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Renewable Energy Policies:
Credible Targets for
Incredible Results?**

By **Simone Borghesi**, University of
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JEL Classification: L11, Q28, Q38, Q42, Q43, Q48

The author would like to thank seminar participants at the 2009 International Energy Workshop, at the European University Institute and at the University Roma Tre for stimulating comments and suggestions on preliminary versions of this work. The usual disclaimer applies.

Address for correspondence:

Simone Borghesi
Faculty of Political Science
University of Siena
Via Mattioli 10
I-53100 Siena
Italy
E-mail: borghesi@unisi.it

The European Emission Trading Scheme and renewable energy policies: credible targets for incredible results?

Simone Borghesi¹
(University of Siena)

Abstract

This paper discusses the merits and limits of the recent European energy policy aimed at reducing carbon emissions, devoting particular attention to the European Trading System of carbon permits and to the measures that the European Union has adopted to promote renewable energy sources. From the comparison of past goals and present results, it is argued that more credible targets for carbon emission reductions and renewable shares would probably help the transition towards an alternative energy system and the necessary reduction of greenhouse gases.

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¹ The author would like to thank seminar participants at the 2009 International Energy Workshop, at the European University Institute and at the University Roma Tre for stimulating comments and suggestions on preliminary versions of this work. The usual disclaimer applies. Address for correspondence: Simone Borghesi, Faculty of Political Science, University of Siena, via Mattioli 10, I-53100 Siena, Italy. E-mail: borghesi@unisi.it

1. Introduction

The current system of energy production and consumption is largely based on the use of Fossil Fuels (FF) that account for 80.3 per cent of the world total energy supply. As it is well known, however, these energy sources have two main drawbacks as they are both exhaustible and polluting. Both aspects are the object of a heated debate in the literature, but while experts disagree on the scarcity of fossil fuels and estimates of their amount deeply differ across different studies, scholars largely agree on the fact that FF contribute to climate change through an increase in greenhouse gas (GHG) emissions. In the 15 original member States of the European Union (EU-15) energy production accounts for 59 per cent of GHGs and this share rises up to 80 per cent of total GHG emissions if all the 27 EU member States are taken into account (European Environment Agency, 2009). These considerations call for a shift towards a different energy system that is less dependent on FF in the future, especially in the EU that import most of these resources from outside and is thus particularly vulnerable to the extreme price volatility of the oil and gas markets. However, opinions deeply diverge on the urgency and on the optimal timing of the transition process.

The object of this paper is to examine the climate and energy policies that the EU has implemented in the last few years, in order to evaluate the role that the EU has played so far and may/should play in the future in leading this transition process.

For this purpose, the structure of the paper will be as follows. Section 2 examines the main measures adopted by the EU to reduce carbon emissions. Section 3 focuses attention on a few possible shortcomings of the European Emission Trading Scheme introduced after 2003. Section 4 analyzes the EU renewable energy policies and discusses the speed that the transition to an alternative energy system has had in Europe so far. Section 5 provides some concluding remarks on the importance of setting credible targets in the future for the success of the EU energy policies that emerges from the comparison between past goals and present results.

2. The EU climate policies

In the last decade, the EU has played a leading role in promoting and implementing an international agreement to reduce climate change. As is well known, following the ratification of the Kyoto Protocol on 31 May 2002, the EU-15 committed to an overall CO₂ emissions reduction target of 8 per cent by 2008-'12 with respect to the 1990 levels, allowing different national emissions target within the EU to account for the different economic and environmental conditions of its member countries in the benchmark year 1990.² Although many experts evaluated the Kyoto Protocol commitments as just a first step in the right direction and certainly insufficient to stop global warming, most member states and the EU overall, however, found it difficult to achieve even the target set by the Kyoto Protocol. This clearly emerges from figure 1 that reports the distance from the Kyoto goal of the EU-15 and its members in 2008.³ The negative values in the figure indicate the over-achievement by 2008 of those “virtuous” countries (about one third of the EU-15 members) that managed to go beyond their target, reducing CO₂ emissions more than initially required by the Kyoto Protocol, while the positive values show what we can call “the Kyoto gap”, namely, the current distance from the Kyoto target characterizing the other countries and the overall EU-15. While Italy, for instance, had committed to cut CO₂ emissions by 6.5% with respect to the 1990 according to the Kyoto Protocol, such emissions did not decrease and actually further increased in the meantime by 4.7% thus enlarging the gap from the Kyoto goal up to 11.2% in 2008.

² The ten countries that joined the EU in 2004 as well as Romania and Bulgaria (that entered the EU in 2007) will have to take part in the overall EU emission reduction of 20 per cent by 2020 that is planned for the post-Kyoto phase in the period 2013-2020 (see discussion below). If we exclude Malta and Cipro, however, all the new member countries were already among the Annex I Parties of the Kyoto Protocol, therefore they had previously committed to different emissions limits under the Protocol.

³ The values shown in the diagram indicate the percentage deviation of actual emissions in 2008 from a (hypothetical) linear path between the base-year (1990) emissions level and the target for 2010, thus measuring the current progress towards the Kyoto target.

According to the latest available data released by the European Environment Agency (2009), however, EU emissions have steadily declined in the last few years due to warmer weather conditions and more expensive fuels. This has led some experts to claim that the EU has already achieved the 8 per cent emissions reduction required by the Kyoto Protocol. As a matter of fact, the overall EU-27 GHG emissions were estimated to be 7.7 per cent below the 1990 levels in 2006 and 11.3 per cent below that benchmark year in 2008 (European Environment Agency, 2010a), so that the Kyoto target would have been actually overcome.⁴

These encouraging results, however, should be interpreted with much caution for at least two reasons. In the first place, the estimated emissions reductions are likely to reflect the recent worldwide economic recession that has significantly reduced industrial production and the related emissions level. In the second place, the overall EU emissions reductions have been mainly driven by the EU enlargement to the Eastern European countries that have experienced a dramatic decline of their production with respect to the 1990 levels. From a closer look at the data, in fact, it emerges that in the new member States GHG emissions have decreased by 26.7 per cent between 1990 and 2008, whereas in the EU-15 emissions have fallen by only 6.5 per cent in the same period (European Environment Agency, 2010a). The 8 per cent target, however, was valid for the 15 member States that preceded the EU enlargement. In our opinion, therefore, it is at this group of countries (rather than at the enlarged EU) that one should look at to evaluate the European performance with respect to the Kyoto target.⁵

⁴ At the moment of going to press, new estimations for 2009 are released by the European Environment Agency (2010b). According to this report, the EU-27 GHG emissions in 2009 were 6.9% below the 2008 level, thus leading to an overall GHG emissions reduction of 17.3% with respect to the 1990 level.

