Integrating Market Based Instruments for Pollution Control
- Strategic Option for Enhancing Competitiveness within Energy Industry -

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ABSTRACT
The paper aims to emphasize the efficiency of using market based instruments for both reducing pollution and enhancing competitiveness within the energy industry. Given the previous experience of European countries, as well as the characteristics of the main market based instruments, the paper is focused on developing two alternatives for combining green certificates schemes, white certificates schemes and emissions trading schemes (black certificates schemes) in strategic options, aiming to increase the competitiveness of the energy industry and to decrease the emissions generated within this field. Each strategic option presented includes an integration scheme, as well as the main advantages and disadvantages deriving from the implementation of these mechanisms. The paper also demonstrates that an integrated market based instruments' scheme is more efficient and even cost-effective than using single instruments. The whole analysis places a higher focus on white certificates, as these are the more recent market based instrument for enhancing competitiveness within energy industry.

KEYWORDS: *competitiveness, energy industry, green certificates, market based instruments, pollution control, white certificates.*

JEL CLASSIFICATION: *Q42, Q52.*

INTRODUCTION

The energy industry has proven to be the driving force for achieving economic growth, supporting the development of energy-intensive industries and the development of new technologies. Even if the contemporary economies shifted towards the *new knowledge-based economy*, the energy industry is still one of the main pillars of economic development.

However, the generation of energy is still dependent on the non-renewable energy sources, such as coal and oil (Mohamed & Lee, 2006), which have a high negative environmental impact. Therefore, energy industry is regarded as a strategic option in sustaining economic growth, although it is considered as one of the most environmental destructive sectors of the global economy.

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Under these circumstances, the application of both energy efficiency and energy saving principles, may prove to be the only suitable alternative for decoupling economic growth from the increase in energy consumption (Liaskas et al., 2000), generating reductions in *Green-House-Gas (GHG)* emissions, by lowering the amount of energy needed for performing certain economic activities. In order to ensure a rational use of energy resources and to obtain control in the pollution levels generated within energy industry, the policy-makers have developed a set of market based instruments, such as green certificates, white certificates or CO_2 trading certificates, aiming to ensure the sustainability of the energy sector. While green certificates are market based instruments used for promoting the generation of electricity from renewable energy sources (Nielsen & Jeppesen, 2003), white certificates are market based instruments used for promoting energy savings within economic activities (Oikonomou et al., 2008).

In this context, the paper assumes the necessity of using an integrated approach of market based instruments as more efficient than using single instruments, both in terms of cost-effectiveness and environmental impact. Taking into account several studies which revealed that investments focused on producing renewable energy as a result of adopting green certificate schemes may prove to be efficient in terms of return on investment (ROI) and internal rate of return (IRR), the previous mentioned assumption is quite invalid for investments focused on saving energy technologies, as a consequence of adopting white certificate schemes. The analysis of white certificate scheme reveals that companies involved will not achieve the highest rating as regards to ROI. Therefore, it is more profitable and efficient to generate energy than to save it. Moreover, it is more profitable to generate energy from non-renewable sources than to generate energy from renewable sources. Under these circumstances, an analysis can be used in order to prove whether using a combined approach of these two market based instruments (TGC and TWC) will equilibrate the financial situation of energy companies, stimulating them to produce renewable energy as well as to save energy.

Also, the paper focuses on revealing the most recent approaches regarding energy efficiency and market based instruments within the scientific literature, emphasizing two alternatives for combining green certificates schemes, white certificates schemes and emissions trading schemes in strategic options, aiming to increase the competitiveness of the energy industry and to reduce the environmental destructive impact of GHG emissions upon the environment. Last but not least, the paper analyses the advantages and disadvantages of integrating green and white certificates in emission trading, in order to achieve better environmental and economic results.

1. LITERATURE REVIEW

Pollution control within energy industry may be achieved by using renewable sources for generating energy, by saving energy and also by reducing GHG emissions. For each of these alternatives, the policy-makers have developed several market based instruments aimed both to enhance the competitiveness within the energy industry and to control the impact of this industry upon the environment.

