MARKET MECHANISMS FOR WHITE CERTIFICATES TRADING

TASK XIV FINAL REPORT

BASED ON NATIONAL AND INTERNATIONAL STUDIES AND EXPERIENCES

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0 EXTENDED SUMMARY

This Final Report describes the activities performed in the frame of IEA-DSM Task XIV "Market Mechanisms for White Certificates Trading".

0.1 Aim

The Report is meant first of all for policy makers and market agents involved in the matter of energy efficiency and energy savings. On the other side, some more in-depth analyses are particularly devoted to the specialists in this field who need to take profit of comparative evaluations of the experiences gained in other countries when it comes to the tradable certificates used in the field of energy efficiency.

0.2 Objectives

This project ("Task") aims to gather and highlight experiences gained in the design and operation on White Certificates (or White Certificates-like) schemes in countries where this policy has been implemented at present (such as Great Britain and Italy) or is being implemented (as in France) or is studied (as in the Netherlands). As a complement to that, knowledge achieved from studies in focused research projects is considered as well.

All the collected results are reported, with goals of:

- extensive review of available information,
- classification of contributions coming from contexts of different nature (policy makers, regulatory, obliged/eligible agents, Academia)
- selection of learned lessons deriving from widespread and/or successful approaches to the possible alternative implementation options of the schemes
- synthesis into general remarks and suggestions.

The main addressed items on the subject are the following:

- whether – and how – a scheme involving the issuing and the trading of White Certificates has effective chances of attaining previously identified and assigned targets of energy savings
- what the possible different formats are for such a scheme
- what implementation problems are involved, at national and extra-national levels
- how it can interact with other schemes

0.3 Approach

As for the adopted working approach, it is necessary to point out that relatively little experience of White Certificates schemes exists. So the proposed work could not count on synthesis of past expertise, as it is often the case with IEA-DSM Tasks. This Task called for exchanges among experts on subjects as diverse as tradable certificates theory, demand-side management policies in the residential, transport and tertiary sectors, or existing British, Italian and French trading schemes. The Task was therefore organised in a non-traditional manner and with strong involvement of IEA-DSM task experts. It was based on five regular events, at about four months’ intervals, made up of:

- one day open thematic discussion/workshop with national practitioners and national experts;
- one day restricted meeting of IEA-DSM Task experts.

Such an approach was very pragmatic, since it was based on know-how, experiences and examples; for this reason, it refers to a necessarily limited practice, with a more sound ambition of considering present expectations and attaining early learned lessons than of producing general and maybe abstract principles. This statement frames the overall character and spirit which inspired Task XIV, acting as suitable reading key to rightly position and evaluate the obtained outcome.
0.4 Rationale/background

0.4.1 Why to adopt White Certificates
The reasons why to adopt a White Certificate system turned out to differ from country to country. Most evidence was paid to the following:

- Kyoto requirements
- Needs to comply with requirement to certify an attribute (energy efficiency), which is a volatile and hardly measurable entity, rather than a quantity. In fact, leaving aside the question of “trading”, a White Certificates scheme is in itself a valid mechanism for formalising the official quantification and endorsement/verification of energy savings.
- New opportunities within an already existing and more general “environmental market”, including Green Certificates and Emission trading.
- Wide public consent/approval, due to the related image, connected to energy savings and environmental issues

In general, market-based policy instruments are increasingly being favoured in a wide range of energy and environment policy fields, due to their envisioned economic efficiency, benefits for competition, conformity with liberalised energy markets, positive incentives for cost reduction and continuous improvement and ability to minimise and equalise costs of compliance with policy targets. They are particularly applicable where countries have mandatory quantitative targets for the actors concerned that must be met in a verifiable way, inside national or extra-national obligation programmes, and within a fixed period.

White Certificates offer a number of practical benefits for all parties involved.

- For Regulatory Authorities, they can be a measurable way to track compliance with policy targets.
- For parties obliged to comply with targets, they are supposed to offer a means to achieve compliance at least cost, and also offer the flexibility to comply by either ‘in-house’ actions or contracting with other obliged parties or with other market parties for their supply.
- For those able to create and sell certificates, they offer an additional revenue stream which is independent of their other business activities, thus offering hedging and risk-management benefits in addition to direct financial rewards.

Wide opinion is that establishing a marketplace for such certificates would be a way of helping to align supply and demand of energy efficiency actions. It also seems to show interesting chances to offer other benefits, by responding to societal and community needs while also respecting the commercial interests of the actors subject to mandatory obligations. This approach has already proved in practice to be more dynamic, more effective and more efficient than legal obligations alone, notably in the field of Renewable Energy Commitment trading (e.g. see ref. [13]). Trading in certificates is an effective way of combining a guarantee of results from regulation with the economic efficiency of market-based instruments. It is thus consistent with the principles of a liberalised market framework.

Finally, the issuing of a European Union Directive on energy end-use efficiency and energy services was officially adopted recently by the European Commission (April 2006). According to this Directive, each Member Country will be required to stick to an indicative target for energy savings “attributable to energy services, energy efficiency programmes and other energy efficiency measures”. Moreover, the Directive is considering the option to study the mechanism of White Certificates as a possible tool, in appropriate time-scheduled national frameworks.

0.4.2 Why different designs of White Certificates schemes
Though based on similar principles, the national schemes (handled in Part II) show design differences due to specific adopted choices in the possible implementation options, according to:

- The ambition of the energy savings goals
- The end-use sectors to be prioritised by the energy savings projects
The commercial sectors to be involved or pushed in the energy savings industry as obliged or eligible agents

The role that the competition is expected to play depending on the structure of national energy industry

These issues will be considered in detail in the Part III or the Report, along the lines summarised form a comparative viewpoint in the following section.

0.5 Analysis/Comparisons on selected issues

0.5.1 Obligation bound actors

A variety of choices exists for the actors who are obliged to attain energy savings targets. The most common choice regards the Energy Suppliers. Other less common choices are:

- Distributors (the owners of the electricity or natural gas grid - Italy)
- Producers with direct contracts with customers
- Large or eligible electricity consumers

The involved energy carriers/services are:

- Electricity - always
- Natural gas - very often (France, Great Britain, Italy)
- Domestic fuel, cooling, heating - specific of France

Pros for Energy Suppliers as obliged agents are:

- Their direct contact with end-users
- Their practice of the energy end-uses world
- Occurrence of competition issues; then, cost containment of Energy savings projects, owing to:
  - choice of effective versus cheap mix of Energy savings measures (e.g. Great Britain)
  - fostering ESCO involvement (Great Britain, Italy, the Netherlands)
  - encouragement for consortia of obliged and/or eligible agents (France, Great Britain)

Cons for Energy Suppliers as obliged agents are connected to the chance of conflicts between obligation and competition regimes and the need of long-term contracts (which is in contrast with existing highly dynamic market rules: e.g. 28 days’ rule in Great Britain). In some cases energy suppliers may wrongly see energy efficiency as part of the social policy of a country and insist that it is kept separately from energy policy. This signals their limited involvement historically in action beyond the meter in some countries.

Pros for Electricity and Gas Distributors as obliged agents (this choice adopted only in Italy) are:

- Absence of conflict between obligation and competition, owing to the following reasons:
  - granted 40 years’ monopoly to Distributors against duties on energy savings obligations and on a price cap on the distribution tariff
  - cost-recovery for certified energy savings projects: a lump sum of 100 Euro/toe is acknowledged to partially compensate the project costs
- Set up of virtuous circles of joint ventures involving Distributors, controlled Companies and ESCOs

Cons for Electricity and Gas Distributors as obliged agents are connected to two circumstances:

- Distributors are pure grid managers: they do not have direct contacts with large end-users nor experience in end-uses
- At present, Italian Distributors are prevented from beyond the meter operations

0.5.2 Eligible actors

A variety of choices exists as well for the actors who can perform eligible energy savings projects, i.e. those measures which are officially acknowledged to be capable of triggering off actual, remarkable and recognisable (that is, verifiable) energy savings.

Careful attention must be given when it comes to widen this category as much as possible and to extend it to the maximum number of participants: distortions with other energy savings policies and instruments can be amplified.
At present, widely accepted eligible actors are energy suppliers (as obligated actors) (France, Great Britain), ESCO's, owners of electricity and gas networks (i.e., Distributors, as for Italy), public municipalities (France). Other eligible actors may include electricity customers (New South Wales) and electricity generators (New South Wales).

0.5.3 Penalties for non-compliance with savings targets
Penalties are generally forecast for the obliged agents in case of non-compliance with energy savings targets. When a maximum value is assigned to these penalties, this also represents a price cap on the value of White Certificates: obviously, there would be no point for an obliged agent in accepting a greater market price for them. Once the market is developed, dependent upon the stringency of the saving target, the value of White Certificates is bound to influence the current price of the energy; then, the price cap on penalty is also aimed at avoiding excessive increase of the energy prices. Payment of the penalty may (France) or may not (Italy) cancel the unfulfilled obligation to savings targets.

Very high values are sometimes assumed as an upper limit: in this case, the penalty is normally dispensed well below this value and in a flexible way, in order to give due account to obliged agent's effective and occurred difficulties in matching the target (as it happens in Great Britain).

In some cases, the exact amount of the penalties is still under definition, as in Italy, though criteria to drive the future choices were stated already:
- The penalty must be proportional and greater than the investment required to compensate the non-compliance.
- The penalty will be related to the number of not saved energy unit with respect to the specific assigned target.
- The characteristics and the economic conditions of the non-compliant operator must be taken into account: to this purpose, the value of the penalty per not-saved energy unit will be also based on market data, i.e.:
  - on incremental costs of products and services for energy efficiency,
  - on the price signals given by the White Certificates market

In some cases, a pre-defined penalty exists (France).

No sufficient experiences exist at present to appreciate the expected effect of pre-defined penalty (France) versus the effect of a penalty where only general principles are clear (Italy) versus one that is not in any way set in advance but to be subsequently calculated by the regulator should the need arise (Great Britain).

0.5.4 Monitoring and Verification of energy savings in performed measures
Synthetically, all the examined White Certificates schemes encourage very much standardised ex-ante procedures to evaluate the energy savings in performed measures; these procedures are characterised by the following features:
- based on lumped and conservative evaluations
- very simple and not ambiguous in the use
- generally shared with the stakeholders through preliminary consultation processes
- involving very few measurements (or none)
- considering baseline/dead-weight
- easily updatable with changes of baseline

The approaches to prove additionality, i.e. the characteristic of a project to produce energy savings supplementary to those which would be obtained anyway even in absence of that project (the baseline), strongly depend on the particular national scheme:
- As for Italy, the baseline is included in the above standardised procedures; reference is made to:
  - existing standards (in the case of insulation in buildings),
- the most diffused or the most traded or the most encouraged efficiency classes of equipment (for electrical appliances)

- As for Great Britain, additionality must be demonstrated for each measure, but it is included in the targets as dead-weight

- As for France, two types of corrections are made. Firstly, the baseline takes into account existing standards and either the current state of the stock for fixed equipment like thermal insulation or boilers and the average of the market sales for other equipment. Secondly, agents already involved in market of efficient materials or equipment can not receive certificates if it increases their turnover.

0.5.5 Role of Trading and Trading Mechanisms

Whether White Certificate can exist without trading is a very discussed subject. A general opinion was expressed in favour of independence, as a line of principle, between the concept of certificate and its trading. More precisely, belief was that the objective of White Certificates schemes was not trading as such. White Certificates are above all a certification mechanisms relevant to "Energy Savings", that is to a "volatile" and hardly measurable quantity.

Nevertheless, trading is in theory an essential flexibility feature given by instruments to reduce costs to comply with savings obligations. It makes the White Certificates mechanisms a market-based alternative to the pure obligation of energy savings. So far, the White Certificates trading shaped as a compliance market, which was able to help the obligated agents to fulfil their obligations with a greater flexibility and at least possible costs. To this purpose, credit is given (as in Great Britain) to the fact that the obligated suppliers are also competitors and are forced to choose solutions which decrease the costs of the project and the need of cost recovery in the competitive market. This could be obtained with a clever mix of measures, finding an optimum among costs, energy savings and compliance to the end-user needs. This incentive by competition works well when an intensive involvement of household end-users occurs.

Other advantages of trading White Certificates follows:

- The obliged agents can find an alternative way to fulfil their targets without being involved in projects out of their usual business

- The eligible agents can find a supplementary source of income, as it happens in the case of Energy Service Companies (ESCO)

- Institutional bodies entrusted to energy efficiency can find in White Certificates purchase a more immediate way of financing energy savings projects, in alternative to a tender procedure and with reduced transaction costs (normally, financing ongoing/completed projects that have already been certified)

- Ethical bodies entrusted of actions to promote energy savings can officially endorse their commitment and pursue possible “image” targets in this field though a certified purchase of Energy Efficiency Titles.

At present, all existing White Certificate schemes involve trading of some kind. Trading may be institutionally established on a marketplace, as in Italy, with definite e-market rules. Also bilateral market with direct trade between eligible and obliged parties occurs in Italy as an alternative to the marketplace. Bilateral contracts are the expected exchange market mechanism in France at the beginning.

A different kind of trading exists in Great Britain, where certification tools are not explicitly entailed and only bilateral trade can occur of either:

- **Energy Savings:**
  - Suppliers can trade energy savings obtained from the energy efficiency measures already completed, which are quantified according to a standardised evaluation procedure
  - The entitlement of the energy efficiency measures will be transferred from one supplier to another

or:
• **Savings Obligations**
  • Suppliers can trade their obligations.
  • One supplier can pay another supplier to gain the right to transfer all or part of his target to him
  • One supplier’s target will increase while another’s target will decrease

### 0.5.6 Integration with other energy efficiency policies

Interaction with other energy savings policies plays an important role for an effective White Certificates system: in fact, among the other things, the price of a White Certificate depends on items like:

- The stringency of the overall energy saving target imposed
- The prices of the energy carriers, which will be saved
- The shape of the curve of the marginal cost of energy saving (the envelope of all sectors)
- The transparency of the White Certificates market
- Possible changes in other policies affecting the White Certificates market (e.g. EU ETS; tax policies)

which are affected on their turn by other possibly energy savings policies under way

Trying to summarise the gained experience into somehow general principle (though still under discussion - see ref. [14]), the following remarks can be expressed:

- White Certificates trading might work better (on the energetic and economic view) in sectors where neither taxes nor plain Voluntary Agreements work well, e.g. service sector, buildings, SME’s,
- The introduction of White Certificates tends:
  - To reduce the need for publicly funded subsidies
  - To reduce the revenues from energy taxes, owing to White Certificates' higher effectiveness and the consequent lower consumption
  - To reduce the sales and to increase the administrative costs of the obligated parties, even though the *impact on profit is case dependent* since they may find compensation in the power market

Based on the above-mentioned theoretical issues, it becomes clear that much more research is needed is order to better understand the impacts of White Certificates on the portfolio of policy instruments addressing energy efficiency and vice versa.

### 0.6 Impact and outcome / Early lessons learned

The process of implementation of White Certificates schemes is quite recent and long-established practice has not been gained yet in most countries. Therefore, it is too early to draw conclusions based on the actual performance of these schemes, in particular for the case of Italy and certainly France. So far, analyses have been already made based mostly on theoretical and ex-ante studies (e.g. in the frame of EU research projects, see [13] and [14], or on the base of ad-hoc national feasibility analyses on recommendations related to implementation of particular schemes, see ref. [8]).

From a more theoretical or general point of view, the following remarks can be pointed out:

- Trading of White Certificates represents in general a market-based approach to energy savings problems but need is to discourage improper expectations and ambitions, since this policy instrument is not capable of handling and solving the problem of energy inefficiency and pertaining barriers to energy efficiency projects as a whole. White certificate schemes thus do not intend to replace other policies in place, but enforce their effects. It remains to be seen whether the theoretical benefits claimed by the implementation of the schemes will be actually achieved.
- Different policy drivers and national conditions have led to different design schemes. Furthermore, with the exemption of Great Britain, very little ex-ante evaluation has been carried out.
- A very important and commonly remarked aspect is that energy efficiency is almost invariably extraneous to the core-business of the obliged agents and the mandatory energy efficiency/saving goals - with the option of White Certificates schemes - are bound to involve supplementary (and often not statutory) operation for them [31]. This circumstance, far from being a burden, was rather deemed a challenge for these actors to face new markets
• Transparent, clear and simple rules of a White Certificates scheme are highly desired, in particular on the decision-maker's side, to be able to rely on stakeholders’ consensus as much as possible and to favour straightforward implementation of this policy.
• Monitoring and verification approaches for energy savings remain as a challenging element to better ensure the theoretical efficiency of White Certificates schemes
• Strong involvement of industry of efficient equipment and high quality building should be considered since the beginning of the process of establishing a White Certificates trading scheme and the implementation of standardised evaluation procedures. Participation of manufacturers in particular should be assured as well, as they are some of the most interested operators in boosting energy efficient technologies
• As energy efficiency is a moving target, permanent development is required of databases on technical characteristics and costs of high efficiency equipment
• Improvement is needed for legal standards on performance and efficiency.
• Energy suppliers must be encouraged in undertaking long-term energy savings projects.
• The territory of operation of a White Certificate scheme should correspond with the territory in which the power market is operating. In other terms, White Certificates must operate within the energy market of which they represent one of the policy instruments

From a practical point of view, the most significant suggestions were given by the already gained experience after completion of the GB Energy Efficiency Commitment - Part 1: 2002-2005. In fact, Great Britain gained good understanding of the energy savings which could be expected from particularly effective measures (the so called illustrative mix). During the operation of the first EEC period, knowledge of under-cost of all the eligible measures was attained as well. Performed experimentation gave then the chance to refine the quantitative target in order to have social efficiency on a global scale.

Very schematically (see also paper T6 - Appendix C), the most effective and profitable applications of White Certificates schemes are expected in connection with the following circumstances:
• where energy taxation mechanisms are less effective in encouraging savings; this may typically occur in sectors as the residential and in the tertiary/service, which are outside the context of the heavy industry (where on its turn EU ETS might show more efficiency)
• instead of investment subsidies and tax deduction options; this alternative looked to work:
  - when these policies showed not to be successful or effective enough,
  or
  - in national contexts where a too marked subsidiary role of the institutional bodies could be considered inappropriate/unfair in energy savings policies
• together with / instead of detailed performance standards (the White Certificates mechanisms are focused anyway, in principle, to optimised mixes of highly effective versus cheap measures), though labelling and minimum standards for new products is still helpful to be used in the standardised M&V procedures
• in conjunction with voluntary agreements (but check must be assured in this case on coherent assumptions on energy savings targets, baselines, etc.)
• in presence of an intensive policy of support for energy audits, in order to identify actual and responsive segments of energy savings and to encourage actions of the specialised operators as ESCOs

0.7 Open Questions
Some issues are still open and worth being re-considered in the future.

0.7.1 Cost effectiveness of White Certificates
The comparison of cost effectiveness of the White Certificates scheme with other Energy savings policy instruments is a very challenging task. Nevertheless, evaluation studies are highly needed in order to know what is actual performance of the White Certificates schemes.
0.7.2 Evolution of competition
A second source of still open discussions arose from particularly high uncertainty on the evolution of the competition or of oligopoly in energy markets and on how it can affect a White Certificates scheme and the other way around.

0.7.3 Cross-border trading
The Task XIV activities gave the chance to focus pros and cons of national Energy Efficiency schemes where a chance of wider cross-border trading of White Certificates exists. Apart from marginal (and sometimes theoretical) advantages, evidence was that countries adopt different approaches for the evaluation of the energy savings, such as:
- different energy accounting systems (e.g. for discount rate, lifetime of a measure),
- different conversion criteria from final to primary energy (that is utterly relevant for electricity),
- different equivalence criteria between saved energy and White Certificates, which are very country-specific (and sometimes site-specific within a country)
- different baseline criteria: the definition of the terms of reference for the calculation of the energy savings is the keystone which an evaluation procedure is built on

Under these circumstances, the subjective sides underlying the evaluation of the energy savings connected to a project are even amplified by the national specificities. This is particularly critical in the cases when the amount of saved energy (or number of certificates delivered) possibly depends (as in France) on the specific targeted geographical area (e.g. to cope with problems of local grid congestion or new building capacity) or on social issues (as poverty policies in Great Britain).

More generally, wide opinion is that the cons of extending a white certificates scheme at the European level seem more important than the pros given the direct benefits for consumers to implement energy savings at the national level.

Common feeling is that harmonised approaches are well far to be identified and the issue of EU-wide schemes turns out to be still early. The harmonisation of White Certificate schemes is another challenging task if one aims at cross-border trading. A remarkable example can be eligible technologies and monitoring and verification procedures.

0.7.4 Interaction with other market-based policy instruments
Lastly, it should be remarked that market-based policy instruments based on a same principle of certificates trading, as White Certificates, Emission Trading and Green Certificates, are already being simultaneously applied in some countries. Interactions among these schemes may then occur. The matter of interaction/conflict/complementarity among the above trading scheme, the problem of double accounting and other similar issues may arise and these questions may need further exploration. Despite of the relevance and the weight of this subject but in order to avoid overlapping, a very definite choice was taken to refer completely to the studies performed in the already completed EU SAVE White&Green project (see ref. [13]), where the matter is handled extensively, to the results which will be made available of the ongoing EU EIE EuroWhiteCert project (see ref. [14]) and to other specialised references (e.g. see ref. [25] and [26]).
PART I - RATIONALE FOR TASK XIV AND ORGANISATION
1 TASK XIV BACKGROUND

1.1 General goal

This project ("Task") aims to gather experiences gained in operation on White Certificates or White Certificates-like schemes in countries where this policy is practised at present (such as Great Britain and Italy) or is being applied (as in France) or discussed (as in the Netherlands). As a complement to that, knowledge achieved from studies in focused research projects is considered as well. All the collected results are reported, with goals of:

- extensive review of available information,
- classification of contributions coming from contexts of different nature (policy makers, regulatory, obliged/eligible agents, Academia)
- selection of learned lesson deriving from widespread and/or successful approaches to the possible alternative implementation options of the schemes
- synthesis into general remarks and suggestions.

It is necessary to point out that such goals, though very pragmatic since based on know-how, can hardly expected to give rise to very general principles since they refer to a necessarily limited experience. This statement frames the overall character and spirit which inspired Task XIV, acting as suitable reading key to rightly position and evaluate the obtained outcome.

The main addressed items on the subject are the following:

- whether – and how – a scheme involving the issuing and the trading of White Certificates has effective chances of attaining previously identified and assigned targets of reduction of primary energy consumption
- what the possible different formats are for such a scheme
- what implementation problems are involved, at national and extra-national levels
- how it can interact with other schemes.

In general, market-based policy instruments are increasingly being favoured in a wide range of energy and environment policy fields, due to their envisioned economic efficiency, benefits for competition, positive incentives for cost reduction and continuous improvement and ability to minimise and equalise costs of compliance with policy targets. They are particularly applicable where countries have mandatory quantititative targets for the actors concerned that must be met in a verifiable way, inside national or extra-national obligation programmes, and within a fixed period. Examples of this policy approach in the energy area include:

- **White Certificates**: Energy Efficiency trading schemes – end-use energy efficiency programmes;
- **Black Certificates**: Carbon trading schemes - programmes for reducing CO2 emissions;
- **Green Certificates**: Renewable Energy Commitment trading schemes – increased use of renewable energy sources in power generation.

The focus of the present Task will be on White Certificates, marginally touching on other Certificates only insofar as there are interactions between White and other certificates.

White Certificates offer a number of practical benefits for all parties involved. For regulatory authorities, they can be an easily-verifiable way to track compliance with policy targets. For parties obliged to comply with targets, they offer a means to achieve compliance at least cost, and also offer the flexibility to comply either through ‘in-house’ action, by contracting with other obliged parties of with other market parties for their supply. For those able to create and sell certificates, they offer an additional revenue stream which is independent of their other business activities, thus offering hedging and risk-management benefits in addition to direct financial rewards.
Wide opinion is that establishing a marketplace for such certificates would be a way of helping to align supply and demand in this particular sector. It also seems to show interesting chances to offer other benefits, by responding to societal and community needs while also respecting the commercial interests of the actors subject to mandatory obligations. This approach has already proved in practice to be more dynamic, more effective and more efficient than legal obligations alone, notably in the field of Renewable Energy Commitment trading (e.g. see ref. [13]). Trading in certificates is an effective way of combining a guarantee of results from regulation with the economic efficiency of market-based instruments. It is thus consistent with the principles of a liberalised market framework.

1.2 Background and rationale for Task XIV

The reasons for addressing the question of White Certificates stem chiefly from the following observations.

- Energy Savings schemes based on Certificates trading are currently attracting increasingly favourable interest on the side of policy makers. In fact, as already noted, they combine social benefits with the economic efficiency of market-based instruments and they are consistent with a liberalised market framework. Moreover, leaving aside the question of “trading”, a White Certificates scheme is in itself a valid mechanism for formalising official quantification and endorsement of energy savings.

- At present, White Certificates schemes are being implemented, in UK, Italy and New South Wales\(^1\) (Australia). Meanwhile, France is planning to do so and Belgium is establishing instruments involving mandatory Energy Efficiency Programmes aimed at economising primary energy (possibly involving White Certificates). Other Countries (the Netherlands, Sweden, Norway) are interested in learning from the experience and progress made by these countries. Nevertheless, expectations regarding the outcome seem quite homogeneous at an international level and alternative implementation procedures have been devised and their pros/cons evaluated (see Part II for details). In this case, the need for communication and sharing of experience is becoming increasingly necessary. The activities of this Task can meet that need.

- The issuing of a European Union Directive on energy end-use efficiency and energy services was officially fostered very recently by a Proposal from the European Commission (December, 2003). According to this Proposal, each Member Country will be required to stick to a progressively increasing annual target for energy savings “to be reached by way of energy services and other energy efficiency improvement measures”. Moreover, the Proposal recommends the mechanism of White Certificates trading as a suitable tool to promote and lend appeal to implementation of the relevant programmes.

- Green Certificates trading can already be regarded as an established practice and positive/negative experience with it can be recorded and assessed. Conversely, much less information is available where White Certificates are concerned. Activities promoted, set up and monitored within the present Task will benefit from all the operational experience already gained with other schemes.

- It should be noted that this Task is intended give material to complement future IEA-DSM Tasks. For example, Task XVI on Competitive Energy Services will take advantage of the knowledge gathered in this Task to examine the interaction between Energy Performance Contracting (EPC) and White Certificates and the possible reciprocal benefits of the interaction.

\(^1\) It should be pointed out that New South Wales system is not a White Certificate system in the strict sense, even though it gives elements for comparisons with other systems.
1.3 Questions to be addressed

A list of key concerns to be considered was drawn up and subdivided into “principle” and “practical” issues.

1.3.1 Principle (Policy) issues

1. Effectiveness of a certificate trading mechanism to promote energy efficiency projects; in other words, whether Certificates Trading is different when applied to promote energy efficiency in the end-use sector, instead of renewable sources or reductions in CO₂ emissions.

2. Who the obligation-bound actors can be (distribution Companies, suppliers, others)

3. Who can buy and who can sell (obligation-bound actors, exempted actors, ESCO, consumers)

4. How to create demand for White Certificates trading

5. Competition issues which can be envisaged apart from an overhanging obligation context

6. Interactions with other trading schemes:

   • Green vs. White Certificates
     - They have different objectives and therefore cannot be interchanged
     - Green energy can be easily measured for certificate issue purposes (only electricity)
     - Energy savings for White Certificates are definitely much more difficult to evaluate and can cover a wider diversity of energy sources
   
   • Interaction among Green / White Certificates and Emissions Trading
     - Both White and Green Certificates have CO₂ emission reduction equivalency
     - CO₂ reductions obtained through Energy Efficiency projects could be sold to the Emission Trading market if convenient²

7. Interactions with other policy tools for the promotion of energy efficiency

8. Prospects for an enlarged extra-national market for tradable certificates

   a. Harmonisation among rules for M&V procedures already existing or projected in different countries

   b. Expected / pursued developments in national legislation on the matter, such as:

      i. Widening of the reference perimeter (from national to EU – see proposal for EU Directive - or from EU to OCDE level)

      ii. Agreement on an international standard for handling the matter; at least at an EU level, with a view to possible wider extension

1.3.2 Practical (Operational) issues

1. Criteria for design and development of projects for energy efficiency in end-use; e.g.:

   - eligibility criteria – technology, actors, etc.
   - size
   - avoiding double/multiple counting, see remarks in Chapter 3.

2. Valuation issues, i.e.:

   - how to measure, or how to evaluate, the saving impact of projects (by measurement, by calculation, mix, baseline, IPMVP)
   - free riders
   - free-drivers
   - involved costs
   - documentation to be kept as proof of the performed measures
   - accreditation/certification of the actors
   - possible ranking of the projects according to merit indexes

3. Monitoring mechanism and non-compliance regime; e.g.:

   - how to assess the duration of an energy saving project,
   - how to handle the inability of an obligation-bound actor to meet his energy efficiency goals

4. Possible cost-recovery mechanisms; e.g.:

   - public benefit charges
   - direct support mechanisms

² This is actually a very controversial issue, especially with regard to EU ETS, see e.g. [25] and [13].
– fiscal incentives:
  – which funding level
  – which mechanism(s)
  – how to deal with projects which receive funding from more than one public source
5. Issuing and use of certificates; e.g.:
  – ex-post
  – ex-ante,
  – metric (toe, kWh, GHGs, k€)
  – accounting rules
6. Trading mechanisms; e.g.:
  – participants,
  – tools, bilateral contracts
  – lifetime of the certificates,
  – frequency of transactions
  – safety rules of the transactions
7. Responsible entity/ies; i.e. which body/ies (institutions, entitled body, independent certified experts) should be responsible for the different activities (i.e. issuing, monitoring and verification, validation, etc.)

The above key concerns has been examined by the participating countries, with a view to identifying for each item:

  • relevance within the national energy policy framework
  • national adopted/planned/expected approaches
  • possible problems relating to implementation
  • experience gained in tackling and solving these problems – case studies

1.4 Approach

Relatively little experience of White Certificates schemes exists. So the proposed work cannot count on synthesis of past experience, as is often in the case with IEA-DSM Tasks. This Task called for exchanges among experts on subjects as diverse as tradable certificates theory, demand-side management policies in the residential, transport and tertiary sectors, or existing British, Italian and French White Certificates schemes. The Task was therefore organised in a non-traditional manner and with strong involvement of IEA-DSM task experts.

A "light" Task has therefore been conceived, as similar to a work group as possible and limited in duration and in cost sharing (which meant more effective task sharing for the country experts). It was based on five regular events, at about four months’ intervals, made up of:
- one day open thematic discussion/workshop with national practitioners and national experts;
- one day restricted meeting of IEA-DSM Task experts.

Each workshop explored a set of issues coming under one of the following main headings:
1. expectations
2. policy/principle issues
3. organisation/practical issues
4. interaction with other trading schemes and with other EE policies (points 6 e 7 of Section 1.3.1)

The following day, a meeting restricted to the Task experts was devoted to processing, discussing and synthesising the workshop results and preparing the next workshop. The below Tab. 1 outlines the planned events schedule.
<table>
<thead>
<tr>
<th>Event</th>
<th>Workshop</th>
<th>Workshop subject</th>
<th>Task experts meeting subject</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NO</td>
<td></td>
<td>– Kick-off,</td>
<td>7-8 June 04</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Task organisation</td>
<td>Milano</td>
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<td></td>
<td></td>
<td></td>
<td>– Preparation of the following workshop</td>
<td>Italy</td>
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<tr>
<td>2</td>
<td>YES</td>
<td>Existing experiences and expectations at national level</td>
<td>– Discussion on the past workshop</td>
<td>8-9 Nov 04</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Preparation of the following workshop</td>
<td>London</td>
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<td></td>
<td></td>
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<td>UK</td>
</tr>
<tr>
<td>3</td>
<td>YES</td>
<td>Policy/principle issues</td>
<td>– Discussion on the past workshop</td>
<td>14-15 April 05</td>
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<td></td>
<td></td>
<td></td>
<td>– First ideas on the Final Report</td>
<td>Paris</td>
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<td></td>
<td></td>
<td></td>
<td>– Preparation of the following workshop</td>
<td>France</td>
</tr>
<tr>
<td>4</td>
<td>YES</td>
<td>Organisation / practical issues: National or international systems for White Certificates?</td>
<td>– Discussion on the past workshop</td>
<td>15-17 June 05</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Comparisons among national procedures for evaluation of Energy Savings</td>
<td>Lund</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Comparisons among national schemes on White Certificates</td>
<td>Sweden</td>
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<td></td>
<td></td>
<td></td>
<td>– Preparation of the following workshop</td>
<td></td>
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<tr>
<td>5</td>
<td>YES</td>
<td>Organisation / practical issues: additionality, penalties, costs</td>
<td>– Discussion on national procedures for evaluation of Energy Savings</td>
<td>26-28 October 05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>– Discussions on organisation and contents of the Final Synthesis Report</td>
<td>Groningen</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Discussion on the present workshop</td>
<td>Netherlands</td>
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<td></td>
<td></td>
<td></td>
<td>– Preparation of the following workshop</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>YES</td>
<td>Interaction with other schemes/EE policies.</td>
<td>– Discussion on the present workshop</td>
<td>22-24 March 06</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Follow-ups from EU EuroWhiteCert project</td>
<td>Trondheim</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>– Comments, revision and finalisation of draft Final Synthesis Report</td>
<td>Norway</td>
</tr>
</tbody>
</table>

Tab. 1: events organised in the frame of Task XIV
The Task has then been mainly based on collection, exchange and review of existing experiences. As for conceptual and theoretical more in-depth studies, instead reference was made to research studies, either already completed or still under way, performed at both national and international levels.

1.5 Deliverables

The content of the contributions and of the discussions relevant to each of events 2 to 6, described in Chapter 1.4, was processed and synthesised in corresponding Critical Synthesis (CS) Reports under the responsibility of the Operating Agent (OA). These reports were discussed among the OA and the task experts. After approval, each of the four CS reports became an official task deliverable restricted to internal diffusion only.

The present Final Synthesis Report (FR), issued by the OA on completion of the Task’s work, contains a summary and a review of all the activities undertaken and experience gained during the progress of the Task.

1.6 Benefits for the participating countries

As pointed out, the Task produced a wide survey of experiences and studies in progress on issues such as:

- effectiveness of a scheme involving the issuing and trading of White Certifications to attain targets of reduction in energy consumption
- the different possible formats for such a scheme
- problems involved in its implementation, at a national and extra-national levels
- possible interaction with the other schemes for energy efficiency

In this context, benefits resulting from the Task can be expected for both the countries who are applying the scheme (even though at a pioneering stage) and for the countries planning to incorporate the scheme into their energy policies. Benefits will stem from enhanced understanding of:

- various alternative approaches that can be adopted for similar types of problem (policy, practical, etc.)
- experience that already exists and that is growing continuously

1.7 Structure of the Final Report and remarks

1.7.1 Organisation the document

Apart from the present PART I of the report, which is relevant to Task XIV objectives and organisation, the Final Report is made up of two main parts:

- **PART II**, relevant to a description of the White Certificates schemes adopted or planned in the countries participating to the Task (France, UK - only for Great Britain, Italy. The Netherlands). Information relevant to a scheme adopted in New South Wales were made available as well. For each scheme, details are given on how the options on principle and practical issues outlined in 1.3 are implemented.
- **PART III** contains a review and some comparisons among selected items, such as:
  - Reasons why introduce and adopt White Certificates
  - Position of national stakeholders
  - Eligible and obliged agents
  - Penalties for non-compliance
  - Monitoring and Verification procedures
  - Methods for the costs evaluation
  - Transaction costs occurring during the lifetime of White Certificates
  - Role of trading and rules for trading - evolution of the market
  - Problems in cross-border trading of White Certificates
  - Interactions with other energy efficiency policies
A last PART IV is devoted to conclusions and suggestions resulting from the performed activity, mainly based on country experiences.

1.7.2 Remarks for the reader

Some remarks must be pointed out.

- The present final report collects and critically re-organises contribution and material gathered during the five workshops and the experts meetings planned during the Task development. A great part of the merit for the assortment of the information and the variety of considered viewpoints and approaches must be ascribed to all the national experts either systematically or episodically attending the Task XIV events, who are gratefully thanked.

- The final report was set up under the initiative of the Task XIV Operating Agent, Antonio Capozza (CESI - Italy), after thorough exchange of opinion with the national experts and with strong reference to their written and oral contributions. The content was agreed with all of them. Nevertheless, many statements are the result of national viewpoints and philosophies, which very often are strongly peculiar to the single Countries. Evidence was then given in this report to the character (either generally shared or particular) of the expressed opinions and positions.

- The reported information, being connected to national policies, turn out to be very often within a process of continuous evolution. They have to be assumed as updated to the date of the document and no engagement on notice can be granted when changes will possibly occur in the future.
PART II - GENERAL PRINCIPLES ON WHITE CERTIFICATES
2 INTRODUCTION: THE CONCEPT OF WHITE CERTIFICATES

2.1 Driving principles
The driving principles for a White Certificates scheme is normally a national energy efficiency policy (possibly connected to local and/or global social and environmental strategies), which involves Energy Savings programmes on energy end-uses

A scheme based on White Certificates can be designed in many different ways. From a general viewpoint, three conceptual steps are almost systematically undertaken:
1. In a first step a Public Board (e.g. Governmental, Federal, etc) defines some principle and operational rules, aimed at pointing out:
   • The energy savings national targets, i.e. the goals to be attained within the issuing Country; these goals can be expressed in terms of final or primary energy to be saved yearly.
   • The obligation bound agents (OB), that is the operators who are obliged by law to comply with mandatory energy savings obligations
   • The eligible energy savings projects, that is the projects which are officially acknowledged as capable of triggering off actual, remarkable and recognisable energy savings
   • The eligible implementers of Energy savings projects (EI), that is the operators who are accredited for carrying on effectively the eligible projects
   • The apportionment criteria of global energy savings targets on the obligation bound agents

2. The second step involves the statement of a quantitative equivalence between energy savings targets and a proportional amount of White Certificates targets, as it is shown in the below Fig. 1:

![Diagram](image)

**Fig. 1: equivalence between energy savings and White Certificates**

According to the definition given in the EC " DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on energy end-use efficiency and energy services, White Certificates are certificates issued by independent certifying Bodies confirming the claims of market actors for savings of energy, as a consequence of end-use efficiency measures. In other terms, energy savings obligations are translated into White Certificates obligations. White Certificates allow, as intrinsic advantage actually shared with any other certification mechanism, the chance to establish an agreed (though somehow arbitrary) correspondence between an objective entity (e.g. an amount of energy efficiency titles) and a more volatile, difficult to measure entity, such as the energy savings themselves. This is essential in the market phase, when an obliged actor needs to demonstrate quantitative compliance with his own savings targets and can rely on issued certificates as negotiable goods.

3. The third step follows from the presence of an offer and a demand of White Certificates created by the above mechanisms:
   • The obligation bound agents must comply with a White Certificates obligations and then they act on the demand-side of them (OBs can also create certificates, so in principle they can be on the supply side too as EIs)
   • The eligible implementers may gain and own acknowledged White Certificates and the then act on the supply side of them. EIs can in principle be OBs at the same time.
Under these circumstances, a market can be established where demand and offer of White Certificates match, since:
- The obliged parties can buy possibly lacking Certificates to reach their targets; they can also in principle sell excess certificates
- The eligible parties can sell their surplus of Certificates for two orders of reasons:
  - They do not have any target to reach, since they are not obliged agents
  - They are also obliged parties but they have gained White Certificates above their targets.

The below Fig. 2 outlines a general trading scheme according to the described lines. Occurrence of pure obliged or pure eligible agents is considered, as well as the frequent situation of parties who are in simultaneously obliged and eligible conditions.
Fig. 2: General trading scheme for White Certificates
2.2 Possible alternatives for implementations

The above general principles may be implemented in several different ways. The variety of schemes which can be devised (and which were actually devised, as it will be shown in this Report) depends on how to specifically implement in practice the options which underlie these principles and on how to combine them into a national mechanism. The following points give more details on such alternatives.

1. **Obligation-bound agents** *(who must possess White Certificates to meet their individual obligations):* the envisaged options are the following:
   - The energy (electricity, heat) producers
   - The energy (electricity, heat, gas) distributors
   - The suppliers of energy or fuel
   - The retailers
   - The consumers
   - For all these agents: with or without a threshold (of turnover or sales or of marketed volumes)

2. **Eligible implementers** of energy savings projects *(who may gain White Certificates)*:
   - The obligation bound agent themselves
   - Not obliged agents (e.g. Distributors or suppliers below the threshold)
   - Energy service companies (ESCO) and other commercial/business EE project implementers
     - With or without a minimum requirement on turnover, experiences
     - Accredited or not through presence in an official register
   - The consumers.
     - All without discrimination or only the large ones
   - Market intermediaries (e.g. brokers or other parties that pool/bundle projects)
   - Any economic actor (with or without threshold)

3. **Allocation criteria for Energy Savings targets** on obligation bound agents *(which the targets are)*; according to:
   - Number of served customers (e. g., market share in a given customer segment or in general)
   - Volume of distributed energy
   - Turnover

4. **Eligible energy savings projects** *(generating White Certificates)*; options connected to:
   - sectors
   - size
   - evaluation of the saving impact (i.e. of the number of generated White Certificates)
   - persistence of the savings effect
   - criteria for additionality *(are the energy savings actually the effect of a devoted project or would they occur anyway?)*; e.g. some of possible alternative criteria are:
     - based on increase of turnover
     - based on innovation
     - based on the present market
     - based on the average performance of components (e.g. insulations)
     - based on existing standards and regulations
   - monitoring mechanisms:
     - duration
     - responsibilities
     - rebound effects, i.e. unexpected greater consumes deriving from chances of increased comfort (e.g. turning up the heating) produced by some energy saving projects (e.g. cavity wall insulation) without additional fuel costs for the residential use

5. **Non-compliance regime** *(what to do when targets are not fulfilled)*:
   - Penalties
6. **Trading mechanisms** (*rules for trading White Certificates*):
   - Participants to the market
   - Lifetime of certificates
   - Organisation of the market transactions (e.g. existence of spot market, registry management)
   - Frequency of transactions
   - Safety rules during electronic transactions
   - Banking (chance to keep and to use in the future years the certificates possibly gained in addition to the targets)
   - Borrowing (issuing of an amount of White Certificates prior to the implementation of the project they refer to)
   - Grandfathering (mechanism typical of Emission trading where certificates are issued also relying on "merits" gained in the past in fulfilling the targets)

7. **Possible cost-recovery mechanisms** (*chances for the obliged agents to recuperate some costs handled while performing the energy savings project*)

8. **Chance of extra-national enlarged market**:
   - Within EU, also based on the EU Directive on Energy efficiency end energy services
   - Within the industrialised Countries
   - Need of harmonisation among the energy savings evaluation procedures

9. **Interaction with other Energy Efficiency policy instruments** such as:
   - incentives
   - taxes and tax exemptions
   - voluntary agreements
   - focused standards
   - subsidised audit campaigns

10. **Interaction with other trading schemes**, such as:
    - Renewable energy commitment scheme (Green certificates trading)
    - Carbon trading scheme (Black certificates trading) – in principle (hypothetically? Possibly Kyoto GHG trading) or in Europe (in concrete EU ETS)

Each of the adopted or planned national schemes considered in the following chapter 3 relies on suitable choices and combinations of the above options.
3 SCHEMES FOR WHITE CERTIFICATES ADOPTED OR ENVISAGED AT PRESENT

The schemes adopted or planned in France, Italy, Great Britain and Netherlands are considered in the present chapter. Even if its basic principles differ from a white certificates scheme, it has been considered interesting to include the presentation of the scheme implemented in New South Wales (Australia), who kindly agreed to make available information on their scheme and to share details on it. This scheme is considered in this report as well.

A synthesis table which summarises comparatively these schemes is shown in par. 3.6.

3.1 Description of the French scheme

These considerations are based on presentations P2, L4 and G4 referenced in Appendix C and on the French expert’s contributions.

3.1.1 DRIVERS/BACKGROUND

The drivers which fostered the French scheme involving White Certificates rely on:

- Security of supply of Energy sources.
- National Kyoto targets

Actually, these divers led to a variety of national energy policies. A French programmatic documents on the matter, the “Le livre blanc sur les énergies”(ref [1]) considers, among the others:

- directives on the energy performance of buildings,
- actions to favour a better exploitation of renewable energy sources,
- fiscal regulations
- mandatory energy saving obligations to be attained.

In connection to this last item, targets on energy efficiency were issued, involving a reduction of energy intensity on 2%/year until 2015, than on 2.5% until 2030 (see Fig. 3).
Fig. 3: Evolution of the final energy intensity in France
The need was acknowledged to apply target energy savings to existing basins residential and tertiary sectors, which are very diffused but characterised by important improvements of energy efficiency. This background brought about opportunities to set up a national policy based on White Certificates trading, with a complementary role to other existing instruments, such as regulations under way, tax credit, etc, and which could be based on encouraging the market parties towards mobilisation of their demand/supply, with no involvement of subsidies as a line of principle.

More synthetically, the main drivers which underlie White Certificates policy instrument in France are essentially:

- Need to reach existing and important but diffuse potentials of energy savings, in particular in residential and tertiary sectors
- Limits of traditional public instruments, which are not really adapted given the target sectors and the size of the target
- Lack of public money to implement energy savings programmes

The envisaged advantages are:

- Economical efficiency
- Direct relationship between obliged parts, the energy suppliers, and the main addressees of the measures, the households
- Open scheme: the energy suppliers can propose measures not planed yet
- New means of financing energy efficiency projects: between expected 500 and 1000 M€ over three years
- Instrument adapted for liberalised markets

A debate on energy occurred at a national level. The concepts which drove the process of definition of the French scheme were debated also in a workshop (see. presentation P5 referred in Appendix C), where basic principles were discussed such as:

- Is White Certificates a system or a market?
- Obliged/eligible actors
- Eligible technologies
- Additionality
- Transaction Costs

which were considered very important and binding in styling the scheme to be developed.

The Law 2005-781: "Loi de programme fixant les orientations de la politique énergétique" (Loi POPE) fixed the general principles steering the future energy policies in France, including the main rules relevant to the French White Certificates scheme and demanding its implementation to specific Decrees to be issued. Three decrees (n°2006-600 on energy savings obligations, n°2006-603 on energy savings certificates, n°2006-604 on the registry management) have been issued in May 2006.

### 3.1.2 NATIONAL ENERGY SAVINGS TARGETS

The mandatory targets of the herein considered French scheme involve for the first three years 54 TWh in final energy cumulated and actualised with a 4% discount rate over the life of the energy efficiency actions (depending on the considered measure).

### 3.1.3 COMPLIANCE PERIOD

The saving actions must be performed in the three years period July 2006- June 2009. Within this period, there are no annual deadlines to be respected, and the targets will be verified only at the end of the period.

### 3.1.4 TYPE OF OBLIGATION

The overall target will be shared among the different energy sources covered, then among obliged actors depending on their market share. As a first approximation, the Industry Ministry has proposed the following repartition among energies,

- 50-64% for electricity supply
• 19- 25 % for gas supply
• 3- 5% for heat supply
• 14-20 % for domestic fuel suppliers

The exact repartition will be given after the declaration of energy sales by suppliers.

3.1.5 OBLIGATION BOUND ENTITIES
Obligation concerns energy suppliers in the fields of:
• electricity,
• natural gas,
• LGP
• domestic fuel (not for transport applications),
• cooling and heating

3.1.6 APPORTIONMENT CRITERIA
3.1.6.1 Threshold
As a rule, the energy savings targets are shared among suppliers with annual sales beyond a fixed threshold. This threshold depends on the kind of supplied energy:
• in case of suppliers of electricity, natural gas, heating or cooling, the threshold is 0.4 TWh in the year; this leads at present to a number of around 30 obliged agents
• in case of suppliers of LPG the threshold is 0,1 TWh in the year
• in case of domestic fuel suppliers, there is no threshold: the obligation occurs “from the first litre”, according to a specific request of the professional organisation

3.1.6.2 Reference parameter
Reference parameter for apportionment is a combination between the volume of sales and the volume of energy supply
Only sales in residential and tertiary sectors are considered
Each supplier makes an annual declaration for total energy sales:
• In kWh of final energy
• For each energy, depending on sales in different sectors (residential, tertiary)
• With reference to the previous year balance

3.1.6.3 Criteria
The amount of the apportioned targets over an obliged entity is proportional to his assessed sales volume (see above).
An annual adjustment system will be considered to account for variations in market shares (increase, decrease, new entries, new exits);
All the domestic fuel suppliers are entrusted with individual obligation; chance will be granted to transfer these obligations to a professional consortium structure. The collective structure will be in charge of the implementation of the sum of the obligations of the components.

3.1.7 ELIGIBLE TECHNOLOGIES
All end-use sectors are eligible, including transport and excluding installations implied in the EU European Trading System (ETS).
All energies are eligible
Energy substitution of fossil energies with renewable energies is eligible, but only in case of heat production
Pre-approval for the eligibility of an action is not mandatory but possible. Standardised projects (for which energy savings amount credited is specified ex ante) are encouraged, since they are considered eligible by default.
There are then some definitely not eligible technologies:
• Installations with CO₂ caps under the EU ETS
• Savings from only substitution between fossil fuels
• Installations required to fulfill the regulations in force

3.1.8 ELIGIBLE IMPLEMENTERS
3.1.8.1 Categories
In theory any economic actor can make savings projects and get certificates but some different conditions must be respected so that in fact only few types of agents can get certificates.
In first, to get certificates an agent must prove an implementation of similar measures generating at least 1 GWh of savings (cumulated and discounted over lifetime of a project as described in 3.1.10.1).
Residential fuel suppliers can cope with difficulties in reaching the threshold: possibility (not obligation) exists for them of gathering together into a collective professional structure to reach the threshold: in this case, a trustee gets the certificates.
In second, an non-obliged agent can get some certificates if the action implemented is not related to its main activity and does not give it direct takings. This condition is not applied to local authorities which are eligible automatically.

3.1.8.2 Accreditation of the implementers
No particular accreditation is required from the eligible actors beyond the evidence of savings. The mechanisms are under definition (see 3.1.11.1), but basically will have to set up and to show some records of the carried out programmes.

3.1.9 ELIGIBLE PROJECTS
3.1.9.1 Categories
The kind of the eligible projects will be as open as possible to allow for compliance with target in the widest and most concurrent way. However, an illustrative and not exhaustive list of project will be set up
Some programmes have already been pointed out and are still under discussion:
- Substitution with low energy light bulbs
- loft insulation
- use of double glazing
- installation of heating control mechanisms
- replacement of domestic appliances with more efficient equipment
- replacement of boilers or water heaters by more efficient equipment
- fitting of insulating jackets to water heaters
- fitting of heating control mechanisms
- boiler maintenance
- creation of wood-fired heating systems for district heating or in industry

3.1.9.2 Accreditation before/after the realisation of energy savings
Eligibility will be assured for the finally listed projects, possibly connected to standard procedures for savings evaluation
Pre-approval will be possible to assess eligibility of actions not included in the above list

3.1.10 IMPACT EVALUATION
3.1.10.1 Approach
The approach for the evaluation of the impact of a project in terms of energy savings is developed through two steps.
1. Definition of elementary Energy Efficiency actions involving products or widely exploited services
   At the beginning of 2006, 71 savings actions were preliminarily pointed out, namely :
   • 32 savings actions in residential sector
   • 22 savings actions in tertiary sectors
   • 14 savings actions in industry
   • 3 savings actions in transport
Standardised methodologies are being set up for saving calculation of each action. These methodologies are based on fast and straightforward user-friendly procedures without complex details. Lump evaluation of energy savings are established for each action, expressed in kWh of final energy, cumulated and present-worthed over the life of the product (the so called CUMAC):

\[ CUMAC = EE \cdot DV \cdot Ca \]

where:

- EE = annual energy savings
- DV = lifetime of the action
- Ca = discount factor

These procedures are the results of “technical”/objective evaluations of savings, obtained by experimental campaigns and/or mathematical models and then processed and weighted in suitable ways to keep into account:

- the specific type of equipment or goods
- the process used to save energy (e.g. switching to renewable sources, etc),
- the state of the market of the processes
- a possible state of grid congestion in particular geographical areas, which could be relieved by recovery of energy efficiency at a local scale

In other words, “smart” weighting criteria may be devised to particularly encourage or discourage some specific actions and the resulting so tuned bouquet of procedures can then be used as a tool to favour focused energy policies.

2. Definition of typical pre-fixed combinations of the elementary actions of the above point 1, aimed at fostering energy efficiency (mainly, in the civil sector)

3.1.10.2 Additionality

The Energy savings actions must be additional with respect to the business as usual activity of the implementer, i.e. they are performed only as a consequence of the present obligation on the mandatory targets. Criteria for additionality depend on the obliged/non-obliged features of the actor performing the energy saving project:

1. Obliged implementer or public municipality: any eligible action aimed at energy savings is considered additional
2. Eligible (but non-obliged) implementers: an eligible action is also additional if the action implemented is not related to its main activity and does not give it direct takings.

Finally, more selective criteria are expected to be set up when the EE action is relevant to own equipment or building of the implementer of the action; at present, this definition is in progress, though it will include very probably two classes of actions:

- Actions connected to standardised evaluation methodologies
- Action characterised by a long payback time (more than 3 years)

3.1.10.3 Time persistence of savings

The savings are cumulated over the time life of an equipment by actualising the annual savings with a discount rate of 4 %.

3.1.11 MARKET DESIGN

3.1.11.1 Certificates features

The White Certificates are negotiable property titles.

1 White Certificate = n saved kWh, according to the standard evaluation procedures described above (see 3.1.10.1). Moreover, in a frame of extensive use of these standard procedures, it should be reminded that an added value of saved energy (and the of White Certificates) results with respect to a plain “technical” evaluation when renewable energies are used or/and within some geographic (specific) zones where local critical conditions of the grid can be overcome by encouraging energy efficiency at a local scale (see 3.1.10.1 again).

The White Certificates are issued by a National Public Body (DRIRE - Directions Régionales de l'Industrie de la Recherche et de l'Environnement)
• in a single lumped delivery for each project, for the total of the declared saved kWh
• on the base of the documentation of the programmes carried out - but before the realisation of the
total energy savings
In case of transfer of obligation from a group of small residential fuel suppliers to a consortium, delivery is
expected for an amount of White Certificates equivalent to the total kWh saved in the project
performed by the consortium.

3.1.11.2 Trading parties
The parties involved in White Certificates Trading are the following:
• Obligation bound parties: all Energy suppliers: electricity, gas, domestic fuels (not for transport
applications), cooling and heating
• Eligible implementers: any economic actor who can make savings actions and get certificates

3.1.11.3 Trading rules
The White Certificates must be presented by the obligated parties to the delivering Body (DRIRE) at
the end of the compliance period, according to the relevant apportionments; after returning, clearance
(redeeming) of these titles will occur. Before this date, the market will reconcile possible lack and excess of titles through a gradual and continuous exchange
An official national marketplace (spot market) is not planned: only chance of bi-lateral exchange is expected. If necessary, actions to encourage the market of White Certificates will be launched by entrusted Bodies (as the Minister of Industry) to foster complete fulfilment of the obligations; to this purpose and to favour this process, a list of potential sellers of certificates will be set up and published by the Administrating Bodies (Minister of industry – Board responsible of the national certificates registry)
Price of transactions will depend on the market but an upper limit is given by the value of the penalty for non-compliance (see par. 3.1.12 below). The Responsible of the National Certificates Registry will publish the yearly average price of transaction for Certificates.

3.1.12 PENALTY FOR NON-COMPLIANCE
A maximum value of 2e€/kWh will be finally assumed as penalty for non-compliance with the
apportioned targets, Payment of the penalty cancels the obligation.

3.1.13 BODY RESPONSIBLE FOR ESTABLISHING THE SCHEME
Industry Ministry (Ministère de l’Économie des Finances et de l’Industrie)

3.1.14 BODY RESPONSIBLE FOR ADMINISTERING THE SCHEME
Industry Ministry in general.
ADEME assists the Industry Ministry in definition and evaluation of the standardised actions (i.e. the
methodologies for savings calculations) but the Industry Ministry (le Conseil Supérieur de l’énergie)
validates the methodologies and is entitled of the final decision.
The Industry Ministry is also responsible for the allocations of savings targets.
Finally, The Industry Ministry also publishes an annual report during each of the three years of
application; the report describes the state of operation of the scheme and of the market. The Ministry of
Industry also publishes a list of potential sellers of certificates.

3.1.15 BODY RESPONSIBLE FOR VERIFICATION OF THE PROJECTS
The Industry Ministry is responsible for control of the actions. DRIRE delivers the White Certificates.
3.1.16 BODY RESPONSIBLE FOR REGISTERING THE TRANSACTIONS
An official national marketplace is not planned. A Body within Ministry of Industry is responsible of the national registry of certificates (in discussion). The responsible of the national certificates registry publishes the average price of transaction for Certificates

3.1.17 SCHEME FINANCING
Regulated tariffs of energy should theoretically take in account the cost of energy saving programs engaged to comply with the obligation. But this comes in addition to other factors of tariff adjustment by the public authority.

3.1.18 INTERACTION WITH OTHER POLICY TOOLS
3.1.18.1 Fiscal and other incentives
This considered French policy was intended as complementary to other existing instruments, such as regulations under way, tax credit, etc. It is based on encouraging the market parties towards mobilisation of their demand/supply, with no involvement of subsidies. Nevertheless, measures to improve quality of the scheme and its products (such as bonus/incentives for audits) are being considered

3.1.18.2 Link with other schemes
Not decided yet

3.1.19 ATTAINED OUTCOMES
The scheme is still under definition. No outcome has been attained yet

3.1.20 PRESENT SCENARIO/STATE-OF-THE-ART
Decrees have been adopted in May 2006 to be applied the 1st of July. The energy savings performed after January 1st 2006 will be eligible Some questions are still waiting to be adopted :

- simple mechanisms for monitoring and verification of the energy savings projects
- definition of the administrative process for certification
3.2 Description of the Great Britain scheme

The below considerations are based on the presentations LO2, LO3, LO4, G2 referenced in Appendix C and on ref. [10] and [11].

3.2.1 The Energy Efficiency Commitment (EEC)

Energy efficiency was identified in UK as the most cost effective way to meet energy policy goals. A great deal of analysis was undertaken during development of the Energy White Paper (ref. [11], published Feb 2003) and the so called Energy Efficiency Action Plan (April 2004). Energy efficiency is at the heart of UK’s climate change programme and an ambitious package of measures is being taken forward through the Energy Efficiency Action Plan. Some figures of Energy Efficiency Action Plan are shown in the below Tab. 2.

<table>
<thead>
<tr>
<th>Energy Efficiency Action Plan</th>
<th>Carbon savings (Mtoe pa) for 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Public Sector</td>
<td>7.9</td>
</tr>
<tr>
<td>Households</td>
<td>4.2</td>
</tr>
<tr>
<td>Total</td>
<td>12.1</td>
</tr>
</tbody>
</table>

Tab. 2– Carbon savings planned within Energy Efficiency Action Plan

The Great Britain scheme for Energy Savings trading is developed in the frame of the Energy Efficiency Commitment. EEC is a sustainable energy policy aimed at reducing use of energy in the household sector. EEC, although key, is currently just one part of the wider policy instrument planned within the Energy Efficiency Action Plan.

EEC is designed to address all the key aims of sustainable development:

- Environmental: EEC is key to UK carbon abatement objectives in the household sector
- Economic: it considers the capacity of the energy efficiency industry while assuming that suppliers do the maximum number of most cost-effective measures.
- Social: cost to consumer and others are evaluated and it contributes to the alleviation of fuel poverty.

In this context, the EEC aims to drive down domestic energy demand, contributing not only to carbon abatement, but also to security of supply and wider social issues. EEC is confined to the domestic sector. Under the EEC, electricity and gas suppliers are required to achieve energy saving targets by promoting improvements in energy efficiency in the household sector in UK. As it was remarked, EEC only covers household sector, whereas the business and public sectors are covered by other policies that are more appropriate for them, such as the Climate Change Levy / Agreements.

The EEC runs in 3 phases of 3 year each:

- The first phase of EEC was introduced in April 2002 and ran to March 2005.
- The second will run from April 2005 to March 2008.
- In 2007 Government will consult on the third phase to run from April 2008 to March 2011.

3.2.2 Mechanisms of EEC

The framework for the EEC and the overall target is set by Government via legislation, following informal and formal consultation. DEFRA has undertaken a wide consultation process with the industry throughout the policy development process and had considered the full range of potential measures. The Energy Efficiency Obligations Orders set the overall target for each phase: , they were 62 fuel-

3 Fuel poverty: people who spend more than 10% of their income on all household fuel use in order to maintain a satisfactory heating regime.
standardised lifetime-discounted TWh for the first phase (2002-2005) and are 130 TWh for the second phase (2005-2008). The value of the overall targets was determined also as a function of the costs of eligible energy efficiency programmes, since these expenses turn into potentially increased cost to consumers’ fuel bills.

As pointed out, the overall targets are intended as cumulated over the life of the energy saving action; in fact, different measures have different lifespans (e.g. a CFL might last 10 years, whereas wall cavity insulation would effectively last for the lifetime of the building): account of this is taken when the level of carbon savings are attributed to a type of measure. The targets are also actualised and a suitable discount rate, dictated by HM Treasury, is then assumed for that (it used to be 6%, but is now 3%). Moreover, the targets are expressed in fuel-standardised terawatt hours. This means the number of kilowatt hours multiplied for a suitable adjusting factor; e.g. for the second phase of EEC (see par. 3.2.5):

- as regards coal, by 0.56
- as regards electricity, by 0.8
- as regards gas, by 0.35
- as regards liquid petroleum gas, by 0.43
- as regards oil, by 0.46

Dead-weight is removed from supplier targets.

The UK regulator Ofgem (The Office of gas and electricity markets) is responsible for setting suppliers’ individual targets, administration of suppliers’ activity, enforcement of the legislation and reporting to Government on progress.

3.2.3 Obliged agents and fulfilling EEC targets

Electricity and gas suppliers are mandatory committed to reach the energy savings targets. Only suppliers with over 15,000 customers are entrusted to operate EEC programmes.

Suppliers are free to meet their targets in a wide range of ways and are not required to spend a fixed budget to meet their obligations. There is not a minimum size for the Energy Efficiency measures; the actual size ranged from 0.3 GWh on. An assumption made is that suppliers would do all the most cost effective measures first.

Suppliers encourage and assist their domestic consumers to make energy savings through measures such as cavity wall and loft insulation and energy efficient boilers, appliances and light bulbs. Suppliers are free to innovate.
Suppliers can do this by working directly with customers, their landlords, or other partners and by working with manufacturers and retailers of energy efficient products. This in turn depends on the available practical opportunities in the housing stock and supply side constraints.

Companies have to target at least half of their energy savings at households receiving benefits or tax credits related to (low) income, that are compelled to spend more than 10% of their income on all household fuel use in order to maintain a satisfactory domestic heating regime. This category, who is known as the 'priority group', is made up of about 7.7 million households including pensioners, aged 60 or over, occupants of social housing or eligible for a qualifying income, recipients of disability benefits, or finally, households receiving benefit with children under the age of 16. The second group of households, who are addressees of the left 50% target, includes another category of consumers, mainly ‘near-benefit’ consumers or low-income consumers, still under fuel poverty, which can contribute to some measures in the context of the EEC.

The requirement on priority group enables the low-income people to receive a fair share of the benefits of the EEC, so ensuring the social goals of mechanism.
3.2.4 EEC 2002-05

3.2.4.1 General
The Energy Efficiency Commitment (EEC), which began in April 2002, is set by Defra and requires gas and electricity suppliers, with at least 15,000 domestic customers, to meet a combined energy saving target of 62 TWh by March 2005; this is the equivalent to a 1% per annum reduction in carbon emissions (likely to be around 0.4 million tonnes a year) from households. This target of 62 TWh should be undertaken as cumulated over the life of the energy savings actions with a 6% discount rate. A group of Energy Efficiency projects was set up at the launch of the EEC and the ex-ante evaluation of the relevant saving per physical reference unit was defined. These information are shown in Tab. 3 in par. 3.2.5.

3.2.4.2 Outcome and learned lesson
Overall suppliers recognised the importance of the EEC scheme and the role they play. The EEC enabled them to brand themselves as green and socially conscientious companies. Suppliers considered EEC very challenging; no “lobby” occurred in Great Britain against its full application.

Detail figures on achievements can be found in presentation LO4 referenced in Appendix C. In particular, also from a chronological viewpoint:

- At the end of 2004, Ofgem had approved 120 such energy savings programmes which had achieved savings of 47 TWh. This figure is equivalent to powering 2 million homes per year (roughly, all the homes in the West Midlands). This represented more than three quarters of the savings needed to reach the 62 TWh target set for the first phase of EEC between 2002 and 2005. Preliminary evaluations, which are being verified, seems to show that the total savings attained in this first period complied with the target with an extra savings amount of about 25 TWh, which is bankable for the second period of EEC.
- In some phases of implementation of EEC 2002-2005, it was remarked that the achievement in the priority group was lower than that in the non-priority group; it was ascribed to various reasons:
  - the fact that the measures are “cheaper” for the suppliers in the non-priority group, since the households in this group can contribute more to the cost
  - very often an energy saving measure (e.g. cavity wall insulation) gives the chance of an increased comfort (e.g. turning up the heating) without additional fuel costs for the residential user; this practice is more likely to be attractive for users in the priority group and can offset the efficiency gain as a typical case of “rebound effect”; no definite estimations about the rebound effect in priority group are available at present.
- The first phase of EEC achieved about a 1.5% reduction in overall household consumption. This result was reached through the implementation of about only 150 projects of relatively large unit size, notwithstanding there is no requirement for a minimum size. The most popular measures so far have been the installation of cavity wall insulation and the provision of energy saving light bulbs.
- The annual cost of the EEC is around £3.60 per household, per fuel, per annum, for the years 2002-2005.
- As for costs for administrating the scheme, according to Ofgem a rough breakdown of the costs involved showed a total ~£ 300,000 per year. The biggest costs were connected to the external auditor and to management of the database. The team at Ofgem consisted of five people. The cost of operating the EEC was a very small portion of Ofgem’s total budget of £ 400 million.

3.2.5 EEC 2005-08
A second phase for EEC was planned for 2005-2008 period as extension of the 2002-2005 programme. Ofgem set out their intentions for administrating the new programme. However, Ofgem pointed out that as the costs of the EEC was rising, it was is important to achieve the right balance between future costs and benefits to customers.

The legal and administrative framework remained broadly the same. In particular:
- Target of 130 TWh approximately double the level of activity of the first phase
- Carbon savings likely to be around 0.7 millions tonnes a year by 2010
• Suppliers must still direct at least 50% of energy savings to a priority group of low-income consumers, which will support UK fuel poverty goals

A group of Energy Efficiency projects was set up also for this second phase of EEC. New measures of microCHP were planned; they would be encouraged by means of a properly devised evaluation of awarded energy savings.
The ex-ante evaluation of the relevant saving per physical reference unit was defined These information are shown in the Tab. 3 in comparison with those of the previous period 2002-2005.

EEC 2005-2008 will add ~£5 per year per fuel to energy bills, on top of ~£4 added by EEC 2002-2005. Therefore, between 2005-2008 the total cost EEC for a customer who uses both electricity and gas was evaluated as ~£18 per year.
<table>
<thead>
<tr>
<th>Projects</th>
<th>Lifetime in years</th>
<th>Energy Savings/year (MWh/Unit/yr)</th>
<th>Discounted Savings for Electricity (GWh)</th>
<th>Aggregate Energy lifespan: Electricity (GWh)</th>
<th>Discounted Savings for Gas (GWh)</th>
<th>Aggregate Energy lifespan: Gas (GWh)</th>
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<tbody>
<tr>
<td>Cavity wall insulation</td>
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<td>5.00</td>
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<td>Social</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<td>Glazing E to C rated</td>
<td>20</td>
<td>0.03</td>
<td>112</td>
<td></td>
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<td>Boiler end-of-life replacement with condensing boiler (Bto A)</td>
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<td>Loft Insulation- top up</td>
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<td>488</td>
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<td>Appliance replacement-higher efficiency models</td>
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<td>Compact fluorescent light bulbs (extra bulbs)</td>
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<td>- retail</td>
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<td>- direct</td>
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<td>0.01</td>
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<td>Compact fluorescent light bulbs (new bulbs)</td>
<td>8</td>
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<td>Hot water tank insulation-new</td>
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<td>15</td>
<td>1.88</td>
<td>129</td>
<td></td>
<td>1,698</td>
<td></td>
</tr>
<tr>
<td>Appliances –Cold</td>
<td>12</td>
<td>0.06</td>
<td>1251</td>
<td></td>
<td>-674</td>
<td></td>
</tr>
<tr>
<td>Wet</td>
<td></td>
<td>0.02</td>
<td>268</td>
<td>-7</td>
<td>-82</td>
<td></td>
</tr>
<tr>
<td>Set Top Boxes</td>
<td>8</td>
<td>0.01</td>
<td>138</td>
<td>-83</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Draughtproofing</td>
<td>20</td>
<td>0.74</td>
<td>210</td>
<td></td>
<td>2,750</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 3 - Energy improvement in the Great Britain EEC scheme 2002-2008

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3.2.6 **EEC 2008-11**

A third phase of EEC is planned for the period 2008-2011. Government will review in 2007 the outcomes of the second phase to inform setting of target for EEC 2008-11. Outcome of review will be statutory consultation in spring 2007

The third phase is expected to involve a wider range of involved actors.

3.2.7 **EEC and market transformation: the ESCO operation**

EEC was also intended as a suitable policy to encourage certain practices and products. In this context, operation of Energy Services Companies (ESCO) was considered with great attention, since it was seen as being the solution to effectively attain the targets.

An effective incentive in the EEC for energy services would be to award suppliers with more points (e.g multiplying savings by a factor) for measures undertaken as part of energy services contracts. In general, EEC encourages ESCO in participating through a more “generous” award of the achieved energy savings.

Up till now, the ESCO operation in this field has not been developed on large scale yet. In fact, the take-up of energy services had been disappointing. A lack of consumer demand had made suppliers reluctant to invest in marketing. The principal reasons for the lack of interest were considered to be twofold.

- Consumers were reluctant to become tied into a long-term contract and lose the flexibility of the 28 day rule: the 28 day rule allows a household consumer for transferring to another supplier, giving the present supplier just 28 days notice\(^4\). This is a barrier to energy services, as a supplier cannot have the guarantee to recover his investments before a customer of his moves to a competitor.
- Moreover, the energy services packages did not contain measures sufficiently compelling to make a long-term contract attractive (in other words, the clients still preferred products – *bare-kWh* - rather than services - *dressed-kWh*).

Some Great Britain Energy Companies are active in both energy sale/distribution and energy services. They must comply with Energy Efficiency Commitment requirements only if their state of suppliers and number of clients oblige them. They have to meet targets by means of energy savings measures relevant to domestic end users. To this purpose, they can operate as ESCO and take advantage of an increased award for the performed measures. No definite information are available at present of this subject.

3.2.8 **Trading in EEC**

There are possibilities for trading between EEC suppliers. Trading in the EEC can be developed through two possible routes:

- **Trading of Energy Savings**
  Suppliers can trade energy savings from the energy efficiency measures already completed
  Energy efficiency measures will be transferred from one supplier to another

- **Trading of Obligations**
  Suppliers can trade their obligations.
  One supplier can pay another supplier to gain the right to transfer all or part of his target to him
  One supplier’s target will increase while another’s will decrease

In practice the use of these mechanisms is limited to the final stages of each target period, when suppliers reconcile their achieved performance against their targets

All these trades need to be approved by Ofgem

3 forms of trading were envisaged:

---

\(^4\) On average, the costs for a supplier to sign-up a new customer is ~£ 200 simply.
• **Horizontal**, i.e. between suppliers; at present, no information is available on this practice
• **Inter-temporal**, i.e. transfer/banking of savings between compliance periods; this solution was very popular, since about 20% of EEC2 targets were met in EEC1
• **Vertical**, i.e. between suppliers and project developers: this is the most important, since suppliers have contracted out most of their measures to 3rd parties

Little formal trading of energy efficiency measures occurred through the legislation. Trading of EE did not involve in Great Britain a formal certification of the attained savings. In other words, the White Certificates issue was not considered for trading in EEC scheme.

The trading of Energy Efficiency (EE) obligations was performed by means of bi-lateral contracts in terms of saved TWh. Actually, trading has been limited to the final stages of each target period, when suppliers reconcile their achieved performance against their targets. As pointed out above, a more standardised platform of trade (e.g. by means of White Certificates in a suitable marketplace) has not been introduced yet.

At present, there is very little incentive for suppliers to trade within the EEC scheme. In fact, with only six major EEC suppliers, the market for trading cannot be sufficiently liquid. Also, most of the suppliers use the same contractors to undertake the work, so it is unlikely any one supplier could run their scheme more cheaply than another.

The gained experiences showed that there are some issues of EEC scheme to be further discussed for more efficient trading:
- Possible use of different target metrics: e.g. absolute or percentage energy demand reduction, carbon reduction
- Set up of different targets to be met within Priority Group
- Measurement and Verification practices
- Application in the commercial building sector

### 3.2.9 Envisaged and remarked costs and benefits

#### 3.2.9.1 Consumer benefits
- Ongoing financial benefits in terms of lower energy bills or increased comfort
- Suppliers must direct at least 50% of energy savings to a priority group of low-income consumers
- As a result, EEC contributes to the alleviation of fuel poverty and of the risk of ill health caused by cold homes

#### 3.2.9.2 Costs to consumers
- Direct costs of the EEC are born by suppliers. Suppliers’ costs are the share of the cost of measures they have to contribute to induce householders to take them up.
- Suppliers may pass on costs to consumers through their energy bills. Also the costs of developing and administering EEC schemes is somehow transmitted to the consumers
- It is not known whether suppliers will pass on costs to consumers in full or in part. If passed on in full, the annual cost per household for the three years of EEC 2005-08 is estimated to be no more than about £16. To give quantitative sensitivity to this statement, it can be observed that households would need only install two 20-Watt CFLs in high usage fittings for the extra cost of EEC 2005-08 to be covered by the financial savings
- While the costs of EEC last only for the three years of the programme (maybe more), the benefits last for the lifetime of the measures – up to 40 years in the case of cavity wall insulation or 12 years for cold appliances
3.2.9.3 Social benefits: carbon saving

- EEC produces benefits to the Society considered in the global, essentially from the environmental viewpoint.
- The first phase is expected to save about 0.4 million tonnes of carbon a year by 2005.
- EEC 2005-08 expected to save around 0.7 million tonnes of carbon a year by 2010

3.2.10 Miscellany on particular aspects

Some specific remarks arisen during the Task XIV workshops are listed below

- **Ways of suppliers of approaching customers**
  Much of the marketing consisted on leaflets with bills, posters and advertisement in magazines. The Energy Saving Trust also provided information about the scheme wherever possible. Interested customers would then contact an EEC supplier. Suppliers also did a lot of work with landlords, particularly in the social sector, as the expensive (time and effort consuming) job of identifying properties is mostly achieved by the landlord. An additional route taken by suppliers was through retailers of electronic goods. Suppliers received points for sales of energy efficient products, such as light bulbs and white goods, that they subsidise.

- **Number of suppliers operating within EEC**
  There are currently nine EEC suppliers in the Great Britain.

- **Compensation/penalisation for suppliers**
  The Utilities Act sets the maximum penalty Ofgem can give at 10% of the supplier’s turnover. It should be remarked that this is a maximum, possible, not “universal” value for the penalty, i.e. this value is expected to affect only very serious faults. No compensation is given, but there is no constraint on how much suppliers charge customers.

- **Proof for a supplier of complying with his target**
  Ofgem maintains a spreadsheet of measures carried out by each supplier, recording the savings they have achieved. These are added up and counted against their target. If trading is carried out, this can be of measures undertaken or of part of their obligation.

- **Evaluation of level of additionality for each measure**
  Different techniques are used for the eligible technologies. For example, for CFLs, the priority group is getting 100% additionality due to the high cost of the bulb and the low income of the consumer (i.e. poorer households are unlikely to purchase CFLs outside the EEC scheme). For social sector measures, the supplier needs to receive a letter from the landlord who self-certifies not to be free-rider, i.e. that he would not have carried out the EE measures outside EEC.

- **Responsibilities of the technical outcome of energy saving measures.** The installer should be liable usually, even if it is conditioned to the contractual arrangement between the supplier and the installer.

- **Relations between White Certificates and energy performance of Buildings Directive** General feeling exists on the fact that Directives and Standards are usually very far from being procedures for energy savings assessment. Nevertheless, Building Standards can at least provide terms of reference (i.e. baseline) against which savings can be evaluated.

3.3 Description of the Italian scheme

The following considerations are mainly based on ref. [2] with up-to-date information obtained from presentations L3 and G3 referenced in Appendix C and from Italian experts' communications.
3.3.1 DRIVERS.BACKGROUND

3.3.1.1 Foreword

The choice of a White Certificates systems in Italy (see ref. [2]) is based substantially on political drivers:
- The need to implement Kyoto protocol: Italy has committed to reducing its emissions by 6.5% between 1990 and 2008-2012. About 26% of the whole emission reduction goal (24-29 MtCO2) will have to be achieved through energy efficiency improvements on the demand side of the energy market.
- The need to implement two European Directives (96/92/CE and 98/30/CE) on the liberalisation of the electricity and gas market. These two EU Directives were implemented into the Italian electricity and gas market by two Italian legislative acts: Legislative Decree no. 79 of 16 March 1999 (Decreto Bersani) and Legislative Decree no. 164 of 23 May 2000 (Decreto Letta) respectively. Both acts determine that concessions for the Distributors’ operation shall contain provisions to increase energy efficiency of end uses, according to quantitative targets to be set by Decree of the Minister of Industry jointly with the Minister of the Environment.
- The need to fix these targets in energy efficiency in end uses. Two Legislative Decrees, the so called Twin Decrees 24 April 2001, finally updated on 20 July 2004, definitely established the quantitative targets in terms of primary energy, the suitable actions to fulfil them and the mechanism of White Certificates trading.
- The affinity with the Proposal for a Directive on energy end-use efficiency and energy services COM (2003) 739.

3.3.1.2 Background

Until recently the promotion of energy efficiency in end-use sectors has not been at the top of the Italian energy and environmental policy agenda. Policy efforts have mainly focused on the supply side of the market, aiming at enhancing the conversion efficiency of the existing capital stock, promoting a shift away from carbon intensive fuels to lower or zero emissions fuels (i.e. renewable sources) and, although to a lesser extent, promoting investments in new capacity and infrastructure.

One reason for this policy choice is possibly linked to the fact that Italy has been traditionally characterised by a relatively low per-capita energy consumption compared to other industrialised countries and this has long (and incorrectly) been interpreted as an indicator of high efficiency in energy use. On the contrary, it is primarily the result of an economic structure characterised by a relatively low share of high energy intensive industries and a significant share of the agriculture and tertiary sector, favourable climatic conditions and a relatively high fiscal pressure on energy-related activities.

In the last few years, driven by the rising environmental concern and the increasing attention being paid to issues related to security of energy supply, a number of studies have explored the technical and economic energy savings potential in the country.

These analyses pointed out that a significant potential existed, although at different levels, in every sector of the economy. These results have fuelled the debate over appropriate ways to promote improvements in the efficiency of energy use.

3.3.1.3 Kyoto requirements

Under the Kyoto Protocol and the subsequent burden sharing agreement among European Union member states, Italy has committed to reducing its GHG emissions by 6.5% between 1990 and 2008-2012. According to 1997 official national estimates this commitment drives Italy to curb national GHG emissions from a forecasted value of about 622 MtCO2e in 2012, to 555 MtCO2e by the first commitment period, resulting in a total reduction of 102 MtCO2e, corresponding to an actual reduction target of −18.5% with respect to 1990’s emissions level.

5 As a consequence of the increasing trend of GHG emissions in the period 1997-1999 these numbers are now being revised.
In November 1998 the Government adopted the second National Programme to reduce GHG emissions (NCP hereafter) which singles out six ‘key actions’ that will deliver this emissions reduction target (cf. Tab. 4). The overall reduction target, the sectored targets and the general policy framework set out in the NCP have been put at the heart of the national energy policy independently from the Kyoto commitment.

According to the NCP, policies and measures to promote energy savings in end-use sectors will play a key role in the reduction of GHG emissions nation-wide: about 26% of the whole emissions reduction goal, corresponding to a cut of 24 to 29 MtCO₂, will have to be achieved through energy efficiency improvements on the demand side of the energy market. On the supply side, over 20% of the total long term reduction target will have to be achieved through efficiency improvements of power plants; a further 18% will have to be delivered via an increase of energy generation from renewable sources.

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Efficiency improvements in power generation</td>
<td>–4 to –5</td>
<td>–10 to –12</td>
<td>–20 to –23</td>
</tr>
<tr>
<td>2 Energy saving in transport</td>
<td>–4 to –6</td>
<td>–9 to –11</td>
<td>–18 to –21</td>
</tr>
<tr>
<td>3 Promotion of renewables</td>
<td>–4 to –5</td>
<td>–7 to –9</td>
<td>–18 to –20</td>
</tr>
<tr>
<td>4 Energy savings in end-use sectors</td>
<td>–6 to –7</td>
<td>–12 to –14</td>
<td>–24 to –29</td>
</tr>
<tr>
<td>5 Emission reductions in non-energy sectors</td>
<td>–2</td>
<td>–7 to –9</td>
<td>–15 to –19</td>
</tr>
<tr>
<td>6 Sinks</td>
<td>–</td>
<td>–</td>
<td>–0.7</td>
</tr>
<tr>
<td>Total</td>
<td>–20 to –25</td>
<td>–45 to –55</td>
<td>–95 to –112</td>
</tr>
</tbody>
</table>


Tab. 4 - Key actions in the NCP and emissions impact (MtCO₂e)

The NCP does not lay down specific policy tools to be used in order to pursue the above mentioned emissions reduction goals; however it does specify that these emissions cuts will have to be achieved via policies and measures that:
- enhance the emission reduction potential of policy measures that have to be introduced in order to comply with EU directives and regulations;
- pursue the modernisation of the industrial and energy system and infrastructure and the improvement of energy efficiency in a cost-effective way;
- promote the development of innovative low-emission technologies.

In other words, the great part of the package of measures implemented within the NCP will have to be of a “non-regret” type: together with emissions cuts, they will deliver a number of secondary benefits in terms of efficiency improvements, enhancement of the competitiveness of the national electricity supply industry, air quality improvements in towns and cities.

3.3.1.4 Energy efficiency and the opening-up of energy markets to competition

A further important criterion for the definition of the policy tool-kit to promote the reduction of GHG emissions nation-wide has emerged simultaneously to the need to implement the two European Directives on the liberalisation of the electricity and gas market (96/92/CE and 98/30/CE): the search for policy tools consistent with the new emerging market framework. The common understanding is that, in order to avoid undue subsidisation, market opacity and discrimination, ‘traditional’ policy instruments such as standards and fiscal incentives have to be gradually substituted by incentives based upon market mechanisms.

The process of implementation of the two European liberalisation Directives has also given rise to a growing concern over the possible negative environmental impacts of the liberalisation process. Many are concerned that as markets become more competitive and prices gradually decline, consumption (and related emissions) increases while utilities adopt myopic behaviours and seek to shed costs, starting from activities which are characterised by high initial investment costs and long pay-back periods, such as renewable sources, R&D initiatives and DSM programs.
With regard to the latter, these concerns have been integrated into the legislative acts which implement the EU Directives in the national electricity and gas market (the above mentioned Decreto Bersani e Decreto Letta): both acts determine that concessions for distributors shall contain provisions to increase the energy efficiency of end uses, according to quantitative targets to be set by Decree of the Minister of Industry jointly with the Minister of the Environment.

The need to set these targets gave the Government a great opportunity to rethink the structure of the policy instruments used until that date to promote energy efficiency in end-use sectors. In July 2004 two Legislative Decrees were issued6 (the Twin Decrees 20 July 2004, one for the electricity distribution sector and one for the natural gas distribution sector) which set these quantitative targets together with a new and quite innovative policy tool-kit to promote their achievement. The policy package combines command and control type of measures (mandatory quantitative targets) with market based instruments (certificate trading) and elements of tariff regulation (cost recovery mechanisms via electricity and gas rates).

The introduction of tradable White Certificates is the transposition to end-uses energy efficiency of a principle that has been applied so far to a number of other topics in a number of countries (e.g. emissions reductions, development of renewable energy sources, water rights). Its major aim is to combine the ‘guaranteed results’ of regulation (i.e. mandatory energy savings targets) with the economic efficiency of market-based trading mechanisms. At least in theory and under strict assumptions, it is expected to achieve the predefined and compulsory targets at the minimum total cost.

3.3.2 GLOBAL ENERGY SAVINGS TARGETS

The mandatory targets of the herein considered Italian scheme involve a gradually growing annual value expressed in Mtoe/year of absolute saving of primary energy, according to the below Tab. 5.

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Energy Savings (Mtoe/year)</th>
<th>Annual Energy Savings (TWh/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.2</td>
<td>2.33</td>
</tr>
<tr>
<td>2006</td>
<td>0.4</td>
<td>4.65</td>
</tr>
<tr>
<td>2007</td>
<td>0.8</td>
<td>9.30</td>
</tr>
<tr>
<td>2008</td>
<td>1.5</td>
<td>17.44</td>
</tr>
<tr>
<td>2009</td>
<td>2.9</td>
<td>33.72</td>
</tr>
</tbody>
</table>

Tab. 5 – Italian Energy saving targets

The following conversion factors hold, according to the considered energy carrier:

- The fuel savings are accounted on the base of their lower calorific power expressed in GJ, considering that 1 toe=41.860 GJ
- The electricity savings are accounted through the conversion factor 1 kWh=0.22·10³ toe.

A conversion of values of Tab. 5 from primary into final energy cannot be done unequivocally, since the quotas of energy savings to be ascribed to different energy carriers (gas and electricity, which are accounted with different conversion factors) are not defined a priori in the scheme (see 3.3.4); in fact, as it will better clarified afterwards, the Italian scheme only specifies that each targeted sector (electricity or gas) must comply with at least 50% of his goal by means of savings obtained on end-uses relevant to his proper energy carrier. This entails that a given target of primary energy savings can be fulfilled with a large variety of combinations of electricity and gas savings.

---

6 These Decree, among the other things, update annual energy savings targets, of two similar previous Decrees issued on April 2001 which are cancelled and substituted by these more recent ones.
3.3.3 COMPLIANCE PERIOD
The saving actions must be performed in the period 2005-2009. Within this period, there are five annual deadlines to be respected, and the targets will be verified (through the surrender of White Certificates) for each year by May 31st of next year, starting from 2006.

3.3.4 TYPE OF OBLIGATION
The overall target can be attained by:
- Electricity savings
- Gas savings
- Other fuels savings
The target is shared over the two targeted sectors, the electricity Distributors and the gas Distributors, according to the following Tab. 6:

<table>
<thead>
<tr>
<th>Year</th>
<th>Annual Energy Savings (Mtce/year)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity Distributors</td>
</tr>
<tr>
<td>2005</td>
<td>0.1</td>
</tr>
<tr>
<td>2006</td>
<td>0.2</td>
</tr>
<tr>
<td>2007</td>
<td>0.4</td>
</tr>
<tr>
<td>2008</td>
<td>0.8</td>
</tr>
<tr>
<td>2009</td>
<td>1.6</td>
</tr>
</tbody>
</table>

Tab. 6 – Italian Energy saving targets sharing
Each targeted sector must comply with at least 50% of his goal (the so called 50% constraint) by means of savings obtained on end-uses relevant to his proper energy carrier. In other terms, the electricity Distributors must reach at least the half of their goals with savings on electrical end-uses; the residual part may be fulfilled with savings on gas or other fuels end-uses (i.e. fuel switching). Accordingly, the gas Distributors must reach at least the half of their goals with savings on gas end-uses; the residual part may be fulfilled with savings on electricity or other fuels end-uses. The 50% constraint translate in an electricity consumption target equal at least at 1.5% of the total electricity distributed to final consumer in 1999 (net of auto-consumption). In the case of natural gas, it translate in a reduction of at least 3% of the total natural gas distributed in the same year.

3.3.5 OBLIGATION BOUND ENTITIES
Obligation concerns a very restricted collection of subjects: the electricity and gas Distributors with more than 100,000 customers as of Dec 31st 2001. They are the owners of the distribution networks. In some cases these operators also act as suppliers towards the end-users (at present –date of report - this is the case of the electricity end-users not eligible for an open market yet - practically, all the household users).

3.3.6 APPORTIONMENT CRITERIA
3.3.6.1 Threshold
The total energy savings targets are shared among Distributors exceeding the lower threshold of 100,000 customers served as of Dec 31st 2001. At the moment, the resulting pool of obliged agents is made up as it follows:
- electricity: 10 Distributors, serving about 98% of total customers
- natural gas: 24 Distributors, serving 9.630.000 customers (over a total of about 16 millions) – about 60 %

3.3.6.2 Reference parameter
Reference parameter for apportionment is the ratio of own electricity/gas distributed to the total in the previous year.
3.3.6.3 **Criteria**
The amount of the apportioned targets over an obliged entity is **proportional to his assessed annual sales volume** (see above).

3.3.7 **ELIGIBLE TECHNOLOGIES**
**All end-use sectors are eligible.** An open list of eligible technologies was set up by the Regulatory Authority (see sect. 3.3.9). Supply-side projects are considered not to be eligible to meet the obligation\(^7\).

3.3.8 **ELIGIBLE IMPLEMENTERS**
3.3.8.1 **Categories**
**All electricity and gas Distributors** are eligible implementers of Energy Savings projects, regardless of their market share. **Companies controlled by the above Distributors**, are eligible as well. Finally, **Companies finalised at supplying energy services** (ESCO's) are eligible implementers.

3.3.8.2 **Accreditation of the implementers**
**Accreditation is required** for ESCO's to become eligible agents within the Italian scheme. The formal acknowledgement is given by the Authority for Electricity and Gas upon delivery of documents which evidence the Company statute. ESCO's are accredited through a suitable self-declaration, which assesses that the supply of integrated services aimed at realising and possibly managing energy efficiency measures is included among their commercial scopes. At present, a list of about 200 accredited ESCO's is available.

3.3.9 **ELIGIBLE PROJECTS**
3.3.9.1 **Categories**
The targets do not refer to specific end-use sectors and/or type of projects. Consequently, the kind of the eligible projects is open to allow for compliance with target in the widest way. The rules to design, implement and quantify (in term of savings) these projects are issued by the Authority for Electricity and Gas (AEEG). An **illustrative (then ‘open’) list of projects** was set up by law; it includes:
1. End-Use Power Factor compensation
2. Electric motors and their applications
3. Lighting Systems
4. Electricity leaking (stand-by losses reduction)
5. Substitution of electricity with other more efficient energy sources
6. Reduction of electricity consumption in thermal uses
7. Reduction of electricity consumption for air conditioning
8. Promotion of high efficiency electric appliances in offices and homes
9. Devices for combustion of non renewable fuels
10. Substitution of electricity to other energy sources with reduction of primary energy consumption
11. Heating/cooling and heat recovery in buildings supplied with non renewable fuels
12. Development of renewable energy sources at users’ premises
13. Promotion of electric and natural gas vehicles
14. Campaigns for education, information and promotion of energy efficiency

3.3.9.2 **Accreditation before/after the realisation of energy savings**
Standard procedures for savings evaluation exist. No pre-approval is requested for projects covered by these procedures.

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\(^7\) This exclusion is specifically mentioned in the decrees. However, a bit contradictorily, eligible projects attached to the two decrees include small photovoltaic plants (< 20 kW).
Pre-approval is possible to assess eligibility of the other typologies (see “metered baseline methods” in the below sect. 3.3.10.1).

3.3.10 IMPACT EVALUATION

3.3.10.1 Approach

Three types of methods are available for the evaluation of the energy savings connected to a project:

- **Default method (no on-field measurement):**
  It is based on standard evaluation procedures with no on field measurements and it gives “ex-ante” the energy savings per physical unit (e.g. per substituted lamp, per kW of installed motor power, etc) of equipment. This approach will be used for projects for which expected savings are reasonably well understood and direct measurement would therefore be not cost effective. The approach is typical for “mass” projects where reliable averages can be determined. For every type of project, a simple equation is provided together with standard values for each of the parameters included in the equation itself. In this default method, gross savings were to be converted into net savings through simple multiplication by a default factor which takes into account for free-riding effects and, depending on the type of project been considered, by a second default factor which takes into account the impacts of different delivery mechanisms (e.g. direct installation, sale without installation, discount bonus, etc.). Subsequent year savings will have to be estimated using a default persistence factor specified by AEES (see also sect. 3.3.10.3).

At present (June 2006) 20 procedures are officially available:

1. Substitution of incandescent lamps with CFLs
2. Substitution of electric water heaters with electronic ignition gas heaters
3. Installation of gas fired boilers rated “4 star efficiency”
4. Substitution of pilot-flame gas water heaters with electronic ignition gas heaters
5. Substitution of single-pane with dual-pane windows
6. Wall and roofing insulation (heating savings)
7. Use of photovoltaic generators below 20 kW
8. Use of solar water heaters
9. Installation of variable speed drives for pumping systems below 22 kW
10. Energy recovery from natural gas decompression
11. Installation of high efficiency electric motors
12. Installation of high efficiency refrigerators, freezers, washing machines, dish washers facilities
13. Installation of low flow showerheads in homes, hotels and recreational
14. Installation of faucet aerators in homes
15. Installation of air source heat pumps in new or renovated residential buildings
16. Installation of power regulators in public lighting systems
17. Replacement of mercury vapour lamps with high pressure sodium lamps
18. Installation of air conditioners with cooling capacity below 12 kW
19. Wall and roofing insulation (cooling savings)

Each procedure was submitted to the interested parties for remarks prior to the official issue through a consultation phase.

An on-line system was set up on the Authority website, which allows the eligible operator to submit in an direct way their requests of verification and certification of attained savings and the relevant accounting records. The following Fig. 4 shows an example of this application for energy savings accounting with reference to a project of substitution of incandescent lamps with CFLs.
Fig. 4 – Example of on-line system to energy savings accounting of an eligible project (use of CFL)

- Analytic method (some on-field measurement)
This method can be considered as an “open” default method, where savings are assessed after on- site metering of few relevant parameters. This method is justified for peculiar projects having relatively large unit size (cogeneration, VSD pumping systems, etc.), that is those projects whose energy saving impact is quite well understood but varies depending on a limited number of identifiable parameters of usage (e.g. number of hours of usage). Also in this case, standard evaluation procedures are going to be established, based on an algorithm where the value of some parameters is fixer whereas direct measurement is required of the parameters of usage which are likely to vary significantly case by case.
At present, only example of procedures of this kind is available:

- Installation of variable speed drives for pumping systems over 22 kW

- **Metered baseline method**

  According to this method, savings are based on the difference between the measured energy consumption ‘before’ and ‘after’ the implementation. Baselines may be normalised and adjusted to other process variable (actual versus reference exploitation of equipment, thermal load of buildings, climatic conditions, etc). This approach will be open only for projects whose performance crucially depends on variables and parameters that change from case to case and is therefore less predictable.

  The approach is based on monitoring plans which must be submitted for pre-approval to the Authority for Electricity and Gas and must conform with pre-determined criteria (e.g. sample size, criteria to choose the measurement technology, etc.). Energy savings are inferred through the measurement of energy use.

  **3.3.10.2 Additionality**

  Additionality evaluations are founded on the baseline concept. The baseline represents what the user would do if he had not been encouraged to choose the most efficient appliances on the market.

  Baselines adopted in the evaluations procedures in default and analytic methods are built on:

  - average consumption of installed stocks according to existing mandatory standards (e.g. see ref. [7]); this criterion holds for energy savings projects in buildings (heating, insulation, etc); for example, the baseline for the insulation to an old building is estimated as the average of the insulation effects, according to the age of the building; the measure will tend to rise the performance of this building to the performance required by the present regulation.

  - average of sales (updated at 2002), which allows for evaluation of “average” consumes of the “average” equipment existing on the market; this criterion holds for energy savings projects based on substitution with high efficiency boilers or high efficiency electric appliances; this criterion is dependent on the market share and on the present technological development\(^8\) and need of periodic updating of baseline is then required to keep significance to the whole evaluation process.

As for the latter above point, some more details should be considered. In fact, the matter of baseline when a substitution occurs deserved particular attention when the procedures were set up in Italy. As a result of wide debates, a basic principle was assumed that the driver for a substitution of an equipment is obsolescence rather than its possible low efficiency; in other words, the end-user carries on a substitution of an equipment since it is old and not in view of higher efficiency. These reasons motivated the above choice of the baseline for the energy savings, which was assumed as the “average” equipment\(^9\) existing on the market and evidenced by recent sales data.

For procedures relying on the default and analytical methods, additionality is included in models which underlay the procedures themselves. For metered baseline methods, the proposed savings programme shall also point out the criteria used to keep additionality into account.

**3.3.10.3 Time persistence of savings**

A default factor may be used in the standard procedures to keep into account the actual savings persistence of the measures. The persistence of savings must be measured directly when analytical and metered baseline methods are used.

---

\(^8\) To this purpose, a continuous and remarkable drift of the market towards class A efficiency is under way in Italy, owing mainly to the a definite position of the equipment sellers in this sense.

\(^9\) Which represents the equipment that the end-user would buy anyway in substitution of his obsolete one.
Apart from that, the maximum lifetime of most eligible projects is conventionally set at 5 years as far as its contribution to the fulfilment of the mandatory targets is concerned.

This conventional lifetime is extended to 8 years for a restricted set of measures on buildings:
- Thermal insulation of buildings
- Control of radiation entering through glass surfaces during summer season
- Techniques of bio-climatic architecture
- Techniques based on passive cooling
- Techniques based on solar water heaters

3.3.11 Market Design

3.3.11.1 Certificates features

The purpose of White Certificates is twofold:
1. they serve as an accounting tool to prove that the corresponding amount of primary energy has been saved; to this aim, at the end of each compliance period, distributors will have to surrender to the Authority for Electricity and Gas a number of White Certificates corresponding, in energy value (ton of oil equivalent), corresponding to the obligation they were asked to meet in that period;
2. they are allowed to be traded either bilaterally or in a White Certificates market platform specifically set up to that purpose by the Electricity Market Operator.

Coherently with the framework designed by the Twin Decrees, three types of certificates are forecast, characterised by different degrees of fungibility between each other (see Tab. 7):
a) type 1 certificate: attest the achievement of primary energy savings through reductions of electricity consumption;
b) type 2 certificates: attest the achievement of primary energy savings through reductions of natural gas consumption;
c) type 3 certificates: attest the achievement of primary energy savings through reductions in the consumption of other fossil fuels (fuel switching).

<table>
<thead>
<tr>
<th>Certificate type</th>
<th>Usability/Tradability/Fungibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity Decree</td>
</tr>
<tr>
<td></td>
<td>Achievement of the target related to the reduction of electricity consumption</td>
</tr>
<tr>
<td>Type 1 certificate</td>
<td>YES</td>
</tr>
<tr>
<td>Type 2 certificate</td>
<td>NO</td>
</tr>
<tr>
<td>Type 3 certificate</td>
<td>NO</td>
</tr>
</tbody>
</table>

Tab. 7 - Types of energy efficiency certificates issued by AEEG and degree of fungibility among each others

Lifetime of these certificates is strictly dependent on time persistence of the related energy savings Measure (5 or 8 years, see 3.3.10.3). Lifetime will turn out to spread out beyond the period 2005-2009 of application of the Twin Decrees. This circumstance was forecast in view of a likely reiteration of these Decrees over 2009.

As for the Certificates metrics, the equivalence:

1 Certificate = 1 toe

is assumed.
3.3.11.2 Banking

Being lifetime of each certificate set at 5/8 years, banking of certificates is allowed whereas borrowing\textsuperscript{10} is not. Banking will allow distributors some additional flexibility in meeting the obligation. No limits were planned for the bankable amounts of White Certificates.

3.3.11.3 Trading parties

The parties involved in White Certificates Trading are essentially the operators (project implementers) to whom the certificates will be awarded: all electricity and gas Distributors, companies controlled by Distributors and ESCOs. Besides these institutional parties, participation of financial intermediates, and voluntary buyers is expected as well.

Joint operation of the Authority for Electricity and Gas and of the Electricity Market Operator (GME) will occur in the trading frame according to the scheme of Fig. 5, with roles and duties specified in following sections.

![Diagram of White Certificates Trading](image)

**Fig. 5 – Parties involved in White Certificates trading**

3.3.12 Trading rules

White Certificates are issued once the related energy savings projects are approved by the Authority (for the amount of savings to be achieved in a given year). The issued number reflects the acknowledged energy savings according to the rule:

\[ 1 \text{ Certificate} = 1 \text{ toe} \]

The White Certificates are to be assumed as the only valid document which entitles the obliged operators to assess compliance with their energy savings targets.

They may be negotiated both via bilateral contracts and in the marketplace organised by the Electricity Market Operator, with trading rules (concerning the periodicity/frequency of trading, safety rules for buyers and sellers, etc.) jointly defined with the Authority.

The main features forecast for the marketplace are the following:

- Continuous trading
- One trading book (registry) for each type of Energy Efficiency Certificate (electricity, gas, primary energy – see 3.3.11.1)
- Guaranteed deposit requested to buyers
- Real-time link with Register

An example of how the bid will work is shown in the following Fig. 6 and Fig. 7, which differ on the assumptions made on whether a price limit occurs.

\textsuperscript{10} That is, issuing of an amount of White Certificates prior to the implementation of the project they refer to.
Bid with **price limit**: Buy 50 @ 190

Fig. 6 – Example of bid with price limit

Bid **without price limit**: Buy 50 @ market

Fig. 7 – Example of bid without price limit

### 3.3.13 PENALTY FOR NON-COMPLIANCE

At present, rules are defined on under-compliance of energy savings, which must be recovered within the following two years. Apart from this grace period of two years, non-compliances will involve
penalties. The exact amount of the penalties is still under definition. The following criteria will drive the future choices:

- The penalty must be proportional and greater than the investment required to compensate the non-compliance.
- The penalty will be related to the number of not saved toe’s with respect to the specific assigned target.
- The characteristics and the economic conditions of the non-compliant operator must be taken into account: to this purpose, the value of the penalty per not-saved toe will be also based on market data, i.e.:
  - on incremental costs of products and services for energy efficiency,
  - on the price signals given by the White Certificates market

The unit value of this penalty is also linked with the allowable cost recovery mechanisms, which acknowledges costs to obliged parties as 100 Euro per redeemed White Certificate (Type I and Type II certificates only - see 3.3.18).

Sanction proceedings will be put in a specific government-administered Fund to be used to back information and training programs on energy efficiency in end-use sectors.

3.3.14 BODY RESPONSIBLE FOR ESTABLISHING THE SCHEME
The Ministry of Productive Activities and the Ministry of Environment defined the general rules of the scheme with the already mentioned Twins Decrees 20 July 2004 (see above 3.3.1.4).

3.3.15 BODY RESPONSIBLE FOR ADMINISTRATING THE SCHEME
The implementation of the policy framework designed by the Government poses a number of technical questions and challenges, including the choice of the more appropriate impact valuation approaches for energy savings projects, the setting up of the trading mechanism itself, the design of effective monitoring and non-compliance schemes, and the sharing of benefits and costs among the different players (users, energy retailers and suppliers, component and services providers, etc).

The implementation of the whole mechanism is under the responsibility of the Regulatory Authority for Electricity and Gas (AEEG), including the definition of a number of elements which are essential to kick-start its operation (definition and approval of standard and analytical procedures, evaluating the projects when pre-approval is requested, etc). The Electricity Market Operator and the Authority for Energy and Gas jointly decide the Market Rules.

3.3.16 BODY RESPONSIBLE FOR VERIFICATION OF THE PROJECTS
The Authority is in charge of:
- verifying the performed projects,
- assessing the related energy savings for each eligible operator,
- giving the Electricity Market operator a “green light” signal for issuing a corresponding amount of White Certificates
- verifying annually the obliged operators obligations and issuing penalties for non-compliance

Projects are not subject to approval before their implementation, although proponents may ask for an ex-ante eligibility check. Each year will have to make an ex-post verification and certification of actual savings achieved by each project presented by qualified actors and will issue an amount of White Certificates corresponding to the (certified) volume of primary energy saved.

In order to certify savings and to issue energy efficiency certificates, the Authority will have to verify that projects have been designed and developed according to the criteria set in the Twin Decrees and in the AEEG’s Guidelines on the preparation, implementation and valuation of energy efficiency projects.
3.3.17 BODY RESPONSIBLE FOR REGISTERING THE TRANSACTIONS
The Electricity Market Operator (GME) is in charge of organising and managing a marketplace for Energy Efficiency Certificates. The above responsibilities are summarised in the below Fig. 8.

Fig. 8 – Responsibilities under the Italian scheme

The chronological flow of duties is outlined in Fig. 9.

- Pre-market phase
  - Authority: Projects examination and approval
  - GME: Register organization, Certificates Issue (after Authority communication)

- Market phase
  - GME: Market sessions (plus bilateral contracts)

- Post-market phase
  - GME: Register update for market based and bilateral transactions

- Verification phase
  - GME: Comunication of register situation to the Authority
  - Authority: Verification procedure (sanctions for those who not comply)

3.3.18 SCHEME FINANCING
Obliged entities cannot recover costs of energy saving projects via tariffs of the energy vector they distribute, since this part of the market is regulated through a price cap fixed by the Authority against a
licence (up to 30 year) granted to the Distributors to operate within their territory in monopoly, not competitive conditions. For this reason, the Twin Decrees allow for the possibility to recover part of the costs borne by Distributors for the development of projects which has not been financed via other sources. The way of recovering these costs is still being defined.

Only Distributors that are subject to the energy efficiency obligation will be able to recover part of the costs borne for the development of energy saving projects via these tariff components. The rationale for this choice being that non-obliged actors who decide to develop energy savings projects, will do so because they see in this a business opportunity linked, *inter alia*, to the tradability of the energy efficiency certificates. The same is true for ESCOs (whose costs could not be recovered via rates).

The level of the tariff components that will be used to cover these costs will be set so as to reflect standard “allowed costs” related to these activities as opposed to a pass-through mechanism of actual costs borne by distributors. Such a system, based on standard rather than actual costs, is intended to introduce incentives for distributors to reduce the costs incurred to meet the obligation via energy saving projects, since not all the costs they incur will be passed on to final consumers via electricity and gas tariffs.

An average standard cost per unit of primary energy saved was determined by the Authority. At present, costs recovery is acknowledged to obliged parties as 100 Euro per redeemed\(^{11}\) White Certificate (Type I and Type II certificates only\(^{12}\)), that is 100 Euro per certified saved toe.

### 3.3.19 Interaction with Other Policy Tools

#### 3.3.19.1 Fiscal and other incentives

Additionality of incentives coming from other mechanisms (e.g. from central and regional Governments) is allowed. Example can be given in the case of installation of low power photovoltaic plants, which is an eligible measure: in this case, the owner of the plant can sell the produced power to the grid system taking advantage of a profitable price fixed by law; simultaneously, he can sell the gained White Certificates to an obliged Operator finding a supplementary source of gain.

#### 3.3.19.2 Link with other schemes

Links with other market schemes are expected, but they have not been decided yet. At present, the different certificates schemes (White, Green, emission allowances) are not interchangeable in Italy.

### 3.3.20 Attained Outcomes

Synthetically, the Italian scheme is expected to operate as the following examples suggests.

Assumption is made (see Fig. 10) that an Energy Service Company performs an eligible Energy Saving project for an end-used (e.g. wall cavity insulation), while supplying an energy service (e.g. heat in the winter season) and earning a fee for that. ESCO is able to gain White Certificates for that, which are issued by the Regulatory Authority after verification. ESCO is also able to transfer their White Certificates to an obliged actor, the Electricity Distribution System Operator (DSO), who reaches his targets and surrenders his White Certificates to the Regulatory Authority (transactions in blue lines)

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\(^{11}\) No matter whether the Distributor obtained the White Certificate (from a project he implemented or from purchase)

\(^{12}\) Based on equity considerations, it was assumed that electricity and gas consumers contribute to finance the diffusion of energy efficient technologies only in their respective sectors. Therefore, only savings achieved via cuts of electricity and gas consumption (evidenced by *type I* and *type II* certificates, will be “eligible” for cost recovery via electricity and gas rates respectively
The Authority is also in charge of defining an amount on the Distribution fee to be set aside for an Energy Efficiency Fund (transactions in black lines), which is fed by both ESCO and end-user (see Fig. 11, transactions in green lines).

The Energy Efficiency Fund acknowledges some costs of the project to the obliged agent DSO, who uses them to buy the White Certificates from ESCO (orange lines of Fig. 12). Owing to this supplementary earning, the ESCO can in principle also reduce the fee to the end-user (see green part of the arrow "reduced fee").

In conclusion, a quite complicate flux of money and tradable goods is created with the net result of energy savings through a virtuous behaviour of the obliged agent and respectfully of the free trade and the market regulations.
The scheme is in its early stage of implementation and significant statistics have not been performed yet. Some expected outcome on the CO₂ emission due to the implementation of the measures relevant to a reduction in electricity consumptions were evaluated as in Tab. 8.

<table>
<thead>
<tr>
<th>Year</th>
<th>National specific target (Mtoe)(+)</th>
<th>Reduced consumption in MWh (*)</th>
<th>MtCO₂ avoided (1 kWh=0.5 kg CO₂)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0.1</td>
<td>454,545</td>
<td>0.23</td>
</tr>
<tr>
<td>2006</td>
<td>0.2</td>
<td>909,100</td>
<td>0.45</td>
</tr>
<tr>
<td>2007</td>
<td>0.4</td>
<td>1,818,182</td>
<td>0.91</td>
</tr>
<tr>
<td>2008</td>
<td>0.8</td>
<td>3,636,364</td>
<td>1.82</td>
</tr>
<tr>
<td>2009</td>
<td>1.6</td>
<td>7,272,727</td>
<td>3.64</td>
</tr>
</tbody>
</table>

(*): specific non-cumulated savings; the whole target is assumed to be fulfilled by reducing electricity consumptions
(+): primary energy

**Tab. 8 – Forecast impact of the electricity measures on CO₂ emissions**

**3.3.21 PRESENT SCENARIO/STATE-OF-THE-ART**

A set of tool for a start-up of the scheme in 2005 was set up by both the Authority (in terms of rules and standard/analytic procedures) and the Electricity Market operator (in terms of transaction mechanisms).

On the base of the obligations fixed by AEEG, the largest obliged agents will have to attain for 2005 a total target of about 155,000 toe. AEEG has received since 1/1/05 more than 350 request of verification and certification of energy savings, obtained through about 1,100 energy savings projects on the demand-side over the 2005. About a half of the projects were performed by the electricity and gas Distributors (the obliged agents), usually in conjunction to third parties (producers of equipment and plants, installers, ESCOs). The other half of the request of certification was presented by the ESCOs among the about 400 accredited by AEEG for projects directly performed by them.

At the end of March 2006, AEEG concluded the evaluation and certified total savings of about 280,000 toe. As for kind of certifications (see 3.3.11.1), they were split as it follows:

- **Type I:** 75%
- **Type II:** 21%
- **Type III:** 4%

Some statistics can be given on the kind of the certification requests:

- the majority of the certification requests were relevant to projects involving the ex-ante "default" or "analytical" methods (see 3.3.10.1) for energy savings evaluation.
- the certified savings relevant to the household and tertiary sectors were so subdivided:
  - 34% white goods and domestic lighting
  - 27% public lighting
  - 20% heating regulation in buildings
  - 14% thermal envelop and boilers
  - 5% industrial electricity uses
- about 80% of the total of the certified savings were relevant to the civil sector
These certified savings can be considered equivalent to either yearly consumption of a city with 380,000 inhabitants or production of a 160 MW power plant. Avoided CO₂ emission for these savings was esteemed as 750,000 ton/year.

The 2005 certified savings exceeded targets: opportunities will then take place for banking or market transactions.

Immediately after AESEG’s certification, the Electricity Market Operator GME issued a correspondent amount of White Certificates, which will be deposited at the National Registry to be safely and transparently negotiated. The market sessions on the marketplace started on March 7th 2006. Some results are shown in the below Fig. 13 and Fig. 14.

**Fig. 13: results of a market session of White Certificates in Italy**
<table>
<thead>
<tr>
<th>date</th>
<th>type</th>
<th>minimum price (€/toe)</th>
<th>maximum price (€/toe)</th>
<th>reference price (€/toe)</th>
<th>TEE traded</th>
</tr>
</thead>
<tbody>
<tr>
<td>07 March 2006</td>
<td>I</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>07 March 2006</td>
<td>II</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>07 March 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>14 March 2006</td>
<td>I</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>295</td>
</tr>
<tr>
<td>14 March 2006</td>
<td>II</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>14 March 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>21 March 2006</td>
<td>I</td>
<td>75</td>
<td>84</td>
<td>79</td>
<td>585</td>
</tr>
<tr>
<td>21 March 2006</td>
<td>II</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>21 March 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>28 March 2006</td>
<td>I</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>851</td>
</tr>
<tr>
<td>28 March 2006</td>
<td>II</td>
<td>90</td>
<td>95</td>
<td>93</td>
<td>788</td>
</tr>
<tr>
<td>28 March 2006</td>
<td>III</td>
<td>32</td>
<td>36</td>
<td>34</td>
<td>76</td>
</tr>
<tr>
<td>04 April 2006</td>
<td>I</td>
<td>80</td>
<td>80</td>
<td>80</td>
<td>2202</td>
</tr>
<tr>
<td>04 April 2006</td>
<td>II</td>
<td>91</td>
<td>94</td>
<td>93</td>
<td>375</td>
</tr>
<tr>
<td>04 April 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>11 April 2006</td>
<td>I</td>
<td>76</td>
<td>80</td>
<td>78</td>
<td>4280</td>
</tr>
<tr>
<td>11 April 2006</td>
<td>II</td>
<td>95</td>
<td>95</td>
<td>95</td>
<td>275</td>
</tr>
<tr>
<td>11 April 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>18 April 2006</td>
<td>I</td>
<td>76</td>
<td>77</td>
<td>76</td>
<td>1650</td>
</tr>
<tr>
<td>18 April 2006</td>
<td>II</td>
<td>96</td>
<td>97</td>
<td>96</td>
<td>209</td>
</tr>
<tr>
<td>18 April 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
<tr>
<td>27 April 2006</td>
<td>I</td>
<td>76</td>
<td>77</td>
<td>77</td>
<td>763</td>
</tr>
<tr>
<td>27 April 2006</td>
<td>II</td>
<td>98</td>
<td>98</td>
<td>98</td>
<td>400</td>
</tr>
<tr>
<td>27 April 2006</td>
<td>III</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>0</td>
</tr>
</tbody>
</table>

Fig. 14: present results of the sessions of White Certificates in Italy

As for bilateral market, it may occur in parallel with marketplace bids. GME only keeps the register the exchanged quantities of WhC (not the transaction prices, which are not disclosed) in bilateral exchanges. Up to now, mainly non-official information are available:
- at present, only the two largest Distributors - **Enel Distribuzione** and **Italgas** - seem to be practising also bilateral contracts
- the operators show a general prudent “wait-and-see” behaviour: for the first year, probable equilibrium will occur towards an upper limit for the price (the value of the cost recovery: 100 €/WhC)

### 3.3.22 Comparisons among base principles of Great Britain and the Italian scheme

Some comparisons can be done between the Great Britain and the Italian model.

A key difference between the Great Britain and Italian approaches was that the former scheme allows for trading of individual obligation, whereas the Italian scheme considers only trading of attained savings translated into White Certificates.

The Italian model does not take account of comfort taking. There have not been any evidence yet in Italy of rebound effects, i.e. that consumers decided to increase temperature levels after installing insulation and more efficient heating systems. DEFRA pointed out that their evidence was that comfort taking did occur and also was not restricted to the priority group.

Great Britain savings are calculated with reference to 2010 (i.e. what annual savings will be by 2010), whereas Italy uses a five-year timescale. The Italian model calculates savings of a measure assuming a constant amount of annual saved toe over 5 years, whereas Great Britain model calculates savings as
they will be in the future, when savings are projected to be lower (measures are projected to make different levels of saving in different years).

A possible shift of energy efficiency obligation from Distributors to Suppliers is beginning to be considered in Italy, even if its possible application is unlikely to occur before full liberalisation of the Electricity Market (2007)
3.4 Options for design of a Dutch White Certificates scheme

The Netherlands is discussing the possibilities of a White Certificates scheme. The definition of the scheme is under way; some possible and sometimes very likely options of the scheme are presented below. They are to be intended as preliminary choices which are bound to need updates in the future. The below considerations are based on the presentations G5 and T5 referenced in Appendix C and on ref. [8] and [9].

3.4.1 Policy background

Dutch energy saving policy is focused on three main goals:

- Security of supply
- Economy
- Environment (reduction of emissions of CO₂, NOₓ, fine particles)

Energy efficiency increase is pursued, but the present rate is too low:

- Yearly energy efficiency improvement rate is 1% (0.3% due to policy pushes, 0.7% autonomously)
- Should be 1.5% / year
- A political debate is under way: the discussion points out values towards 2% yearly or more
- These policies must be harmonised with the EU Directive on Energy efficiency and energy services, which foresees 1%, yearly per 9 years

3.4.2 Existing EE policy instruments

Netherlands gained in the far and recent past a wide experience in Energy Efficiency instruments (see also chapt. 16):

- MAP: Environmental Action Plan: voluntary energy saving programmes of energy companies
- Subsidies
- Energy Performance Audits (EPA) for existing building stock
- Energy tax
- Tax deduction schemes
- Environmental permits including “energy management obligation”
- Labelling schemes
- Energy Performance Standards for new buildings

Currently, two more instruments are about to kick off, namely Temporary Regulation for energy savings in the built environment (Tijdelijke Regeling Energiebesparing in de gebouwde omgeving) and TELI (Energy savings tender for lower incomes).

An evaluation of energy savings and technologies implemented from these policies can be found in section 16.1.2.

A SWOT analysis13 allowed for a comparative review of pros and cons of these policies:

- Subsidies look generally effective, but they tend to overspend public resource and reward free riders
- Energy Performance Audits give high informational value, but they do not guarantee effective results
- The mechanism of environmental permits is potentially effective, but in practice it turns out to be too complex and demanding for local authorities
- Energy tax are ineffective in practice, due to low price-elasticity of consumer energy use, especially in some sectors, such as residential
- Tax deduction are effective for larger companies, but they are costly for the Institutions

In conclusion, a large and cost-efficient energy saving potential remains untapped and need occurs for a more effective and efficient instrument. A White Certificates scheme was then considered as a new

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13 SWOT analysis: analysis of Strengths, Weaknesses, Opportunities and Threats
policy that can overcome market barriers for energy efficiency. A preliminary study by Oikonomou et al (forthcoming) on a Dutch scheme for households demonstrates the high-effectiveness of this instrument (ref [30]).

3.4.3 Envisaged advantages and disadvantages of a White Certificates scheme

On the base of the ref. [8] and [9], the preliminary studies performed in the Netherlands allow to outline the envisaged advantages of a White Certificates scheme in this national context. Among other:

- such market based instrument is expected to foster guaranteed energy saving results, leading to lowest cost solutions
- it does not usually require large government budgets and it can work together with other existing or planned policy instruments (such as those considered in 3.4.2)
- it fosters quite naturally and effortlessly energy services to consumers, particularly if it can be tightly connected to existing market activities
- it helps new industries to develop, due to its expected attitude to favour ESCO’s, Third Part Financing (TPF) and Energy Performance Audits (EPA) mechanisms
- it passes costs to energy users, according to the analogous “polluter pays principle”
- it contributes to EU Directive on Energy efficiency end energy services

Conversely, some disadvantages were pointed out as well:

- this instrument is perceived as a burden to obliged parties
- Potentially high transaction cost may occur
- Potential chance is for a lot of free riders, owing to the difficulties in dealing with the BAU-deadweight

3.4.4 Overall design

The overall design of the scheme is sketched in Fig. 15; it shows many parallelisms with other existing White Certificates schemes.
Fig. 15: overall design of the Dutch scheme of White Certificates
Some options of a Dutch Scheme are summarised below.

**Duration** will take the period 2008-2020
The **energy savings targets** are expressed as 50-80 PJ (14-22 TWh) ‘additional savings’ of primary energy
**Target groups** were identified in dwellings and tertiary sector (existing building stock in trade, services and public sectors)
**Classes of eligible measures** were pointed out:
- All measures contributing to an improved energy performance of buildings (use energy-efficiency indexes ΔEI\(^{14}\))
- Selected other efficiency measure:
  - not already compulsory
  - with still a small market share or small penetration
- Anyone can propose new measures

**Obliged parties** are to be decided, but most probably the energy supply companies. Target will be proportional to energy delivered in target groups.
**Banking and borrowing** are allowed.
**Non-obliged parties** will be allowed to create certificates

**Targeted sectors** will be:
- Building-linked: strong links with the Energy Index and the EPBD Directive
- White and brown goods
- Small goods
- Innovative goods
- Behavioral measures
- Leasing goods

**Energy savings evaluation** will be based on deemed savings approach, aimed at realistic ‘energy saving values’ (e.g. corrections for rebound, effective life span of measures, misuse, etc. will be introduced)

**Certification** will be preferably based on:
- EPBD\(^{15}\) energy-efficiency indexes (ΔEI-approach - see 9.2.4)
- existing energy-efficiency labels for appliances (labels better than those with high market share)

**Measures are also taken to enhance market confidence**, such as:
- Preferably long time certainty about targets; e.g. the following criteria:
  - 3 compliance periods of 3, 5 and 5 years
  - Mechanisms for adjusting targets for coming compliance periods should be know in advance (e.g. corrections for energy prices)
- Predictable development of eligibility and value of measures; e.g. the following criteria:
  - 1 or 2-yearly updates of assigned “energy saving value” of ΔEI and individual measures
  - when a measure reaches a specific market share or penetration level, it will be no longer eligible or be assigned a lower “energy saving value”

**Measures are finally assumed to minimise costs**:  
- electronic and web-based Register and Certificates
- Use of existing energy efficiency “proof” (EPBD-EI and efficiency labels)
- Using existing EPBD tools and software to provide EI and ΔEI calculation
- Use of thresholds for certification, based:
  - on a minimum energy saving value
  - on a minimum number of measures (e.g. per 50 dwellings with improved EI; or per 1000 efficient dryers sold)
- Electronic proof of sales allowed

---

\(^{14}\) ΔEI: Difference of Energy Index values (method used at a previous scheme, the EPA: Energy Performance Advice and now in the EPBD (buildings directive). The Energy Index is a number/meter for the energy use of a house under standard conditions. The median of EI in existing buildings in the Netherlands is 1.47. A lower value means lower energy use.

\(^{15}\) Energy Performance Building Directive
No consumer involvement with ESC. ESC stays ‘behind the counter’.

3.4.5 Market opportunities offered by the Dutch scheme
The envisaged Dutch scheme is likely to offer interesting market opportunities:
- Housing companies executing strategic stock management already did a lot of Energy Performance Audits: they are ready to participate
- Local schemes are encouraged to improve housing stock and reduce overall housing costs
- Dormant potentials may find chances to form voluntary agreements and environmental permit assessments
- ‘Overdue maintenance’ is a quite common situation in buildings. Insulators, installers, contractors, mortgage -resellers are aware of this potential and they are eager to take part in this market
- Green mortgage or green finance schemes available but scarcely used may find greater chance of application in this context

3.4.6 Discussion topics
Some subjects are to be more deeply investigated.
- Definition of obligation-bound agents. The envisaged alternatives are energy distribution companies and energy supply companies; the latter looks more likely and attractive
- How to cope with the additionality of the savings, the definition of a baseline to assess additional savings, the BAU-deadweight issue and how to prevent from “free riders” operation.
- Whether methods based on the Energy-efficiency index ΔEI, mediated from EPBD, are a valid input to value energy savings in practice; in other words, suitability of the link with EPBD
- The real relevance of transaction costs. Studies on this subject were performed in the Netherlands on this subject (see e.g. 11.2.2.7), though they reflect transaction costs in general and does not reflect only a proposed Dutch scheme (i.e. not necessarily all these costs will be included in the Netherlands' future scheme).

3.4.7 Current status of application
At present, design options for a White Certificate scheme are being discussed and alternative policy options also on the agenda (e.g. tenders for energy efficiency without obligations).
Some more definitive results are expected in the coming months.
3.5 Description of New South Wales (Australia) Greenhouse Abatement Scheme

These considerations are based on the presentation/paper P3 referenced in Appendix C.

3.5.1 Foreword

An energy efficiency certificates trading scheme is currently being implemented in New South Wales, Australia. These certificates are part of a larger Greenhouse Gas Abatement Scheme introduced by the State Government of New South Wales, the most populated state in Australia.

Under the New South Wales Greenhouse Gas Abatement Scheme, from 1 January 2003 electricity retailers and other parties are required by legislation to meet mandatory targets for reducing the emission of greenhouse gases resulting from the electricity they supply or consume. To achieve the required reduction in emissions, eligible parties purchase and surrender tradeable certificates called New South Wales Greenhouse Abatement Certificates (NGACs). NGACs can be created in several ways, one of which is by undertaking 'demand side abatement' which includes energy efficiency projects.

![Graph showing reduction in greenhouse gas emissions over time.](image)

3.5.2 Greenhouse Benchmark

The New South Wales Government has set a state-wide benchmark of reducing greenhouse gas emissions to 7.27 tonnes of carbon dioxide equivalent per capita by 2007. This is five per cent below the per capita emissions in the Kyoto Protocol baseline year of 1989/90. To ensure continual progress towards this end target, progressively tighter targets have been set year-on-year, commencing with a target of 8.65 tonnes per capita in 2003 and leading to the final benchmark level of 7.27 tonnes per capita in 2007. The level of 7.27 tonnes per capita will then be maintained until at least 2012.

3.5.3 Benchmark Participants

Under the New South Wales Greenhouse Gas Abatement Scheme, parties who are required to meet targets for greenhouse gas emissions are called benchmark participants. Each year, the Scheme sets individual benchmark reductions of greenhouse gas emissions for each benchmark participant based on their contribution to the supply of electricity in New South Wales. Each benchmark participant then has to reduce the average emissions of greenhouse gases from the electricity they supply or consume to the pre-set individual benchmark level.

Benchmark participants comprise:
- electricity retailers;
• electricity customers taking supply directly from the Australian National Electricity Market;
• electricity generators with contracts to supply electricity directly to customers;
• certain other parties who consume large volumes of electricity in New South Wales and who elect to participate directly in the Scheme, rather than have their electricity retailer manage the emission reduction obligation in relation to the electricity they consume.

3.5.4 Penalty
If a benchmark participant does not reduce the average emissions of greenhouse gases from electricity they supply or consume to their pre-set individual benchmark level, they pay a penalty of AUD10.50 (6.25 €) per tonne of carbon dioxide equivalent above their benchmark.

3.5.5 Creation of NGACs
To achieve the required reduction in greenhouse gas emissions, benchmark participants purchase and surrender certificates called New South Wales Greenhouse Abatement Certificates (NGACs). NGACs are transferable certificates that may be freely traded between any parties. One NGAC represents one tonne of carbon dioxide equivalent that would otherwise have been released into the atmosphere in generating electricity.

The activities which allow persons to create NGACs include:
• reduction in the greenhouse intensity of electricity generation;
• activities that result in reduced consumption of electricity;
• the capture of carbon from the atmosphere in forests, referred to as carbon sequestration; and
• activities carried out by elective participants that reduce on-site greenhouse gas emissions not directly related to electricity consumption.

3.5.6 Demand Side Abatement
In the New South Wales Greenhouse Gas Abatement Scheme, activities that result in reduced consumption of electricity are termed ‘demand side abatement’. Demand side abatement (DSA) refers to actions to reduce electricity consumption that occur on the 'demand side' of the electricity meter, ie at the point where electricity is consumed.

Under the Scheme, a demand side abatement project comprises the alteration of an installation that results in reduced greenhouse gas emissions compared with the emissions without that project.

The Scheme identifies five types of demand side abatement project.
• modifying an installation, or the usage of an installation, resulting in a reduction in the consumption of electricity;
• replacing an installation with another installation that consumes less electricity;
• implementing a new installation that consumes less electricity than other installations of the same type;
• fuel switching - substituting another energy source for electricity, or vice versa, where the substitution results in reduced greenhouse gas emissions;
• substituting electricity generated on-site for electricity supplied from the grid, where the substitution results in reduced greenhouse gas emissions.

3.5.7 Boost to the Energy Services Industry
The right to create and sell NGACs rests with the person who is liable to pay for the energy consumed at the site where a demand side abatement project is implemented. That person may transfer the right to create and trade NGACs to other parties including, but not limited to, electricity retailers and other benchmark participants.

The ability to assign the right to create NGACs to third parties creates an opportunity for firms providing energy management services to offer the creation of DSA NGACs as an additional value-adding service.

For example, an energy management firm which specialises in undertaking energy efficiency projects can offer a discounted price to carry out an energy efficiency upgrade at a site if the site owner agrees to assign the creation of NGACs from the project to the energy management firm.

Therefore, one result of the introduction of the New South Wales Greenhouse Gas Abatement Scheme may well be an increase in activity in the energy services industry in the State.
3.5.8 Further Information on background and rationale for a trading scheme

The New South Wales scheme started in 1995 as a consequence of choices of the politic class. In ’90 the socialist government of New South Wales decided to liberalise the electricity market. Since they could not rely on a majority in the Upper house of the Parliament, they hoped to gain a wider consent on that legislation by stressing the environmental issue. Consequently, a requirement was introduced for electricity retailers to make plans to reduce the green house intensity connected to the produced electricity.

In a first phase of application, lots of plans were established, but no actual actions was carried out. Then, they introduced a requirement to retailers for a reduction in green house emissions due to electricity production. Nothing happened, even because a mechanism for sanctions had not been defined yet.

In a third phase, this requirement on retailers to reduce the green house emission intensity was implemented by further evolutions of the trading scheme, with particular attention to the penalty mechanism.

The base-line has been met in 2004 relatively easily; at present, concerns occurs on a very likely lack of green house certificates to actually enable the 2005 targets to be met.

The main reasons for the trading of NGACs relies on the scarce ability and background of electricity suppliers, simply being market retailers, to actually carry out energy efficiency or any other low emission generation. On these circumstances, this NGAC trading scheme gave them the chance to substantially fulfil their obligation, while *subcontracting* to third parties those activities hardly related to their core business.

Further information on the New Wales scheme are available on the web site of the New South Wales Greenhouse Gas Abatement Scheme at:

http://www.greenhousegas.nsw.gov.au

3.6 Synthetic overview of the schemes

After the detailed description previously presented, a synthesis table is shown in the below Tab. 9, Tab. 10 and Tab. 11. It allows for fast and schematic comparisons among these schemes on the base of the following attributes:
### Principle/policy issues

<table>
<thead>
<tr>
<th>Scheme basis</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Drivers/Background</td>
<td></td>
</tr>
<tr>
<td>Global energy savings targets</td>
<td></td>
</tr>
<tr>
<td>Reference term of savings</td>
<td></td>
</tr>
<tr>
<td>Compliance period</td>
<td></td>
</tr>
<tr>
<td>Other type of requirements</td>
<td></td>
</tr>
<tr>
<td>Obligation bound entities</td>
<td></td>
</tr>
</tbody>
</table>
| **Apportionment criteria** | **Threshold**  
**Reference parameter used for apportionment Criteria** |

### Practical/operational issues

| Eligible technologies | Categories |  |
| Eligible implementers | Accreditation of the implementers |  |
| Eligible projects | Categories | **Accreditation before/after the realisation of energy savings?** |
| **Impact evaluation** | **Criteria**  
**Approach**  
**Additionality**  
**Time persistence of savings** |

### Principle/policy issues

| Market design | Certificates features  
**Borrowing/grandfathering**  
**Banking**  
**Trading parties**  
**Trading rules** |
| **Penalty for non-compliance** |  |
| **Body Responsible for establishing the Scheme** |  |
| **Body Responsible for administering the Scheme** |  |
| **Body Responsible for Verification of the projects** |  |
| **Body Responsible for Registering the transactions** |  |
| **Scheme financing** |  |
| **Interaction with other policy tools** | **Fiscal and other incentives**  
**Link with other schemes** |
| **Attained outcomes** |  |
| **Present scenario/state-of-the-art** |  |
|-----------|--------|-----------------|-----------------|-------|-------------|----------------|
| **PRINCIPLE ISSUES** |        |                 |                 |       |             |                |
| Scheme basis | Mandatory | Mandatory | Mandatory | Mandatory | Mandatory | Mandatory |
| Drivers/Background | Revival of the energy demand-side management policy due to:  
  • Security of supply of Energy sources.  
  • National Kyoto targets | • UK Climate Change Programme  
  • Part of a package of measures within the Energy Efficiency Action Plan | Id | Statutory obligation to achieve energy efficiency targets due to:  
  • National Kyoto targets  
  • EU Directives on market liberalisation of electricity and gas | • Security of supply  
  • Economy  
  • Environment  
  • EE&ES Directive Need of more efficient EE policies than past ones | White certificates are one component of a larger greenhouse emission certificate trading scheme operating in NSW since 1/1/03 |
<p>| Global energy savings targets | 54 TWh lifetime-discounted (4% discount rate) | 62 TWh fuel weighted energy benefits | 130 fuel-standardised, lifetime-discounted TWh | Quota system: 2.9 Mtoe/year, about 34 TWh/year (regime value in 2009) | 50-80 PJ (about 14-22 TWh) additional savings | Reduction of emissions in 2007 from 8.675 to 7.27 tCO₂-e per-capita |
| Reference term of savings | Final energy | Final energy | Final energy | Primary energy | Primary energy | Tons of CO₂ equivalent per-capita |
| Absolute savings | Absolute savings | Absolute savings | Absolute savings | Absolute savings | Absolute savings |</p>
<table>
<thead>
<tr>
<th>Other type of requirements</th>
<th>No particular obligation</th>
<th>50% from “priority group”</th>
<th>Obligation to be achieved in relation to domestic consumers in Great Britain. 50% of energy savings to be achieved from a “priority group” of low-income consumers</th>
<th>50% from electricity/gas consumption reduction</th>
<th>Dwelling and tertiary sector</th>
<th>No particular obligation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obligation bound entities</td>
<td>Energy suppliers of: • electricity, • natural gas, GPL • cooling and heating and domestic fuel (not for transports), Possibility to form consortia of fuel suppliers</td>
<td>Electricity suppliers and gas suppliers</td>
<td>Electricity and gas suppliers</td>
<td>Electricity and gas distributors</td>
<td>To be decided: energy supply companies</td>
<td>• electricity retailers; • electricity customers supplied directly from the National Market; • electricity producers with contracts to supply electricity directly to customers; • certain large electricity consumers in New South Wales</td>
</tr>
<tr>
<td>Apportionment criteria</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Threshold</td>
<td>• ≥ 0.1 TWh in annual sales for GPL • none for domestic fuel suppliers • ≥ 0.4 TWh in annual sales for other energy suppliers</td>
<td>≥ 15,000 domestic customers served</td>
<td>≥15,000 domestic customers supplied</td>
<td>≥ 100,000 customers served</td>
<td>No threshold proposed</td>
<td>Yearly defined by the Scheme Administrator</td>
</tr>
<tr>
<td>Reference parameter used for apportionment</td>
<td>Volume of global annual sales in residential and tertiary sectors</td>
<td>Number of domestic customers served</td>
<td>Number of domestic customers supplied</td>
<td>Electricity/Gas distributed (market share)</td>
<td>Energy delivered</td>
<td>Volume of distributed electricity compared to the total in NSW</td>
</tr>
<tr>
<td>-----------------</td>
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</tr>
<tr>
<td>Criteria</td>
<td>Linear with annual adjustment.</td>
<td>Progressively tighter for companies of increasing capacity</td>
<td>Linear</td>
<td>Linear</td>
<td>Linear</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 9 – Comparison among schemes for White Certificates trading – Principle issues
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>PRACTICAL ISSUES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Eligible technologies</td>
<td>• All end-use sectors (transports included)</td>
<td>• Domestic uses</td>
<td>• Domestic uses</td>
<td>• All end-use sectors</td>
<td>• In principle, all improvements to EPB</td>
<td>• Electricity only</td>
</tr>
<tr>
<td></td>
<td>• All energies</td>
<td>• Open-ended</td>
<td>• Open-ended</td>
<td>• Open-ended (from the start)</td>
<td>• Open-ended</td>
<td>• All end use sectors</td>
</tr>
<tr>
<td></td>
<td>• Substitution fossil with renewable (in some cases)</td>
<td>• Pre-approval</td>
<td>• Pre-approval (action to be notified to Ofgem within one month of commencement)</td>
<td></td>
<td>• Differentiation of measures: EPB, White and brown goods, small goods, innovative goods, behavioural measures, lease goods</td>
<td>• Projects must be accredited (i.e. pre-approved) before certificates can be created.</td>
</tr>
<tr>
<td></td>
<td>Exclusion:</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>• measures on sites covered by ETS</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• if savings due only to substitution between fossil fuels</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Eligible implementers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Categories</td>
<td>• All obliged agents</td>
<td>• electricity and gas suppliers responsible, but flexible to work with social housing providers, retail businesses, consumers and other partners</td>
<td>• Obligation is on electricity and gas suppliers, but flexible to work with social housing providers, retail businesses, consumers, ESCOs and other partners</td>
<td>• all electricity and gas distributors and ESCOs</td>
<td>• Installers</td>
<td>• Any end user of electricity can create certificates from an accredited energy efficiency project in their premises. However, the cost of project accreditation means only larger energy efficiency projects are viable.</td>
</tr>
<tr>
<td></td>
<td>• Local municipalities</td>
<td></td>
<td></td>
<td></td>
<td>• ESCO</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Economic actors implementing actions which are not related to their main activity and does not give them direct takings</td>
<td></td>
<td></td>
<td></td>
<td>• Housing companies</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• Building corporations</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• (Leasing companies of efficiency measures)</td>
<td></td>
</tr>
</tbody>
</table>

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|-----------------------------------------------|--------|------------------|------------------|------------------------------------|---------------------------------|-----------------|
| Accreditation of the implementers             | No     |                  |                  | ESCO accredited through a suitable self-declaration | Not yet decided | • Any end user can be accredited as an implementer if they have an accredited energy efficiency project.  
• Any end user can transfer the ability to create certificates to a third party who then becomes the accredited project implementer. This facilitates the development of the energy services industry (ESCOs). |
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</thead>
<tbody>
<tr>
<td>Eligible projects</td>
<td>• Focus on standard measures (more than one hundred planed) but …</td>
<td></td>
<td></td>
<td>• open (pre-approval of schemes) –</td>
<td>• based on technology requirements</td>
<td>Any project that results in reduced consumption of electricity is eligible for accreditation (pre-approval).</td>
</tr>
<tr>
<td>Categories</td>
<td>• other measures can be proposed</td>
<td></td>
<td></td>
<td>• actions approved by the Regulator, Ofgem, as promoting an improvement in energy efficiency</td>
<td>• all measures improving EPB</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• incentive for energy service action</td>
<td>• other EE measures not compulsory or with small market</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• incentive for innovative action</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Accreditation before/after the realisation of energy savings?</td>
<td>• possible pre-approval for measures</td>
<td></td>
<td></td>
<td>No pre-approval for typologies covered by procedures - but possible for other typologies</td>
<td>• Predictable development of eligibility</td>
<td>Accreditation may take place before or after the realisation of energy savings</td>
</tr>
<tr>
<td></td>
<td>• but <em>de facto</em> ex-ante eligibility granted for standard measures</td>
<td></td>
<td></td>
<td></td>
<td>• 1-2 yearly updates of energy saving values</td>
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<td></td>
<td>• Accreditation may take place before the realisation of savings</td>
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</tbody>
</table>
| Impact evaluation | For standard measures *ex ante* evaluation based on data on technologies, sales of equipment, houses stocks, ….  • At the beginning of 2006, 75 savings actions | Annual reports by Ofgem to Government. Following Ofgem’s final report on EEC 2002-05, Government will consider its impact, including carbon abatement. | Annual reports by Ofgem to Government. Following Ofgem’s final report on EEC 2002-05, Government will consider its impact, including carbon abatement. | a) Deemed-savings approach  
b) Engineering savings approach  
c) Direct measurement approach | Deemed-savings approach based on a realistic energy saving value | • Audits may be required at the accreditation (per-approval) stage.  
• Audits may also be required after energy savings are realised; these audits are imposed on a random basis. |
| Additionality   | • obliged: any eligible action is additional  
• Non-obliged: turnover must not be increased | • to be demonstrated by suppliers (deadweight removed from targets) | • to be demonstrated by suppliers (deadweight removed from targets) | • Dealt with baseline definition and technology requirements  
• Other adjustments foreseen but not implemented yet | Related to market share or penetration of the EE measure and rebound effects | None required; projects do not have to be additional. |
|-----------------------------------|------------------------------------------------------------------------|------------------|------------------|---------------|----------------------------------------|-------------------------------------------------------|
| Time persistence of savings       | Savings cumulated over the time life of the equipment: differs according to the measure | • Account of this is taken when the levels of savings are attributed to a type of measure. | • Account of this is taken when the levels of savings are attributed to a type of measure. | • 5 years in most cases  
   • 8 years for a restricted set of measures on building | Attributed to specific types and categories of measures (see eligible technologies) | Savings are cumulated over the lifetime life of the equipment: differs according to the measure and is based on engineering estimates for most measures. The number of certificates which can be created is deemed for some measures, based on assumptions about equipment lifetimes. |

Tab. 10 - Comparison among schemes for White Certificates trading – Practical issues
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td><strong>OTHER ISSUES</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Market design</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certificates features</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• life-time: at least 3 periods</td>
<td>• Transfer of Savings</td>
<td>• Transfer of Savings</td>
<td>• 3 types</td>
<td>Preferably based on:</td>
<td>1 certificate = 1 abated tCO2-e Certificates have an indefinite lifetime and can be banked</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• existing EE index</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>• existing EE labels for appliances</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 certificate = n kWh saved</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Each certificate bears an ID, which determined the source of savings, place and time</td>
<td></td>
</tr>
<tr>
<td>Borrowing/grandfathering</td>
<td>Not allowed</td>
<td>allowed</td>
<td>allowed</td>
<td>Not allowed</td>
<td>allowed</td>
<td></td>
</tr>
<tr>
<td>Banking</td>
<td>allowed</td>
<td>allowed</td>
<td>allowed</td>
<td>Allowed</td>
<td>allowed</td>
<td></td>
</tr>
<tr>
<td>Trading parties</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Obliged energy suppliers</td>
<td>• Obligated electricity and gas suppliers</td>
<td>• Obligated electricity and gas suppliers</td>
<td>• Entitles to whom the certificates will be awarded: all electricity and gas distributors, companies controlled by distributors and ESCO’s</td>
<td>• Obliged energy suppliers</td>
<td>Anybody can trade, though the two main trading parties are:</td>
</tr>
<tr>
<td></td>
<td>• Eligible parties who can make saving actions and gain White Certificates</td>
<td></td>
<td></td>
<td>• Others: financial intermediates, voluntary buyers</td>
<td>• Eligible parties who can make saving actions and gain White Certificates (including “aggregators”)</td>
<td>• Obliged energy suppliers</td>
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<tbody>
<tr>
<td>Trading rules</td>
<td>• Official marketplace not planned</td>
<td>All trades will have to be approved by Ofgem</td>
<td>All trades will have to be approved by Ofgem</td>
<td>• Under discussion: Frequency of trade - Safety deposit - others</td>
<td>Thresholds for certifications based on: • minimum saved energy • minimum number of measures • register and certificates electronic &amp; web based</td>
<td>• Most trades are bilateral though some brokers are operating. • No government involvement in trading.</td>
</tr>
<tr>
<td>Penalty for non-compliance</td>
<td>• 2c€/kWh</td>
<td>• Penalty for not complying with its energy efficiency target may be up to 10% of the supplier’s turnover.</td>
<td>• Penalty for not complying with its energy efficiency target may be up to 10% of the supplier’s turnover.</td>
<td>• “Missing” energy savings to be recovered in the following two years. In addition, heaviest non-compliances will involve penalties proportional and greater than the investment required to compensate the non-compliance.</td>
<td>Not decided</td>
<td>Penalty is currently AUD 11.00 per tCO2-e. Penalty is increased in line with inflation.</td>
</tr>
<tr>
<td>Body Responsible for establishing the Scheme</td>
<td>Ministry of Industry</td>
<td>Government</td>
<td>Government</td>
<td>Ministries of Productive Activities and of Environment</td>
<td>Government</td>
<td>Government established the Scheme.</td>
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</tr>
<tr>
<td>Body Responsible for administrating the Scheme</td>
<td>Ministry of Industry ADEME helps the Ministry to define and evaluate the standard actions</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>Regulatory Authority for electricity and gas</td>
<td>(Not decided)</td>
<td>The Scheme is administered by the independent Regulator which covers the electricity industry as well as several other industries in NSW</td>
</tr>
<tr>
<td>Body Responsible for Verification of the projects</td>
<td>DRIRE delivers White Certificates :</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>To be appointed by Regulatory Authority for electricity and gas</td>
<td>(Not yet decided)</td>
<td>The independent Regulator imposes random audits which are carried out by contractors.</td>
</tr>
<tr>
<td>Body Responsible for Registering the transactions</td>
<td>Not specified for the moment</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>Gas and Electricity Markets Authority (Ofgem)</td>
<td>GME - National Electricity Market Operator (Non electric Markets area)</td>
<td>Registry</td>
<td>Certificate creations and trades are recorded in a registry maintained by a private sector contractor. The registry is not a trading platform</td>
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</tr>
<tr>
<td>Scheme financing</td>
<td>• Cost-recovery via tariffs of the supplied energy vector</td>
<td>Costs fall on energy suppliers, who may pass them on to their consumers through domestic electricity and gas tariffs</td>
<td>Costs fall on energy suppliers, who may pass them on to their consumers through domestic electricity and gas tariffs</td>
<td>• Cost-recovery via electricity and gas tariffs (customer differentiated, updatable) • Acknowledged costs to obliged parties: 100 Euro/certificate redeemed (Type I and Type II certificates only)</td>
<td></td>
<td>Cost recovery via a small charge on tariffs for registering each created certificate</td>
</tr>
<tr>
<td>Interaction with other policy tools</td>
<td></td>
<td></td>
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<tr>
<td>Fiscal and other incentives</td>
<td>No involvement of subsidies planned</td>
<td>Incentive for energy service action Incentive for innovative products</td>
<td>Allowed additionality of incentives (from central and regional governments)</td>
<td></td>
<td></td>
<td>None</td>
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<tr>
<td>Link with other schemes</td>
<td>• Not decided yet</td>
<td>• ETS: only surplus</td>
<td>• Suppliers may undertake action with Government programmes, as long as there is an additional improvement in energy efficiency. • Suppliers may undertake action which is not in conjunction with a Government programme, but uses contractors who are also managing agents for a Government programme.</td>
<td>• Not decided yet</td>
<td>• Not decided for trading schemes, but will take place with the EPBD and EPA • no links with EU ETS.</td>
<td>• Projects cannot create both NSW greenhouse emission certificates and renewable energy certificates under the Australian federal government scheme. • Discussions are continuing between the state governments about establishing a national greenhouse emission certificate trading scheme</td>
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<tr>
<td>Attained outcomes</td>
<td>Ofgem reports formally in July 2005 on EEC 2002-05. April 2005 informal update indicates that suppliers have exceeded the overall target</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>To date, sufficient certificates (about 920,000 on end-uses) have been created to meet the obligated suppliers’ needs. Shortfalls may be possible in the future.</td>
</tr>
</tbody>
</table>
| Present scenario/state-of-the-art | • Law defined  
• Decrees issued  
• Beginning of the system: 1st of July 2006 | EEC 2005-08 commenced on 1 April 2005. | | | | First operational white certificate scheme in the world; commenced in January 2003. White certificates are one component of a larger greenhouse emission certificate trading scheme |

Tab. 11 - Comparison among schemes for White Certificates trading – Other issues
PART III - ANALYSES AND COMPARISONS ON SELECTED ISSUES
4 RATIONALE AND BASES: WHY WHITE CERTIFICATES?

4.1 France

French policies about energy efficiency and energy savings in general had been somehow disregarded in the '90's. A national debate on energy involved France at the beginning of the year 2003 and strong political consensus arose on the need for more energy savings clearly came out of that. The Government had to establish suitable policies to show priority of energy savings on their agenda. The question arose about the most proper system to be implemented.

First of all, need was felt of something like a multi-scope system, suitable to reach a wide range of actors, widespread enough to include most of the end-uses, domestic consumers in particular, apart from energy intensive industries or few large consumers. The revival of interest on energy savings eased compliance with this approach. The Government had to handle the matter of financial and human resources connected to this policy: in fact, chronic shortage occurred in the public sector promoting energy efficiency of both dedicated finances and human resources in direct contact with domestic consumers. These circumstances prevented from a fast implementation of the scheme. So, a mechanism involving more actively actors in different complementary fields (funding, energy supply, diffusion of information to the consumers to help them save energy) was planned.

A further justification of the French scheme relies on commitments taken in EU about the CO₂ savings, which has been an essential driver also for the Australian scheme and an important one for Great Britain and Italy.

The introduction of a scheme on White Certificates trading was also encouraged by a general interest in market systems.

4.2 Great Britain

It is to remark that UK has been adopting a fully liberalised energy market for longer than many other countries. In this context, the general principle of avoiding any distortions to market and to the competition is assumed. Accordingly, introducing and fostering systems:

- market based as much as possible
- capable of driving the lowest cost options
- suitable to prevent consumers from unnecessary pricing increases

was considered a key priority for UK policy makers.

Moreover, though a very good understanding exists now about all the barriers to energy efficiency at the energy management level, there is still little uptake by consumers; hence, the need was felt for obligated suppliers in order to achieve energy efficiency.

Supplementary eligible technologies were introduced for the second period of EEC. They deal with really additional standardised measures, which had not been captured by other national programmes yet. Besides microCHP, more information about these technologies can be found in ref. [28]. There will be still the option for the suppliers to develop on their own other energy efficiency measures than the standardised ones established by Ofgem. In this case, savings are to be calculated and demonstrated to the Administrator of the scheme. Ofgem is launching a consultation on how to encourage innovation measures.

4.3 Italy

It must be remarked that Italy is at present considering three levels of legislation in the so called “Environmental Markets”. First, the mechanism of Green Certificates was adopted. The market of Green Certificates started in 2003. The market for White Certificates started on March 2006 and also Emission trading is going to be established at present.
The choice of a White Certificates systems in Italy (see ref. [2]) is based substantially on policy drivers:

- The need to implement Kyoto protocol: Italy has committed to reducing its emissions by 6.5% between 1990 and 2008-2012. About 26% of the whole emission reduction goal (24-29 MtCO2) will have to be achieved through energy efficiency improvements on the demand side of the energy market
- The need to implement two European Directives (96/92/CE and 98/30/CE) on the liberalisation of the electricity and gas market. These two EU Directives were implemented into the Italian electricity and gas market by two Italian legislative acts: Legislative Decree no. 79 of 16 March 1999 (Decreto Bersani) and Legislative Decree no. 164 of 23 May 2000 (Decreto Letta) respectively. Both acts determine that concessions for the Distributors’ operation shall contain provisions to increase energy efficiency of end uses, according to quantitative targets to be set by Decree of the Minister of Industry jointly with the Minister of the Environment
- The need to fix these targets in energy efficiency in end uses. Two Legislative Decrees, the so called Twin Decrees 20 July 2004, definitely established the quantitative targets in terms of primary energy, the suitable actions to fulfill them and the mechanism of White Certificates trading
- The affinity with the Proposal for a Directive on energy end-use efficiency and energy services COM (2003) 739

In the above context, the common understanding (see ref. [2]) is that, in order to avoid undue subsidisation, and discrimination and to promote market transparency, “traditional” policy instruments such as standards and fiscal incentives have to be gradually substituted by (or, at least, used jointly with) incentives based upon market mechanisms.

Apart from these political drivers, demand management programmes, fostered by mandatory energy savings targets, take a considerable advantage from the certainty of savings that a certification tool allows for. In this context, a market mechanism creates opportunities to give economic value to energy savings themselves, which are usually considered a volatile and difficult to measure entity. In fact, energy efficiency could not be considered a product in itself; it is a characteristic of a product that is chosen and manufactured for other aims but energy savings. Certification allows for separating this attribute from the product: the attribute is turned into a product itself, which can be marketed on an exchange system.

Finally, a market-based mechanism was chosen as one of the most efficient ways to reduce the costs for the overall systems. Actually, competition among market players was expected to lower the price that the consumers will have to bear at the end of the market chain.

4.4 Synthetic closing overview
The reasons why to adopt a White Certificate system differ from Country to Country. Most attention has been paid to the following issues:

- Kyoto requirements (and EU-level ones)
- Wide public consent/approval, due to the related image, connected to energy savings and environmental issues
- New opportunities within an already existing and more general “environmental market”, including Green Certificates and Emission trading.
- Needs to comply with requirement to certify an attribute (energy efficiency), which is a volatile and hardly measurable entity, rather than a quantity
5 ADVANTAGES AND RISKS OF WHITE CERTIFICATES

The greatest part of these information was gathered in the discussions of the workshop held in Paris on 14/5/05 (see Appendix C).

5.1 General views

5.1.1 Advantages

Some advantages were envisaged for schemes involving White Certificates for a general viewpoint. A general position for most countries is that in theory all White Certificates schemes are grounded on the economic benefits of tradable permit systems, but actual and sometimes unexpected practical reasons prevent from full attainment of these advantages. More in particular, the positions of the Countries are presented below.

Benefits from increasing Energy Efficiency are rather clear for Great Britain. They are consistent with the great interest of reducing energy intensity and for policies suitable to cope with climate changes. White Certificates make operations in Energy Efficiency more straightforward also for companies who do not have Energy Efficiency in their core business and they are an efficient tool in simplifying the market of EE obligations.

A White Certificates scheme has been preferred in France for its lower public budget burden than other policy instruments. A White Certificates scheme speeds up the diffusion of efficient technologies. It involves operators who can be directly engaged with efficient equipment dealers. White Certifications link energy savings, which is not a product but an attribute (a really subjective one, sometimes) of a product, with an objective economic value.

By increasing EE, awareness is created in relation to environmental and economic problems arising from inefficient use of energy. There is an extra or added social value in increasing EE. The Netherlands thinks that White Certificates, if devised with suitable features, can promote efficient investments in the EE sector.

Benefits can be straightforward for increasing EE, but less clear when it comes to the performance of White Certificates schemes. This sill has to be analysed. It is clear that people or society is in favour of increasing EE but concerns are anyway whether White Certificates can be more efficient than other policy instruments.

5.1.2 Risks

A risk is invariably envisaged in all the Countries: the generation of White Certificates occurs with sometimes high uncertainties on the chances to profitably market them, since only conjectures can be made on the demand, in the starting phase in particular.

Another risk is connected to the very likely attitude of some obliged agents to privilege, at a first approach, only a very small subset of already established energy savings measures, disregarding a larger potential of other more effective measures owing to their too innovative character or not their not sufficient diffusion on the market. (“cherry picking”)

Risks are also present in all White Certificates schemes based on standardised measures with calculations built on statistics. In fact these systems, though simple, risk to give the wrong signals to the consumers, since standard procedures usually find their truth at a statistical rather than an individual level. So, it’s important that the scheme addresses the obliged/eligible operators and the consumers with different messages:

• the operators will have to take advantage of the statistic and standardised feature of the present procedures, while actually complying their obligations in the most straightforward way,
• the consumers need more customised messages on their own situation: an energy savings measure is generally undertaken by an end-user for reasons connected to wellness (welfare and/or comfort) and
other subjective needs; then, they need further elements to choose among a range of eligible measures, which can be possibly equivalent from the subjective side but with a different inference on overall commercial/societal aspects.

Finally, some doubts were expressed in principle on the actual suitability of White Certificates schemes to develop energy services market and to promote ESCOs, as it is assumed in the related EU Directive.

Some more details are given below for each country.

5.2 France

The envisaged advantages of White Certificates schemes are schematically the following:
- Economical efficiency
- Direct relationship between obliged parts, the energy suppliers, and the main addressees of the measures, the households
- Open scheme: the energy suppliers can propose measures not planned yet
- New means of financing energy efficiency projects: between 500 and 1000 M€ over three years
- Instrument adapted for liberalised markets

Risks are mainly related to the novelty of the system and to the lack of experience and knowledge about costs. Furthermore, the coverage of the scheme – larger than existing schemes- imposes several administrative and institutional challenges to national stakeholders. Owing to these reasons, test and trial of the scheme application in the period 2006-2008 are planned, since widespread experience has not been gained yet in France. Monitoring will be thoroughly performed on the outcomes during the test period; review of the overall performance of the scheme will occur at the end of the period and tuning on pointed out malfunctions will take then place.

Apart from this general remark, the main risk of the French scheme follows from a balance between simplicity and complexity, which is maybe too much in favour of the former aspect. In fact, dangers from a complex system (increase in administrative costs, scarce operators visibility, difficult system management) were firstly envisaged and inspired the straightforward philosophy of the French scheme. A too simplified system is bound to underevaluate the actual energy savings which a give measure is capable of attaining.

Other possible envisaged risks in the French frame are the following:
- The first goal of the scheme is energy savings in the household sector, but the fact to authorise measures in the industrial sector can compromise this goal
- Maybe the demand will be limited and this will not allow for trading development; in this case, local authorities will not take profit from the system
- The oligopolistic structure of the energy sector is likely to stiffen the certificates market developments

5.3 Great Britain

One of the biggest risks is probably the uncertainty on the cost evaluations. Expected costs, expected impact on prices and expected energy savings can be worked out with a variety of methods. But all these items will have to be monitored and potentially all the instruments have to be adjusted if need of tuning arises. As obvious example, if price increase were higher than it was assumed, this would have to be taken into account for its possible implications. Great Britain gained anyway good knowledge of under-cost of all the eligible measures during the first part of EEC 2002-2005; performed experimentation gave then the chance to refine the quantitative target in order to have social efficiency on a global scale.

Another risk in the Great Britain scheme is connected to possible inadequacy of manufactures to keep pace with needs of fast target increase required in the scheme. This fact can induce potential bottlenecks. Then, establishing a scheme must involve a preliminary survey on the capability of the available
manufacturers to comply with a rapidly growing extent of their intervention (e.g. they must assure suitable quantities of insulation materials, of boilers, etc). For the same reasons, availability of adequately trained installers over the whole duration of the EEC scheme must be assured. These chances of bottlenecks, together with the development of a possible dominant/monopoly position for a single supplier of the energy saving equipment, are very likely sources of risks on price.

Another risk is connected to a not sufficient amount of publicity. A scheme like EEC must be supported with a consumer-awareness campaign, otherwise the scheme potentially will not attain the expected goals. The Energy Saving Trust actually devoted funding to this specific purpose in EEC.

A last possible demographic reason for risks in EEC can be envisaged in the disproportion of the measures that have to be installed in the so-called “priority groups” and the actual customers portfolio of the suppliers. In fact, EEC states that 50% of energy savings must be achieved from a “priority group” of low-income consumers and of course those sectors of the population are not evenly spread among suppliers. In other terms, a supplier who has particular high proportion of high income of households living within their region will find more difficult to reach the priority group than a supplier serving an inner city borough. So, a need will be likely to occur to recover a better and rational apportionment of the obligations in EEC, e.g. through a higher degree of flexibility within the achievement, if the present exchangeability mechanisms prove not to allow a sufficiently lively market.

5.4 Italy

As most of the existing or planned White Certificates schemes, the Italian scheme advantageously combines command and control type of measures (mandatory quantitative targets) with market based instruments (certificate trading) and elements of tariff regulation (cost recovery via electricity and gas rates).

Another intrinsic advantage (which is actually shared with any other certification mechanism) is the chance to establish an agreed (though somehow arbitrary) correspondence between an objective entity (e.g. an amount of energy efficiency titles) and a more volatile, difficult to measure entity, such as the energy savings themselves. This is essential in the market phase, when an obliged actor needs to demonstrate quantitative compliance with his own savings targets.

The main risk is connected to the complexity of the resulting procedure to implement this policy and to put it into practice. Another possible (actually obvious) risk arises from the fact that arbitrary/conventional/standardised assumptions used in the above procedures can originate sometimes too conservative certification evaluations.

Another risk is connected to the conventional savings persistence of 5 years assumed for most measures, which is likely to penalise the implementation of measures with actually longer lifetime.

5.5 Other opinions

5.5.1 The Netherlands

The advantages explicitly pointed out by the consulting group entrusted to outline a Dutch scheme are the following:

- a guarantee exists of certified energy saving results
- this market based instrument is expected to lead to lowest cost solutions
- no large governmental budgets are required, since most of costs tend to involve obliged and eligible actors
- connection was planned to existing market activities
- the scheme is suitable in working together with other policy instruments, e.g. EPBD
- it is a widely acknowledged easy route to deliver energy services to consumers
• it helps new industries to development, through the typical ESCO mechanisms based on Third Part Financing
• a costs transfer occurs towards energy users, according to the “polluter pays principle”
• this scheme contributes to implement EU Energy Efficiency and Energy Services Directive

Disadvantages of White Certificates schemes are synthesised into the following :
• impact as a burden to obliged parties
• potentially high transaction cost
• potentially high chance of free riders (the problem arises of how to handle the BAU-deadweight concept)

5.5.2 New South Wales
The ability to assign the right to create White Certificates to third parties generates an opportunity for firms providing energy management services to offer the creation of White Certificates as an additional value-adding service.
For example, an energy management firm which specialises in undertaking energy efficiency projects can offer a discounted price to carry out an energy efficiency upgrade at a site if the site owner agrees to assign the creation of White Certificates from the project to the energy management firm.
Therefore, one result of the introduction of the New South Wales Greenhouse Gas Abatement Scheme may well be an increase in activity in the energy services industry in the State.
6 POSITION OF NATIONAL STAKEHOLDERS

The positions kept by the national stakeholders are below described on the base of information gathered in the discussions of the workshop held in Paris on 14/4/05 (see Appendix C).

6.1 France

France focused definitely on an open system capable of actively involving a number of stakeholder as large as possible. The debates in Parliament did not point out any particular remark on the concept and implementation of the scheme; public debates did not evidence specific problems either. The two largest obliged parties are EDF and GDF, which were previously state owned, and in which private opening is still less than 30% by law. Therefore, these companies keep in mind their responsibility towards sustainable energy development and energy efficiency. They were already involved in energy efficiency programs before, for example by voluntary agreements with ADEME. The white certificate scheme changes their way of driving this action and increases their involvement in energy efficiency. While the scheme is an innovative instrument in a market which is not well known, they expressed the uncertainties on their ability to comply with the amount of obligations.

Some new suppliers of industrial consumers, who recently joined the electricity market, are complaining about the system, since they consider it more tailored on domestic customers than on very large ones; incidentally, this is the one of the reasons why these operators will not be obliged during the first period of implementation of the scheme.

6.2 Great Britain

Generally speaking, the scheme had been fairly well accepted by all the stakeholders, even if the energy suppliers, as obliged agents, pointed out worries about bottlenecks for some products (see sect. 5.3). Stakeholders groups were established and dialogue with these groups is under way.

6.3 Italy

The national choice to introduce a policy based on White Certificates was not so welcome by the group of obliged agents, the Electricity and Gas Distributors with a number of clients over a given threshold. In fact, as plain grid owners, they are bound to loose progressively direct relationships with the end-users: on these circumstances, it is hard for them to promote effectively projects at the end-users. Moreover, at present the legislation even prevents them from performing any measure beyond the meter. The only left choices for the obliged agent are to act though Companies controlled by them or to buy White Certificates from ESCO’s to comply with obligations.

As for the eligible agents (see next par. 7.3), no particular objections arose, though some difficulties had to be overcome on defining the rules for their accreditation. There are now good chances for ESCO’s to get into the market and to benefit from the opportunity to create projects and to introduce energy measures.

6.4 The Netherlands

The Dutch Ministry of Economics has established a working group compiled of various stakeholders that deals with discussing and providing options for a possible domestic White Certificates scheme. During these working sessions realistic options for such a scheme were proposed and gained significant attendance in the policy debate. An outcome of all discussions is that energy suppliers will receive an energy conservation target, whether in the form of obligations or voluntary agreements. Energy suppliers nevertheless have opposed WhC as a form of mandatory scheme and have proposed instead alternative schemes, namely energy efficiency tenders. Currently, this debate is going on and in the coming months official notes will be sent to the relevant Ministries with all options and decisions will be taken.
7 ELIGIBLE AND OBLIGED ACTORS

This section of the document addresses a specific subject:
"which the national choices are on obliged and eligible agents and whether eligible agents or potentially eligible agents are asking to be in the system, owing to the possibly envisaged benefits".
The national approaches to these problems are below described on the base of information gathered in the discussions of the workshop held in Paris on 14/4/05 (see Appendix C).

7.1 France

The obliged agents in France are the suppliers, as in Great Britain. Other sectors in addition to natural gas and electricity are concerned. Another specificity of the French system is the wider range of targeted sectors; inclusion of heating oil suppliers was considered very important for competition on the heating markets. These choices are also bound to make the system much more complex than the existing ones in other Countries, because of a possibly very large number of obliged agents operating in non-homogeneous sectors (presumably, few electricity and gas suppliers and hundreds, if not thousands, of small heating oil suppliers).

The eligible actors are:
- the obliged parties
- local municipalities
- any other company if the energy saving actions don’t increase the turnover

7.2 Great Britain

Obligations are placed on energy suppliers, the Operators who provide the gas and electricity (and invoice for them) to the customers. There are basically five ways in which they can comply with their obligations:
• they can do the work themselves,
• they can pay a private Company to install household measures; in this case, the obliged operator issues a tender and any independent Company could potentially get that business; this is also the case of the e-consortia\textsuperscript{16}, which are capable of offering aggregated savings to the obliged Operator acting as wholesalers of energy savings.
• they can work in partnership with Warm Front Agents (see below)
• they can work with local Authorities in partnership\textsuperscript{17}: in this case, energy suppliers can get credit for that, provided they can prove additionality of this activity
• they can trade their possible energy savings surplus with another energy supplier

\textbf{Warm Front} is a Great Britain scheme connected to the Fuel Poverty Scheme. It’s entirely separated from the Energy Efficiency Commitment and it works in the private sector. Warm Front basically provides grants, which are administered by two companies around the U.K. and targets the poorest households. Warm Front implements into these households a large range of measures: boilers installation, cavity wall insulation, loft insulation, draught-proofing etc. A limit was fixed on number and size of the measures on a single house.
A Company operating in the EEC with an obligation to perform some of these above mentioned measures finds a real incentive to tie up with a Warm Front Agent. A typical paradigm of joint venture could involve the Warm Front Agent as the already working party on a housing estate, e.g. installing

\textsuperscript{16} public housing providers are brought together and their contractual power is used to purchase the energy efficiency measures from the suppliers. So these measures are actually implemented in advance, but that purchasing power is used to bargain on price with the obligated suppliers
\textsuperscript{17} a partnership with local Authorities can be very attractive, owing to their strong involvement in the energy savings issue, in particular in the building sector (e.g. providing decent standards throughout their regions, social housing, etc).
cavity wall insulation and draught-proofing. In the case that the Warm Front Agent reached the size limit for his intervention in that household, the EEC agent would offer to complete the project (e.g. by installing loft insulations) at a lower price than what a completely independent company would require. In fact, this activity of EEC agent is to considered a marginal portion of the an already designed and operating project that the Warm Front Agent is performing in those houses; only marginal costs are then likely to be involved. Each party finds benefits from this operation:

- the Warm Front Agent can perform interventions even beyond the size limit he would have to comply with
- the household benefits of less financial constraints on the number of measures that can be put into a particular house
- the obliged EEC supplier takes advantage from the lower expenses he will have to cope with, since he operates in an already started-up project at marginal costs

The case of a Company totally devoted to energy savings trading, e.g. in condition to fund and to perform on his own an eligible project and to sell completely the energy savings, was not considered in the frame of EEC. This option is bound to be explored in the Climate Change Programme review, as a more creative way of improving energy efficiency in the future.

7.3 Italy

The obliged agents are the Electricity and Natural Gas Distributors beyond a thresholds of 100.000 customers as at 31.12.2001: the resulting pool of obliged agents is made up as it follows:

- electricity: 10 distributors, serving about 98% of total customers
- natural gas: 24 distributors, serving 9.630.000 customers (over a total of about 16 millions)

Discussion are in progress whether to extend the obligation to other categories of agents.

The eligible agents are:

- All the electricity distributors (directly or via controlled companies): about 180
- All the gas distributors (directly or via controlled companies): about 300
- ESCOs

Accreditation is required to become eligible agents within the Italian scheme. The formal acknowledgement is given by the Authority for Electricity and Gas upon delivery of documents including the Company statute. ESCOs in particular are accredited through a suitable self-declaration, which assesses that the supply of integrated services aimed at realising and possibly managing energy efficiency measures, is included among the commercial scopes in the Company statute.

Some remarks should be paid to the fact that, according to the above accreditation rule, even plain manufacturers of equipment (even though their business model is not explicitly focused on energy savings) may be acknowledged as ESCO. This could create unfair market opportunities to already flourishing companies, whereas actual ESCOs, that could take benefits of the system, would be hindered by those big companies. The matter was considered by the Italian Authority and monitoring on effective distortion of competition will be carried out once the market is developing. In any case, the present position of the Authority is to enrol as many eligible agents as possible and to be much stricter in delivering White Certificates than in the accreditation phase. So, on one side it will be very easy in principle for very large and established manufacturers (e.g. insulation companies) to get accreditation as ESCO; on the other side, they will have to comply with very severe and definite rules to be actually entitled to the Certificates and this fact will balance possible risks of unfair trading chances.

At present, a list of about 200 accredited ESCOs is available.

According to the above figures, the total numbers of parties that can be actually involved as eligible agents in Italy looks quite remarkable.
7.4 Other experiences

Under the New South Wales Greenhouse Gas Abatement Scheme, parties who are required to meet targets for greenhouse gas emissions are called benchmark participants. Each year, the Scheme sets individual benchmark reductions of greenhouse gas emissions for each benchmark participant based on their contribution to the supply of electricity in New South Wales. Each benchmark participant then has to reduce the average emissions of greenhouse gases from the electricity they supply or consume to the pre-set individual benchmark level.

Benchmark participants comprise:
- electricity retailers;
- electricity customers taking supply directly from the Australian National Electricity Market;
- electricity generators with contracts to supply electricity directly to customers;
- certain other parties who consume large volumes of electricity in New South Wales and who elect to participate directly in the Scheme, rather than have their electricity retailer manage the emission reduction obligation in relation to the electricity they consume.

The right to create and sell White Certificates rests with the person (the eligible agent) who is liable to pay for the energy consumed at the site where a demand side abatement project is implemented. In other words, any end user of electricity can create certificates from an accredited energy efficiency project in their premises. That person may transfer the right to create and trade White Certificates to other parties including, but not limited to, electricity retailers and other benchmark participants.

7.5 Synthetic closing overview

7.5.1 Obligation bound actors

A variety of choices exists for the actors who are obliged to attain energy savings targets. The most common choice regards the Energy Suppliers. Other less common choices are:
- Distributors (the owners of the electricity or natural gas grid - Italy)
- Producers with direct contracts with customers
- Large or eligible electricity consumers

The involved energy carriers/services are:
- Electricity - always
- Natural gas - very often (France, Great Britain, Italy)
- Domestic fuel, cooling, heating - specific of France

Pros for Energy Suppliers as obliged agents are:
- Their direct contact with end-users
- Their practice of the energy end-uses world
- Occurrence of competition issues; then, cost containment of Energy savings projects, owing to:
  - choice of effective versus cheap mix of Energy savings measures (e.g. Great Britain)
  - fostering ESCO involvement (Great Britain, the Netherlands)
  - encouragement for consortia of obliged agents (France, Great Britain)

Cons for Energy Suppliers as obliged agents are connected to the chance of conflicts between obligation and competition regimes and the need of long-term contracts (which is in contrast with existing highly dynamic market rules: e.g. 28 days’ rule in Great Britain). In some cases energy suppliers may wrongly see energy efficiency as part of the social policy of a country and insist that it is kept separately from energy policy. This signals their limited involvement historically in action beyond the meter in some countries.

Pros for Electricity and Gas Distributors as obliged agents (this choice adopted only in Italy) are:
- Absence of conflict between obligation and competition, owing to the following reasons:
- granted 40 years’ monopoly to Distributors against energy savings obligations and existence of a price cap on the distribution tariff
- cost-recovery for certified energy savings projects: a lump sum of 100 Euro/toe is acknowledged to partially compensate the project costs

- Set up of *virtuous circles* of joint ventures involving Distributors, controlled Companies and ESCOs

Cons for Electricity and Gas Distributors as obliged agents are connected to two circumstances:
- Distributors are pure grid managers: they do not have direct contacts with large end-users nor experience in end-uses
- At present, Italian Distributors are prevented from *beyond the meter* operations

### 7.5.2 Eligible actors

A variety of choices exists as well for the actors who can perform eligible energy savings projects, i.e. those measures which are officially acknowledged as those capable of triggering off actual, remarkable and recognisable energy savings.

General trend is to widen this category as much as possible and to extend it to the maximum number of participants, but careful analysis is required, as distortions with other energy savings policies and instruments can be amplified.

At present, widely accepted eligible actors are energy suppliers (France, Great Britain), ESCO’s, owners of electricity and gas networks (i.e., Distributors, as for Italy), consortia of end-users (France). Other eligible actors may include electricity customers (New South Wales), electricity generators (New South Wales).
8 PENALTIES

Many information on this subject were gathered during the workshop held in Groningen on 27/10/05 (see Appendix C).

A general danger was pointed out, connected to the fact that chances are of possible scarce liquidity of the White Certificates market in the starting phases (and not only). On these circumstances, obliged agents could find no other solution but accepting the penalty payment (especially in Countries where the payment cancels the obligation) as the only mean to comply with their obligations and passing somehow their higher costs on the customer. Should such a situation occur extensively, it would become just an extra taxation for the obliged agent and an extra energy cost for the end-user with no real guaranteed energy saving advantage.

8.1 France

A maximum value of 2e€/kWh will be finally assumed as penalty for non-compliance with the apportioned targets. In a first estimation, coming mostly from the UK experience, the average costs of the saving programmes was assumed to be 1 e€/kWh. As the actual cost could not be precisely evaluated, it was considered that this value could be an acceptable cost, that should not increase in a too strong way the price of energy for the final customer.

Thus, this maximum value of 2e€/kWh represents a price cap on the value of White Certificates: Payment of the penalty cancels the obligation.

8.2 Great Britain

Penalty for not complying with its energy efficiency target may be up to 10% of the supplier’s turnover. This very high value must be assumed as an upper limit value (very seldom applied): the penalty is normally dispensed well below this value and in a flexible way, in order to give due account to Supplier's effective and occurred difficulties in matching the target.

8.3 Italy

At present, rules are defined on “missing” energy savings, which must to be recovered within the following two years. In addition, heaviest non-compliance will involve penalties. The exact amount of the penalties is still under definition. The following criteria will drive the future choices:

- The penalty must be proportional and greater than the investment required to compensate the non-compliance.
- The penalty will be related to the number of not saved toe’s with respect to the specific assigned target
- The characteristics and the economic conditions of the non-compliant operator must be taken into account: to this purpose, the value of the penalty per not-saved toe will be also based on market data, i.e.:
  - on incremental costs of products and services for energy efficiency,
  - on the price signals given by the White Certificates market

The unit value of this penalty is also linked with the allowable cost recovery mechanisms, which acknowledges costs to obliged parties as 100 Euro per redeemed White Certificate (Type I and Type II certificates only - see 3.1.17).

Sanction proceedings will be put in a specific government-administered Fund to be used to back information and training programs on energy efficiency in end-use sectors.
8.4 Other experiences

According to the scheme adopted in New South Wales, if a benchmark participant does not reduce the average emissions of greenhouse gases from electricity they supply or consume to their pre-set individual benchmark level, they pay a penalty of AUD10.50 per tonne of carbon dioxide equivalent above their allowance (about 15 € for not saved toe).
9 EX-ANTE OR EX-POST PROCEDURES FOR EVALUATIONS OF ENERGY SAVINGS - ADDITIONALITY - FREE RIDERS EFFECTS

9.1 Foreword
The present issue is relevant to:
- the most suitable ways to evaluate the energy savings,
- whether an ex-ante estimation can be fruitfully exploited
- how to verify if the ex-ante estimate really corresponds to reality.
These considerations are mainly based on the national experts’ contributions given at the roundtables held during the Task XIV workshops.

From a general perspective, a strong and shared inclination towards standardised ex-ante procedures arose from all the Countries involved in White Certificates schemes; these are the procedures which allow for energy savings before the correspondent project is performed. Ex-post procedures, based on measurements taken before and after the energy savings project implementation, were considered as well in some scheme (e.g. the "metered baseline methods" in the Italian scheme, see 3.3.10.1); nevertheless, the present legislation involves a large amount of administrative burdens which do not encourage at all this latter approach. As a matter of fact, the ex-ante procedures show many aspects which make easier the Monitoring and Verification operations of Administrators of the Scheme and therefore make them very attractive for them:
- they are based on lumped and conservative evaluations
- they are very simple and not ambiguous in the use
- they are generally well accepted by the stakeholders, provided that preliminary consultation processes are organised which involve a wide and meaningful audience
- they involve very few measurements (or none)
- they can be devised in order to include baseline/deadweight
- for the same above reason, they are easily updatable with changes of baseline

Nevertheless, ex-ante procedures tend to give average, somehow arbitrary, often conservative evaluations of energy savings with respect to ex-post procedures; this circumstance may mask actual greater savings. Moreover, additionality requirements are more easily and directly fulfilled and verified with ex-post procedures.

The criteria to define the baseline (e.g. reference to existing regulations, to the average consumption of the installed stock of equipment, to the average consumption of the equipment on sale, etc) and to revise it according with technology improvements are very crucial. If too stringent rules are taken to define the baseline, control over the whole scheme could become cumbersome and unbalance between administrative costs and economies gained by energy savings could occur. Moreover, excessive strict rules on additionality (e.g. invariance on the Company turnover in implementing energy saving measures) could disincentive eligible agents operating in a free market.

9.2 Baseline definition and energy savings evaluation

9.2.1 France
For new buildings, the French scheme handles additionality with reference to the Building Code.
As for existing buildings, two different situations were considered.
average sales will be addressed for equipment. This has been considered the best way to avoid business as usual measures, that is, the measures not driven by energy savings requirements but by the need of substituting out of order ones. For this reason, the present French approach fosters measures involving high efficiency class equipment and energy savings are referred to average equipment sold on the market.18.

18 Integration of the building structures for good reasons of energy savings rather than substitution occurs
For insulation and for fixed energy systems like boilers or electric heaters, the reference is based on the stock of building or equipment, not on average sales of retrofitting.

As for electrical appliances, the baseline very often involves elements related to current sales; for instance:
- the average power of incandescent lamps installed at households
- an estimated value of the percentage of CFL sold to replace incandescent lamps
- annual consumptions of equipment (refrigerator, freezer, refrigerator + freezer) representative of the market sales

Some more details about these criteria are given in 9.4.2.1 and 10.2.2.1, where some quantitative examples of energy savings and cost/benefit evaluations are given according to the French approach.

### 9.2.2 Great Britain

For Great Britain, the base line is substantially considered within the target of TWh itself. This is the result of a series of complex preliminary analyses and studies that Great Britain performed to work out these targets into the so-called *illustrative mix*, where dead-weight was removed:
- fairly detailed models were firstly set up
- the costs of energy efficiency measures were reasonably evaluated, together with the amount of energy they could be potentially saved, the savings persistence and the involved fuels
- assumptions about rebound effects were then made and adjusted according to the served group

All these information found their background on on-going survey works carried out in Great Britain by a building research establishment, which also relied on a lot of historical data about costs fuel savings and so on. All this matter was established after consultation and a persistent dialogue with stakeholders.

Reference can be made to Tab. 25, where conventional specific savings and costs are defined for eligible projects.

Since the British system have already been operating for several years, chance have been to verify compliance between ex-ante and ex-post evaluations through very extensive monitoring campaigns on the number of measures that have been completed, as a part of the auditing process. Consultants at the moment are evaluating EEC on behalf of DEFRA, based on current data; they will be making recommendations on possible additional monitoring.

A system of energy efficiency indicators is under development, for both the business and household sectors, finalised to evidence the effects on energy efficiency.

Household surveys are being performed as well, to verify the assumptions made about the rebound effects.

Every single climate change programme policy is now under evaluation, as part of the climate change programme review. A review of the EEC mechanism and the Energy Efficiency Action plan is planned in 2007 as well.

Additionality is procedurally handled in the particular case of social houses, where operation of the Warm Front Agent is very common. Within this procedure, a Warm Front Agent installs a given group of measures (e.g. boilers installation) for which he is funded by the Government (who is invoiced for those measures after their completion). If at the same time the Warm Front Agent is in partnership with an EEC obliged supplier in performing supplementary measures on the same house (e.g. loft insulation), he will not invoice Government for these ones but the EEC supplier, who on his turn will be able gain credits from that and use them to fulfil his mandatory targets. With such a procedure, double-counting (getting credit for something and get paid twice for the same thing) is hindered.

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19 The suppliers have to serve both priority (indigent) and non-priority group, and higher rebound effects are expected from the former
9.2.3 Italy

The ex-ante evaluation of energy savings is carried on by means of standardised procedures, which allow for a lump evaluation of the energy savings per physical unit of equipment. These procedures are typically applicable for “mass” projects, where reliable averages can be determined. Net savings are considered in these procedures, i.e. the energy savings produced by a project net of the savings obtained in any case if the project itself were not implemented, because of technology and market improvement and including mandatory compliance with law and regulations. The base-line represents what the user would do if he would not been encouraged to choose the most efficient appliances on the market. Baselines adopted in the procedures evaluations are founded on:

- The consumption of the average-on-the-market appliance - not the consumption of the replaced equipment - for energy savings projects based on substitution with high efficiency electric appliances
- The energy consumption without the added device or insulation - for energy savings projects based on addition of energy saving/producing device (solar water heater, PV generator) or improvement of thermal insulation in buildings

For equipment, the base line is based on the performance of the most commonly used appliance on the market and restrictions apply to eligibility. For example:

- only class-A air conditioners are eligible: since the average efficiency of the standard air-conditioner sold corresponds to the class-C, the savings is evaluated as the higher consumption of the C-rated air conditioner versus an A-rated conditioner
- only efficiency class A (or above) is accepted for domestic electric appliances
- only 4** category is accepted for boilers
- only eff1 category is eligible for electric motors

As for measures in buildings, reference is made to the standards in force. For example, the baseline for the insulation to an old building is estimated as the average of the insulation mean effects, according to the age of the building, and the measure will tend to equalising the performance of this building to the performance required by the present regulation.

In the case of the installation of a variable speed drives, the savings are evaluated as the performance over dissipated regulation system compared to the performance of an efficient regulation system through an inverter.

In other cases some measures, to be eligible, require to be implemented in situations where standards are fulfilled with a particularly high margin. This is the typical situation when heat pumps are installed to replace other heating equipment based on fossil fuels: this measure is eligible to receive White Certificates if the heat pumps are installed in buildings which have an insulation level which is 30% higher than the existing building standard. This approach is quite close to the overall (though not actually implemented yet) French philosophy, aimed at pushing towards integrated solutions and not just single element solutions; that is, solutions based on installation of efficient active equipment in a physical framework over-compliant with the existing standards. Failing such stimuli, the market would hardly pursue these integrated solutions spontaneously, but will rely on the simplest solutions as much as possible.

Considering the implementation of these principles in the standard procedures to evaluate to net savings, the following remarks must be pointed out:

- When necessary an adjustment coefficient $a$ can be foreseen that reduces the gross savings of a quota due to technology and market evolution
- Further saving reductions depend on indirect delivery of equipment, e.g. in case of discounts through coupons or vouchers, which make less “effective” the energy savings measures with respect to a direct delivery. In these conditions, an adjustment coefficient $b$ is applied.

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20 Efficiency class for boilers according to Directive 92/42/CEE
• Also the persistence of savings may play a critical role: at length, technical and behavioral aspects may affect the actual energy savings. A persistence coefficient \( P \) can be defined.

In general:

\[
Net \ Savings = Gross \ Savings \cdot (1 - a - b) \cdot P
\]

where:

\[
a \geq 0 \\
b \geq 0 \\
P \leq 1
\]

In case of replacement of incandescent lamps with CFLs, when the project includes sending coupons by mail, gross savings are reduced by 50% \((b = 0.5)\). In all other cases: \( a = 0; \ b = 0; \ P = 1 \)

The values of \( a, b, \) and \( P \) will be updated based on the evidence of market transformation and the results of monitoring and verification activities.

Some more details about these criteria are given in 9.4.2.2 and 10.2.2.2, where some quantitative examples of energy savings and cost/benefit evaluations are given according to the Italian approach.

9.2.4 The Netherlands' experience in measuring energy savings in buildings

These considerations are based on presentation G7 referenced in Appendix C and on the Dutch experts' contributions.

The Netherlands gained a remarkable experience in evaluating energy savings in buildings, owing to EE policies adopted in the past the ongoing expertise in applying the Energy Performance Building Directive (EPBD). The following goals were pursued in order to implement these policies at the best:
1. Accuracy: adequate representation of savings
2. Reproducibility: the evaluations of a same EE measure on a building made by different verification Officers should not differ beyond given tolerances
3. Acceptable assessment cost
4. Feasible registration scheme
5. Feasible quality assurance: procedures suitably featured to be tracked and recorded in each phase of their development

It was remarked by several instances that these requirements are very similar to those characterising the schemes based on White Certificates. The experiences on features, advantages, problems, criticality gained by Netherlands for this field of certification are more extensively handled herein in view of:
• possible transfer and exploitation in the present context of White Certificates
• assessment of the limits for this more extensive implementation of the above principles

Three approaches were considered in Netherlands for evaluation of EE measures (see Fig. 16). They are reviewed below.
Fig. 16: Adopted approaches to EE evaluation

1. **Register measures**
   A set of results of EE measures is established, collected and processed. As outcome, estimates are obtained for normalised Energy Savings values (i.e. referred to a Physical Reference Unit - PRU - such as m² of insulated surface, of dual-pane windows, etc). These values are registered and used for ex-ante Energy Savings evaluations by associating the normalised ES value to the actual number of PRU.

2. **Asset rating**
   This technique is based on a modelling approach, where the reality (a real building hosting given families in actual climate conditions) is schematised through a "type" building hosting a standard family at standard climate conditions. The energy savings are than obtained as a result of a calculation.

3. **Operational rating**
   This is a typical ex-post methodology. Measurements of energy consumes are taken before and after the performing the energy efficiency project and the energy savings are evaluated as the difference between these consumes.

   The two phases of measurement occur with different internal and external conditions. Suitable corrections must then be introduced to reconcile these two phases; in particular:

   - External conditions are connected to climate deviations in time: this kind of correction may be very important in heating load dominated buildings, since even a degree days 20 % difference may occur between the two measurements
   - Internal conditions depend on user's behaviour, who can act on:
     - Indoor temperature: the average value may differ 5° C, i.e. +/- 30% , according to user's set-ups
     - Ventilation may vary for factors 2 to 3 depending on the needs of the user.

   It should be pointed out that the first approach is not consistent with the requirements of EPBD and consequently it involves a separate non-EPBD evaluation scheme. On the contrary, the second and the third approach are consistent with the methodologies suggested by EPBD.
These methodologies are implemented through the use of a meaningful parameter, the Energy Index EI. The Energy Index is a number/meter for the energy use of a house under standard conditions and corresponds to a method used at a previous Dutch scheme, the EPA- Energy Performance Advice (see 16) - and now in the EPBD. The value of EI depends on a number of primary parameters characteristic of the building:

- Floor area
- Wall area
- Roof area
- Window area
- Insulation thickness
- Window U-value
- Ventilation
- Solar transmission
- Efficiency of thermal systems

The median of EI in existing buildings in the Netherlands is 1.47; a lower value means lower energy use. It can also be used to characterise a building by means of a class of energy efficiency, provided that a correspondence is set up between classes and EI ranges.

Of course, errors on the above primary parameters will be reflected in corresponding errors on the evaluated energy consumes of a building, then on the EI index. On the base of past Netherlands' experiences, this dependence is shown in Fig. 17, where the percent error in energy consumption is displayed as a function of given percent errors on the primary parameters, made during evaluation/inspection phases.
Fig. 17: Effect of inspection errors
Besides, as it was pointed out for the "Operational rating" methodology, large efforts are to be performed to generalise and neutralise as much as possible (e.g. through normalisation) the dependence between EI and other parameters such as:

- The user behaviour
- The size and form of the building (e.g. adopting form factors, etc)
- The saved quantity (final energy, primary energy, CO₂ emissions)
- The energy service involved
- The choice of values rather than ranges for EI

According to the Dutch experts, the value of EI depends highly on the form of the building and this dependence can be hardly neutralised, unless remarkable inaccuracies on the energy consumptions are accepted. For the same reasons, the choice to express EI through values instead of classes involves unexpectedly high processing efforts (see Tab. 12).

**Tab. 12: How to neutralise the building Energy Performance Index**

In any case, the considered procedures lead to inaccuracies of different kind and origins. Such errors play a critical role when inspection activity performed by Inspection Officers, aimed at establishing the EI value of a specific building, since the result is bound to became more or less consultant-dependent (see Fig. 18) and this fact impacts very crucially on the reproducibility/accuracy requirements. In other word, chance exists that different consultant give different score and different class award to the same building.

**Fig. 18: Reproducibility in certification**

Going into greater depth, the process to evaluate the energy consumption and the EI index is developed through the following schematic phases:
• Some default and conventional values are adopted as starting assumptions (e.g. thermal transmittance of insulations, etc)
• Other parameters (e.g. the primary parameters of Fig. 17) are measured; these measurements are those typically affecting the reproducibility requirements
• These two classes of data must be processed by calculation to obtain EI

Each of these phases involves some errors, which contribute to the overall inaccuracy in the EI value. Normally, the overall inaccuracy is dominated by the remarkable errors performed during the phase of measurements - inspection (see Fig. 19).

### Fig. 19: Accuracy and reproducibility

Very considerable decrease of dispersion for these values can be then attained by a suitable balance among the inaccuracies of the single phases, mainly focused on the data acquisition step: luckily, this substantial contribution to the total imprecision can be governed and cut down in a relatively easy way. A result of balancing accuracies is qualitatively shown in Fig. 20, where a remarkable decrease (from 30% to 10%) is assumed for the data acquisition errors, which compensates a greater accepted inaccuracy (from 5% to 10%) on the default values.
Fig. 20: Balance among accuracies of the single phases

With reference to the objectives described in the above points from 1 to 5, the three approaches to the evaluation of the energy efficiency measures are compared, as Tab. 13 shows.

<table>
<thead>
<tr>
<th></th>
<th>Register measures</th>
<th>Asset rating</th>
<th>Operational rating</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Adequate accuracy</strong></td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td><strong>Reproducible</strong></td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td><strong>Acceptable cost</strong></td>
<td>-</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(EPBD)</td>
<td>(EPBD)</td>
</tr>
<tr>
<td><strong>Feasible registration</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(EPBD)</td>
<td>(EPBD)</td>
</tr>
<tr>
<td><strong>Feasible quality control</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(EPBD)</td>
<td>(EPBD)</td>
</tr>
</tbody>
</table>

Tab. 13: Comparison among the approaches

It must be remarked that none of these approaches looks satisfactory from the accuracy viewpoint (in effect, accuracy has been repeatedly pointed out as quite a critical issue in this context). On the other side, some approaches prove to be particularly effective when they are performed after EPBD (i.e. downstream possible requirements or obligations EPBD called for). In particular:

- Straight forward asset rating seems the most adequate approach; especially when combined with the EPBD
- Straight forward operational rating is expected to be less appropriate
- Registering measures can be appropriate but requires a separate scheme (non-EPBD)
• The most effective kind of approach also depends on the particular considered measure and a tailoring process, based on balancing the approach performances (accuracy, reproducibility, cost, feasibility of the scheme), is unavoidable.

In conclusion, it is necessary to recall that these considerations really hold for EI index, intended mainly as a tool for labelling and certification of building performance. Some limits of the method were pointed out:
• It consists of an integral parameter, which sums up and averages the results of a multiplicity of elementary energy savings actions; for this reason, it is could be inappropriate to evidence the effects, on the energy consumes, of improvements performed on a single component (as on the other hand White Certificates procedures generally are aimed at)
• Its quantitative evaluation for specific cases leads to a remarkable dispersion of values (inaccuracy)
• It may be adopted for a subset of ES measures (those on the building), whereas it cannot consider the wider field of measures involving electrical appliances, electric motor and variable speed drives, PV plants etc.

As a consequence, no undue credit should be paid to this methodology beyond its specific goals and any extrapolation to the White Certificates concept should be carried on very carefully and very prudently.

Some more details on the matter are given in 9.4.2.3 and 10.2.2.3, where quantitative examples of the Dutch approach to energy savings and cost/benefit evaluations are shown.

9.3 Free-riders effect
Free-riders are those economic actors involved in an energy efficiency project and participating in it, who would adopt the relevant measures in any case, even lacking the project itself, but who share the advantages of it (incentives, etc) as the other finalised participants as a consequence of their formal participation.
Concern exists about the operation of free-riders and their action in possibly hindering the mechanism; owing to its relevance, this phenomenon is calling for greater and greater interest even in strongly market-oriented Countries (as US) where particular emphasis had not been given so far (see for example the recent conference of ref. [23].
Mechanisms are required to discourage unfair operation of this category. The free-riders matter is tightly connected with the additionality concept, already considered in the previous section 9.2. Some national views are reported below.

9.3.1 France
Different rules have been set for obliged suppliers and for eligible actors to prevent from windfall effects.
Any energy efficiency project undertaken by obliged actors is considered additional if not in-house, so eligibility is practically assured for all their actions. The in-house actions are eligible if the return rate of the investment is superior to three years.
For other agents, the actions must not concern their main activity and not lead to financial benefits. In fact this restrictive criteria exclude all the agents whose business is related to energy efficiency. These last agents could participate to the system via consortia with obliged agents.
Local authorities should be the main eligible actors.

9.3.2 Great Britain
Dead-weight was taken into account in defining the savings targets (see sect. 3.2.10), but opinion is that it could hardly be 100% avoided.

9.3.3 Italy
The problem of preventing from free-riders effects (or at least of accounting for them) is still open and not definitely solved in the Italian scheme. As a general rule, account of free-riders is taken in many of the above standardised procedures (see sect. 9.2.3) by a suitable increase of the adopted baseline, even if this approach
tends to be unfair (it discourages a small number of free-riders compared with the number of undeservedly penalised eligible agents).

9.4 Review and examples of different national procedures to evaluate energy savings

9.4.1 Forewords

Shared opinion exists that standard procedures for the evaluation of energy savings of eligible Energy Savings measures facilitate the implementation of a White Certificates scheme and make up a suitable and acceptable alternative to M&V operations based on measurements. Such an approach is adopted at present in many of the countries involved in schemes on White Certificates.

A review was carried out on the available standard procedures, in order to improve the understanding of the national peculiarities and to give practical contributions for common approaches and criteria in view of possible international exchange of White Certificates.

Three procedures were considered, which are used at national level to evaluate the energy savings (toe or kWh or other) resulting from Energy Efficiency measures. To have a common platform, the following classes of measures were considered:

- Use of high efficiency electrical appliances (refrigerators, freezers, washing machines)
- Use of compact fluorescent light bulbs
- Wall insulation

For each measure, the criteria for quantitative savings evaluations were pointed out, together with the evaluation of investment and information costs for implementing the measure and avoided operation costs due to the greater efficiency.

The participating Parties gave contributions of different kind: UK and Italy according to their present experiences, other Countries on the base of future plans or expectations.

A review of the adopted national approaches is considered below. These considerations are based on presentations G12, G13 and G14 referenced in Appendix C and on French, Italian, Dutch and UK experts' contributions.

9.4.2 Results of the review

France, Italy and the Netherlands synthesised the requested information into the annexed tables, where the energy data were associated to the selected measures.

9.4.2.1 Remarks on the French contribution

9.4.2.1.1 General

France synthesised the requested information into the annexed Tab. 14, where the energy and cost data were associated to the selected measures. It must be remarked that all these information are to be considered only as reference “work” values, since several energy savings measures are still under discussion among ADEME, Ministry of Industry and Professional Associations: an agreement exists about the measures involving household high efficiency electrical appliances, whereas negotiations are under way about projects relevant to building, in particular about the way of defining the eligible measures and the baseline. For these reasons these data can be subject to modifications with no engagement of any part.
<table>
<thead>
<tr>
<th>Measure identification</th>
<th>Lifetime (years)</th>
<th>Specific criteria</th>
<th>Annual savings in kWh/appliance or in kWh/m²</th>
<th>Energy Savings (kWh saved actualised at 4% over lifetime)</th>
<th>Method</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFL</td>
<td>7.5</td>
<td>No</td>
<td>34.72</td>
<td>230</td>
<td>Comparison with an incandescent lamp. Current market of CFL is taken into account.</td>
<td>Replacement of an incandescent lamp for 70% and of a CFL for 30%</td>
</tr>
<tr>
<td>Washing machine A+</td>
<td>10</td>
<td>No</td>
<td>15.5</td>
<td>130</td>
<td>Comparison with the current sales of washing machines.</td>
<td>/</td>
</tr>
<tr>
<td>Refrigerator A+</td>
<td>10</td>
<td>No</td>
<td>66</td>
<td>560</td>
<td>Comparison with the current sales of refrigerators.</td>
<td></td>
</tr>
<tr>
<td>Deep freeze A+</td>
<td>10</td>
<td>No</td>
<td>50</td>
<td>420</td>
<td>Comparison with the current sales of refrigerators.</td>
<td></td>
</tr>
<tr>
<td>Refrigerator + deep freeze A+</td>
<td>10</td>
<td>No</td>
<td>67</td>
<td>570</td>
<td>Comparison with the current sales of refrigerators.</td>
<td></td>
</tr>
<tr>
<td>Wall Insulation with thermal resistance ≥ 2.40 m²K/W</td>
<td>35</td>
<td>Electricity</td>
<td>Climatic area H1 100.1</td>
<td>1943</td>
<td>- Initial insulation: mean coefficient of the outside wall not insulated: 3.3 W/m².K valorisation at 100%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climatic area H2 81.9</td>
<td>1590</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climatic area H3 54.6</td>
<td>1060</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Fossil fuel</td>
<td></td>
<td>idem</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climatic area H1 158.4</td>
<td>3075</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climatic area H2 129.6</td>
<td>2516</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Climatic area H3 86.4</td>
<td>1677</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Measure identification</td>
<td>Lifetime (years)</td>
<td>Specific criteria</td>
<td>Annual savings in kWh/appliance or in kWh/m²</td>
<td>Energy Savings (kWh saved actualised at 4% over lifetime)</td>
<td>Method</td>
<td>Remarks</td>
</tr>
<tr>
<td>------------------------</td>
<td>-----------------</td>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td>----------------------------------------------------------</td>
<td>--------</td>
<td>---------</td>
</tr>
<tr>
<td>Wall Insulation with thermal resistance 1.2 m²K/W ≤R &lt; 2.40 m²K/W</td>
<td>35</td>
<td>Electricity</td>
<td>Climatic area H1 45.1</td>
<td>875</td>
<td>- Initial insulation: mean coefficient of the outside wall not insulated: 3.3 W/m².K valorisation at 50%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climatic area H2 36.9</td>
<td>716</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climatic area H3 24.6</td>
<td>477</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fossil fuel</td>
<td>Climatic area H1 71.5</td>
<td>1388</td>
<td>idem</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climatic area H2 58.5</td>
<td>1135</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Climatic area H3 39</td>
<td>757</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Tab. 14 – Preliminary data on envisaged French energy savings measures**
For equipment, the most common French choice criteria for the **baseline** to be considered in these procedures was the “current sales”. Some data containing sales statistics exist, being updated quite regularly. ADEME is referring to the most recent of these data to define the baselines for the procedures under development. Further updating of the baseline can be performed regularly scheduled in the future. For actions such as insulation, the baseline takes into account the state of the current stock of the existing buildings. Some more details on CFL and refrigerators measures are synthetically given below.

### 9.4.2.1.2 Case of CFL

**Measure**

To replace a theoretical incandescent lamp of 80W by a CFL of 18 W belonging to energy class A

**Market**

- 152 million of incandescent lamps by year
- 8 million of CFLs by year ~ 5% of market share

**Baseline**

1. A virtual incandescent lamp of 80 W which corresponds to the average of powers of incandescent lamps installed at households.
2. 70% of CFLs sold replace an incandescent lamp and 30% replace a CFL

**Annual gain**

\[ 0.7 \times (80W - 18W) \times 800h = 34.72 \text{ kWh/year} \]

800 hours come from a measure campaign in 2003 to 100 households during one year. After having selected the most used light points (lounge, …), 800 hours is the average use of the light points.

**Lifetime**

7.5 years

**Gain over the lifetime**

- Total gain without discount = 260.4 kWh/LFC
- Total with discount of 4% = 230 kWh/LFC
- Total with discount of 6% = 205 kWh/LFC

### 9.4.2.1.3 Case of refrigerators

**Measure**

To replace a refrigerator representative of current sales by a refrigerator belonging to energy class A+

**Market**

- 3 million of refrigerators, freezer and refrigerator + freezer sold by year
- 10% of appliances belonging to energy class A+

**Baseline**

Annual mean consumption:

- Refrigerator representative of market sales = 221 kWh/year
- Refrigerator A+ = 155 kWh/year

The normalised consumptions for energy classes have been used.

**Annual gain**

66 kWh/year
• **Lifetime**  
  10 years

• **Gain over the lifetime**  
  Total gain without discount = 660 kWh/refrigerator  
  Total with discount of 4% = 557 kWh/refrigerator  
  Total gain with discount of 6% = 486 kWh/refrigerator

9.4.2.2 *Remarks on the Italian contribution*

9.4.2.2.1 General  
Italy synthesised the requested information into the annexed Tab. 15.
### Tab. 15 - Preliminary data on envisaged Italian energy savings measures

<table>
<thead>
<tr>
<th>MEASURE (installation of)</th>
<th>Reference Physical Unit</th>
<th>Yearly Primary Energy Saving [RPU]</th>
<th>Lifetime of the measure [Years]</th>
<th>Lifetime cumulated Final Energy Savings [kWh/RPU]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Freezer class A</td>
<td>1 Freezer</td>
<td>0.0290</td>
<td>10</td>
<td>970</td>
</tr>
<tr>
<td>Refrigerator class A</td>
<td>1 Refrigerator</td>
<td>0.0260</td>
<td>10</td>
<td>870</td>
</tr>
<tr>
<td>Washing machine class A</td>
<td>1 Washing machine</td>
<td>0.0079</td>
<td>10</td>
<td>264</td>
</tr>
<tr>
<td>Dish washer class A</td>
<td>1 Dish washer</td>
<td>0.0092</td>
<td>10</td>
<td>308</td>
</tr>
<tr>
<td>CFL for Residential</td>
<td>1 Lamp</td>
<td>0.0146</td>
<td>6</td>
<td>326</td>
</tr>
<tr>
<td>Wall insulation Residential - Zone A &amp; B (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0006</td>
<td>30</td>
<td>96</td>
</tr>
<tr>
<td>Wall insulation Residential - Zone C (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0012</td>
<td>30</td>
<td>192</td>
</tr>
<tr>
<td>Wall insulation Residential - Zone D (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0023</td>
<td>30</td>
<td>368</td>
</tr>
<tr>
<td>Wall insulation Residential - Zone E (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0039</td>
<td>30</td>
<td>624</td>
</tr>
<tr>
<td>Wall insulation Residential - Zone F (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0062</td>
<td>30</td>
<td>992</td>
</tr>
<tr>
<td>Wall insulation Hospitals - Zone A &amp; B (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0011</td>
<td>30</td>
<td>176</td>
</tr>
<tr>
<td>Wall insulation Hospitals - Zone C (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0018</td>
<td>30</td>
<td>288</td>
</tr>
<tr>
<td>Wall insulation Hospitals - Zone D (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0030</td>
<td>30</td>
<td>480</td>
</tr>
<tr>
<td>Wall insulation Hospitals - Zone E (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0046</td>
<td>30</td>
<td>736</td>
</tr>
<tr>
<td>Wall insulation Hospitals - Zone F (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0067</td>
<td>30</td>
<td>1,072</td>
</tr>
<tr>
<td>Wall insulation Office Bldgs - Zone A &amp; B (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0005</td>
<td>30</td>
<td>80</td>
</tr>
<tr>
<td>Wall insulation Office Bldgs - Zone C (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0010</td>
<td>30</td>
<td>160</td>
</tr>
<tr>
<td>Wall insulation Office Bldgs - Zone D (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0020</td>
<td>30</td>
<td>320</td>
</tr>
<tr>
<td>Wall insulation Office Bldgs - Zone E (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0033</td>
<td>30</td>
<td>528</td>
</tr>
<tr>
<td>Wall insulation Office Bldgs - Zone F (k=1.1-1.3)</td>
<td>1 m² of insulated wall</td>
<td>0.0049</td>
<td>30</td>
<td>784</td>
</tr>
</tbody>
</table>

**Energy Conversion Factors**
- for electricity: 1 toe= 4,545 kWh<sub>e</sub>
- for heat: 1 toe= 11,628 kWh<sub>h</sub>

**Energy Rates (average 2003. tax included)**
- Electricity residential: 1 toe= 900 € (yearly consumption: 3,500 kWh)
- Nat. Gas residential.: 1 toe= 801 € (yearly consumption: 2,199 m<sup>3</sup>)
- Nat. Gas non resid: 1 toe= 435 € (yearly consumption: 1,09958 m<sup>3</sup>)
The data of column “Lifetime cumulated Final Energy Savings” (coloured in blue) give the balance between yearly cost savings (positive) and annual amount of actualised costs, all related to data of column “Yearly Primary Energy Saving” (coloured in green). Cases of specific yearly net benefits with a negative value were pointed out (e.g. washing machines, wall insulation in hot climatic zones). This was a consequence of high implementation costs not offset by energy cost savings; fostering these measures would require some incentives to the end-user from the organisation launching the energy saving programme.

The following comments give greater details on it.

**Minimum performance standards** exist in Italy, relevant in particular to the building sector (building insulation must comply with minimal requirements specified by law). Another standard of this kind is relevant to minimum efficiency boiler labelling: at least 1 star is mandatory. Finally, an obligation exists on labelling electrical appliances, though no obligation exists on a minimum performance on this kind of equipment. Pros and cons of tightening the requirements of energy efficiency standards deserve great attention. In fact, such an approach would lead inexorably to higher investment costs; yet, convenient benefits/costs ratio could be attained in contexts where high energy costs occur.

**Baseline** adopted in the standardised procedures adopted in Italy is founded on:

- existing mandatory standards (e.g. see ref.[7]) in the case of energy savings projects in buildings (heating, insulation, etc);
- average of sales (updated at 2002) for energy savings projects based on substitution with high efficiency boilers or high efficiency electric appliances. The adoption of this criterion allows for evaluation of an “average” consumption of the “average” equipment existing on the market; this criterion is dependent on the market share and on the present technological development\(^{21}\) and need of periodic updating of baseline is then required to keep significance to the whole evaluation process.

As for the latter above point, some more details should be considered. In fact, the matter of baseline requires particular attention when procedures involving equipment substitution are considered. As a result of wide national debates, a base principle was assumed in Italy that the driver for a substitution is obsolescence of an equipment rather than its possible low efficiency; in other words, the end-user is assumed to carry on a substitution of an equipment since it is old and not in view of higher efficiency. These reasons motivated the performed choice of the baseline for the energy savings and for the possible additional implementation costs of a project, which was assumed as the “average” equipment\(^ {22}\) existing on the market and evidenced by recent sales data.

As for **lifetime of the measures**, the Italian scheme considers annual energy saving and awards White Certificates only for the first 5 years (8 in some cases), which are issued yearly against the annual savings by means of the evaluation procedures. This mechanism encourages short-term energy saving projects; nevertheless, long term projects must not be disregarded if they can produce high savings in the early years (and meaningful amounts of White Certificates) and remarkable medium-term savings, which compensate anyway the implementation investments.

No actualisation of the energy savings obtained in different periods through a discount rate coefficient is considered in the Italian scheme, since yearly savings are considered in principle. Regardless of national choices about the discount rate, advantages of actualisation were remarked, since this approach relies on requirements of a prizing mechanisms for projects triggering early energy saving with respect to medium/long-term ones. For these reasons, the Italian table also shows cumulated savings over the lifetime of the measures. A discount rate of 6% was assumed; this reasonable but somehow arbitrary value complies with harmonisation requirements with the contributions of the other Countries.

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\(^{21}\) To this purpose, a continuous and remarkable drift of the market towards class A efficiency is under way in Italy, owing mainly to the a definite position of the equipment sellers in this sense.

\(^{22}\) Which represents the equipment that the end-user would buy anyway in substitution of his obsolete one.
As for the **accounting** of energy savings, **primary energy** was considered adopting toe (tons of oil equivalent) as unit of measure for it.

Moreover, a ratio of 0.22×10^{-3} toe (primary energy) per kWh saved (final electric energy) is prescribed by the present Italian legislation; in other words, you have to save 4545 kWh of electricity in order to save 1 toe (this corresponds to a conventional electric power system efficiency of 39%).

Considering in particular the substitution of incandescent lamps with CFL lamps, details were give on the evaluation of the specific primary energy savings. A standard procedure was set up, which led to an average value of savings keeping into account:

- a suitable distribution of lighting in a typical house
- the hours of use of lighting for each room
- the probability of performing the substitution

The procedure is summarised in the following Tab. 16:

<table>
<thead>
<tr>
<th>Case No</th>
<th>Room</th>
<th>$P_{\text{inc}}$ [W]</th>
<th>$P_{\text{CFL}}$ [W]</th>
<th>$\Delta P$ [W]</th>
<th>Use [h/yr]</th>
<th>$\Delta F_{\text{es}}$ [kWh/yr/lamp]</th>
<th>$\Delta F_{\text{es}}$ [10^{-3} toe/yr/lamp]</th>
<th>$p$ [%]</th>
<th>$\Delta F_{\text{es},\text{prob}}$ [10^{-3} toe/yr/lamp]</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Kitchen</td>
<td>100</td>
<td>20</td>
<td>80</td>
<td>1200</td>
<td>96</td>
<td>21.12</td>
<td>30</td>
<td>6.34</td>
</tr>
<tr>
<td>2</td>
<td>&quot;</td>
<td>75</td>
<td>15</td>
<td>60</td>
<td>&quot;</td>
<td>72</td>
<td>15.84</td>
<td>10</td>
<td>1.58</td>
</tr>
<tr>
<td>3</td>
<td>&quot;</td>
<td>60</td>
<td>11</td>
<td>49</td>
<td>&quot;</td>
<td>58.8</td>
<td>12.94</td>
<td>5</td>
<td>0.65</td>
</tr>
<tr>
<td>4</td>
<td>Living room</td>
<td>100</td>
<td>20</td>
<td>80</td>
<td>800</td>
<td>64</td>
<td>14.08</td>
<td>20</td>
<td>2.82</td>
</tr>
<tr>
<td>5</td>
<td>&quot;</td>
<td>75</td>
<td>15</td>
<td>60</td>
<td>&quot;</td>
<td>48</td>
<td>10.56</td>
<td>5</td>
<td>0.53</td>
</tr>
<tr>
<td>6</td>
<td>&quot;</td>
<td>60</td>
<td>11</td>
<td>49</td>
<td>&quot;</td>
<td>39.2</td>
<td>8.62</td>
<td>5</td>
<td>0.43</td>
</tr>
<tr>
<td>7</td>
<td>Bathroom</td>
<td>60</td>
<td>11</td>
<td>49</td>
<td>300</td>
<td>14.7</td>
<td>3.23</td>
<td>10</td>
<td>0.32</td>
</tr>
<tr>
<td>8</td>
<td>Bedroom</td>
<td>40</td>
<td>9</td>
<td>31</td>
<td>300</td>
<td>9.3</td>
<td>2.05</td>
<td>10</td>
<td>0.2</td>
</tr>
<tr>
<td>9</td>
<td>External</td>
<td>100</td>
<td>20</td>
<td>80</td>
<td>2000</td>
<td>160</td>
<td>35.2</td>
<td>5</td>
<td>1.76</td>
</tr>
</tbody>
</table>

Tab. 16 – Procedure to evaluating average energy savings for CFL lamps

In this table:

- $P_{\text{inc}}$ = Power of the used incandescent lamp
- $P_{\text{CFL}}$ = Power of the substituting CFL lamp
- $\Delta P$ = Saved power per lamp
- Use = Annual hours of use
- $\Delta F_{\text{es}}$ = Specific savings per lamp in final energy
- $\Delta F_{\text{es}}$ = Specific savings per lamp in primary energy
- $p$ = Probability of substitution
- $\Delta F_{\text{es},\text{prob}}$ = Probability weighted specific savings per lamp in primary energy

The weighted average value of primary energy which can be attained for a single substitution is:

$$\bar{\Delta PE} = \sum_{n} \frac{\Delta F_{\text{es},n} \cdot p_n}{100} = 14.6 \cdot 10^{-3} \text{ toe/year \cdot lamp}$$

In this particular case, this must considered a gross value. Assuming that the substitution of the lamps is the effects of a promotional campaign of the obliged party (e.g. who gives economic incentives for the purchase of CFLs or makes a free delivery of them to a selected sector of clients), this gross value should be reduced to keep into account the free-ridership effects (i.e. the probability that the substitution would have been carried on by the
user regardless of the promoted DSM measures) and the actual use of the CFL (i.e. the probability that the user actually installs the CFL\textsuperscript{23}); these abatement values have been considered already in sect. 9.2.3)

With reference to this measure, some different evaluation of the lifetime cumulated final energy savings with respect to the French results is a consequence of different assumptions for the specific implementation cost, of the lifetime and of the additionality (Italy: each CFL substitutes an incandescent lamp; France: 10 CFL substitute 7 incandescent lamps and 3 existing CFL).

Some more details on CFL and refrigerators measures are synthetically given below.

9.4.2.2.2 Case of CFL

- **Energy Savings**
  Replacement of an incandescent lamp with a CFL in a household can produce different savings according to wattage and use of the lamp. The above Tab. 16 summarises the main substitutions.
  The weighted average value of energy savings which can be attained for a single substitution is:

  \[
  \Delta FE = \sum_{n} \frac{\Delta FE_{n} \cdot p_{n}}{100} = 66.5 \frac{kWh}{yr \cdot CFL}
  \]

- **Persistence**
  Lifetime of a CFL: 6 years.
  Lifetime of an incandescent lamp: 1 year.

- **Lifetime cumulated savings**
  Present value of the energy savings cumulated over the lifetime of the CFL:
  - 327 kWh/CFL at 6\% discount rate
  - 349 kWh/CFL at 4\% discount rate

9.4.2.2.3 Case of refrigerators

- **Energy Savings**
  Replacement of the average-on-the-market refrigerator (baseline) with an efficient refrigerator belonging either to Class A, or Class A+, or Class A++. Savings are assigned according to the corresponding reduction in consumption:
  - Installation of a Class A Refrigerator 118 kWh/yr
  - Installation of a Class A+ Refrigerator 180 kWh/yr
  - Installation of a Class A++ Refrigerator 248 kWh/yr

- **Persistence**
  Lifetime of a Refrigerator: 10 years.

- **Lifetime cumulated savings**
  Present value of cumulated energy savings at 6 \% discount rate are:
  - Class A 870 kWh/Refrigerator
  - Class A+ 1325 kWh/Refrigerator
  - Class A++ 1823 kWh/Refrigerator

  Lifetime cumulated energy savings at 4 \% discount rate are:
  - Class A 959 kWh/Refrigerator
  - Class A+ 1460 kWh/Refrigerator
  - Class A++ 2009 kWh/Refrigerator

\textsuperscript{23} In the past, Enel carried on very massive free supplies of CFL to their clients; nevertheless, it turned out into a small number of actual substitution, owing to a possible scarce involvement of the user into the spirit of the DSM project.
9.4.2.3 Remarks on the Dutch contribution

9.4.2.3.1 General

Developments are in progress in the Dutch Ministry of Economic Affairs for a possible use of White Certificates in the next future.

A simple modelling with a discount rate of 6% (similar to the Italian table) for a period of 10 years (from 2000 to 2010) was carried on. Netherlands synthesised the requested information into the following Tab. 17. In this table:

A. Primary Energy Saved are to be referred to all the Dutch potential
B. Annual Cost are relevant to investments for the measures
C. Cost effectiveness depends on the difference between cumulated savings benefits (>0) and investment costs (<0)
D. Total Cost = A·C

Different RPU were used from the Italian tables; in particular:
- Measures relevant to the residential sector are expressed “per dwelling”
- Measures relevant to the service and office sectors are expressed “per m² of floor surface”
- Primary energy was considered for the savings evaluations.

These data were obtained by the use of the ICARUS model24. This model involves energy efficiency data for all sectors in the Netherlands; in particular:
- a total of about 85 energy savings measures; among the others:
  - Wall insulation cavity construction
  - Wall insulation solid construction (internal./external)
  - Wall insulation (upgrades Rc 2.5-8)
  - CFL’s (per room and general)
  - Dryer (Technical potential 2000-2020)
  - Dishwasher (Technical potential 2000-2020)
  - Washing machine (Technical potential 2000-2020)
  - Deepfreeze (Technical potential 2000-2020)
  - Combi fridge and freezer (Technical potential 2000-2020)
  - Energy efficient computers
  - Energy efficient faxes
  - Energy efficient copiers
  - Energy efficient printers

- 12 sectors were considered with more subsectors; among the others:
  - Households (buildings after1995)
  - Households (buildings before1995)
  - Education
  - Trade
  - Catering
  - Non office services
  - Service public offices (buildings before and after1995)
  - Health

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24 An important remark in these figures is that they originate from ICARUS database and they do not take into account the effect of other policies so far. Updated and more realistic figures will be available as soon as the final proposal for a scheme is being completed.
• Data on achievable energy savings, costs and penetration data per measure were made available
• Opt-in for user economic and energy price scenarios is allowed
• Modelling until 2020 can be performed and energy and price scenario can be evaluated

ICARUS is administrated by the Utrecht Centre for Energy Research, belonging to Utrecht University. ICARUS is freeware and it is available on:
http://www.uce-uu.nl/showproject.php?id=2

### Tab. 17: Preliminary data on envisaged Dutch energy savings measures\(^{25}\)

Conservation supply curves were also evaluated for residential and service/office sectors, relying on the data of the above points A. and C. They are shown in Fig. 21. As it is already mentioned, nevertheless, these data do not take into account actual energy savings that have taken place as a result of other energy efficiency policies from 2000.

\(^{25}\) The appliances for the other service sectors are not further analysed since the data are identical with the once already shown.
Fig. 21 – Dutch energy saving data: conservation Supply Curve

These data will be updated when they are actually used for purposes of White Certificates schemes in the Netherlands.

Some more details on CFL and refrigerators measures are synthetically given below.

9.4.2.3.2 Case of CFL
CFL’s are responsible of almost 16% of domestic electricity consumption

- **Measure description**
  Replacing an incandescent lamp of 60W with a CFL of 20W used for 3.5 hours per day. The CFL’s are distinguished for the households (<1995) as an overall measure, for living room, for kitchen and remaining bulbs, with different energy saving potentials. We use here the overall measure. For the services (with all sub-sectors) they also have different values.

- **Functional unit**
  Dwelling (number of households assumed to be the same).
  Number of dwellings 6.5 million (1999) increasing to 7.3 million (2010) and 7.8 million (2020).

- **Lifetime**
  10,000 burning hours (almost 8 years) instead of 1,250 hours of an incandescent lamp

- **Penetration rate**
  Almost 72% with a technical penetration rate of 100% in 2020 for households <1995.

- **Energy saving potential**
  170 kWh energy saving per household (ECN). Almost 70% electricity savings from an incandescent lamp.
  Electricity savings over lifetime: 2.97 PJ primary energy (around 113 kWh/household), discount rate 6%

9.4.2.3.3 Case of refrigerators

- **Measure description**
  Replacement of a refrigerator (technology 1998) of average energy demand 223.5 kWh, with a refrigerator of technical potential 2010 or technical potential 2020.
  The refrigerators are available in 3 forms, of conventional technology, technical potential 2010 and technical potential 2020. Furthermore, another category distinguished in the model are the combi-fridges and deep freezers (which are most common)
• **Functional unit**
  Dwelling (number of households assumed to be the same).
  Number of dwellings 6.5 million (1999) increasing to 7.3 million (2010) and 7.8 million (2020).

• **Lifetime**
  Refrigerator best practice (1998): 15 years
  Refrigerator technical potential 2010: 15 years
  Refrigerator technical potential 2020: 15 years

• **Penetration rate (technical maximum potential)**
  Refrigerator best practice (1998): 67%
  Refrigerator technical potential 2010: 33%
  Refrigerator technical potential 2020: 100%

• **Energy saving potential**
  An electricity reduction of 35% per refrigerator is estimated. By making use of vacuum insulation and energy efficiency, the energy consumption of a refrigerator can be reduced by almost 70%, resulting in electricity consumption of around 70 kWh/year. More specifically the electricity saved is 5% for refrigerator best practice level (1998), 4% for refrigerator technical potential 2010 and 10% for refrigerator technical potential 2020.

9.4.2.4 **Remarks on Great Britain contribution**
Some information of the kind of those processed by the other Countries is available in Tab. 18, where energy improvements in the Energy Efficiency Commitment (EEC) 2005-2008 are shown.
After the first period of application 2002-2005, UK pointed out that the EEC gave a chance of better household appliances and equipment to residential users who otherwise could not afford these kind of products (the so-called *priority group* of clients).
<table>
<thead>
<tr>
<th>Possible EEC Measure</th>
<th>Total installations via EEC programmes (including ‘deadweight’)</th>
<th>Lifetime of measure</th>
<th>Net Energy Improvement (1)</th>
<th>Discounted aggregate energy improvement for lifetime</th>
<th>Discounted aggregate energy improvement for lifetime - fuel standardised GWh</th>
<th>Total EEC target, lifetime-discounted and fuel-standardised TWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavity wall insulation - private</td>
<td>1.00</td>
<td>40</td>
<td>5.15</td>
<td>110.1</td>
<td>7,139 93,641 1,627 7,278 5,719 33,069 1,018 3,373</td>
<td>43.2</td>
</tr>
<tr>
<td>Cavity wall insulation - social</td>
<td>0.70</td>
<td>40</td>
<td>5.00</td>
<td>108.7</td>
<td>4,802 63,770 1,244 4,905 3,864 22,520 693 2,297</td>
<td>29.4</td>
</tr>
<tr>
<td>Loft ins - professional - private</td>
<td>0.70</td>
<td>30</td>
<td>2.71</td>
<td>49.8</td>
<td>2,286 29,001 583 2,323 1,628 10,550 375 1,077</td>
<td>13.8</td>
</tr>
<tr>
<td>Loft ins - professional - social</td>
<td>0.42</td>
<td>30</td>
<td>1.87</td>
<td>34.5</td>
<td>938 12,300 240 956 751 4,344 134 443</td>
<td>5.7</td>
</tr>
<tr>
<td>Loft insulation DIY</td>
<td>0.46</td>
<td>30</td>
<td>3.34</td>
<td>61.4</td>
<td>1,834 24,058 469 1,859 1,469 8,496 261 867</td>
<td>11.1</td>
</tr>
<tr>
<td>Glazing E to C rated (in m2)</td>
<td>4.50</td>
<td>20</td>
<td>0.03</td>
<td>0.4</td>
<td>112 1,474 20 115 90 521 16 53</td>
<td>0.7</td>
</tr>
<tr>
<td>B to A-rated boilers</td>
<td>1.00</td>
<td>15</td>
<td>1.15</td>
<td>13.3</td>
<td>13,283 0 0 0 4,674 0 0</td>
<td>4.7</td>
</tr>
<tr>
<td>A/B rated boilers (exceptions)</td>
<td>0.20</td>
<td>15</td>
<td>3.10</td>
<td>35.7</td>
<td>0 7,302 0 0 0 2,570 0 0</td>
<td>2.6</td>
</tr>
<tr>
<td>Fuel Switching</td>
<td>0.06</td>
<td>15</td>
<td>7.91</td>
<td>91.1</td>
<td>3,236 6,128 8,470 0 2,505 2,104 4,718 0</td>
<td>5.1</td>
</tr>
<tr>
<td>Heating controls - upgrade with boiler replacement</td>
<td>0.45</td>
<td>15</td>
<td>0.66</td>
<td>7.9</td>
<td>0 3,523 0 0 0 1,244 0 0</td>
<td>1.2</td>
</tr>
<tr>
<td>Heating controls - extra</td>
<td>0.09</td>
<td>15</td>
<td>1.88</td>
<td>21.7</td>
<td>129 1,628 33 132 104 600 18 61</td>
<td>0.8</td>
</tr>
<tr>
<td>CFLs - retail</td>
<td>0.75</td>
<td>16.0</td>
<td>0.01</td>
<td>0.1</td>
<td>3,756 2,448 48 190 3,010 8,864 27 88</td>
<td>2.0</td>
</tr>
<tr>
<td>CFLs - direct</td>
<td>32.64</td>
<td>16.0</td>
<td>0.01</td>
<td>0.1</td>
<td>12,583 6,196 160 3,37 10,880 2,865 88 296</td>
<td>6.8</td>
</tr>
<tr>
<td>Fridgesavers-type schemes</td>
<td>0.10</td>
<td>12</td>
<td>0.14</td>
<td>1.3</td>
<td>327 -176 -3 -14 262 62 -2 -6</td>
<td>0.2</td>
</tr>
<tr>
<td>Appliances - Cold</td>
<td>0.00</td>
<td>12</td>
<td>0.08</td>
<td>0.6</td>
<td>1,251 -874 -13 -52 1,002 230 7 -24</td>
<td>0.7</td>
</tr>
<tr>
<td>Appliances - Wet</td>
<td>1.17</td>
<td>12</td>
<td>0.02</td>
<td>0.2</td>
<td>206 -7 0 -1 215 -3 0 0</td>
<td>0.2</td>
</tr>
<tr>
<td>Appliances - Set Top Boxes</td>
<td>0.50</td>
<td>8</td>
<td>0.01</td>
<td>0.1</td>
<td>138 -83 -2 -6 110 -20 -1 -3</td>
<td>0.1</td>
</tr>
<tr>
<td>Tank insulation - top-up</td>
<td>0.46</td>
<td>10</td>
<td>0.45</td>
<td>3.7</td>
<td>111 1,456 28 113 89 515 18 53</td>
<td>0.7</td>
</tr>
<tr>
<td>Draughtproofing</td>
<td>0.31</td>
<td>20</td>
<td>0.74</td>
<td>10.5</td>
<td>210 2,750 54 214 168 971 30 99</td>
<td>1.3</td>
</tr>
</tbody>
</table>

TOTAL: 39,180 237,454 12,752 17,052 31,385 83,855 7,103 7,905 130.2

(1) including the heat replacement effect for CFLs and appliances

Tab. 18 – Great Britain EEC 2005-2008: Basis of target
9.4.2.5 Comparative synthesis of the review

A comparative synthesis of the considered review can be outlined in terms of unit energy savings for the cases of CFL and Class A+ refrigerators, in order to point out common views and differences in the national approaches. These rough comparisons are shown in the below Tab. 19 and Tab. 20.

<table>
<thead>
<tr>
<th>Country</th>
<th>Lifetime</th>
<th>Unit</th>
<th>Unit annual electricity savings</th>
<th>Discount rate</th>
<th>Lifetime cumulated electricity savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>years</td>
<td>Final kWh</td>
<td>%</td>
<td></td>
<td>Final kWh</td>
</tr>
<tr>
<td>France</td>
<td>7.5</td>
<td>34.72</td>
<td>6%</td>
<td>205</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>6</td>
<td>66.5</td>
<td>6%</td>
<td>327</td>
<td></td>
</tr>
<tr>
<td>The Netherlands</td>
<td>8</td>
<td>170</td>
<td>6%</td>
<td>1,056</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>16</td>
<td>10</td>
<td>3.50%</td>
<td>121</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 19 - National EE evaluation procedures: substitution with CFL

<table>
<thead>
<tr>
<th>Country</th>
<th>Lifetime</th>
<th>Unit</th>
<th>Unit annual electricity savings</th>
<th>Discount rate</th>
<th>Lifetime cumulated electricity savings</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>years</td>
<td>Final kWh</td>
<td>%</td>
<td></td>
<td>Final kWh</td>
</tr>
<tr>
<td>France</td>
<td>10</td>
<td>66</td>
<td>6%</td>
<td>486</td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>10</td>
<td>180</td>
<td>6%</td>
<td>1,325</td>
<td></td>
</tr>
<tr>
<td>The Netherlands</td>
<td>15</td>
<td>70</td>
<td>6%</td>
<td>680</td>
<td></td>
</tr>
<tr>
<td>UK</td>
<td>12</td>
<td>140</td>
<td>3.50%</td>
<td>1,353</td>
<td></td>
</tr>
</tbody>
</table>

Tab. 20 - National EE evaluation procedures: substitution with A+ refrigerators

It should be pointed out that the results of this comparative review are to be considered very cautiously in order not to foster misleading and hurried conclusions. In fact, possible disagreements are very often connected with different assumptions on:

- the physical unit reference (component/dwelling), baseline, the use intensity (e.g. the hours/year) and the probability of substitution (which lead to different unit energy savings)
- lifetime and discount rate (which lead to different lifetime cumulated energy savings).

The main lesson which follows from these comparisons is that harmonisation among procedures of different countries on the same measure is a very hard task and this can make cross-border exchange of White Certificates unrealistic and unfeasible, as it will be shown with greater detail in chapter 15.

9.5 Synthetic closing overview

Synthetically, all the examined White Certificates schemes showed a strong general inclination towards standardised ex-ante procedures, characterised by the following features:

- based on lumped and conservative evaluations
- very simple and not ambiguous in the use
- generally shared with the stakeholders through preliminary consultation processes
- involving very few measurements (or none)
- considering baseline/dead-weight
- easily updatable with changes of baseline

The approaches to prove additionality, i.e. the characteristic of a project to produce energy savings supplementary to those which would be obtained anyway even in absence of that project (depicted by the baseline), strongly depend on the particular national scheme:
• As for France, two types of corrections are made. Firstly, the baseline take into account existing standards and the current state of the market for equipment. Secondly, agents already involved in market of efficient materials or equipment can not receive certificates.

• As for Great Britain, additionality must be demonstrated for each measure, but it is included in the targets as dead-weight

• As for Italy, the baseline is included in already available standard tools, finalised to a lump evaluation of energy savings: reference is made to:
  - existing standards (in the case of insulation in buildings),
  - the most diffused or the most traded or the most encouraged efficiency classes of equipment (for electrical appliances)
10 EVALUATION OF COSTS – USED METHODS

10.1 Development of ad hoc methodologies for Costs/Benefits analysis of EE projects

This contribution was explicitly performed for the present Final Report by the Italian expert W. Grattieri. Though many of its features are tailored on the Italian context, the general approach, the adopted methodology and many conclusions are of a wider and more extensive interest. They are presented below according to this spirit.

10.1.1 Foreword

An energy efficiency program involves several players, with often diverging interests, who, according to specific parameters, have to evaluate the opportunity to participate in, or to promote, the initiative. Three categories of players are heavily involved in the implementation of the Italian White Certificate Mechanism, there are:

- **Energy Users**, whose participation in a program is justified from the economic point of view, with the possibility to pay back through energy cost savings the extra investment required by the more efficient equipment;
- **Distributors**, (also known as “obliged parties”) that have the task to obtain the energy savings assigned and to better do so, have to rank the eligible projects in an economic order;
- **Energy Saving Companies (ESCOs)**, that can act as catalysts by facilitating the access of end-users to the market of efficiency and make profit through the sale of the awarded White Certificates.

Several publications already exist that deal with the general principles of DSM programs cost/benefit analysis: for example see ref. [22] for a comprehensive description of the recommended performance tests under different perspectives. Based on what already stated by the international literature, this report explores the financial perspectives of Energy Users, Distributors, and ESCOs respectively, under the implementation rules specifically foreseen by the Italian White Certificates framework.

10.1.2 The Energy User Perspective

Cost/Benefit Analysis under the Energy User perspective consists in comparing costs and benefits involved in the participation in an energy efficiency program. Needless to say, as costs and benefits involve the entire life of the equipment installed, the economic calculation has to be performed on a multiyear base.

To better analyse pros to and cons of the participation it is necessary to consider separately two typical situations, respectively without and with the project.

Without the project, that is under baseline conditions, it is assumed that the User:

- **a)** Would have done nothing thus continuing with the usual consumption (average installed characteristics), or
- **b)** Would have installed an appliance with average-on-the-market characteristics (namely, cost and energy performance)

When participating in a program, the User installs an eligible, efficient appliance that provides energy savings equal or greater than those determined with the approved calculation template. This in turn creates two situations – addition or replacement - , each confronting with one of the two above mentioned baselines conditions:

- **a)** New addition of a device of a kind non existing before (solar water heater, photovoltaic generator, etc.), or improvement of the structural energy performance of a building (insulation upgrade);
- **b)** Installation of an appliance with an A or better energy label, that is with an higher efficiency than the average-on-the-market appliance.
As of regards the cash flow analysis the two situations, without and with the project, can be represented in the following Fig. 22.

![Fig. 22: Cash Flows under the Energy User perspective](image)

Where:

- $I_b$, $I_p$ investment costs of the baseline and of the project respectively, (generally, $I_p > I_b$, $I_b = 0$ in case a))
- $CE_b$, $CE_p$ energy costs for the baseline and the project respectively (generally, $CE_b > CE_p$), these costs include the adders for financing the promotion of end-use efficiency
- $M_b$, $M_p$ maintenance costs for the baseline and the project (generally $M_b = M_p$, seldom $M_b = 0$ and $M_p \neq 0$ in case a))
- $P_p$ participant payments (these can either be the customers’ partial contribution to project expenses, or the reimbursement by installments of loans)
- $Cl_b$, $Cl_p$ tax credits, if any, on the investment costs for the baseline and the project respectively (in general, $Cl_p > Cl_b$, $Cl_b = 0$ in case a))
- INC incentives paid to the participant

For the same “useful effect”, the requirement for the User’s profitability is that the Net Present Value (NPV) of cash outflows for the participation is less than the NPV of the outflows in the baseline, that is:

$$
\sum_{t=0}^{N} \left( \frac{CE_p_t + M_p_t + I_p_t + P_p_t - INC_t - Cl_p_t}{(1+r_c)^t} \right) \leq \sum_{t=0}^{N} \left( \frac{CE_b_t + M_b_t + I_b_t - Cl_b_t}{(1+r_c)^t} \right) \quad (1)
$$

where:

- $t$ generic year of operation
- $N$ life of the appliance (years)
- $r_c$ User’s discount rate (per unit)

The equation (1) can also be written as:

$$
\Delta B_c > \Delta C_c
$$

where $\Delta B_c$ and $\Delta C_c$ are the respective NPVs of the additional Benefits and Costs involved by the participation.

Additional Benefits are represented by the cash inflows due to:

1. Bill reduction for the reduced consumption

---

26 Red arrow: outflows. Green arrow: inflows.
2. Reduced maintenance costs  
3. Incentives provided by the Distributor (or other entities) such as:  
   – Direct financial support (no reimbursement)  
   – Low interest loans  
4. Additional tax credits  
   \[ \Delta Cc = \sum_{0}^{N} \frac{\Delta CE_{t} + \Delta M_{t} + INC_{t} + \Delta CI_{t}}{(1 + r_{c})^{t}} \]
   
   Where:
   \( \Delta CE_{t} = CE_{t} \cdot CE_{p_{t}} \) participant’s bill reduction in year \( t \)  
   \( \Delta M_{t} = Mb_{t} \cdot Mp_{t} \) maintenance cost reduction in year \( t \)  
   \( \Delta CI_{t} = CI_{p_{t}} \cdot CI_{b_{t}} \) greater tax credits in year \( t \)

   Additional Costs are represented by the cash outflows due to:
   1. Greater than the baseline investment costs (design, procurement, substitution/installation of equipment)  
   2. Participation payments to the program administrator (these can either be the customers’ partial contribution to project expenses or the reimbursement by installments of loans)
   \[ \Delta Cc = \sum_{0}^{N} \frac{\Delta I_{t} + Pp_{t}}{(1 + r_{c})^{t}} \]
   
   Where:
   \( \Delta I_{t} = Ip_{t} \cdot Ib_{t} \) additional investments in year \( t \)

   As stated earlier, the participation is profitable for the User if:
   \[ VAN = \Delta Bc - \Delta Cc > 0 \]

   The following Tab. 21 reports the economic calculation in the perspective of the Energy User for a set of energy efficiency measures in the residential sector. With respect to the complete methodology described above, for sake of simplicity we have skipped a few cash flows, whose value is often zero or close to that: the Participation payments \( Pp_{t} \), the change in maintenance costs \( \Delta M_{t} \), the variation of tax credits \( \Delta CI_{t} \), and the incentives to participants \( INC_{t} \). To facilitate the direct comparison among the possible alternatives, the NPV has been calculated both respect to the Reference Physical Unit (€/RPU column), that is to the single appliance or device the program is targeting, and with reference to the tons of oil equivalent saved by the appliance itself (€/toe column). The calculation has been performed with a 4% interest rate and adopting a cost of electricity equal to 0.1274 €/kWh, that corresponds to the average residential rate (in Italy) in the last quarter of 2005 for a family consuming 2500 kWh/year.
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Freezer Class A</td>
<td>1 Freezer</td>
<td>0.0290</td>
<td>31</td>
<td>16.79</td>
<td>10</td>
<td>105.16</td>
<td>447.07</td>
</tr>
<tr>
<td>Freezer Class A +</td>
<td>1 Freezer</td>
<td>0.0398</td>
<td>76</td>
<td>23.04</td>
<td>10</td>
<td>110.87</td>
<td>343.44</td>
</tr>
<tr>
<td>Freezer Class A ++</td>
<td>1 Freezer</td>
<td>0.0516</td>
<td>243</td>
<td>29.87</td>
<td>10</td>
<td>-0.73</td>
<td>-1.75</td>
</tr>
<tr>
<td>Refrigerator Class A</td>
<td>1 Refrigerator</td>
<td>0.0260</td>
<td>59</td>
<td>15.05</td>
<td>10</td>
<td>63.07</td>
<td>299.09</td>
</tr>
<tr>
<td>Refrigerator Class A +</td>
<td>1 Refrigerator</td>
<td>0.0396</td>
<td>123</td>
<td>22.92</td>
<td>10</td>
<td>62.93</td>
<td>195.92</td>
</tr>
<tr>
<td>Refrigerator Class A ++</td>
<td>1 Refrigerator</td>
<td>0.0545</td>
<td>336</td>
<td>31.55</td>
<td>10</td>
<td>-80.12</td>
<td>-181.24</td>
</tr>
<tr>
<td>Washing machine Class A</td>
<td>1 Washing machine</td>
<td>0.0079</td>
<td>23</td>
<td>4.57</td>
<td>10</td>
<td>14.09</td>
<td>219.92</td>
</tr>
<tr>
<td>Dish washer Class A</td>
<td>1 Dish washer</td>
<td>0.0092</td>
<td>13</td>
<td>5.33</td>
<td>10</td>
<td>30.20</td>
<td>404.65</td>
</tr>
<tr>
<td>CFL</td>
<td>1 Lamp</td>
<td>0.0146</td>
<td>3.57</td>
<td>8.45</td>
<td>6</td>
<td>40.73(b)</td>
<td>532.20(b)</td>
</tr>
</tbody>
</table>

Conversion factor: 4’545 kWh/tep  
Electricity cost: 0.1274 €/kWh ==> 579 €/tep  
(yearly consumption: 2’500 kWh)  
Discount rate: 4.00%

NOTES:  
(a) Difference in the period May-June 2005 between the cost on the Italian market of a class A appliance and the average-on-the-market appliance  
(b) