

Tradable energy efficiency certificates: the Italian experience

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Abstract The Italian white certificates scheme took effect in January 2005. The command and control component of the scheme, i.e., the energy efficiency obligation, was introduced with the implementation of the first European directives on the liberalization of the electricity and natural gas market (Ministero dell'Industria, del commercio e dell'artigianato. *Legislative Decree of 16th March 1999, n.79, 1999*; Ministero dell'Industria, del commercio e dell'artigianato. *Legislative Decree of 23rd May 2000, n. 164, 2000*), in the form of a public service obligation (PSO) raised on distribution companies. The market-based component, the trading of energy efficiency certificates (EECs), was introduced by the government in mid-2001, together with the definition of the level of the obligation and of the other elements of the policy package. In the following three years the regulatory authority for electricity and gas (AEEG) designed the implementing technical and economic regulation governing the system through an extensive public consultation. During the same period, a revision of some of the basic elements of the scheme was also carried out, in order to take into account some institutional changes (i.e., new shared responsibilities between the federal

government and regional administrations in the energy policy field), as well as some improvements suggested by the regulator. In December 2007, some components of the mechanism were updated on the basis of the results achieved and of the critical issues that emerged during its implementation (Ministero delle Attività Produttive (MSE). *Ministerial Decree of revision and update of the Ministerial Decrees of 20th July 2004, 2007*).

Keywords Energy efficiency · Energy savings · Energy services · Market-based mechanisms · Energy regulation · Energy policy · Measurement and verification · White certificates

Major design elements¹

The basic design elements of the scheme are summarised in Tables 1 and 2. In this paragraph we would like to highlight some distinctive features of the mechanism that we believe should be taken into account when comparing the Italian scheme with other country experiences where some form of end-use energy efficiency obligation and/or trading element is in operation. In particular, we would like to stress the following characteristics.

- The policy purpose(s): while the system aims at a range of policy purposes (e.g., greenhouse gas

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¹For a more detailed description of the design elements of the scheme as well as of the major reasons behind certain legislative/regulatory choices see Pavan, M. (2006).

Table 1 Basic elements of the scheme before the changes introduced in December 2007 (MSE 2007)

Subject	Effect
National target	2.9 Mtoe/year in 2009 (cf. Table 2) (*) Compliance period: annual Regulatory period: 2005–2009 (*) Banded: at least 50% of savings have to be delivered via measures on electricity and natural gas uses (*)
Obligated parties	Electricity and natural gas distributors; initially only those serving at least 100,000 customers as to 31 December 2001 (*) Apportionment rule: respective market share (*)
Eligible projects and measures	All end-use sectors plus small photovoltaic system and some measures concerning intermediate natural gas uses Only ‘hard’ measures (i.e., technology change); information campaigns only if add-on to specific ‘hard’ measures Early actions: projects developed as early as 2001 provided they have not been granted government, regional or local funding Other restrictions: some restrictions apply to projects that have access to other government incentives (e.g., CHP plants with access to green certificates, PV plants with access to feed-in tariffs) Minimum project size, but bundling of projects allowed with some restrictions
Eligible parties (i.e., parties that can be granted certificates)	a) All electricity and natural gas distributors; b) companies controlled by electricity and natural gas distributors; c) energy service providers (including, but not limited to ESCOs) (*)
M&V	Method of accreditation: savings are accredited ex post as opposed to lifetime-discounted accreditation Crediting lifetime: generally 5 years; 8 years for heating and air conditioning M&V methods: a) deemed savings; b) engineering methods (partially ex post); c) complete monitoring plans approved ex ante by the regulator (AEEG). Regularly up-dated Additionality: only savings achieved over and above market trends or legislative requirements are certified Verification and accreditation body: regulator (AEEG)
Certificates	Issuing body: electricity market operator upon AEEG authorization Types of certificates: a) for electricity savings (type I); b) for natural gas savings (type II); for savings of other fuels (type III) Un-restricted banking in the first regulatory period (*)
Trading	On a specific spot market or over the counter Market rules defined by the electricity market operator and approved by the regulator Who can operate: eligible parties plus market intermediaries (i.e., traders)
Non-compliance regime	Financial penalty for non-compliance with targets defined by AEEG General criteria governing the quantification of the penalty set in advance, but no pre-defined unit penalty (e.g., euro/toe not saved). According to its institutional law (Law n. 481/95), for the purposes of carrying out its functions AEEG can levy fines ranging from a minimum of approximately €25,000 to a maximum of approximately €155 million
Cost recovery	Designed and administered by: AEEG Level: 100 euro/toe; can be updated Eligible parties: obliged distributors Eligible costs: cost related to electricity and natural gas savings; up to the occurrence of the target; including costs of purchased certificates