Thus, market based instruments are regarded as public policies, which make use of market mechanisms with transferable property rights to distribute the policy burden (Wiebe & Dick, 1998). However, there is a thick border between policy instruments (which are regarded as environmental targets or emission quotas proving the environmental

compliance) and market instruments (which are tradable instruments, such as green certificates, white certificates and carbon allowances). Therefore, market based instruments are a much narrower concept representing just a tradable commodity (Langniss & Praetorius, 2004) whereas policy instruments are compulsory rules which ensure environmental compliance.

Under these circumstances, several opinions regarding whether to use single instruments for controlling pollution within energy sector or integrated approaches of two or more market based instruments arise. Lennard (2009) states that energy saving is one of the quickest, most effective and cost-efficient ways to reduce not only GHG emissions, but also to improve air quality.

A similar opinion is promoted by Bertoldi and Huld (2006), who argue that white certificates (which are the market based instruments associated to energy saving policies) are the most efficient and inexpensive way to achieve savings by selecting end-use sector and technology.

Langniss and Praetorius (2004) state that there is a close relationship between the energy consumption and the level of economic development within a country and argues that saving energy is a non-efficient and not recommended policy.

They assume that the most adequate policy for reducing GHG is to promote the renewable energy sources and to minimize the intensive use of conventional resources within the energy industry. Okoro and Madueme (2004) present several models for trading green certificates (which are the market based instruments associated with the generation of renewable energy) as business opportunities, emphasizing, beside the environmental benefits, their economic dimension.

However, pollution control is a wide objective, which is hardly achievable unless many market based instruments are being used simultaneously for obtaining a synergy effect, both in the field of environmental compliance, as well as in the field of environmental costs reduction.

Therefore, it is highly necessary to develop strategic options, encompassing energy saving targets, emissions reduction targets and renewable energy targets, in order to comply with energy efficiency policies, under cost-effectiveness circumstances.

According to Patterson (1996), energy efficiency improvement is technically defined as the decrease use of energy per unit of economic activity without substantially affecting the level of these actions. Energy efficiency can be determined thus as the reduction of energy input to total output, or a reduction of energy intensity, defined as the amount of energy used to produce the current level of output.

Assuming the premise that countries strategic objectives for the next period involve developing a sustainable, efficient, non-polluting energy system, the decision-making process in the energy field should focus on setting-up policies based upon the following dilemmas:

- it is more efficient to promote already mature technologies within energy industry, recalled as efficient and highly profitable on short run, although they have a strong negative impact upon the environment and, moreover, they fasten the depletion of the non-renewable resources, ***or*** to promote emergent technologies, recalled as very expensive and non-profitable on short run, but environmental friendly and compulsory on medium and long run;

- it is more efficient to promote technologies within energy industry which are focused on saving energy ***or*** to promote technologies which are focused on the intensive exploitation of resources, even if they use either non-renewable or renewable energy sources;
- it is more efficient to promote energy efficiency by lowering the energy consumption ***or*** to act in order to reduce the total amount of energy produced.

Analysing the previous statements in terms of decision-making, should determine which is the most suitable mix of market based instruments for a certain company (or even for a certain country), so that the energy policy reaches its objectives.

2. MAIN CONCEPTS IN DEVELOPING A MARKET BASED SCHEME FOR POLLUTION CONTROL

Currently, the pollution control policies within the energy industry are focused on developing three main types of market based instruments, usually used separately as formalized trading schemes: *green certificates*, *white certificates* and *black certificates* (also known as CO_2 certificates or carbon allowances).

A trading scheme can be defined as a general regulated framework which establishes certain assets and commodities, according to specific market based regulations, generally related to demand-supply mechanisms. A trading scheme within the energy industry might be developed for a single market based pollution control instrument, as well as for a mix of market based instruments.

Tradable green certificates can be defined as market based instruments used for promoting the generation of electricity from renewable energy sources and for developing the renewable energy market. A tradable green certificates scheme might include one of the following:

- a regulated certificate trading framework, an obligation for disclosure and a feed-in tariff for renewable energy sources;
- a regulated certificate trading framework and a regulated obligation for suppliers;
- a regulated certificate trading framework, a regulated obligation for suppliers/importers and a feed-in tariff system for renewable energy sources;
- a voluntary certificate trading framework and financial incentives for end-users;
- a general renewable energy target and a regulated obligation for end-users.