⁵ On the basis of the preliminary data just released for 2009 (European Environment Agency, 2010b) in the EU-15 emissions have dramatically fell in 2009 due to the recent economic crisis, so that the average emissions for 2008 and 2009 were 2.2% below the EU-15 emission targets. Notice, however, that estimates of the 2009 GHG emissions are currently available for only 7 of the EU-15 members. Moreover, as explicitly pointed out by the European Environment Agency (2010b, p.6), the possible over-achievement of the emissions reductions at the EU-15 level “relies on the assumption — which cannot be taken for granted — that certain Member States will exceed their target and cover any shortfall in other Member States”.

The current debate on the best policy instruments to reach the Kyoto target requires a deeper analysis of the EU directives and energy policies that have been implemented so far to achieve the required emissions cut, since the European experience may provide valuable lessons also for other countries in the post-Kyoto phase and as a proto-type for a global GHG emissions trading regime (Ellerman, 2008). In this regard, since the beginning of the century the EU has adopted two Climate Change Programmes (2000 and 2005) and three important directives that deserve particular attention: the Directive 2003/87/EC (“*Emission Trading*”), the Directive 2004/101/EC (“*Linking*”) and, more recently, the Directive 2009/29/EC that improves and completes the other two. The Emission Trading Directive 2003/87/EC introduced also in Europe carbon emission permits, a market instrument that had been already used with some success in the US. As is well known, the aim of this instrument is to create a market and an artificial price for the pollution of public environmental goods (such as the atmosphere) that can otherwise be used for free. The creation of a market price generates an incentive to adopt a more environmental friendly technology to avoid the cost of purchasing the permits. The EU Directive allowed each member State to establish a national emission scheme to determine the initial allocation criteria of emission permits and the share allocated to selected sectors in two trading phases (2005-’07 and 2008-’12).⁶ Once the emission permits are allocated by single countries, their trading is allowed within the EU, so that a firm in a given European country that needs for its activities more permits than those at its disposal can purchase them from a firm in another country that has permits in excess of its needs and intends to sell them. The EU Directive (art.16), moreover, established penalties equal to 40€ (in the first trading phase: 2005-2007) and 100€ (in the second phase: 2008-2012) per tonne of CO₂ emitted in excess of the allowances at disposal.

The Emission Trading Directive has been subsequently modified by the so-called “*Linking*” Directive (2004/101/EC) that allowed for the use in the European Emission Trading Scheme (EU-

⁶ The sectors indicated by the Directive were: energy activities (for example oil refineries); production and processing of ferrous metals; mineral industry; pulp and paper industry.

ETS) of emission credits deriving from Clean Development Mechanism (CDM) and Joint Implementation (JI) projects. In other words, the emission credits obtained by reducing emissions outside the EU can be transformed into emissions permits to be used within the EU-ETS, thus “linking” the latter system to the CDM and JI projects (which explains the name of the Directive).

Finally, in April 2009 the new Directive 2009/29/EC entered into force that substantially reforms the EU-ETS to overcome the application problems that emerged in the first few years of its functioning. In the next section we will examine some of these problems and the revisions of the EU-ETS that have been recently implemented to get over them.

3. The European Emission Trading Scheme: open issues

The introduction in the EU of an ETS and its subsequent connection to worldwide implementation projects represents an important change in the European energy policy towards the more intensive use of market-based policy instruments. This change goes in the direction of the US energy policy that has traditionally been more market-oriented than the European one, thus incidentally reducing the conflict between the opposite viewpoints of the EU and the US on how to implement the Kyoto Protocol or a possible follow-up, although many other problems remain to be solved before achieving a new international agreement in this field, as it clearly emerged from the last Conference of the Parties (COP-15) in Copenhagen. However, it is possible to identify several open issues that may adversely affect the functioning of the EU-ETS.⁷ The first problem concerns the allocation criteria that have been used so far. As a matter of fact, emission permits have been given mainly for free on the basis of the firms’ historical emission levels using a grandfathering allocation system. This criterion, however, tends to preserve the *status quo*, reducing the firms’ incentive to adopt more environmental friendly technologies. Moreover, it may create potential

⁷ The performance of the EU-ETS is the object of increasing attention among scholars. See, among the others, the recent contributions on this issue by Ellerman and Buchner (2007), Convery and Redmond (2007), Krueger *et al.* (2007), Bredin and Muckley (2010) and Kettner *et al.* (2010).

disparities in the permits market between large firms (that receive many initial permits to maintain their activity level) and small-medium enterprises. For these reasons, it may be preferable to adopt an auction system as initial allocation criterion.⁸ Whether carbon permits are given away for free or sold by the government through an auction system, this will not affect the market-clearing price that emerges in a competitive market.⁹ The two allocation methods, however, can have very different distributional effects according to how the auction revenues are used and whom the permits are grandfathered. In a grandfathering system scarcity rents go to the recipient of permits, while in an auction system the government collects these rents as revenues that can be used to reduce the deficit and/or cut distortionary taxes. Therefore, while the method of allocation of carbon permits does not affect their price (since it influences neither their demand nor their supply), it will determine who is going to pocket the extra revenues, whether potential emitters or taxpayers¹⁰. Moreover, the government entries generated by the auction system could be used to promote R&D in environmental innovation and the diffusion of better technologies, with a potential double-dividend effect in terms of higher economic growth and lower environmental damages.¹¹ Finally, as some authors have argued (cf. Cramton and Kerr, 2002), another attractive feature of an auction system is that it may entail lower administrative costs and lower delays in the implementation with respect to

⁸ Several contributions seem to support this argument. Some authors (Parry et al., 1998), for instance, estimate that the reduction cost of air emissions in the case of grandfathering is three times higher than with an auction system. Grubb and Neuhoff (2006), moreover, point out that the maximum use of allowed auctioning would improve efficiency without precluding most participating sectors from profiting from the EU-ETS. Mandell (2005) argues that the auctioning of allowances is to be preferred to their allocation for free and compares the effects of alternative frequencies of carbon permit auctions. See also Demailly and Quirion (2008) for a partial equilibrium analysis of the impact on competitiveness and economic efficiency of alternative allocation rules in the EU-ETS.

