneurs and company directors through its master's degrees and executive education programmes. IE is characterised by its markedly global approach, its spirit of entrepreneurship and innovation, its applied research projects and the promotion of socially responsible initiatives. Instituto de Empresa has an alumni network that currently comprises some 30,000 IE graduates that hold management positions in 85 countries. IE generates knowledge under rigorous academic conditions. It promotes applied research projects in its centres of excellence and participates actively in international forums and institutions that analyse trends in business management.

Your sincerely,

INSTITUTO DE EMPRESA Business School
www.ie.edu

Appendix 2. Electronic questionnaire

QUESTIONNAIRE FOR A TELEPHONE INTERVIEW - INSTITUTO DE EMPRESA BUSINESS SCHOOL

Name:	
Position:	
Company:	
Phone Number:	
Mail:	

Dear Sir / Madam,

We are looking forward to receiving your response to this questionnaire. Your response will be considered confidential. Furthermore, we would like to discuss shortly by phone your answers in next two weeks. Therefore, before moving to the question I, we kindly ask you to suggest us a time to call you for a short interview (max. 20 minutes):

1) Please, estimate future changes in your generation mix in two time periods: 1) between the present and the year 2015 and 2) between the year 2015 and the year 2025. Use the scale from -3 to +3, in which +3 indicates very strong growth of the type of generation, +1 moderate growth, 0 no impact, -1 moderate reduction -3 very strong reduction.

Type of generation:	The present – 2015	2015 – 2025	Possible comments:
Nuclear	-	-	
Hydroelectric	-	-	
Gas	-	-	
Coal and fuel-oil	-	-	
Renewables (excluding hydro)	-	-	

- indicates "no response"

(App. 2. cont.)

2) Please, rank the following competitiveness factors with regard to their influence on the investment decisions of your company.

RANKING:			
-	Changes in nuclear energy policy	-	Liberalisation
-	Oil prices	-	Kyoto and post-Kyoto process
-	Regulated prices	-	Changes in renewables policy
-	Other environmental regulations	-	Other? Please, define:

- indicates "no response"

3) In this project, we have identified six macro-level scenarios that may emerge after the year 2012 as a result of international post-Kyoto negotiations.

Scenario:	Description:
A) Kyoto continued	Continuation of the Kyoto regime. Country specific reduction objectives and international emissions trading. No participation of the US. No objectives for less developed countries.
B) Kyoto modified	Like the scenario (1) but with the upper price limit for the emissions permits and voluntary objectives for less developed countries.
C) Kyoto parallel	The regime similar to Kyoto for the Annex I countries that have presently ratified the Protocol and the parallel agreement with the US, Australia and some developing countries of the Southeast Asia with the objectives of gradual emission reductions and the use of international emissions trading or technology agreements.
D) National linkages	No global agreement, but possible linkages and coordination between national emissions trading systems (EU, other European countries, Canada, Japan, New Zealand). The process is gradual, the countries add up to the system. The creation of the international fund to foster the adoption of mitigation technology in developing countries.
E) National policies and measures (P&M)	Radical change with respect to the Kyoto system. No existence of quantitative objectives. The bottom-up process in which each country commits to adopt certain measures to control its emissions based on its national circumstances.
F) International policies and measures (P&M).	The countries agree to implement the packages of measures (for example, a carbon tax or international agreements on the energy efficiency on the process level). No quantitative objectives. Harmonized P & M. In contrast to the scenario (6) attention to commitments into multilateral agreements. The fulfillment is not evaluated in terms of the foreseen achievement of objectives.

Please, identify and comment the scenario(/s) that is the closest one to the vision that your company applies when making the investment decisions. If none of the scenarios appear suitable, please describe your approach shortly.

(App. 2. cont.)

4) Is your company involved in CDM and / or JI projects? In view of the importance on your business strategy, please, rank the type of initiatives that you are involved with:

Ranking	Type of Involvement	Description
-	Pay on delivery	A simply agreement for the the buyer to receive CERs (Certified emission reductions generated through the CDM). The buyer is an offtaker of CERs, with payment to be made upon delivery, rather than providing project finance or becoming an equity participant in the project.
-	Involvement in carbon funds	Participation in a carbon fund as a financing entity.
-	Project finance	Participation in the project as an investor with an agreement to receive CERs without the involvement in the management of projects.
-	Project management	Participation in the project management as an investor. The investor runs the project and provides not only financing but also human and technological resources.

- indicates "no response"

5) Please, describe how do uncertainties in the post-Kyoto process influence on your ranking of activities?

6) Please, specify what types of further managerial challenges (information shortages, etc.) post-Kyoto process lays on your company.

