

1.1 M&V in the Italian white certificates scheme

1.1.1 Policy background

The [Italian White Certificates scheme](#) is an Energy Efficiency Obligation Scheme in which the electricity and gas distributors with more than 50,000 clients are obliged to reach annual energy efficiency targets, proportional to the share of energy carriers distributed. White Certificates (WhC) give proof of end-use energy saving achieved through projects aimed at increasing energy efficiency in the final uses of energy. Eligible projects can be implemented by the obliged parties themselves, or by eligible parties (small DSOs, ESCOs, companies with a certified energy management expert or energy management system), which can obtain certificates and subsequently sell them via the dedicated spot market or bilateral exchange platform.

The Ministerial Decree D.M. 11 gennaio [2017](#) introduced a deep redesign of the Italian scheme, in particular for the M&V process. Direct energy saving measurement is requested for all types of projects and in all sectors.

WhC scheme is the **sole scheme in Italy that provides measured savings**: this ensures the assessment of high-quality and real savings, that can be verified and validated. Although measured savings have been in place since the start-up of the mechanism, in 2017 stricter rules were introduced regarding the evaluation of the energy consumption baseline, the required meters, and the evaluation of additionality. The main reason for the introduction of strict measurement requirements was an attempt to avoid frauds that were generated in the previous period of the scheme, almost entirely for projects evaluated as deemed savings, together with the idea of reducing issues in the evaluation phase related to unsatisfying and/or unreliable information provided by the proponents.

1.1.2 Technical aspects

Two methods for energy savings calculation are presently considered in the scheme:

- **standard projects with sample methods**: it is a mix of deemed and metered savings, used when a project implements numerous, but homogeneous, interventions (e.g. a project consisting in 120 installation of similar energy efficiency devices among different end-users). The savings achievable from the standard project are assessed on the basis of a calculation algorithm and the direct measurement on a suitable sample, representative of the operating parameters that characterize the project, and the interventions that compose it. The algorithm is applied by extending the results of the measurements made on the representative sample to all the interventions carried out within the project (e.g. considering the above

mentioned example, measurements are implemented on 10 installations and then the total energy savings are evaluated by proportionally applying the measured savings to the other 110).

- **monitoring plan projects:** savings are measured according to an algorithm and a set of meters (used both for the assessment of energy consumption and adjustment factors).

In retrofit interventions, evaluation of ex-ante **baseline** is made usually through **1-year measurements** of energy consumption, with **hourly meters required**. A guide produced by GSE, WhC managing authority, is dedicated to the methodologies eligible to evaluate the ex-ante energy consumption when data are available for periods of time below one year: in this case the reduction should be adequately justified and a precautionary approach should be applied. The baseline has to be adjusted based on identified operational variables such as production, climate, occupation, etc. The proponent is required to carry out an analysis aimed at identifying the operating parameters that influence the consumption of the systems subject to intervention in order to allow the **normalization** of ex-ante consumption to the ex-post conditions.

For people familiar with M&V protocols, the approach can be considered in line with IPMVP option B¹, although the international protocol is not mentioned and much more flexible (e.g. in terms of required meters, measurement frequency and duration, and other aspects).

This strict approach to M&V represents one of the main challenges for the proponents, especially when the required meters are not already installed when the project starts to be discussed.

For new installations (i.e. no substitution), the evaluation of the baseline is done based on reference market values (average of market supply for the chosen product/process) and standard adjusted baselines (es. BREF, BAT). Since 2021 (after the publication of [D.M. 21 maggio 2021](#)²) this approach can be used for retrofitting projects too, but this usually implies a large reduction in eligible energy savings if compared to those achievable using ex-ante measured consumption as baseline.

White certificates can be requested once a year (but up to four times a year for larger projects) by presenting ex-post measurements. The assessment of the energy savings is carried on for the period of time in which the issuing of certificates is foreseen,

¹ The [International Performance Measurement and Verification Protocol](#) includes four main options: A (measurement of key parameters only; close to deemed or scaled savings), B (measurement of all parameters; close to metered savings), C (whole facility; variant of metered savings, for example at building level) and D (calibrated simulation; variant of scaled savings). Options A and B require measurement at project level, and so are more complex than option C that, on the other hand, is usable only when the expected energy savings are quite large with respect to the energy consumption at facility level, a circumstance that only seldom can be applicable to energy efficiency projects.