⁹ As a matter of fact, for the potential emitter what matters is the opportunity cost of using the permit, whether received for free or through an auction, that is given by the loss of the opportunity to sell that allowance in the future.

¹⁰ See Ellerman and Joskov (2008) for a further discussion of the controversial issue of “windfall profits” for incumbents, namely, additional profits earned by potential emitters to which allowances were allocated for free. See also Pearson (2010) for a detailed analysis of the profits that the main companies may have derived from the free allocation of the allowances in the EU-ETS.

¹¹ See Bovenberg and Goulder (2001) for an analysis of the literature on the “double dividend” hypothesis, the possible uses of auction revenues and the relative performance of various policy instruments in a second best context.

grandfathering. The latter system, in fact, often implies long negotiations between the government and the interest groups that invest much time and resources in lobbying activities in order to obtain the highest possible number of initial permits.

Despite the potential benefits of an auction system with respect to a grandfathering system, the final design of the EU-ETS has been heavily influenced by the existence of powerful interest groups in the sectors regulated by the ETS that have hindered so far the adoption of auctioning as initial allocation rule (see Cramton and Kerr, 2002, and Markussen and Svendsen, 2005). The European Commission had originally proposed a huge increase in auctioning as early as 2013, with full auctioning becoming the rule from 2013 onwards for the power sector and between 2013 and 2020 for the other sectors. But the fierce opposition of the dominant interest groups of the regulated sectors has induced the Commission to postpone the deadline for the complete phase out of the free allocation system in the final text of the Directive, that requires the level of auctioning to achieve 70% of all allocations in 2020 and 100% in 2027.¹²

A second problem that emerged in the initial phases of application of the EU-ETS concerns possible inconsistencies between this system and the National Allocation Plans (NAPs) of the emission permits. During the first trading phase (2005-'07), most NAPs allocated a number of emission permits that was inconsistent with the Kyoto target, going well above the upper bound originally established for each member state by the Kyoto Protocol (Gilbert et al., 2004; Sijm, 2005). The over-allocation of allowances by the NAPs was largely responsible for the sharp fall in the spot price of the emissions permits observed during the first period. A similar over-allocation occurred also in the second phase, when the European Commission had to intervene on 11 of the 12 original NAPs proposals (with the only exception of the UK), reducing the total number of emission permits that were originally allowed by each state.

¹² Some energy-intensive sectors, however, could continue to receive their emission permits for free if they are considered to be at risk of “carbon leakage”, namely, if their firms might decide to relocate their activities in countries with less restrictive environmental policies.

The creation of too many allowances by member states was mainly due to political pressure on the governments from interest groups who wanted to receive more permits. However, defining a binding cap turned out to be difficult for most member states also because there was strong uncertainty on the actual emissions level that had to provide the baseline data to set the cap and because “installation data had to be assembled in great haste to meet the tight implementation deadlines” (Ellerman and Joskov, 2008, p.32). The over-allocation of allowances to emitters and its price consequences have largely contributed to the recent decision to abolish the NAPs in the next trading phase (2013-2020), replacing the decentralized structure of the EU-ETS with a centralized cap-setting process.¹³

Empirical evidence suggests a third problematic aspect that arises with the application of the EU-ETS, namely, the extreme market price volatility. As a matter of fact, the price of CO₂ emission permits tripled in the period January-July 2005, then more than halved in just one week during April 2006 (when new data were released reporting emissions levels substantially lower than expected) and subsequently declined to zero over the next year (see figure 2). Several reasons may have contributed to the price volatility observed in that period (Ellerman and Joskov, 2008). In the first place, the verified emissions data were released relatively late, leaving participants little time at disposal to adjust their expectations to the new information. In the second place, restrictions on banking between the first and the second trading phases prevented arbitrage from reducing the price difference between the first and the second period allowances.¹⁴ Therefore, it may be argued that the dramatic price volatility described above was mainly due to the price discovery on a new market and to the mistakes initially done by policy-makers in the trial period, that was intended to provide a sort of learning phase for a successful use of the ETS in the following periods. Extreme price

¹³ See D'Amato and Valentini (2008) and Ellerman and Buchner (2008) for an analysis of the consequences of a decentralized EU-ETS *versus* a centralized one.

¹⁴ Such allowances were treated as two different products because of the absence of banking from the first to the second period. See Ellerman and Joskov (2008, Fig.1, p.13) for the evolution of the price gap between the first and second period allowances. Inter-period banking, however, will be allowed for the second and following trading periods, thus avoiding this major flaws that occurred in the design of the trial period.

volatility, however, is not always limited to the initial phases of cap-and-trade systems. This is clearly shown, for instance, by the extreme price fluctuations of the sulphur dioxide allowances that occurred in the US between 2004 and 2006, long after the start-up of that programme (that was introduced in 1993), as well as by the recent evolution of the price of the carbon permits in the EU-ETS that more than halved in a few months (from above 27 €/tonne in June 2008 to 13.25€/tonne as of 15 January 2009). In December 2009, moreover, the carbon price showed high volatility in the EU market reflecting rapidly changing expectations on the stringency of the future environmental policies. The price of EU allowances, in fact, rose by nearly 3 per cent ahead of the COP-15 since agents expected an international agreement on more stringent emissions reductions to be reached in Copenhagen, and then dropped by 8.7 per cent to a 6-months low immediately after the conference failure to achieve a legally binding treaty on emissions cut. This explains the existing concern for further price fluctuations in the EU-ETS in the future. High market instability, in fact, generates uncertainty among the agents that may discourage their investments in more environmental friendly technologies. If the agents expect that the price of carbon permits may suddenly decline in the future, they will prefer to keep on using the old polluting technology rather than shift to a new, less polluting but more expensive technology.