Elements marked with a (*) have been modified starting from January 2008; please refer to paragraph “Recent legislative and regulatory changes”

emission reductions, reduced dependence on energy imports, development of the market for energy efficiency products and services) the target is set in terms of primary energy savings, i.e., tons of oil equivalent saved (toe).

- The market: the trading of certificates is a central element of the system. Market deals require no

authorization by AEEG or any other institutional body. Certificates are registered in an electronic registry and a specific electronic trading platform has been set up to allow the purchase and sale of certificates as an alternative to bilateral trading. Detailed rules and procedures have been designed to regulate access to the marketplace, to guarantee

Table 2 National energy saving targets before the changes introduced in December 2007 (MSE 2007)

Year	Target (Mtoe/year)	
	Electricity distribution sector	Natural gas distribution sector
2005	0.10	0.10
2006	0.20	0.20
2007	0.40	0.40
2008	0.80 (*)	0.70 (*)
2009	1.60 (*)	1.30 (*)

Elements marked with a (*) have been modified starting from January 2008; please refer to paragraph “Recent legislative and regulatory changes”

market transparency, security of market deals, as well as market liquidity.

- The target: energy savings are accredited on an ex post basis, i.e., only *after* they have been delivered. In addition, the crediting lifetime (that is the period over which certificates can be generated by a project) is fixed at five years, with the exception of projects that reduce consumption for heating and air conditioning, whose crediting lifetime is currently set at eight years. Both elements significantly increase the stringency of the energy efficiency obligation when comparing the Italian system with other national schemes where lifetime (discounted) energy savings count against the targets.
- Additionality: the scheme is governed by a strong additionality criterion. Only savings achieved over and above market average or legislative requirements (whichever is the more stringent one in terms of energy efficiency) count against the targets. Both in the ‘deemed savings’ and in the ‘engineering’ measurement and evaluation approach (cf. Table 1) the choice of the technological baseline is rooted in the calculations (Pavan 2006). In the ‘monitoring plan approach’ additionality has to be clearly demonstrated via a careful selection of the technological baseline, according to criteria set up by AEEG. All three M&V approaches are regularly updated in order to take into account the dynamic nature of the technological baseline. The criteria for the definition as well as for the implementation of the updated baseline have been set by AEEG at the start of the mechanism, on the basis of an extensive public consultation.

- Sector coverage: the system is completely open-ended, as any type of end-use energy efficiency measures qualifies for the issuing of certificates.
- Tariff component: as obliged parties (i.e., electricity and natural gas distributors) operate in a regulated market, the policy package includes a cost recovery mechanism that allows them to benefit from a tariff contribution (cf. Table 1). The design of this component poses a number of specific regulatory challenges (Pavan 2006).
- Non-compliance regime: national legislative rules prevent one from setting fully in advance the penalty for non-compliance with the energy saving targets, as well as from linking the non-compliance regime to the cost-recovery mechanism (that is to say, to impose the penalty as a reduction of the tariff contribution, or to use the sanction proceeds to increase the contribution to compliant parties, as in the case of quality of service regulation in place in Italy).

Overall progress and emerging issues

At the time of writing, the scheme has passed the first half of its current time frame (2005–2009), and it is possible to comment the results achieved in the first two years of implementation.

Compliance with targets and measures delivered

The overall target allocated to obliged distributors for 2005 and 2006 was approximately equal to 468,000 tons of oil equivalent saved, roughly 60% of which allocated to electricity distributors and 40% to natural gas distributors.