² This decree also introduced some flexibility for the evaluation of the consumption baseline and improved supporting measures, like guidelines and other tools available for proponents.

which ranges from 3 to 10 years depending on the type of project (to less structured and cost-effective energy efficiency projects corresponds a minor WhC lifetime).

In terms of process timeline, the steps are the following:

- The proponent start measuring the requested ex-ante variables (both energy and non-energy) to evaluate the consumption baseline for the designated energy efficiency measure.
- The proposal – which includes the description of the project, the meters and the algorithm to be used both for ex-ante and ex-post energy consumption (i.e. the M&V plan), and the evaluation of the energy consumption baseline – must be presented before the installation of the new equipment.
- GSE evaluates the application that can be rejected if the strict requirements are not met.
- The proponent implements the energy efficiency project, then carries on the required ex-post measurements (usually for a year) and presents the request to get the white certificates corresponding to the measured energy savings (one certificate for each ton of oil equivalent of savings).
- GSE evaluates the request (i.e. measurements shall be presented according to the accepted M&V plan and no variations between the approved project and the implemented one shall be present) and, if valid, issues the white certificates.
- The proponent presents additional requests for each year of WhC lifetime.

With standard projects with sample methods the approach is the same, with the difference that M&V is applied only to the defined sample.

1.1.3 Experiences

The described approach is complex, thus it can be applied especially for medium and large energy efficiency actions to justify the cost of ex-ante meters (ex-post meters are usually installed in any case nowadays). It is nevertheless worth pointing out that the continuous reduction of the costs and the increasing diffusion of energy monitoring systems is making in many cases the approach possible and worthy also for small projects.

Most of the submitted projects and issued certificates are in the industrial sector since M&V for transport and buildings can be more complex. Nevertheless successful applications have been presented in all sectors. Besides the obvious advantage in terms of effectiveness of the energy saving assessment, the metered approach is quite flexible in terms of inclusion of different energy efficiency projects. It has also been accepted by proponents other the years, since as long as discussion between the

managing agency, information, and training are provided the approach is feasible. Moreover, frauds are less probable and on-site verification is a viable option.

High quality M&V improves projects quality, qualifies operators, and provides a lot of valuable data to managing authorities (for this purpose it is important to design the database in which the proposals are saved in a clever way, to allow effective indexing and sorting of the collected information). Metered savings stimulate proponents to achieve high performance, since the incentive is based on the real results.

On the other side, it requires an effort for the proponents in project presentation and for the evaluators that shall be skilled and capable of dealing with very different typologies of projects and M&V plans. With metered savings the possibility that an application is rejected exists³ and this poses a risk for the proponents. Besides, it requires time for the white certificates associated to a new project to be available on the market due to the need for ex-post measurements (usually at least one year and a half). This is an issue both for the proponent (time to get the incentive) and for the tradable market if present, since the supply of WhC becomes highly inelastic (in other words, if a shortage in terms of supply of certificates happens, the situation cannot improve for some years with prices going rapidly up, unless targets are reduced). This is a reason why a mix of deemed savings and metered savings can be the most effective option for policy makers.

Finding out the right mix between feasibility and strictness is important to avoid disaffection and to maintain cost-effectiveness.

1.1.4 Further readings

Reports on the results (Italian):

<https://www.gse.it/dati-e-scenari/rapporti>

Guidelines (Italian):

<https://www.gse.it/servizi-per-te/efficienza-energetica/certificati-bianchi/documenti>

Market results (Italian):

<https://www.mercatoelettrico.org/It/Statistiche/TEE/StatisticheTEE.aspx>

FIRE's papers (English):

<https://www.dariodisanto.com/tag/whc/>

WhC in the Italian strategy (in the Italian NECP, English):

³ In recent years, according to GSE's data, one proposal out of ten has been rejected. But the percentage rises to around forty percent if also "week" proposals are considered.

https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

1.1.5 Stakeholder interview

Two experts who work for an Italian ESCo and who have carried out an efficiency project at a manufacturing company were interviewed. The project deals with compressed air production in an Italian glass factory. First step of the project was electricity consumption analysis and specific consumption analysis. Second project phase was leaks detection for compressed air optimizing the distribution internal grid. Finally, the last part was the substitution of 3 engines of 270 kW power with 2 engines of 270 kW plus a new one of 400 kW. Losses reduction and replacement of a compressor with a more performing and correctly sized one, allows you to generate energy savings. Ex-post analysis showed almost 180 toe/years of expected savings and the project was admitted to white certificates Italian scheme. It's important to note that measurements were performed both before and after the project to identify the most effective solution and accurately report energy efficiency.