Finally, as far as the penalty system is concerned, art.16 of the Emission Trading Directive described above establishes that if an operator emits more than allowed by the permits at disposal, it will be liable not only to pay the penalty, but also to purchase the excess emissions “when surrendering allowances in relation to the following calendar year”. This suggests that the price that the non-compliant firm has to pay for its excess emissions is given by the market price when the purchase is made. It follows that the large fluctuations of the market price observed above, together with possible limitations in the monitoring system, might generate moral hazard behaviours among the operators. For instance, if the price of the permits in the following period and/or the ability of the national authority to monitor non-compliant behaviours are/is expected to be sufficiently low,

then the operator might have an incentive to “cheat” (i.e. surrender less allowances than its actual emissions) and pollute in excess of the allowances at disposal.

This point can be illustrated in heuristic terms through a simple analytical framework.¹⁵ Consider an operator that has to decide at time 0 whether to buy the x permits for the emissions in excess of the allowances at disposal.¹⁶ Let us indicate with p_t the price of the permits that prevails on the market at time t . If the operator purchases at time 0 all the additional permits it will obviously pay:

$$(1) p_0x$$

If, on the contrary, the operator decides not to purchase the additional permits that would be necessary to cover its excess emissions, then the expected cost will be:

$$(2) \delta[Fx+p_1x]$$

where $0 \leq \delta \leq 1$ is the probability to be “discovered” by the national authority, F is the penalty for each tonne of emissions x in excess of the allowances at disposal and p_1 is the present discounted value of the expected price of the permits in the next period that the operator will have to pay for the additional allowances if “discovered” by the national regulator.

From (1) and (2) it follows that if:

$$(3) p_0 > \delta[F+p_1]$$

the operator will prefer to cheat and run the risk of being discovered rather than buy all the necessary permits today. As claimed above, therefore, the lower are δ and/or p_1 , the higher the

¹⁵ As it is well known, the heuristic method provides a simplified analysis of the phenomenon that lies in between a purely intuitive explanation of the problem and an exhaustive theoretical model. The illustration proposed here is kept deliberately simple to focus the attention of the reader on a few basic logical passages that allow to support the main statement that the observed price volatility may induce moral hazard behaviours. The following passages, therefore, should be interpreted as just a first step in the direction of a thorough analytical model. See Carmona et al. (2009) for an analysis of the equilibrium price dynamics of the emission permits that takes the penalty level into account. See also Grull and Taschini (2009) for an investigation of the main design mechanisms proposed by policy makers to keep the permit price from rising or falling too much.

¹⁶ We assume for the sake of simplicity that the operator has to purchase one permit for each tonne of emissions, so that the variable x indicates both the number of permits to be purchased and the tonnes of pollutant emitted by the operator.

probability that the operator may decide to cheat. From (3) it follows that the penalty system indirectly introduces a price-ceiling in the market since if the current price p_0 is sufficiently high (above the right-hand side of (3)), then the agents will have an incentive not to “cover” all their emissions.

To avoid moral hazard behaviours, the regulator should obviously improve its monitoring system as much as possible. But even if $\delta=1$ (operators have no chance to “escape” the penalty if they try to cheat), agents might still prefer not to purchase all necessary permits if:

$$(4) p_0 > F+p_1$$

To avoid this risk the penalty can obviously be increased as the price of carbon permits rises.¹⁷ However, one can find opposite reasons that lead to keep the penalty constant and thus introduce a price ceiling in the market. In the first place, if the penalty becomes very high, it might also lose its credibility and thus generate time consistency problems. As a matter of fact, if the penalty becomes extremely high, the firms may reasonably expect that the fee will not be applied as this would cause non-compliant firms to close up and thus increase unemployment in the country, generating high social costs that the local authority may not be willing to face. In the second place, if we let the penalty grow with the carbon price, then a similar non-compliant behaviour would be punished more or less heavily depending on the price fluctuations, what may raise doubts on the equity of the sanction. Finally, a price ceiling might provide a useful “safety net” against possible mistakes by policy-makers. The latter, in fact, often lack sufficient information on the firms’ abatement costs when establishing the emission cap. A price ceiling, therefore, may prevent abatement costs from rising above what is socially optimal and in this sense a penalty system might be a useful instrument against upward price fluctuations. If so, however, it would be reasonable to introduce in the market also a lower bound for the carbon price to prevent that possible flaws in the policy design (such as a too high emissions cap) may reduce the carbon price below what is socially

¹⁷ For instance, the penalty could be set above the carbon price by a given percentage r , i.e.: $F=p_0(1+r)$. This would allow the penalty to move along with the carbon price, ensuring that the former lies always above the latter so that condition (4) does not hold.

optimal. Stated differently, if one accepts the idea that some form of market regulation would be desirable to correct the possible inefficiency of a cap-and-trade system, then we might consider to set not only a ceiling but also a floor on the carbon price that prevent potential polluters from paying too much (too little, respectively), that is, more (less) than socially optimal.

The problems that affect the application of the Emission Trading Directive 2003/87/EC have recently led to a substantial revision of the EU-ETS. In particular, the new Directive 2009/29/EC has introduced the following three main changes: (i) the extension of the EU-ETS to further industries (for example, the petrochemical, aluminium and ammonia sectors) and gases (nitrous oxide and perfluorocarbons), (ii) a unique EU emission permits ceiling (rather than 27 different national ceilings) that decreases every year during the third trading phase (2013-2020), (iii) higher share of emissions allocated through auctions rather than grandfathering, along with the harmonization of the allocation rules when permits are instead given for free.

All these proposals seem rather desirable. The extension of the ETS can produce a thicker market of carbon permits, thus reducing the potential lack of transactions and of competition that constitutes one of the main application problems reported in the literature on tradable permits (cf. Hahn 1984, Hagem and Westkog, 1998). As to the harmonization of the emission permits ceilings and the allocation rules, this may help to reduce the consistency problems described above that may occur between the EU energy policy and the one pursued by single member States. In this direction seems to go the Directive on energy taxation (2003/96/EC) that sets a minimal taxation level on electricity and energy products in all member States. Finally, also the adoption of an auction rather than grandfathering as allocation criterion may improve the functioning of the ETS. In this case, however, particular attention should be devoted to the design of the auction as this may play a crucial role for the success of the system (Cramton and Kerr, 2002). As a matter of fact, if the auction is not properly designed it may favour a few large firms that initially buy most of the permits for strategic reasons. This problem is certainly more likely to occur in small, local markets rather than in the EU-ETS for carbon emissions that covers thousands of firms across different

