White certificates as a tool to promote energy efficiency in industry

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Abstract

Energy efficiency obligation schemes (EEOs) are used in many EU countries as a policy measure to reach energy efficiency targets. Some of the first EEOs (UK, Italy, France, Denmark) have been capable to reach positive results over the years, as clearly demonstrated by the ENSPOL project. The Italian mechanism, in particular, is an interesting example of white certificate scheme (WhC), since it is one of the most long-lasting schemes (operatively started in 2005), has ambitious targets, covers all sectors and energy efficiency solutions, and has many flexibility options in place (e.g. non-obliged parties, tradable market, bankability, etc.).

Another point of interest is Italian WhC development over the years. In the first phase, most of the projects were related to buildings with deemed savings as energy savings assessment method. Then the industrial sector rose constantly, till covering 80 % of the savings in 2014, mostly assessed through metered savings procedures. In the last three years, the buildings sector has started to recover, while metered savings have remained the most used energy savings evaluation procedure. This last development is mainly due to some regulatory decision and to the modification of the assessment of additionality for many industrial projects categories.

The paper will illustrate the reasons behind these developments, the issues that have arisen over the recent years, and the decisions taken to address them through a major redesign of the Italian scheme that has been introduced with new ministerial guidelines in 2017: many aspects – such as targets, baseline and additionality, saving assessment, and measurement, verification and control procedures – has been deeply affected. The paper will cover such themes, focusing in particular on the industrial side and highlighting themes like cost effectiveness, energy savings assessment, and how baseline and additionality have been dealt with over the years.

Introduction

When in 1999 Italy designed the liberalisation of its electricity and gas markets, it was decided to introduce some policy to involve energy distributors in energy efficiency measures. The policy was defined in 2011 as a white certificate scheme with a tradable market, with yearly energy efficiency targets expressed in primary energy savings and electricity and gas distributors as obliged parties. The main characteristics of the scheme as originally planned can be summarised as follows:

- An EEO scheme – the first in Italy dealing with energy efficiency – with targets increasing year over year (from 0.2 Mtoe in 2005 to 7.0 Mtoe in 2020);
- Only additional savings – as defined later in the document – are accounted for the issuing of white certificates (each certificate corresponding to one ton of oil equivalent saved);
- The capability to cover all sectors (from industry and buildings to transport and agriculture) and most energy efficiency solutions (provided they were not related to power production and they didn't consist only in control optimization and management);

- High flexibility, due to the possibility to have third parties implementing the energy efficiency project and for the obliged parties to use the market to supply of white certificates; besides, distributors are allowed to recover up to 40 % of each year target in the following year without incurring in fines;
- The idea of also promoting the ESCO market, since originally only ESCOs were allowed as voluntary parties in the scheme, as a way to improve the effect of the scheme to stimulate the growth of the ESCO market.

Due to the ambition of the scheme and its innovativeness, since most of the existing schemes were limited in terms of eligible solutions and/or sectors, the operative design took more time than anticipated and the scheme effectively started in 2005. Considering the long life of the Italian mechanism, it is interesting to illustrate how it evolved over time and the transformation it incurred in, in particular to highlight the main issues and the solutions adopted to overcome them. The last modification of the rules was introduced in 2017 with the Ministerial Decree 11 January 2017, also referred to as new guidelines in this paper. The changes introduced were aimed at extending the targets till 2020, improving the evaluation of energy consumption baseline and additionality, clarifying the responsibility of proponents and investors, and reducing the risk of frauds.

Before entering into such details, it is useful to briefly explain the scheme basics under the new guidelines.

The Italian WhC scheme's basics under the new guidelines

The Italian WhC scheme [2,3,4,5,6,7,9,12,14,15] is an EEO in which the electricity and gas distributors with more than 50,000 clients are obliged to reach increasing annual energy efficiency targets. It is a flexible mechanism – since the energy efficiency savings can be obtained through interventions from market operators (i.e. non-obliged distributors, ESCOs, and companies with a certified energy management system or energy management expert) – managed by GSE (public company in charge of operating the Italian scheme). White certificates are used to certify the energy savings and obliged distributors can buy them from voluntary parties, beside obtaining them directly. Each certificate corresponds to one toe of additional annual savings.

Figure 1 shows the various phases and activities related to the WhC scheme, from the energy efficiency project idea by the end-user (usually an organization, but can also be a person) to the verification of the target achievement for each obliged distributor. The exchange of white certificates between obliged and voluntary parties takes place on a dedicated platform managed by the GME (public company owned by GSE in charge of the Italian power exchange IPEX and of environmental and energy efficiency markets, i.e. emission trading, green and white certificates), either as a spot market exchange, or as a bilateral agreement between parties. The WhC scheme can thus work as an incentive for the voluntary parties, considering however that the WhC price can vary over the time and that there are no assurances that the certificates can be sold every year (in case of oversupply the price of the certificates drops and it can become difficult to sell the owned certificates).

The cancellation request consists in the obliged distributor asking GSE to use a certain number of owned certificates to achieve its target (totally or partially). Such certificates are then "cancelled" from the distributor's GME registry, avoiding the possibility to trade or use them a second time.