Tradable white certificates can be defined as market based instruments used for promoting energy savings within economic activities. The scheme is less popular and more specific than tradable green certificates scheme. A tradable white certificates scheme is considered to be defined if it reveals:

- an energy saving target;
- certain obliged parties;
- certain covered sectors;
- a set of eligible participating parties.

Starting from the mentioned assumptions, the most efficient and mature tradable white certificate schemes are compared in *Table 1.*

Table 1. Comparison between the most popular tradable white certificate schemes

Country / *Item*	*Great Britain*	*Italy*	*France*
Scheme starting date	April 2002	January 2005	July 2006
Energy saving target	○ 62 TWh (2002-2005) ○ 130 TWh (2005-2008) ○ 200 TWh (2008-2011)	○ 68 TWh (2005-2009) ○ 141 TWh (2009-2013)	○ 54 TWh (2006-2009) ○ 110 TWh (2009-2012)
Obligated parties	Gas and electricity suppliers	Gas and electricity grid distribution companies	Energy suppliers delivering electricity, gas, domestic, fuel, cooling, heating and stationary application
Covered sectors	Residential sector only	Energy end-use sectors, but at least 50% of savings should be achieved via a reduction of electricity and gas - end uses	All sectors, including transport, which are not already covered by the European Union Emissions Trading Scheme
Eligible participating parties	Gas and electricity suppliers	Gas and electricity grid companies	Any economic agent

Source: adapted from Labanca (2007), p. 12

Taking account of the mentioned items regarding both the green certificates and white certificates schemes, efficiency can be achieved, when considering the assumption that producing renewable energy is more profitable than saving energy, if the effort for achieving a tradable white certificate is lower than the effort for achieving a tradable green certificate, or if the net financial value of a tradable white certificate is higher than the net financial value of a tradable green certificate.

Tradable black certificates, the most common market based instrument for pollution control within the energy industry, is regarded in European Union as European Union Emissions Trading Scheme (EU ETS) or simply cap-and-trade.

According to schemes' regulations, each member state or accession country should implement EU ETS at national level in order to reduce the CO_2 emissions, therefore contributing to the environment quality improvement, as well as to a better pollution control. Also, EU ETS consists in setting the total quantity of allowances in order to provide an allocation mechanism among the operators covered by the scheme. The schemes' basic principle is that any increase in emission from a given source must be offset by a decrease in emissions of an equivalent quantity. For instance, when a statutory ceiling on pollution levels is fixed for a given area, a polluting firm can set up a new facility or expand its activities only if it does not increase the total pollution load.

Summarising, the relevancy of developing an integrated trading scheme, combining either two or all of the market based instruments presented above, starting from their main characteristics, is discussed in *Table 2*.

Table 2. Green, white and black certificates overview

Market Based Instruments / *Criteria*	*Green Certificates (Tradable Green Certificate Scheme)*	*White Certificates (Tradable White Certificate Scheme)*	*Black Certificates (European Union Emissions Trading Scheme)*
Definition	Securities proving the generation of a certain amount of renewable energy	Certificates proving certain energy savings	Certificates proving a certain amount of CO_2 emissions
EU Objective	Increasing renewable energy sources supply to 22% in the European Union by 2010	Achieving 1% of energy savings per year and 1,5% of energy savings for the public sector	Reducing GHG emissions by 8% compared to 1990's rate
Market	• Tradable green certificates market • Renewable energy certificates market • Power market	• White Certificates Market • Power Market	• EU allowance market • CDM market • Power market
Commodity traded	Green certificate allocated for a unit of renewable energy produced	White certificate allocated for one unit of energy saved	EU allowance allocated for 1 ton of CO_2 equivalent
Participants (mandatory/voluntary)	• Renewable energy producers and importers; • Distribution companies • Consumers	• Electricity and gas suppliers	• Energy intensive industry

Source: adopted from Bonneville & Rialhe, (2005), p.7

3. INTEGRATING MARKET BASED INSTRUMENTS FOR POLLUTION CONTROL DESIGNED FOR ENHANCING COMPETITIVENESS

The main consequence of integrating market based instruments for pollution control, within energy industry, is the development of a common market capable to assure the trading process for the entire commodities, facilitating the alignment between supply and demand in this particular sector. The common market is susceptible to respond to both social and environmental needs of the community, respecting, at the same time, the commercial interests of the companies' involved (Nielsen & Jeppesen, 2003).