sectors. However, market concentration and the potential abuse of market power may arise even in similar contexts with many firms, as it emerges from the experience of the UK ETS, the world's first large-scale GHG trading scheme that was launched in April 2002. In the UK ETS, although the number of participants was very high (approximately 1400 firms in over 40 industrial sectors the first 3 years), sales were very concentrated, with the four largest sellers accounting for 65.7 per cent of total sales (Smith and Swierzbinski, 2007). Interestingly enough, all four largest sellers entered the UK ETS as a result of an auction in 2002 which allocated a budget for abatement subsidies.¹⁸ According to Smith and Swierzbinski (2007), the observed concentration on the permits supply side is likely to reflect the concentration in the auction outcome where some firms might have coordinated their behaviour to manipulate the auction price. The UK experience, therefore, may provide important insights for the EU-wide carbon trading scheme, suggesting that the issue of market concentration should not be neglected in the auction design even in the EU-ETS despite the large number of potential participants.

4. The EU renewable energy policies

The other main route beyond the ETS that the EU has followed so far to come closer to the Kyoto targets is given by the progressive shift of the energy system towards renewable sources. While the ETS can be interpreted as an application of the “polluter pays principle” (which does not exclude pollution but aims at internalizing its negative effects), the increasing attention to renewables moves in the direction of an alternative zero-emissions energy model.

It can be argued (cf. Kolev and Riess, 2009) that the promotion of renewables and energy efficiency can contribute to reduce emissions if they are applied to sectors not covered by the ETS scheme, but may fail to do so if applied to the ETS sectors. In fact, if the supply of emission permits

¹⁸ See Smith and Swierzbinski (2007) for a detailed description of the functioning of the UK ETS and its results.

is kept constant at a given carbon emissions level, supporting these policies in the ETS sectors might end up simply decreasing the demand of the emission permits and thus their price without generating additional emissions cut. If so, the renewable energy policies set forth in the ETS sectors should be seen as a substitute rather than as a complement to the ETS. However, the reduction in the demand of emission permits induced by the promotion of renewables in the ETS sectors can be counterbalanced by a progressive reduction in the supply of permits from the regulatory authority aimed at reducing emissions over time.¹⁹

The steps of the transition towards an alternative energy model have been determined by three main Directives: the Directive 2001/77/EC on renewables, the 2003/30/EC on biofuels, and the recent Directive 2009/28/EC on the promotion of energy use from renewable sources that modifies and repeals the two previous Directives. The first Directive established that renewable energy sources (solar, wind, biomass, geothermal and so on) should have increased up to 21 per cent of electricity consumption and 12 per cent of all consumption by 2010. In 2005, however, the share of renewables on electricity and energy consumption was still 15 per cent and 6.38 per cent, respectively, so that the original target is unlikely to be reached. A similar argument applies to the Directive on biofuels²⁰ (2003/30/EC) whose past target for the year 2005 (biofuels growing up to 2 per cent of total transport fuels by 2005) was largely missed (only 1 per cent being reached in the EU-25 by that year) and the current target for the year 2010 (5,75 per cent of total transport fuels) seems rather unlikely to be achieved (see figure 3).²¹

The European Commission's Communication "*Limiting global climate change to 2 degrees Celsius. The way ahead for 2020 and beyond*" looks even more ambitious than the Directives

¹⁹ A progressive reduction of the EU-wide cap might actually occur in the future given the long-term EU goal of cutting CO₂ emissions by 50 per cent by 2050, though at the moment there are no formal commitments to such a reduction.

²⁰ As it is well known, by this term we mean any fuel from biomass, such as bioethanol, biodiesel and biogas.

²¹ This is also due to the negative side effects that biofuels have recently provoked on the food market that are the object of a heated debate among experts and policy-makers. We will omit the analysis of this issue here as it goes beyond the scope of the present paper.

mentioned above. As it is well known, this Communication (published on 10 January 2007, and subsequently approved by the EU Council, on March 8-9, 2007) establishes the EU unilateral commitment to cut GHG emissions by 20 per cent by 2020 with respect to 1990 (or by 30 per cent if a global agreement on climate change will be reached). Moreover, the EU commits to increase energy savings by 20 per cent by the year 2020 and to raise by the same year the share of renewables on total energy supply up to 20 per cent. To achieve these targets, in April 2009 the EU has adopted a new Directive on renewables (2009/28/EC) that sets individual targets for each member state for 2020 accounting for their different per capita GDP levels, as well as intermediate targets (the so called “indicative trajectories”) to be reached during the progress towards the 2020 targets.²² According to the new Directive, each country is free to choose its preferred “mix” of renewables to meet its target. All member states, moreover, are required to present National Renewable Energy Action Plans and progress reports every two years to evaluate their effective advancement towards the 2020 targets.

The new legislative framework adopted by the EU, commonly named the “20-20-20 plan”, is certainly attractive as it conveys a clear goal that can easily catch the attention of public opinion and the mass-media. But the question that should be asked is whether and to what extent this commitment is reliable. If one looks at the unsuccessful attempts to achieve less ambitious environmental targets in the past, we are inclined to believe that *a fortiori* this more stringent goal might be missed in the future, especially because the “20-20-20” plan deals with a near future. The more so, since the current global financial crisis might lead the EU to postpone intervention, giving lower priority to the environmental issues in the next few years. This consideration does not deny the important step forwards that the EU has done in these years in developing renewable energy sources. As a matter of fact, the electricity production from renewable sources has rapidly increased in Europe from the 1990s onwards. And the EU currently plays the role of world leader in several

²² More precisely, the Directive sets the following intermediate targets: 20% of the final target to be reached between 2011 and 2012, 30% between 2013 and 2014, 45% between 2015 and 2016 and 65% between 2017 and 2018.

renewable energy markets such as the wind power market in which 60 per cent of all firms are European ones. However, the share of primary energy supply from renewable resources increased very slowly in the EU countries that are member of the Organisation for Economic Cooperation and Development, passing from 6.8 per cent in 1990 to 7.6 per cent in 2003, and is expected to remain well below 10 per cent in 2010.