Figure 1 also shows the various institutional bodies involved in the white certificate management, in addition to GSE: Ministry of Economic Development (MiSE), which is in charge of the policy and defines the guidelines in accordance with the Ministry of Environment, ARERA (Regulatory Authority for Energy, Grids, and Environment), which deals with tariff reimbursement and obliged parties not meeting their minimum

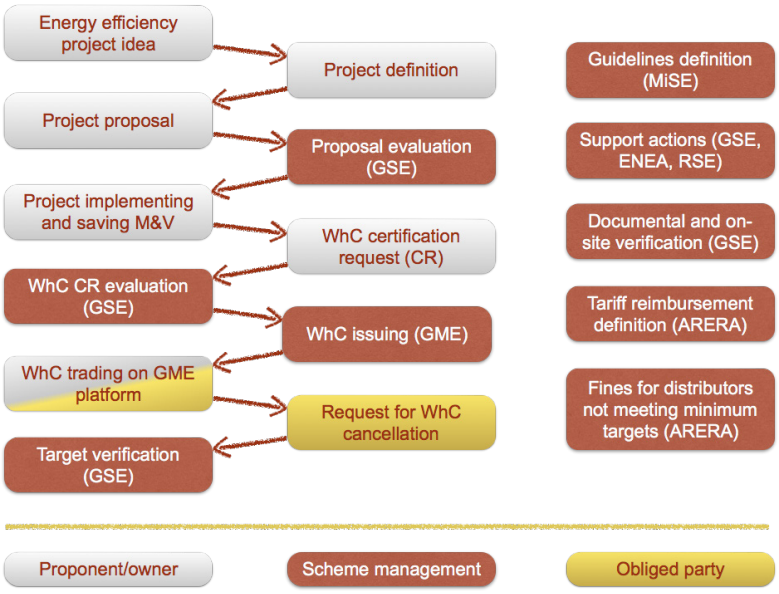

Figure 1. WhC scheme phases and activities, from project definition to white certificates cancellation.

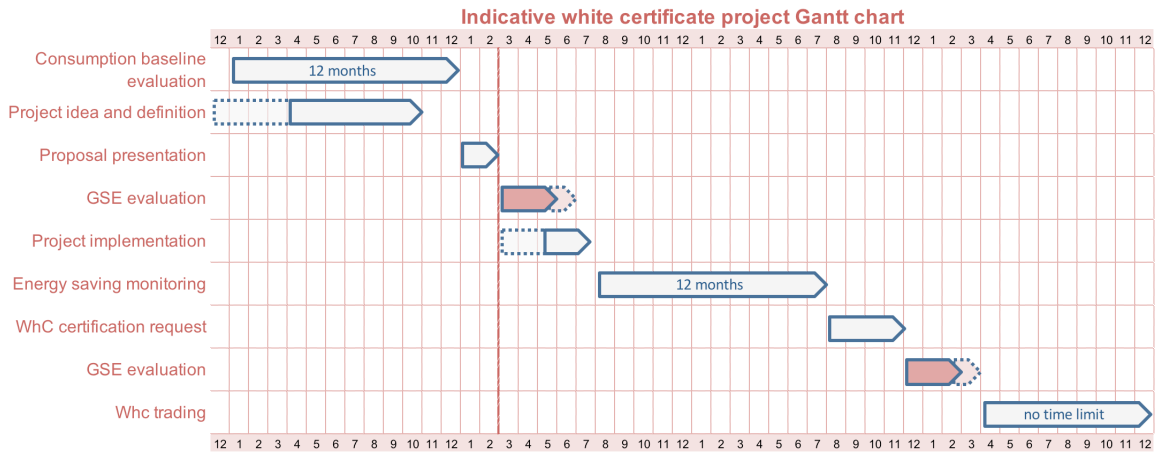

Figure 2. Indicative Gantt chart of a white certificate project.

targets, ENEA (Italian Agency for new technologies, energy and environment) and RSE (public company owned by GSE in charge of research activities in the energy field), which support GSE in its evaluation and verification activities.

In terms of methodologies for evaluating energy savings, two methods are now considered:

- Standard projects (SP, a mix of deemed savings and metered savings), where savings are calculated based both on the installed units and the measurements done on a statistically representative sample. This will ensure a more reliable evaluation of energy savings for standardised solutions.
- Monitoring plans projects (MPP, a type of metered savings), which remain similar to the past [12], but with additional requirements for the consumption baseline that has to be based on meters capable of at least daily measures of the savings and on recorded data for at least one year (exceptions are possible in terms of shorter monitoring periods, but should be adequately justified and a precautionary approach should be applied).

In both cases the proponent (i.e. the applicant) has to first present a proposal in which the project is defined and all the required information needed to assess it are provided (i.e. needed meters, algorithm to calculate the savings, consumption baseline, adjustment factors, additionality, forecasted working condition, etc.). In particular, all factors that impact the energy consumption should be considered (e.g. climate, load factors, manufacturing trends, etc.). Such request shall be presented before the beginning of the project implementation and this, coupled with the twelve-month measurements for the consumption baseline, introduces an important constraint. After such proposal is accepted, the energy savings shall be measured (only for the sample in the case of SP) over at least one year, and then a request of certificates (CR) could be presented. GSE checks both the savings and the additional documentation that demonstrates that the project has been effectively implemented and complies with all the relevant regulations and standards. Then a number of white certificates corresponding to the measured additional savings is issued and the proponent can start trading them (or it will just stock them to fulfil its target if an obliged distributor).

Figure 2 shows the timeline of the various activities related to an energy efficiency project that exploits the WhC scheme.

To assess the additionality, the energy savings are evaluated as follows (Figure 3):

1. *Ex-ante* baseline. The energy consumption baseline is evaluated (for example, the consumption of the old lighting system in a manufacturing site, based on fluorescent lamps, is monitored over twelve months);
2. Adjusted baseline. The "*ex-ante* baseline" is then adjusted to the reporting period conditions, considering the external variables influencing the consumption (e.g. in the lighting example: effective working hours, illuminated area of the floor, etc.);
3. A) Market-adjusted baseline. The "adjusted baseline" is further adjusted considering the application of the new technologies available on the market (as average market offer) to deliver the service provided by the evaluated project (e.g. in the lighting example: since presently the average market offer is based on led lamps, the "adjusted baseline" is reduced as if such lamps were already used in the *ex-ante* situation).
3. B) Standard-adjusted baseline. If minimum performance standards exist that affect the acceptable energy consumption of the new technology, they are applied to the "adjusted baseline" (e.g. in the lighting example: in this case, there aren't performance standards that go beyond the led lamps on the market, so there is no "standard-adjusted baseline").
4. Reference baseline. The minimum value between 3.A and 3.B is used to evaluate the savings by subtracting the *ex-post* energy consumption determined by the new installed solution.