It can be assumed that strategic options mentioned further could be achievable if certain suppositions are respected, as follows:

- the single market based instruments should be taken off the market, in order to be completely replaced with a common market, focused on pollution control within the energy industry;
- the participants onto the market should be reduced to energy suppliers and distribution companies;
- the market should be regulated by a central authority and the regulations should be similar in all the European Union countries.

Therefore, trading green certificates, white certificates and emissions certificates onto a common market may prove to be an effective way to combine a policy compliance target with the economic efficiency of market based instruments. Further, we present two strategic options for enhancing competitiveness within energy sector, by integrating the main market based instruments stated above.

3.1 Option 1: Integrating White Certificates and Green Certificates

From the cost perspective, integrating the supply and demand for tradable green and white certificates should result in a lower cost for society than if a single instrument from the ones stated above is being used. The integration scheme is presented in *Figure 1*.

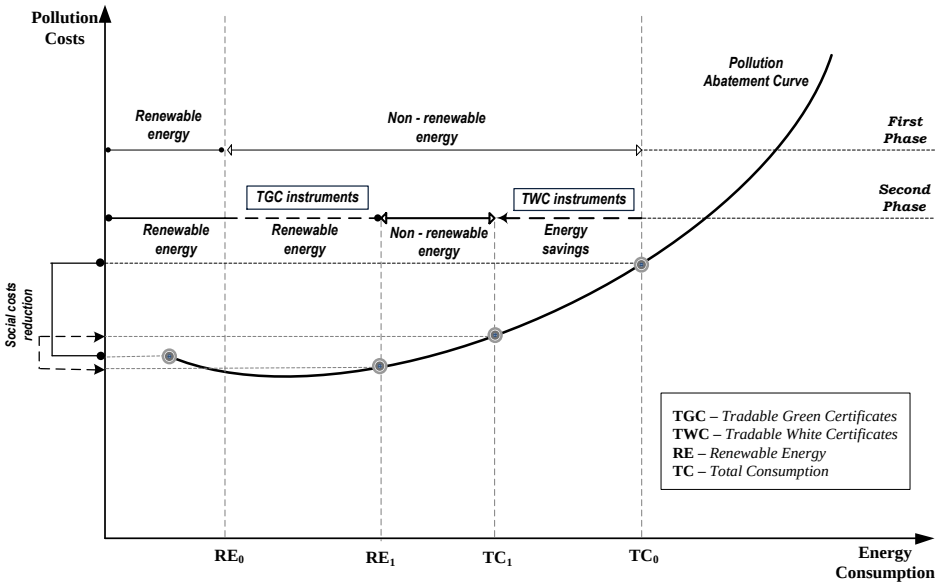

Figure 1. The consequences of integrating White and Green Certificates onto a common market
Source: Author

The main *advantages* of using this scheme can be summarized as follows:

- the strategic option, if applied correctly, may provide an efficient framework for reducing pollution abatement costs as well as for achieving Kyoto compliance;
- the strategic option leads to environmental risks downsizing, reflected in a lower dispersion of the pollution costs and therefore in lower risk provisions and higher liquidity indicators;
- the strategic option, if applied correctly, is susceptible to generate a high positive impact on the local community and on the environment;
- the strategic option, if applied correctly, could lead both to an increase in renewable energy production and to a higher cost-effectiveness in the achievement of given saving targets;
- the strategic option, if applied correctly, could lead to the creation of incentives to privately finance energy efficiency;

- the strategic option could lead to the avoidance of the very high transaction costs, resulted after the introduction of energy performance standards.