The speed of the transition process from exhaustible to renewable resources is obviously affected by the price gap between them. It is generally argued that a more rapid transition to renewable resources has not occurred so far since the cost of producing energy from exhaustible resources is well below the correspondent cost from most renewable resources. Thus, for instance, a study carried out by the International Energy Agency (IEA, 2005a) on more than 130 power plants in several countries finds that the lowest cost of generating electricity from traditional (coal-fired and gas-fired) power plants ranges between 25 and 45 United States dollars (US\$) per megawatt-hour (MWh), whereas the correspondent cost is about 150 US\$/MWh for solar plants.²³

This argument would be perfectly sound if the market price could signal the true scarcity of the resources. In reality, however, the market price signal may be distorted by several factors (Borghesi, 2008; Borghesi and Vercelli, 2008). In the first place, it does not take into account the oligopolistic nature of FF markets (especially in the case of oil and natural gas). In the second place, the market price does not account for the negative externalities deriving from the production and consumption of FF. If this was the case, the market price of FF should be much higher than it is today and one cannot exclude that in this case renewable resources could already be competitive with the exhaustible resources so that the transition process should be much accelerated. Finally,

²³ The estimated costs, however, differ substantially across different studies according to the underlying assumptions on the discount rate, the projected prices of exhaustible and renewable resources, and the size and economic lifetime of the power plants taken into account. According to the IEA (2005b), for instance, the cost of generating electricity from photovoltaics ranges between 200 and 400 US\$ per MWh, while the correspondent cost ranges between 431,4 and 508 US\$ according to the World Bank (2005). Also notice that, if we exclude photovoltaics, others renewables are already competitive with most fossil fuel based power plants. For instance, the estimated cost of producing energy is about 30-40 US\$/MWh for large hydro power plants and about 40-60 for wind generating technologies (IEA, 2005b).

most government subsidies are still mainly directed to FF rather than to renewable resources, although more attention has been devoted to subsidising renewable resources in the last few years. If the energy subsidies were progressively shifted from exhaustible to renewable resources, this might contribute to increase the price of the exhaustible resources and simultaneously decrease that of the renewable resources, thus potentially reducing the current price gap that induce to postpone the transition towards renewable resources.²⁴

The above mentioned distortions in the market price signal might have slowed down so far the transition to an alternative energy system. The speed of this transition process, however, is not the same within Europe but shows large differences across the EU countries. In the case of photovoltaics, for instance, almost 90 per cent of the whole production capacity installed in the EU in the year 2006 occurred in only one country (Germany). Surprisingly enough, very sunny countries such as Spain, Italy and especially Greece lag much behind in the investments specifically devoted to this renewable resource. Similarly, the share of biofuels over total transport fuels show huge differences in Europe where Germany plays again the role of market leader and is the only European country that managed to go beyond its national target.

These considerations call for both an acceleration and an harmonization of the transition process towards renewable resources. In this regard, the new Directive 2009/28/EC seems to go in the right direction as it adopts binding targets for 2020 for single member States and harmonizes the national standard and certificate systems. The new normative framework, moreover, addresses explicitly the heating and cooling sectors, as well as the transport sector that account, respectively, for about 50 per cent and 31.5 per cent of the energy final consumption in the EU-27 (European Environment Agency, 2009). In our opinion, however, much remains to be done. In particular, the normative framework should be reinforced, introducing financial penalties based on strict criteria -

²⁴ An increase in the subsidies to renewable energy sources, however, may also raise their demand and thus lead to an increase rather than a decrease in their price level. This is what might actually be occurring in the case of biofuels whose price has recently increased with negative side effects on the food price.

rather than the generic threat of legal action that remains at the Commission's discretion- for those countries that fail to reach the intermediate targets. Moreover, in order to speed up the transition towards alternative energy sources it would be of crucial importance to reduce the uncertainty on the reiteration of the renewable energy policies by member States. In fact, at the national level the environmental and energy priorities have shown to be very sensitive to the prevailing political orientation. As a consequence, government changes can result in abrupt policy changes in the promotion of renewable energies that may discourage the agents from investing in this field.

5. Concluding remarks: credible goals for “incredible” results

The current global warming process poses serious problems not only for its biophysical effects, but also for its potentially vast economic consequences. A more rapid transition from the current fossil fuel economy towards an alternative energy system seems highly desirable to set free from the unavoidable future scarcity and the current pollution problems that come along with the use of fossil fuels. In the case of Europe, moreover, shifting to a different energy model could provide the additional large benefit of reducing the present EU dependency on costly energy imports and the vulnerability of energy supply that often comes from politically unstable world regions (such as OPEC countries in the case of oil, or Russia and Iran for gas imports). This aspect may explain the increasing efforts of the EU in developing alternative, pollution-free energy sources and the leading role that the EU has played at the world level in the endeavour to reduce CO₂ emissions. Despite these efforts, however, much remains to be done to increase the role and improve the performance of the renewable energy sources, as well as to achieve the minimal CO₂ reduction requirements that would be needed to slow down the ongoing global warming process.

As to the CO₂ emissions reductions, the creation of a European ETS is probably the most important change in the EU energy policy after the ratification of the Kyoto Protocol. Although this system can potentially increase emissions abatement, its design and functioning should still be

improved in many respects. In particular, a well-design auction system for the initial allocation of carbon permits might perform better than the grandfathering system mainly adopted so far that tends to preserve the existing situation and may generate entry-barriers to new competitors. Moreover, the National Allocation Plans should be fully consistent with the EU-ETS to reinforce the credibility of the European CO₂ reduction efforts. In addition, the large price volatility observed in the EU-ETS market represents a further problematic aspect in the functioning of the system since it tends to increase the operators' uncertainty and may thus discourage investments in new environmental friendly technologies. Finally, as argued in the paper, the present constant penalty system might potentially generate moral hazard behaviours. Although at the moment this is admittedly a minor problem (since the fee is currently much above the market price), to avoid this risk it might be preferable to let the penalty move along with the carbon price rather than keep it constant over time.