With reference to Figure 3 the "adjusted baseline" can be higher or lower than the "*ex*-ante baseline".

Considering the industrial lighting example, to be able to deliver savings under the scheme, the new lamps shall have an efficiency higher than the market average and only the difference of performance between them determines the accounted savings. It can be noticed that such definition of additionality is very tight and goes beyond the EED requirements. Clearly it

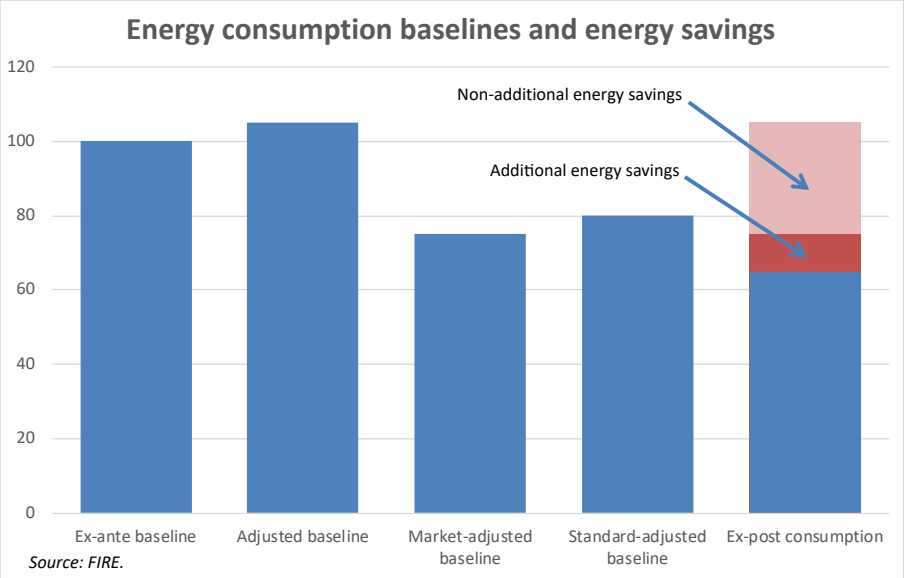

Figure 3. Energy consumption baseline and additional energy saving in the Italian white certificate scheme.

makes the generation of new white certificates quite difficult, since the baseline to compare with becomes the technologies available on the market and not the installed ones under the business as usual scenario. The possibility to produce additional savings depends on the particular energy efficiency solution considered, but this approach doesn't help improving the supply of white certificates on the market. The data on 2017 confirm this issue: MPPs approved with the new guidelines have an average potential of 277 toe per proposal, against 3,340 toe per proposal of MPPs approved with the previous guidelines.

It is worth highlighting that in the Italian scheme it is the proponent that has to evaluate the additionality of the energy efficiency project. This is not an easy task, especially in the industrial sector, where the variety of manufacturing processes makes the definition of a business as usual scenario quite complicated. In practice, the proponent has to present data on the existing plant, on the offer of technologies available on the market with the respective efficiency indicators, and on the forecasted modification of the manufacturing process.

The savings generate white certificates for a period of time that varies from seven to ten years, apart from behavioural measures (an option introduced by the new guidelines), which get three years of certificates. Previously the WhC projects lifetime was five years for most cases, eight years for building envelope projects, ten years for high efficiency cogeneration, and fifteen years for district heating. However, high efficiency cogeneration and district heating follow different rules and are not considered in this paper. This change in the rules implies a reduction of certificates, at the same savings, with respect to the previous rules, as summarized in Table 1 (typical values).

In terms of eligible projects, the new guidelines reduce the available options with respect to the previous years. The main reasons behind the exclusion of many solutions are the low additionality and the short pay-back time, which would have translated in an over incentive. Table 2 shows the list of eligible projects in the industrial sector. Other ones can be proposed to the Ministry of Economic Development, which in case will issue a statement to integrate the list. It is worth noticing that heat recovery remains available in the industrial sector, but provided it wasn't technically possible in the *ex-ante* situation. This reduces the possibility of using it only in very particular cases, for example thanks to the introduction of new materials or innovative solutions in the chemical sector.

A project proposal can be presented either by the owner of the refurbished or newly created plant (i.e. the investing subject) or by a proponent (a distributor or an ESCO) that can be delegated to both present the proposal and manage the white certificates (GME registry, trading, etc.) or just present the proposal, with the owner managing the certificates. In the first case both the proponent and the owner share the responsibility of the project against the GSE in case of non-conformities. White certificates cannot be cumulated with other state incentives since 2013.

Main results

As shown on Figure 4, after a first phase of oversupply (available certificates overcoming the yearly targets) lasted three years, for the following seven years the scheme dealt with a slight undersupply, with the opposite sign exceptions of 2010 and 2013. Then, in 2015 and 2016 a large lack of available certificates took the scheme toward a high pressure on supply, with the effect on WhC prices that are summarized in Figure 5 as weighted averages.

The reduction of targets set for the last four regulated years take into account both the mentioned undersupply and the elimination of the so-called *tau* coefficient [4,7,9,15]. The *tau* coefficient was introduced in 2011 to take into account the technical life of the energy efficiency projects, thus ensuring a better promotion of long life, and usually more complex, ones. More information on how it worked are available in the indicated references.

To be noticed that distributors have a two-years window to recover the certificates not produced in 2015 and 2016 taking

Table 1. Discounted value of white certificates received over the WhC lifetime at 150-400 Euro/certificate for a typical industrial project. 5 % discount rate considered.

	WhC lifetime	Total certificates per saved toe issued over WhC lifetime	Total discounted value of certificates euro/toe
Previous guidelines	5	16.8	2,182–5,819
Present guidelines	10	10.0	1,158–3,089

Table 2. List of eligible projects in the industrial sector under the new guidelines.