The amount of energy savings certified by AEEG exceeded this target by more than 90%.

Type I certificates (electricity savings) accounted for 78% of the total issued, type II certificates (natural gas savings) for 18%, and type III (other fuels savings) for 4%. Although this breakdown (as well as the split of the certificates that have been redeemed against the targets) shows that the “50% constraint” was met in both years, the overall picture looks relatively more favourable for electricity distributors: total type I certificates issued amounted to nearly five

times the minimum quantity required for obligated electricity distributors, while for obligated gas distributors the quantity of type II EECs issued was nearly two times the minimum quantity required for the two years.

The very low portion of type III certificates is clearly the result of the lack of tariff contribution for measures that reduce consumption of energy carriers or fuels others than electricity and natural gas (cf. Table 1).

The largest share of EECs (72.3%) has been issued to energy service companies, followed by non-obligated distributors (12.2%) and obligated parties (15.5%). A comparison between the first and the second year reveals that the portion of certificates issued to obligated distributors has significantly decreased, mainly to the advantage of non-obligated distributors.

While the picture looks quite different for different obligated distributors, these figures reveal that the dominant strategy of obligated parties so far has been to rely on trading in order to cover a substantial part of their respective target. The energy savings certified can be broken down into five broad categories of measures as shown in Fig. 1.

A comparison between the first and the second year shows the growing role of measures on electricity use in the household sector (e.g., replacement of light bulbs and electrical appliances with low-consumption models), whose share of the total certified savings has increased by 22 percentage points in the second year, and a decreasing contribution from measures on public lighting (high-efficiency light-bulbs, automatic systems to regulate lighting levels, etc.) and on energy production and distribution

systems in the residential sector (e.g., solar panels, cogeneration plants, district heating systems, etc.), whose shares have decreased by 15 and 10 percentage points, respectively.

Looking at specific types of measures, the largest contribution has been delivered by the diffusion of compact fluorescent light bulbs in a domestic context (53%), followed by the replacement of mercury vapour light bulbs with sodium vapour bulbs with incorporated feeder for public illumination uses (10.3%), industrial cogeneration (10%), the diffusion of flow shower heads and aerating nozzles for domestic uses (9.3%), district heating schemes (8.2%) and solar thermic energy (4%).

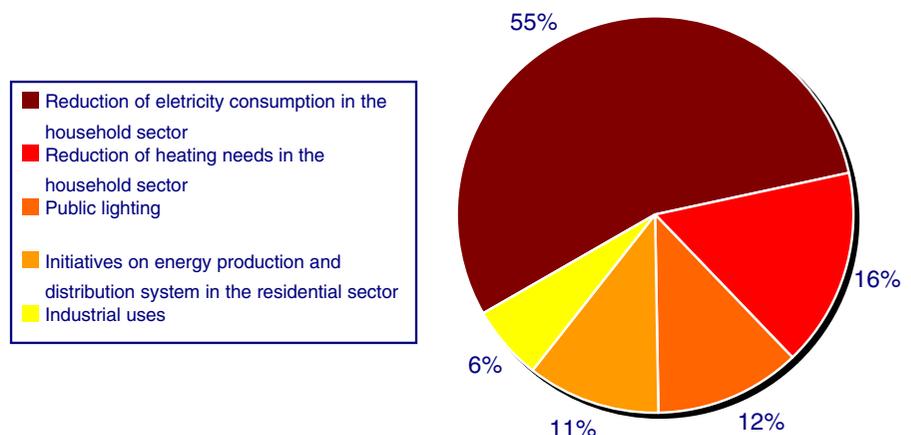
Of course this breakdown, as well as the observed trends, is still influenced by early actions and thus can not be taken as indicative of market preferences vis-à-vis the structure of incentives to end-use energy efficiency.

The overwhelming majority of the energy savings certified to date (roughly 90%) refers to projects for which stipulated savings and engineering M&V methods have been developed by the regulator (Pavan 2002, 2004, 2005a, b).