Even in the case of the renewable policies, despite the leading role played by the EU in this field, there remains much scope for further improvements. Although the goals in terms of carbon emissions reduction and renewable energies were often missed (or, at best, hardly achieved) so far and some of them are likely to be missed by the end of the reference period, the "20-20-20" EU plan established even more ambitious targets to be reached by 2020. This policy that keeps on raising up the target and postponing the deadline, however, is hardly credible. It looks pretty much like the behaviour of a jumper in a pole-vault competition that keeps on raising up the height of the pole aiming at the world record although she misses even the first attempts at lower levels. This (hopefully wrong) impression is somehow reinforced by the recent proposals at the last G8 meeting in Hokkaido (Japan) and at the COP-15 in Copenhagen that aim at halving carbon emissions by 2050. This long-run objective that was originally proposed by the European Commission (2007) is certainly of crucial importance to prevent the massive disruption of the global climate system. But it looks again as an even more ambitious target that is further postponed in time, the achievement of which appears rather unlikely at present given the difficulty of the EU-15 to reach the much easier

goal set by the Kyoto target (that was largely met only via the current crisis) and the failure of international negotiations to achieve a binding treaty for the post-Kyoto period. This international energy policy seems to recall similar very ambitious targets recently set by the United Nations' Millennium Development Goals (like, for instance, halving extreme poverty and the proportion of people who suffer from hunger by 2015) that are provoking some critiques for the extreme difficulty in achieving or even –in some case- getting close to the desired result.

The inability to achieve intermediate results may pose serious time inconsistency and credibility problems that are well-known and well-described in other areas of the economic literature such as monetary economics (Kydland and Prescott, 1977; Barro and Gordon, 1983). The attempt to avoid these problems have also guided the European monetary policy and its effort to “tight her own hands” underlying the Stability and Growth Pact. The recent difficulties to achieve the monetary goals and the consequent revision proposals of the Stability Pact should induce the EU to adopt feasible goals even for its energy policy in the future. Otherwise, credibility problems might hinder its capacity to reach concrete results. For instance, if agents believe the EU energy and emission targets will not be seriously pursued, they could decide not to buy carbon permits since they may expect that a legally binding international treaty will not be reached in the near future, that the authority will not be able to monitor polluting emissions or that the penalty system will not be applied. If so, the demand and the price of carbon permits in the EU-ETS might decrease to very low levels as it recently occurred after the disappointing outcome of the COP-15 in Copenhagen, thus reducing the firms' incentive to invest in different production technologies and costly renewable energies. In other words, credible goals are probably necessary if we are to achieve “incredible” (that is, unexpectedly good) results in the emission reductions in the next few years.

This does not imply that policy makers should lower their long-run targets since they appear too ambitious with respect to the results pursued so far, but they should set feasible and binding intermediate targets that are then to be reached in order to avoid time consistency problems. If not, the tendency to announce ever stricter environmental policies for the years to come while failing to

achieve the intermediate targets may undermine the credibility of the future energy policies and thus also the capacity to implement them.

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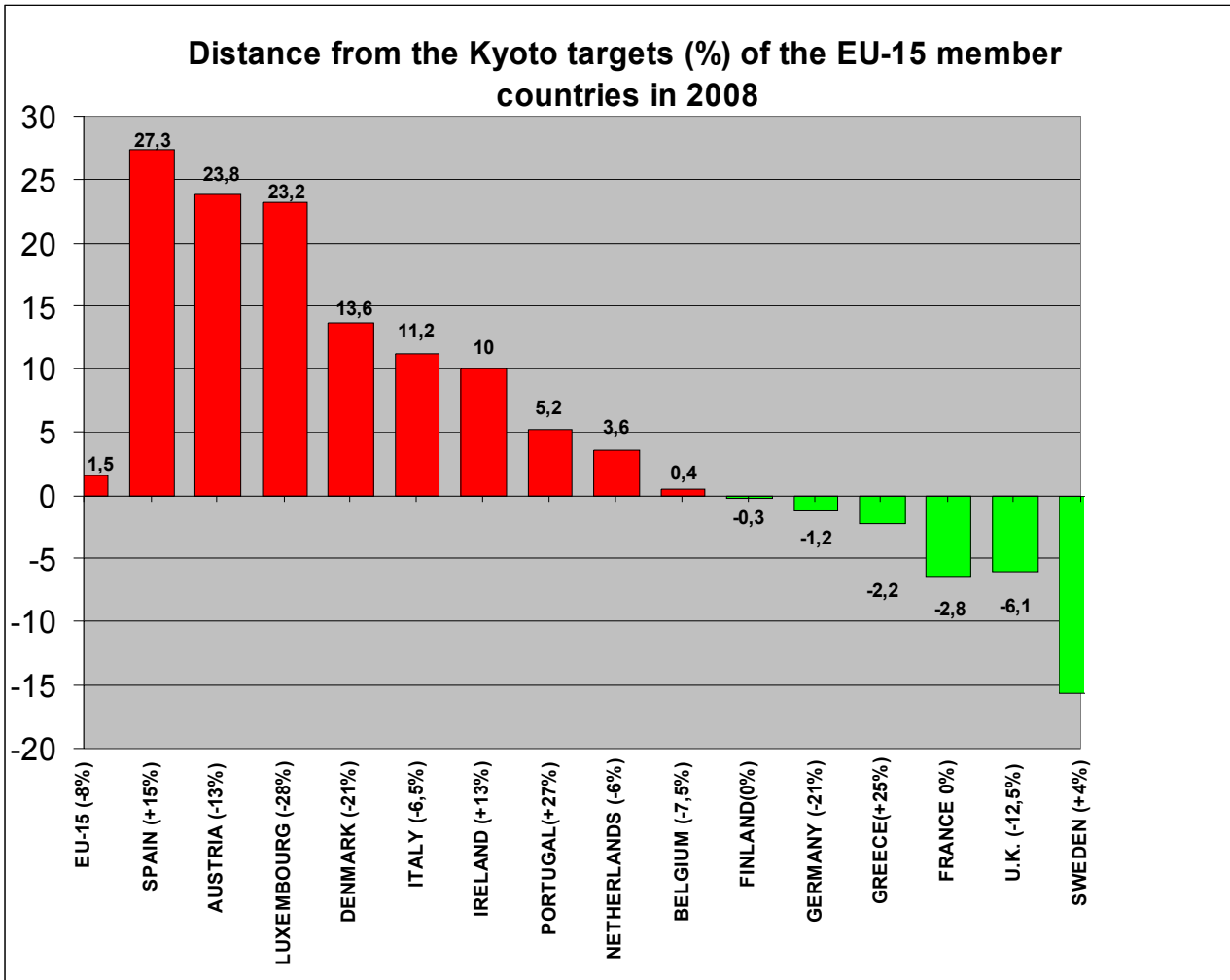


Figure 1: distance in 2008 of the EU-15 from the Kyoto targets (reported on the horizontal axis).