Eligible energy efficiency measures in the industrial sector	WhC lifetime (years)
Behavioural measures (efficient reporting and management systems, data analysis systems for individual plants, utilities and vehicles, initiatives aimed at the use of low emission vehicles)	3
Components for heat recovery, mechanical steam recompression systems, regenerative burners, electric motors, compressed air production plants, power quality systems, refrigeration units and heat pumps, lighting systems	7
Thermal energy production plants, systems for the treatment of gaseous effluents, hot air generation, dryers, cooking ovens, melting furnaces, pre-heating ovens, high temperature radiant systems for air conditioning, energy recovery in LNG regasification systems, ORC plants in non-cogenerative asset	10

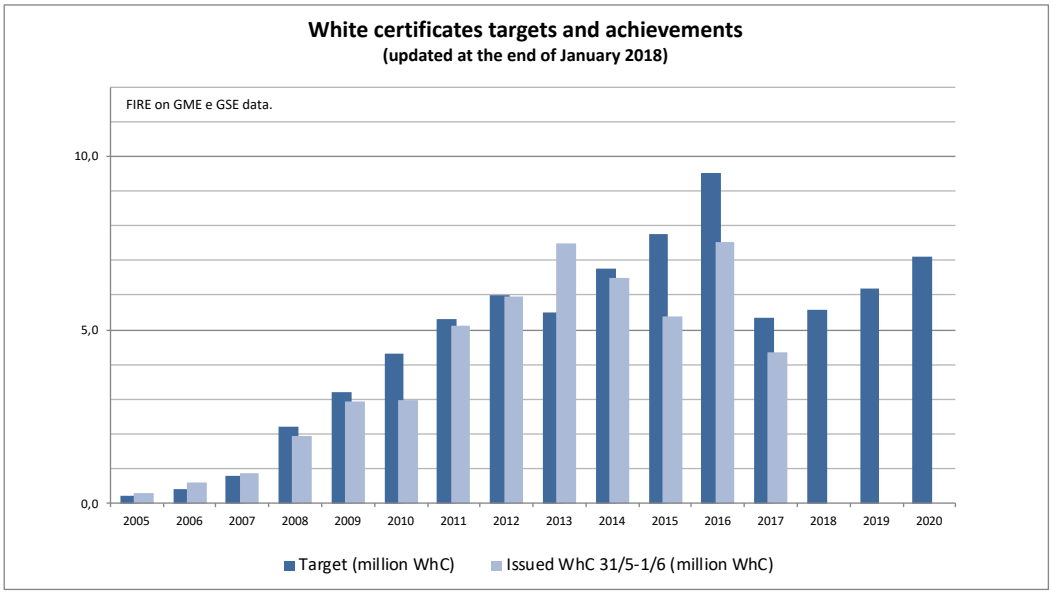

Figure 4. White certificates targets and issued certificates over time.

advantage of the 60 % minimum target. Cumulatively, over 3.4 million certificates have to be recovered, making the 2017 and 2018 targets quite ambitious despite the targets decrease.

The reduction of the capability of the scheme to produce a quantity of certificates in line with the targets is the results of a mix of factors, which will be illustrated in detail later and can be summarised as follows:

- Introduction over time of very tight requisites on additionality;
- Progressive reduction of the possibility to use deemed savings methodologies, pointing towards effectively measured savings;
- Introduction of tighter requirements for the evaluation of the energy consumption baseline in the last years;
- Progressive reduction of the eligible projects, due both to the evolution of the additionality and to the saturation of low capital-intensive projects.

With capital-intensity the ratio between the CAPEX and the yearly energy savings of a project is intended here. Short payback time projects have a capital-intensity below 1,000–2,000 Euro/toe, with a cost of energy respectively around 500–1,000 Euro.

White certificates can be traded either on the spot market or bilaterally, in both cases on a platform managed by GME. Prices are transparently available: for every weekly spot market session minimum, maximum and weighted average prices and quantities are available, together with the intra-session trend, whereas bilateral exchanges are reported as monthly averages, divided by price classes.

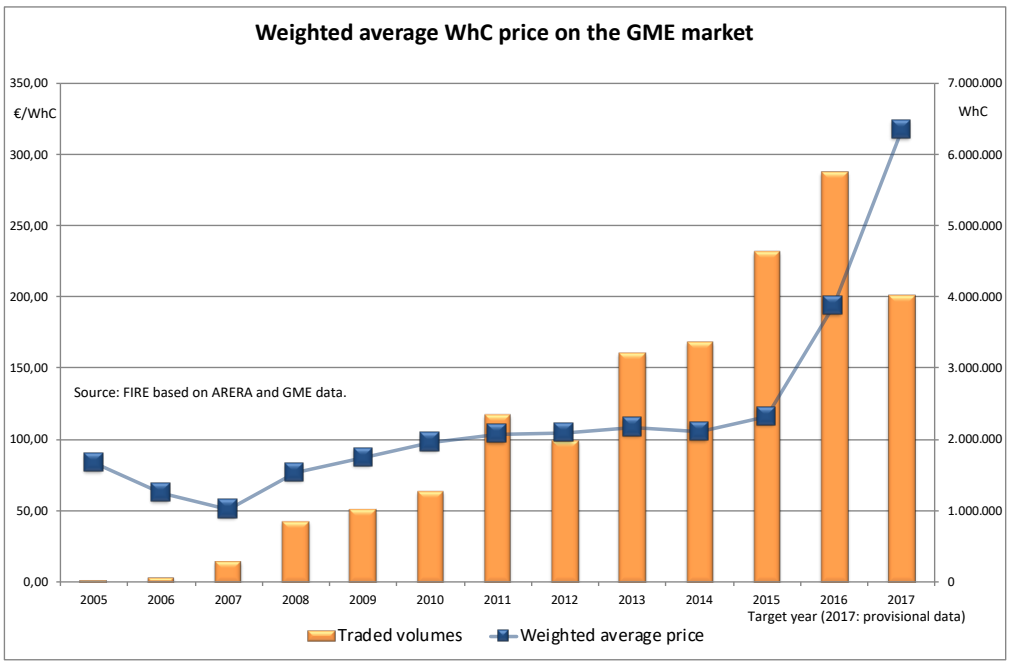

Figure 5. Weighted average price of white certificates on the spot market and traded volumes.