Trading

Both the number of parties on the registry and of market operators has been increasing, with the share of energy service companies growing faster ‘at the expense of’ distributors and traders. Also, the portion of parties that choose to register as market operators, thus showing an interest in trading during organised spot market sessions, is increasing.

Fig. 1 Major categories of certified energy savings (Autorità per l'energia elettrica e il gas 2007)



A total of nearly 472,500 EECs have been traded in the two-year period (with 1 EEC attesting 1 toe saved), a quantity slightly larger than the target, corresponding to roughly half the total certificates emitted during the same period of time, with virtually no change in these percentages between the first and the second year.

If one compares the traded volume with the minimum quantities required to meet the 50% constraint, the trading activity has been significantly higher in the case of type I certificates as compared to type II. This of course reflects the distribution of issued EECs between the demand and the supply side of the market. Virtually no trade has been registered in type III EECs as a result of the lack of tariff contribution for these certificates, coupled with the abundance of type I and II EECs to meet the target.

The volume of certificates traded over the counter (OTC) has been markedly higher than the volume bought and sold on the trading platform (78% versus 22% of all exchanged certificates), with a slight increase of the portion traded via the electronic exchange place in the second year. The relevance of OTC trading versus market trading has been higher in the case of type I certificates as opposed to type II, with OTC trading gradually decreasing in percentage from the first to the second year for both types of certificates.

The total economic value of trading via the marketplace amounted to €2.1 million in the first year and to €4.8 million in the second year. If one considers that the amount of certificates traded roughly tripled in the same period, this is clearly the result of the substantial decrease in market prices than has been registered particularly during the second year.

Figure 2 shows the development of market prices over the two years: the weighted average price of type I EECs traded in the spot market drop from about €77

to approximately €47.70, while for type II EECs the average price decreased from €94 to around €84.

Avoided energy costs

A comprehensive assessment of the costs and benefits of the scheme will be carried out at the end of the first implementation period. Some preliminary considerations can be made comparing the avoided energy cost for consumers that profited from the installation of more efficient technologies, with the tariff contribution granted to obliged distributors and with the average market prices of certificates. Figure 3 shows the trends in the final prices of different energy carriers expressed in comparable terms (€/toe). As it is shown, the energy cost avoided by consumers widely exceeded both the amount of the tariff contribution and the average market prices of certificates.

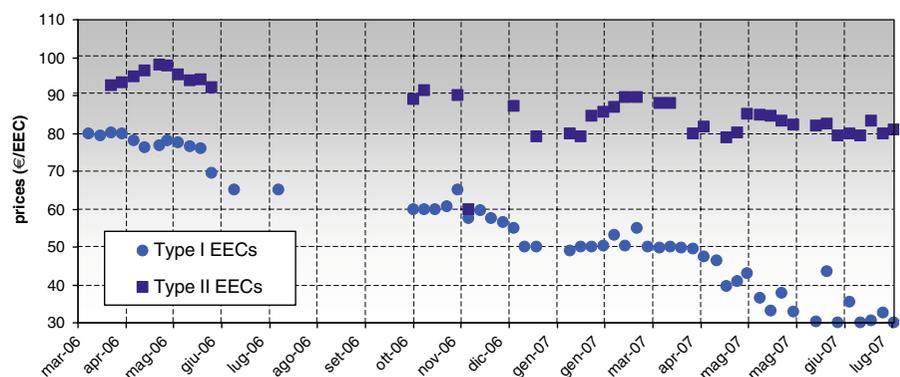
An interim assessment

The above figures and short-term trends showed a system that, overall, was working fairly well: the annual targets had been over-achieved, trading was an important option for obligated parties and contributed to the (over)achievement of the targets in a cost-effective way. These results were definitely positive and more than encouraging given the complexity of the overall scheme and its pioneering nature. Still, the same figures suggested further actions to improve the effectiveness of the system.