However, the main *disadvantages* of applying the stated strategic option, especially when the monitoring process concerning its implementation is weak, can be summarized as follows:

- the strategic option is not efficient, unless the energy savings certified through white certificates are due to non-renewable energy sources downsizing;
- the strategic option is not effective, if the green energy generated does not lead to lower energy saving levels;
- the efficiency of the strategic option depends on the ratio between the amount of renewable generated energy and the amount of non-renewable generated energy, which also influences the companies' position on the pollution abatement curve.

3.2 Option 2: Integrating White Certificates and Green Certificates in Emission Trading Scheme

The assumption of this strategic option (which has already been implemented in Great Britain and Italy) is that the integration of green and white certificates leads to CO_2 emission reductions and to even lower cost for society than in previous version, as shown in *Figure 2.*

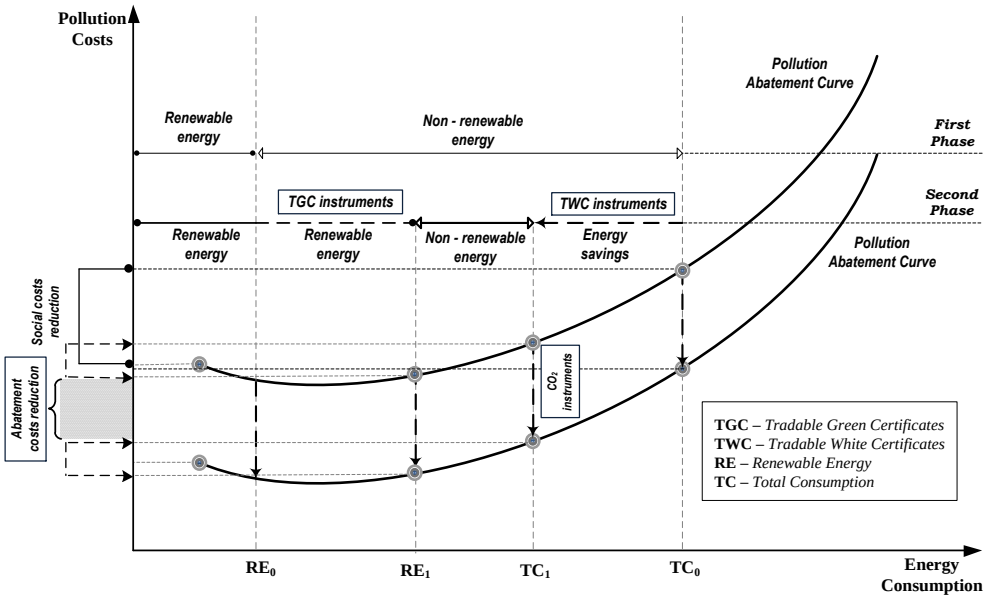

Figure 2. The consequences of integrating White and Green Certificates in Emission Trading Scheme
Source: Author

The main *advantages* of using the stated strategic option can be summarized as follows:

- it combines three types of tradable commodities, for cutting-off the social costs

and decreasing the pollution abatement costs, while increasing the economic benefits within energy operators and achieving energy efficiency targets;

- is one of the adopted actions taken in order to shift down the pollution abatement curve, as shown in *Figure 2*, as a result of the competitiveness growth within the energy industry, generated by a common market for the entire market based instruments;
- if applied consequently, unlike the previous one, it generates an increase in profitability, as a consequence of lowering the environmental costs and, subsequently, the overall cost of an operator.

The main *disadvantage* of the stated strategic option refer to the degree of uncertainty regarding the proper functioning of a common integrated market, as well as the long period of time necessary for building up a mature market mechanism, capable to ensure a fair competition onto the common market.

Beside these advantages and disadvantages, there are also other methodological issues which can influence the effectiveness of the strategic options. As shown both in *Figure 1* and *Figure 2*, one of the main purposes of strategic options is to downsize somehow the aggregate pollution abatement curve (the aggregate pollution abatement curve is one of the most popular instruments which emphasizes the intensity of pollution control within a given industry). However, aggregate pollution abatement curve is a more complex concept, being related to GDP per capita. Thus, it is the compound function of four pollution abatement curves (the direct damage curve, the cost of compliance curve, the cost of avoiding damage curve and the cost of pollution curve) and it synthesizes the relation between the economic development and the environmental costs. Hence, if the abatement costs are low, the level of pollution is high; also, if the income (GDP per capita) is high, the pollution abatement costs grow and the pollution level decrease.