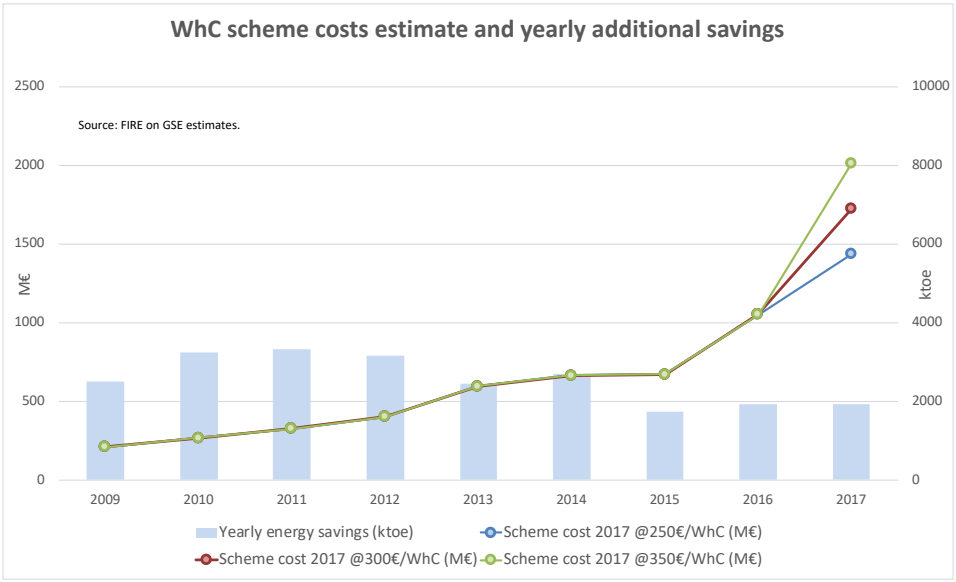

Figure 6. Estimated cost of the WhC scheme and yearly additional energy savings.

The costs incurred by the obliged distributors, being regulated companies, are partially reimbursed through a tariff reimbursement component defined by ARERA and linked to the weighted average price of the certificates in the spot market the previous year (the difference in the past has been confined within 2 Euros/certificate; for more information, see [9]). That means that the cost of the scheme can be calculated as the product of the cancelled certificates[1] and the tariff reimbursement component.

Figure 6 shows the estimated cost of the white certificate scheme in Italy, as related to the total value of the tariff reimbursement, together with the yearly additional savings generated under the scheme. The yearly savings differ from the issued certificates because of the *tau* coefficient [7,9]. There is no rule to link the two variables, since a) the value of the average *tau* changed over time and b) the *tau* coefficient was not applied to all the issued certificates.

The costs incurred by GSE for information, evaluation, and control has been around 14 million Euros in 2016. No comprehensive information is available on the investments made to implement the energy efficiency projects, even if in the recent years such data have been requested for all MPPs. Nevertheless, GSE estimates investment slightly below 1 billion Euros and around 11,000 full time equivalent direct and indirect jobs created.

1. As previously explained, a certificate is cancelled when is presented by an obliged distributor to GSE to fulfil its target.

The industrial sector

Most EEO and white certificate schemes deal mainly with the building sector [9,10,13]. The Italian WhC scheme has taken over time a different road. Even if theoretically up to 2016 all sectors were completely eligible, with few exceptions due to solutions considered non or slightly additional, there have been two phases. The first one (2005-2011) was dominated by projects related to the building and service sectors. The main reason was the easiness to propose projects in those sector thanks to the larger availability of standard projects files [2].

In the second phase (2012–2017) the industrial sector took the leadership, delivering most of the certificates. Figure 7 exemplifies such trend. It is to be noticed that in the years 2012–2014 the result was affected both by the possibility to present proposals for projects already implemented, leading often to more than one year of savings presented with the first application, and by the higher average value of the *tau* coefficient in the industrial sector.

The reason of the rise of the industrial sector can be imputed to two facts (see also [6,7,12]): a) the higher convenience of industrial projects, usually characterised by shorter pay-back times than interventions in other sectors, and b) the larger dimension in terms of savings, which make it easier to reach the minimum project size admitted by the guidelines. On the other hand, industrial projects required some years before increasing in quota due mostly to the higher complexity (only a few standard projects files available, requiring thus the use of metered saving projects [9,12,14]).

Some elements have been successful and demonstrate that white certificates can promote industrial projects: a) since 2012 industry has produced over half of the annual certificates and energy savings, b) almost all savings are measured, besides being additional, c) the presence of white certificates not only stimulated many projects, but also created much more attention to energy efficiency in industrial enterprises, d) WhC spread the knowledge of energy efficiency opportunities in the industrial sector.

Figure 8 shows what solutions contributed more to the issuing of certificates in the industrial sector in 2017, on a total of 3,535 thousand certificates issued through MPPs, corresponding to 1,078 ktoe of energy savings. As it can be seen, most of the savings comes from improvements in the manufacturing process. In [6,7] many details are given on industrial projects and type of interventions implemented until 2014. Unfortunately, no official statistics or report have been available since then with the same degree of detail. Apart from MPPs, around 50,000 certificates were produced through simplified project (standard and metered savings), confirming that almost all the certificates come from MPPs. Globally, 47 % of the over 41 million issued certificates are related to industrial projects.