Source: author's elaboration on the European Environment Agency (2010a) dataset.

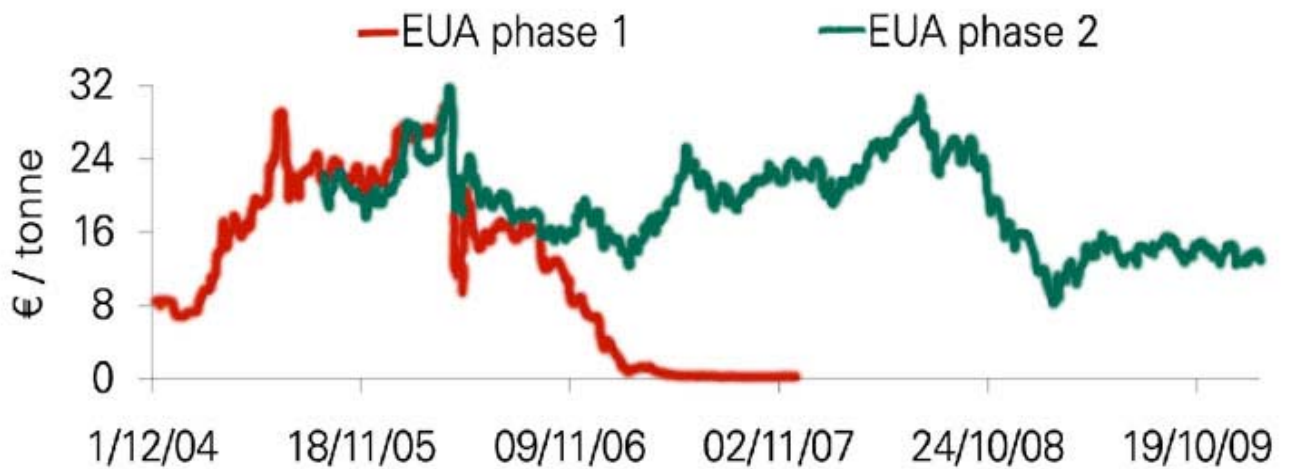


Figure 2: price volatility of the EU carbon permits

Source: www.pointcarbon.com

Share of biofuels in fuel consumption of transport (%)

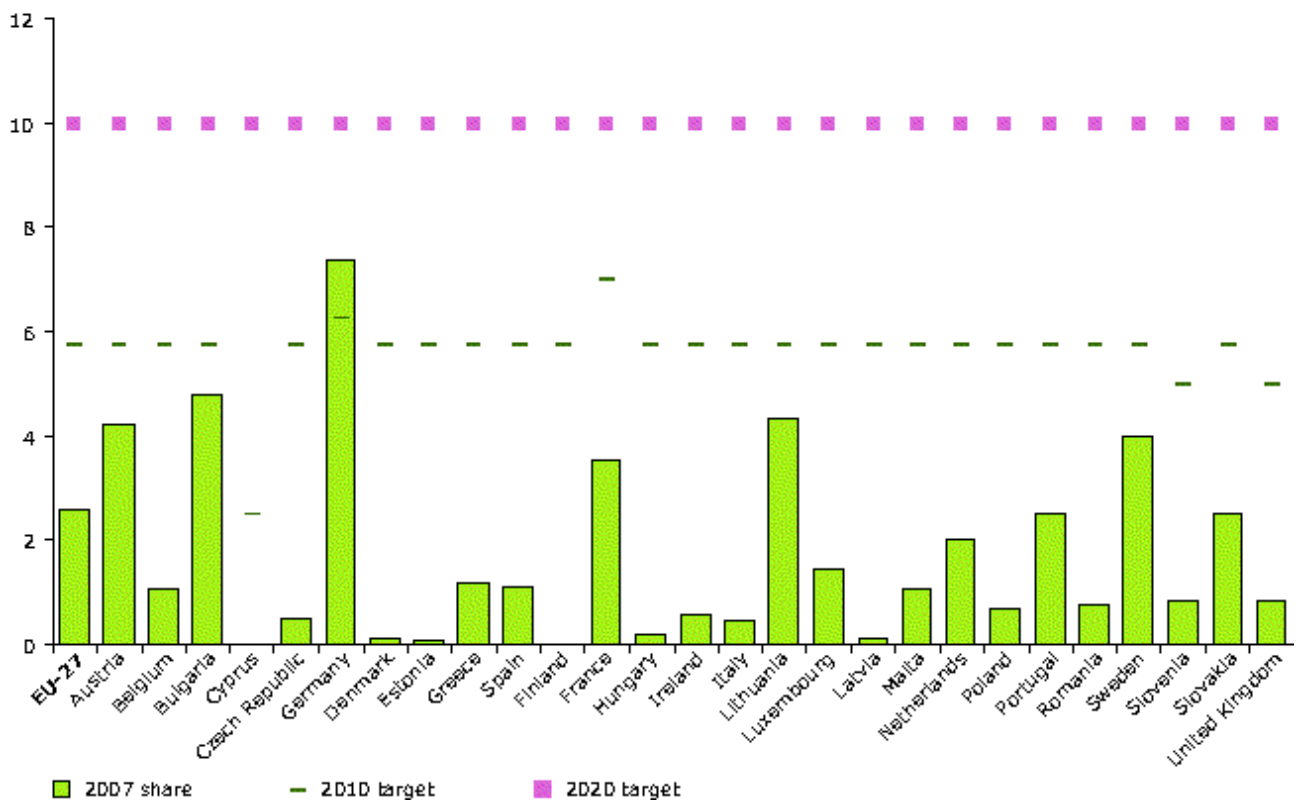


Figure 3: Share of biofuels in fuel consumption in the EU-27 member countries in 2007 as compared to the 2010 and 2020 targets.

Source: European Environment Agency (2009)

URL: <http://www.eea.europa.eu/data-and-maps/figures/share-of-biofuels-in-fuel-consumption-for-transport-in-eu27-in-2007-compared-to-2010-and-2020-targets>

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