4. DISCUSSION ON IMPLEMENTING A MARKET BASED INSTRUMENTS INTEGRATED APPROACH

As shown before, if implemented properly, *a project developing process focused on generating renewable energy and saving energy may lead to a decrease in CO_2 emissions*. Thus, the carbon displacement value, resulted as a consequence of applying a strategy onto the green certificates or white certificates market, along with CO_2 allowances (black certificates), could be integrated in an aggregate tradable instrument, which might be the object of either *futures* or *options contracts*, increasing the economic performance of the operators.

On the other side, one of the strongest arguments for promoting integrating *market based instruments* is that, under perfect competition circumstances, they *minimize the costs to society*. The minimum cost is achieved when the market price of the commodities equalises the marginal compliance cost (which is defined as the expenses made in order to comply with a certain environmental target or quota). Taking into account that currently each operator has a specific marginal compliance cost, implementing a market based instruments integrated approach will lead to the smoothing of the marginal compliance cost and therefore to a minimum level of environmental costs, in given circumstances of energy consumption.

However, an integrated trading scheme may involve complex administrative and technical mechanisms, increasing the risks of failure and requiring a long period of time in order to start functioning properly. The risks of failure are associated to any regulation on the

market, which generates additional complexity, whereas simple trading schemes could be implemented faster and can be controlled better. Thus, the decision of adopting a simple or an integrated scheme relies on the trade-off between a lower risk and rather inefficient alternative and a higher risk efficient alternative.

Despite the limits stated above for integrated schemes, the author recommend a unique commodities market, as simple schemes, such as White Certificates Trading schemes, for example, additional to other existing policy instruments that should not be used as barrier for implementing them.

Moreover, both energy saving and generating renewable energy, are multi-purpose targets, aiming pollution control, as well as regional cohesion, poverty alleviation or life-quality improvement, which cannot be managed throughout a simple TGC (*Tradable Green Certificates*), CO_2, or TWC (*Tradable White Certificates*) scheme. Under these circumstances, it is very difficult to find a commonly agreed measurement unit to link energy saving, renewable energy and CO_2 allowances systems, unless a common commodities market is developed.

Approaching the implementation of market based instruments in an integrated manner raise some questions regarding the focus of the energy policy.

Therefore, even if the tendency of policymakers in the global energy and environmental community is to develop and analyse a new policy instruments to combat climate change and secure the supply of energy, several aspects are still being overlooked or often neglected. The most important of them is the evaluation of potential interactions of these instruments, which can either inhibit the achievement of both targets, as well as increase the energy industry effectiveness.

Concluding, the tension between the economic development and the environmental compliance is still an up-to-date challenge both for national governments and for economic agents. Although several environmental actions were taken, especially regarding the development of environmental standards and regulations, there is still a trade-off between the economic growth and the environmental issues.

CONCLUSIONS

The paper presented two strategic options of integrating the main existing market based instruments for pollution control (*Tradable Green Certificates*, *Tradable White Certificates* and *Tradable Black Certificates*), in order to simultaneously achieve, under cost-effectiveness circumstances, both energy saving targets, as well as renewable energy targets.

It has been shown that using an integrated approach, despite its multiple side effects, is more efficient and rather recommended than using a simple trading scheme, which involves lower risks but is less efficient. Also, the paper provided a short overview of the main single market based instruments developed for ensuring pollution control, along with the main strengths and weaknesses of each strategic option of combining two or even three of the market based instruments presented above.

Moreover, there have been emphasized both the advantages and disadvantages for each strategic option and also the significance of a proper implementation of each of the schemes. Taking into account that our results are valid under perfect competition, further

research could be carried out under asymmetric information circumstances, or under chaos theory assumptions. Further research could be carried out in the field of evaluating whether developing an integrated approach will have a positive or a negative feed-back from the participants onto the market. Therefore, a deeper analysis upon Great Britain and Italy integrated schemes might provide the background for further improvements as well as for developing new market based instruments, more effective than already existing ones.

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