Analysing the supply surplus

The supply surplus in the EECs market was the first and key element of the above analysis that drew the

Fig. 2 Trends in EECs market prices in the first two years



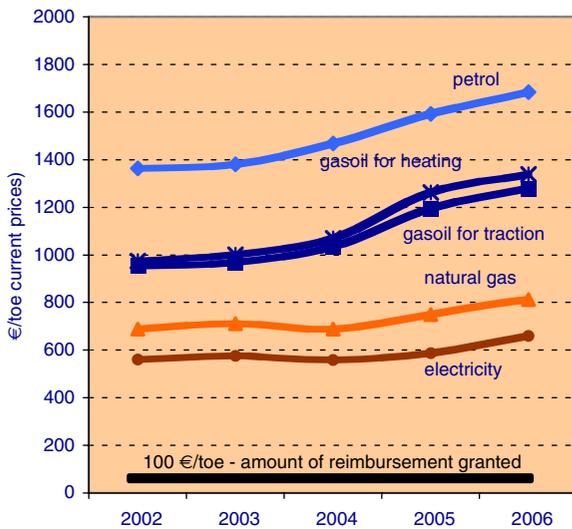


Fig. 3 Direct benefit of the energy saving for a domestic user (gross of taxes; Autorità per l'energia elettrica e il gas 2007)

attention of the regulator. Although this is unquestionably an index of success of the policy package itself, particularly if one considers the inevitable difficulties that are typical of the early stages of operation of any new mechanism, it requests some qualifications.

The first qualification relates to early actions: energy savings delivered by measures implemented as early as the year 2001 represent roughly 27% of the total issued certificates in the two-year period. Possibly, the contribution of early actions to the achievement of the targets was under-estimated when these were introduced as an element of graduality in the implementation of the scheme. However, it is worth noting that this contribution will constantly decline, as these measures reach the end of their crediting lifetime.

The second qualification regards the assigned targets: the apportionment criteria set by the government (size-threshold and market share: cf. Table 1), coupled with the structure as well as the dynamic of the electricity and natural gas markets, resulted in about 22% of the national target not being allocated. In other words, the demand for certificates driven by the EEO had been 22% lower than it could have been. Moreover, this gap would have inevitably grown in absolute terms, in proportion to the growth in the national targets envisaged in the coming years.

The total removal of the size-threshold would have totally removed this gap; however, as a result of this,

the administration of the mechanism would have become far more complex (and costly), since the number of obligated parties would have grown nearly 20-fold. A possible way out included lowering the size-threshold to an intermediate level (e.g., 50,000 customers served as opposed to the current 100,000 threshold) and redistributing the leftovers to distributors over this size, on a pro-quota basis.

Had some form of size-threshold remained in place, looking at a more recent snapshot of the market than the situation in 2001 would have allowed taking into account the trends and developments affecting the two obligated sectors to the advantage, once again, of the integrity of the national targets.

Analysing the current drop in market prices

The supply surplus had resulted in gradually declining average market prices of certificates (particularly for Type I EECs) and, thus, in dropping incentives to new investments (cf. Fig. 2).

As already mentioned, OTC trading had represented the largest share of the overall trading activity. Although there were signals that OTC prices had decreased less than the prices in the marketplace, most of the bilateral contracts have a multi-year time span and, as a consequence, the prices at which EECs have been or will be sold reflect the use of these contracts to hedge against the risk of price volatility in the coming years.

Understanding the reasons behind this entails to go beyond the simple ratio between the overall short-term demand and the total supply of EECs.

The more immediate consideration that one would make is that the growing stringency of the annual targets, together with the possibility to bank certificates, should have at least limited this effect. In our view, what happened is the likely outcome of an array of factors, including (but not limited to): expectations of market operators regarding the persistence of a supply surplus over the longer term; uncertainty over the future, given the lack of targets and of a clear political commitment for the post-2009 period; prevailing short-term strategies on the supply-side (which, in turn, is at least in part the outcome of the characteristics of this market); possible market power on the demand-side which, again, is mainly the result of the structure of the two reference markets; lack of confidence on the penalty mechanism, due to its complexity and to the lack of a pre-defined penalty (Pavan 2006).

If the above factors have had a major role in determining the observed price trends, then the situation and the resulting decrease in the level of incentives to investments in new energy efficiency measures required a number of actions. Some of those actions could have been taken reasonably in the short term, while others could eventually be undertaken over the longer-term and following a deeper analysis and political discussion, since they might concern some design elements of the scheme.