Among the aspects that favoured the success of the industrial sector, the MPP approach played a positive role. Even if it requires the proponent to deal with complex issues, like adjusted consumption baseline, reliable monitoring and verification, additionality, etc., it also gives flexibility, since theoretically allows almost all energy efficiency measures to be presented within the scheme, and ensures an accurate assessment of energy savings. Simplified procedures to evaluate the energy savings, on the other hand, pay the simplicity to participate in the scheme with gross and unreliable estimates of energy savings, no assurance that savings are really obtained over the project lifetime (or at least its "incentivised" lifetime), and higher risks of frauds.

The approach based on metered savings and reliable M&V procedures produced two other benefits: a) it improved the know-how and skills of end-users, ESCOs and other market operators, leading to an improved capacity of the market to find and propose energy efficiency measures integrated with manufacturing processes, and b) offered to the management bodies (GSE, ENEA, and RSE) a lot of data on industrial processes and their usage and transformation. The advantages of

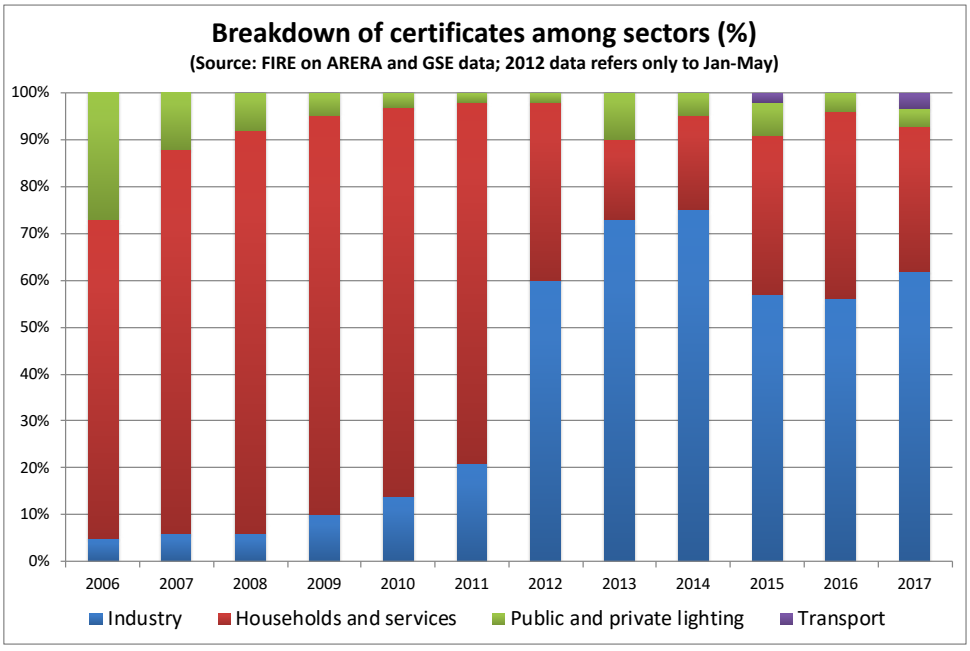

Figure 7. The composition of energy savings under WhC.

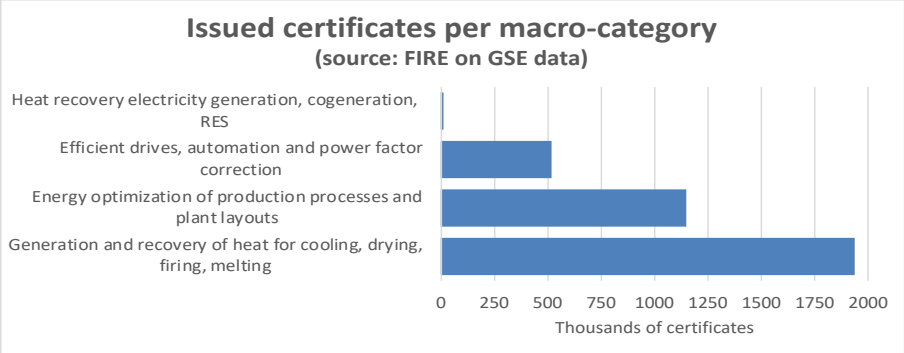

Figure 8. Contribution from different types of industrial solutions (2017).

such availability of data appeared clear during the analysis of industrial projects implemented under the EU-MERCI project, to produce its database of industrial energy efficiency good and best practices (the EU-MERCI projects' database is available at www.eumerci-portal.eu).

The existence of the WhC scheme created a more favourable environment for energy efficiency in enterprises. According to many energy managers interviewed by FIRE over the years, the possibility to get an incentive gave them access to the initial decision process about investments related to their companies' core business, since top managers understood the value of energy efficiency improvements by exploiting WhC.

The prominent role of industrial projects was recognised in the two national strategies issued in 2013 and 2017 (Ministerial Decree 8 March 2013 and Ministerial Decree 10 November 2017) that require to improve the WhC scheme especially toward the industrial sector, whereas tax reductions and the so called "heat account" scheme were aimed to the building sector. Due to the strict additionality requirements of the scheme, this shift toward industry of the scheme represented a challenge in terms of evaluation, both for the managing bodies and for the proponents.

Main issues arose over time and changes adopted to overcome them

Every policy scheme presents some issue over time. A complex scheme like the Italian WhC faced many problems during its twelve years' lifetime. The main ones are described below, together with the changes introduced to overcome the issues.

Materiality. The capability of the WhC scheme to effectively promote energy efficiency projects has been changing over the years, depending on general rules and also particular cases. In the first years, the connection between the scheme and the adoption of compact fluorescent lamps (CFL) and other low-cost interventions is crystal clear. However, the possibility to present projects after their implementation and start-up posed some questions, in particular on proposals presented as MPPs in the industrial sector.

For this reason, it was decided to change this rule for MPPs starting from 2014: since then the proposal should be submitted before the implementation of the project. This is a tough requirement, especially with the new guidelines, since it is not always possible to match the needs of an industry in terms of decision process with the timeframe of the WhC scheme. In particular, if the required meters are not already in place when the company starts to define the new project, it is difficult to comply with the deadlines of Figure 2. The new rules thus ensure a higher materiality, but at the cost of reducing the number of projects available to be presented, or, to express the issue in another way, reduce the number of projects that can profit from the white certificate scheme.