SEND PRINT

REFERENCES

Bodansky, Chou (2004). International Climate Efforts Beyond 2012: A Survey of Approaches. Pew Centre on Global Climate Change (USA).

Böhringer y Finus (2005). "The Kyoto Protocol: Success or Failure". In Helm (ed.). Climate Change Policy. Oxford University Press. Oxford, pp 253-281.

CAN (2003). "A Viable Global Framework for Preventing Dangerous Climate Change", Climate Action Network Discussion Paper. COP 9, Milan, Italy.

Den Elzen, M.G.J., Lucas, P. and van Vuuren, D.P. (2005). "Abatement costs of post-Kyoto climate regimes". Energy Policy, 33(16): pp. 2138-2151.

Ellerman, D., Joskow, P. and Harrison, D. (2003). Emissions trading in the US. Experience, Lessons, and Considerations for Greenhouse Gases. Pew Centre on Global Climate Change (USA).

G8 (2005). Gleneagles Plan of Action: Climate Change, Clean Energy and Sustainable Development. G8 Gleneagles, July 2005.

Höhne, N., D. Phylipsen, S. Ullrich and K. Blok (2005). "Options for the second commitment period of the Kyoto Protocol", Climate Change 02/05, ISSN 1611-8855, prepared by Ecofys for the German Federal Environmental Agency, Berlin, Germany, available at http://www.umweltbundesamt.org/fpdf-l/2847.pdf

IEA (2005). Act Locally, Trade Globally – Emissions Trading for Climate Policy. International Energy Agency, OECD, Paris.

IETA (2005). Greenhouse Gas Market 2005: The rubber hits the road. Geneve, Switzerland.

Kameyama, Y. (2003). "Maximizing Incentives Through Dual Track Approach—A Proposal for a Comprehensive Framework for Climate Regime Beyond 2012," in Climate Regime Beyond 2012: Incentives for Global Participation. National Institute for Environmental Studies and Institute for Global Environmental Strategies Joint Research Report, December 2003.

Michaelowa, A., Butzengeiger, S., Jung, M. and Dutchke, M. (2003). "Beyond 2012. Evolution of the Kioto Protocol Regime. An Environmental and Development Economics Analysis." Expertise for the WBGU Special Report, Climate Protection Strategies for the 21st Century: Kioto and Beyond. WBGU website, http://www.wbgu.de/wbgu_sn2003_ex02.pdf

Philibert, C. (2005). Approaches for Future International Co-Operation. IEA, Paris.

Sterk, W. and B. Wittneben (2005). Addressing opportunities and challenges of a sectoral approach to the Clean Development Mechanism. Wuppertal Institute, Wuppertal, Germany, http://www.wupperinst.org/Sites/Projects/rg2/1078.h

Storey, M. (2002). Kyoto and Beyond, Issues and options in the global response to climate change, for the Swedish Environmental Protection Agency, Stockholm, Sweden. www.internat.environ.se/documents/issues/climate/report/Kyoto.pdf

Sugiyama et al. (2005). CDM in the Post Kyoto Regime: Incentive mechanisms for developing countries to promote energy conservation and renewable energies. METI.

Torvanger, A., Twena, M. and Vevatne, J. (2004). Climate policy beyond 2012. A survey of long-term targets and future Frameworks. CICERO Report 2004:02. Oslo, Norway.

Watson, C., Newman, J., Upton, R. and Hackmann, P. (2005). Can transnational sectoral agreements help reduce Greenhouse Gas Emissions?. OECD background paper for the Round Table on Sustainable Development. Paris.

WBGU (2003). Evolution of the Kyoto Protocol Regime. An Environmental and Development Economics Analysis. Expertise for the WBGU Special Report, Climate Protection Strategies for the 21st Century: Kyoto and Beyond. http://www.wbgu.de/wbgu_sn2003_ex02.pdf

Woerdman, E. (2001). "Emissions trading and transaction costs: analyzing the flaws in the discussion". Ecological Economics 38, 293-304.

World Economic Forum (June 2005). Statement of G8 Climate Change Roundtable.

Yong-Gun, K and Baumert, K. (2002). "Reducing Uncertainty Through Dual-Intensity Targets," in Building on the Kyoto Protocol: Options for Protecting the Climate, Kevin A. Baumert with Odile Blanchard, Silvia Llosa, and James F. Perkaus (Eds.). World Resources Institute, Washington, D.C., October 2002.

Zhang, Z. (2000). "The design and implementation of an international trading scheme for greenhouse gas emissions". Environment and Planning C: Government and Policy, vol 18, 321-337.

NOTAS

Depósito Legal: M-20073 I.S.S.N.: 1579-4873