Potential short-term actions included the following:

- Extending the time frame of the EEO for at least a further five-year period, plus a strong political commitment for a longer time horizon, comparable to the time-frame of the European Directive 32/2006/CE and of the European Council Resolution of March 2007
- Broadening of the scope of the EEO to include smaller distributors, and the revision of the apportionment rules so as to allow the entire national target to be allocated and, thus, to drive the demand for certificates
- Simplifying the penalty system and strengthening of the enforcement mechanism
- Improving information publicly available on expected savings from approved measures compared to future targets; to this respect, however, one should notice that the inclusion in the system of measures for which energy savings have to be measured ex post inevitably limits the completeness of this information.
- Increasing the targets for the coming years, possibly via a temporal redistribution of the overall target already set, so as to keep this change politically acceptable.

Market trading versus OTC

The relative preference for OTC trading as opposed to market trading is not a failure of the system; rather it is a weakness from a regulatory point of view, since it reduces the transparency of trading both for market operators and for the regulator. Indeed, market signals (if not distorted) are important to monitor the costs incurred by the system to meet the energy saving goals, and are one of the possible reference parameters to update the tariff contribution to obligated parties, as well as to define the penalty for non-compliant parties.

The overwhelming preference for OTC trading has been observed despite the implementation of market rules specifically designed to ease access to the market, to grant transparency of market deals, to enhance security of market transactions, as well as to promote market liquidity (Pavan 2006).

One possible explanation to the prevalence of OTC trading includes the opportunity, for both the buyers and the sellers, to conclude forward contracts to hedge against the risk of price volatility. In addition, according to the major obliged distributors, bilateral contracts would allow them to limit transaction costs by purchasing large quantities of certificates ‘in one shot’ as compared to the small quantities being offered during market sessions. The nature and characteristics of some of the actors on the supply-side of the market (e.g., limited human as well as financial capacity) certainly had a role in driving these actors on the OTC market rather than on the spot market. Finally, trading between energy service providers and obliged parties which are part of the same company inevitably occurs under OTC.

A number of regulatory actions may be taken in order to enhance the intelligibility of the overall trading activity, to the advantage of all the parties involved e.g., introduction of price transparency in OTC trading or, alternatively, of an obligation to trade via the marketplace a certain percentage of the total traded quantities; introduction of measures to promote the aggregation on the supply-side; promotion of training initiatives specifically targeted at energy service providers and aimed at improving their knowledge of market rules, procedures, use of the electronic platform.

M&V

The overwhelming preference for measures for which simplified M&V methods have been developed by AEEG together with streamlined (electronic) accounting procedures, confirms the importance of having reliable but simplified energy savings calculation approaches and verification rules in order to ease the functioning of such a policy scheme by lowering its administrative burden. While every effort needs to be devoted at increasing the number of stipulated and engineering methods, whenever feasible and cost-effective, it is important to underline that the extensive sector coverage of the mechanism prevents

from covering a significant share of the total eligible measures.

More generally, the development of simple and easy-to-be-applied M&V rules requires the availability of constantly updated market studies and national statistics on the technological baseline, at least in those end-use sectors that are most likely to participate in this sort of policy mechanism. Official labelling scheme and minimum energy efficiency requirements are also very useful to this respect, since they greatly contribute to the identification of the technological baseline.

Complementary measures

Despite the positive results delivered so far, including the gradual development of new forms of partnership among various actors, the mechanism would greatly profit from the development of complementary, structural initiatives, aimed at facilitating the access of consumers to information on energy saving opportunities, as well as the access to credit, and the networking between actors on the supply-side.

In the first two years of operation, a number of information and awareness-raising campaigns were launched by obliged distributors through public funding specifically earmarked for this purpose. Consumers associations and environmental NGOs have set up some information clearinghouse targeted at consumers. However, much more is required in this respect at both the national and local level, and measures should be designed with a longer term prospective if they are to support the further development of the EEC market.

Finally, further effort should be put to encourage the financial sector to play an active part in the development of energy saving projects. This includes the definition of rules to enhance the use of third party financing, as well as the development of mechanisms in security for credits towards customers.

Recent legislative and regulatory changes

The above picture, together with the viable policy options to tackle the above-mentioned concerns, has been at the centre of the policy debate.

In order to increase the transparency of OTC trading, in December 2007 the regulator (AEEG)

introduced an obligation for obliged distributors to register the price at which each OTC trade is concluded, together with an obligation to provide the regulator with information on the main content of each bilateral contract concluded to meet their targets e.g., overall contracted volumes, criteria for price formation and update (in the case of multi-year contracts).

In the same month, the government issued a new bill in which some revisions as well as integrations of the scheme were introduced, with the aim of rebalancing the EECs market, promoting an upsurge of EECs market value and, thus, an upsurge of the incentives to the development of new investments in energy efficiency measures. The major changes can be summarized as follows:

- The targets for the year 2008 and 2009 have been increased and new targets have been set for the period 2010–2012 (cf. Table 3).
- The “50% constraint” (cf. Table 1) has been removed.
- A mechanism for ‘automatic adjustment’ of future targets in case of significant supply surplus has been introduced.
- The energy efficiency obligation has been extended to all electricity and natural gas distributors that serve at least 50,000 customers in the year $t-2$.
- The apportionment rules have been revised so as to allow the entire national target to be allocated to obliged parties.
- Certain industrial and non-industrial customers (e.g., public bodies, commercial customers) have been granted access to EECs for measures developed to reduce their own energy consumption and provided they have an “energy manager”.

Table 3 New national energy saving targets (MSE 2007)

Year	Target (Mtoe/year)	
	Electricity distribution sector	Natural gas distribution sector
2008	1.2	1.0
2009	1.8	1.4
2010	2.4	1.9
2011	3.1	2.2
2012	3.5	2.5

- The enforcement mechanism has been simplified and reinforced.
- Banking has been extended from the first (2005–2009) to the second regulatory period (2010–2012), without any quantitative restriction.

AEEG is currently working on the revision of the technological baseline for a number of deemed savings projects, starting from those technologies that typically penetrate quickly the market and undergo swift reductions in unit cost, such as compact fluorescent lamps.

In addition, AEEG is considering introducing new minimum product as well as project requirements for measures presented under the scheme, on the basis of the experience gained in projects evaluation since the start of the mechanism. These requirements will be subject to public consultation, together with the revised technological baselines.

Concluding remarks

The above analysis confirms the relevance of basic design and regulatory choices in determining the outcomes of a white certificates scheme: the choices of the obliged parties and the structure of the energy efficiency obligation; the scope of the mechanism in terms of eligible projects; the number and characteristics of the actors that are granted access to the market on the supply side; the nature of the enforcement mechanism; the technical (i.e., M&V rules) and economic regulation (e.g., cost-recovery mechanism, market rules and procedures) governing the system.

The analysis also confirms the need to look for an balance between apparently conflicting policy goals when taking regulatory decisions, for example: economic efficiency asks for diversity of technological and cost options and, thus, for a broad scope in terms of eligible projects and eligible parties; but a broad scope inevitably entails high(er) administration costs for both the regulator and the various market actors; efficacy in terms of energy savings delivered calls for accurate M&V rules and procedures, but this may conflict with the need to keep these rules and procedures as simple as possible in order to limit transaction costs.

In other words: the combination of “command and control” policy tools with market-based ones does not guarantee, per se, the achievement of both efficacy (in terms of targets) and economic efficiency.

Finally, white certificates are not a panacea, nor they work in a vacuum: they need to be complemented (and supported) by other policy actions aimed at overcoming the obstacles to the development of a market for energy efficiency products and services, e.g., information campaigns and clearing houses, energy labelling, minimum energy efficiency requirements, market studies and statistics to help identify the technological baseline and, thus, to give incentives where they are more needed.

In turn, the coexistence of different policy tools to promote end-use energy efficiency gains and the related public benefits, require a strong policy coordination effort at the institutional level in order to avoid over-incentives and alterations of market forces and signals, the latter being a key input for fine-tuning and updating the regulatory framework.

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