Over incentivizing. In a market scheme that incentivises the saved toe irrespective of the project, it is expected that some technological solutions are particularly stimulated (e.g. short pay-back time interventions like heat recovery, compressed air, and lighting), whereas others remain slightly moved (e.g. long pay-back time measures like some manufacturing process transformations). Among the specimen of the first group it is possible to identify solutions that are over incentivised, i.e. get more money than requested to promote the investment (see [7] for examples).

Theoretically this issue is automatically solved, since the interest risen by the involved projects improve rapidly their market quota and makes their savings non-additional. Since this evolution can be more or less fast and in certain cases the amount of certificates involved can be huge, especially when dealing with industrial projects, policy makers have to decide if waiting for this self-fix or accelerating the transition by making the related projects non-eligible. This is the road followed in the Italian case with the new guidelines, which excluded many technical solutions to avoid over incentivising. However, the risk is to deal with a basket of eligible projects with a high capital-intensity, which require a higher incentive to be implemented. This poses some questions on the rationale of the choice. In fact, other schemes can be more effective when dealing with high capital-intensive projects, since the price of the certificate can vary over the time, which constitutes a risk against the expected revenues for the proponents. To be able to move the investment decisions the certificate prices shall rise to offer a higher contribution than the one expected with a traditional incentive scheme (e.g. a subsidy or a feed-in tariff). In the industrial sector this can be insufficient, since the perceived risk not to reach the desired economic performance can lead to a disinterest in the scheme. This is one of the issue policy makers have to confront.

Consumption baseline. In the Italian scheme, most of the savings are effectively measured. The new guidelines substantially require the adoption of a measurement and verification protocol (even if they impose some rigidity, as for the metering daily

sampling, and don't ask to adopt any existing protocol, like for example the IPMVP, a well-known international performance measurement and verification protocol). This ensures that the evaluation of the energy savings is quite precise and reliable, but, on the other hand, makes it costly. The decision to extend it also to SP, requiring the metering of a qualified sample of interventions even for simple projects, adds to the present difficulty to produce new projects under the scheme.

Additionality. Being an integrated concept, i.e. the proponents have to understand and evaluate it for each project, this is the main barrier to the scheme utilization. Since the beginning the approach to additionality has been quite advanced in the Italian scheme, but with the new guidelines has been taken beyond the requirements of the EED directive, as previously explained, focusing on the promotion of the best technologies. With two consequences: not only presenting additional savings has become a real challenge, but also an important part of the savings conceptually collectable under EED art. 7 are missed.

The reason beyond the evolution of the additionality rule is that of reducing the complexity and subjectivity of the previous approach, which allowed to also consider the accelerator effect permitted by the EED. But this choice is under discussion and most probably will be modified.

Complexity and attractiveness. A scheme can work even if complex, as demonstrated by the Italian WhC, provided attention is dedicated to support and accompanying measures and that the market price is allowed to reach the value required to make it attractive for end-users and market operators. The tradable market, in particular, helps in finding good equilibrium points, avoiding posing such task on the policy maker, as it happens with traditional incentive schemes. But it can also lead to serious problems in terms of price and cost if there is no equilibrium between demand and supply.

The new guidelines, to lighten the complexity burden, introduced the provision of sectoral guidelines to be produced by GSE to address in particular the evaluation of the consumption baseline and the additionality.

Target setting. One of the main issues with EEOs is the definition of the target that the obliged parties should comply with. Despite the *ex-ante* evaluation implemented to address potentials and options, many variables can affect the effective capability of an EEO scheme to deliver the expected result. In the case of a white certificate scheme with a tradable market, target definition is even more important, since the price of the white certificates depends on the trend of demand (target) and supply (available certificates). An inadequate target will either translate in low prices and limited attractiveness of the scheme, thus reducing its capability of stimulating the market, or rise the market price and the cost of the scheme, with the risk of providing a low cost-effectiveness, attracting speculative and/or fraudulent behaviours, or making the scheme non-sustainable.

One of the issues with the additionality requirement, if integrated in the scheme, is that it is challenging to forecast for how much time single energy efficiency measures will remain eligible, before the modification of additionality makes them non-additional or slightly additional. This has been the case with CFL and many industrial interventions (e.g. heat recovery, use of refuse-derived fuels – RDF – in the cement industry, indoor LED lighting, etc.) in Italy. The result has been a dramatic reduction of the capability of the system to supply enough certificates, leading both to a white certificates undersupply – with the subsequent increase of the market prices – and to the need to reduce the targets in the last regulation periods.

Figure 4 shows that there have been four phases in the definition of the scheme targets. After the first three years, it seemed possible to consistently rise the target, due to the oversupply that characterised that period. However, the subsequent increase of the targets (2008–2012) was too optimistic and wasn't accompanied with a sufficient response from the supply (even if between 2005 and 2012 there has been an impressive tenfold increase of certificates issued annually). The third phase (2013–2016) was thus opened by a reduction of the targets, but two factors contributed to make it insufficient: the request to present the proposal before the implementation of the energy efficiency project and the decision to exclude a lot of projects due to over-incentivising considerations. The second aspect impacted especially industrial project, characterised usually by shorter pay-back times.

The idea, in line with a rigorous approach to ensure a better expenditure of state and tariff-collected resources adopted for all incentives in the recent years, was probably under evaluated. In fact, the effect on the market has been the rise of prices expressed in Figure 5 and the corresponding rise of total cost shown by Figure 6. If such price values should be maintained the negative effects will overcome the positive ones. More than that, many industrial companies, especially the multinational ones, see negatively the risk related to WhC price volatility, even if the present prices appear quite interesting.