- **To obtain ex-ante consumption data, did you install *ad hoc* meters or did you make use of existing equipment?**

The measurement instrumentation, consisting of a mass meter, a pressure transducer and an electrical consumption meter for each compressor, was installed *ad hoc* in order to evaluate the system's pre-performance and to be able to compare it with sector benchmarks and with improvement solutions available on the market.

Regarding to the electricity consumption meters, for each compressor, it was necessary to install meters having the precision features required by GSE as part of the white certificates scheme for measuring post-intervention consumption. GSE prescription for the measurement of electricity consumption provides for a certain precision class based on the system's power supply voltage:

- Accuracy class C (voltage greater than 100 kV, power greater than 2,000 kW);
- Accuracy class B (voltage greater than 100 kV, power less than or equal to 2,000 kW; for any other voltage);

- **How long did the ex-ante measurement phase last?**

The ex-ante measurement phase lasted 4 months, from mid-September 2022 to mid-January 2023. The ex-ante measurement therefore mainly affected the autumn/winter

seasons. The measurement period of less than 365 days represented the greatest criticality for the admissibility of the project.

The reduced measurement period was necessary in relation to the intervention programming imposed by the Owner.

- **Was the leak detection task in the compressed air distribution internal grid challenging? How did it was accomplished specifically? How long did it last?**

Although the scope of the project related only to the 3.5 bar compressed air production plant, the leak detection task using ultrasonic instrumentation involved both the 7 bar and 3.5 bar air distribution systems. The task took place partly in the field (on site, on the plants) and partly in the back-office for the processing of the measurement data collected.

The duration of the field task lasted 3 days but typically this varies depending on the surface area of the factory served by the plant and the complexity of the plant. The task made it possible to map the entire distribution system, with the identification of numerous leak points (around a hundred). The identified leak points were catalogued according to the extent of the leak, the area/department, of the reference machine and depending on the specific component from which the leak originates. This information allowed us to draw up a leak report indicating various information useful for quickly identifying the point of leak and evaluating the costs associated with the repair. Each leak point was also physically marked with the affixing of tags to facilitate rapid identification.

- **How was the savings calculation algorithm identified? Was it necessary to adapt the algorithm to the available data?**

For energy efficiency projects relating to the replacement/new installation of compressors, the GSE has defined a standard calculation algorithm based on the comparison of specific consumption before and after the intervention, normalized according to the operating pressure levels of the compressors in the conditions before and after -intervention to guarantee the evaluation of potential savings with the same useful effect.

- **How long did the ex-post measurement task last?**

The project, presented in the second quarter of 2023, was approved by GSE in the third quarter of 2023.

The reporting of savings (or final balance sheet useful for the release of the incentive) provides, for the specific size of this project, an ex-post monitoring period lasting 365 days. Currently, the first reporting period of the project has not yet ended but from a

preliminary analysis of the partial data available, primary energy savings of approximately 180 toe/year are expected.

- **Did you have difficulties in the administrative/bureaucratic procedures for obtaining white certificates? Did GSE have a collaborative attitude, or did it request multiple documentary additions that hindered your job? Was there certainty in response times? Was the customer satisfied with the timing of obtaining the white certificates?**

The expertise acquired by our ESCo in energy efficiency projects within the white certificates scheme, and especially in projects relating to the replacement/new installation of compressors serving compression plants, has allowed effective and rapid management of the practice, anticipating the potential critical issues encountered by GSE for this type of project.

The main critical issue concerned the duration of the ex-ante monitoring period, less than 365 days. Given the availability of a shorter monitoring period, an analysis was necessary to demonstrate that the operating parameters recorded in the ex-ante measurement period were nevertheless representative of the annual functioning of the system.

The analysis, initially based on the characteristic parameters of the compressor being replaced and its operation for the purposes of process needs (air demand profile, operating pressure profile, correlation of specific consumption as a function of the air flow rate produced) was not initially considered exhaustive.

Subsequent additions were therefore requested by GSE and provided by our ESCo to admit the project to the White Certificates scheme.

Regarding to the duration of the entire process, from project presentation to project admission there were almost five months.