The price trend is not due only to the present ratio between demand and supply, since distributors can use target flexibility, but to the uncertainty on the capability of the new guidelines to produce enough certificates in the future.

The main consideration is that targets setting, especially with a tradable market scheme and in case of important changes to the rules, requires a lot of attention. Scenario evaluation can help, but it is not always reliable, especially with a large involvement of the industrial sector, since unexpected market transformation that can affect energy efficiency projects are more frequent than with the building sector. The right balance between the potential of the supply, the need to stimulate it, and the EU targets has to be found. And rules play a fundamental role in facilitating supply developments both in the short and medium term.

Frauds. One of the consequences of the high WhC prices has been the attempt from criminal organisations to exploit them by presenting proposal under standardised projects. Thanks to GSE verification activities and Guardia di Finanza action, a large fraud was discovered in summer 2017. The provisional value of the involved certificates was 700 million Euros (of which 105 million Euros unfortunately already obtained and delivered to Eastern Europe countries and UAE through a series of linked companies).

Similar issues emerged also in France[2] and are unfortunately easy to create with simplified approaches to energy saving evaluation. So, it is important, especially in the case of simplified procedures like standard projects, to pay attention to the docu-

2. F. Lacas, "Certificats d'économies d'énergie : alerte aux frauds", www.batiactu.com, 27 November 2017.

mentation requested and to control and verification activities from the managing bodies.

Such risk was already evaluated in the previous years and is one of the reason behind the withdrawal of the old standard procedure from the new guidelines and the substitution with the SP procedure, which reduces the risk of frauds by requiring the measurement of sample savings as with MPPs.

It is interesting to notice that most frauds dealt with the building sector, since it is easier to find ways to produce false documents and data than with the industrial sector.

Additionality: is that really a good idea?

Additionality is an important concept, considering it is used to define the mandatory target under EED art. 7. It is sharable, since it is reasonable to promote energy savings that wouldn't have been obtained in any case in the business as usual scenario. It is also a complex concept, at least when it has to be practically applied, with limited experiences in its application. Looking at the approach from different Member States a variety of different methodologies emerges [9,11], not always satisfactory.

The new EED proposal stresses the concept even more, with the idea of making it clearer and facilitating its adoption. COM (2016) 761 final, Annex V, states for example that 2(a):

> the savings must be shown to be additional to those that would have occurred in any event without the activity of the obligated, participating or entrusted parties and/or implementing authorities. To determine what savings can be claimed as additional Member States shall establish a baseline that describes how energy consumption would evolve in the absence of the policy measure in question. The baseline shall reflect at least the following factors: energy consumption trends, changes in consumer behaviour, technological progress and changes caused by other measures implemented at national and EU level

and 2(e)

> for policies that accelerate the uptake of more efficient products and vehicles, full credit may be claimed provided it is shown that the uptake takes place before the expiry of the average expected product or vehicle lifetime, or before the product or vehicle would usually be replaced, and savings are only claimed for the period until the expiry of the average expected lifetime of the product or vehicle to be replaced.

The problem is that both the requested baseline and the entity of the acceleration effect are quite complex to determine and difficult to question afterwards. So, a lot of discretionary power remains in the hand of EU member states policy makers. Moreover, the stricter the evaluation of such baseline, the higher the risk to find it hard to reach the EED art. 7 target. To avoid issues among member states a uniformed methodology should be developed and mandatorily used by all countries. But this won't be an easy task, considering the great differences among different member states.

If additionality is integrated in the scheme, there is the additional burden on proponents to identify the additionality of their projects and on GSE to evaluate it, with a high risk of legal dispute. Moreover, after some time it becomes difficult and costly to produce new projects, with negative effects on the price of white certificates and in the cost of the scheme. For this reason, it is better not to integrate it in the scheme, but to collect information from the projects that allow policy makers to improve its evaluation afterwards.

In general, additionality remains a concept not enough developed yet and some more thought should be made before basing on it the EU mandatory target. During the years of application of the first EED, more time should have been dedicated to defining procedures and protocols to evaluate additionality, but this has not been the case. Project like ENSPOL and EU-MERCI have shown that member states have adopted very different approaches. The majority of them mainly dealt with the building sector, that is present less issue than the industrial one. The risk is that the next EED target will face serious applicative problems, in particular with industrial interventions.

Conclusions

The Italian scheme faced in twelve years of activity many issues. Some of them were solved, others were unexpectedly created. The scheme has in any case succeeded in producing interesting results in terms of capability to reach important targets, covering a wide variety of sectors and technologies, and in spreading the know-how of industrial energy efficiency solutions among ESCOs and practitioners. In particular, the large quota of industrial projects is an interesting aspect at international level and a lot of experience has been gathered in terms of adopted solutions and trends in various industrial subsectors. A lot of information has been used to populate the EIEEP platform created under the EU-MERCI project, which lists the available best practices and good practices for the main industrial sectors.

Besides, the approach adopted for the evaluation of energy savings, and in particular of the consumption baseline and the additionality in the industrial sector is very advanced, and could provide much information to policy makers interested in implementing effective schemes in the industrial sector. A discussion at EU level on the procedures and options to evaluate the additionality should be promoted, both to provide tools to policy makers and evaluators and to spread some common approach among the MSs. Some perplexity remains in the choice of additional savings to define the mandatory target of the existing EED and of the new proposal. More flexibility should be granted to MSs to find out cost-effective schemes and approaches to reach their targets.

Many changes to the previous rules introduced by the new guidelines in 2017 have improved even further the reliability of the energy efficiency projects presented under the WhC scheme and of the assessed savings, besides reducing the risk of frauds. Unfortunately, such approach also determined a growing difficulty in presenting new projects, a critical aspect in a period characterised by an important undersupply and high certificates prices. Some further changes are thus needed and, hopefully, they will go beyond the easy route, i.e. a reduction of the targets, and try to find a new equilibrium capable of stimulating new energy efficiency projects, not only in the industrial sector.

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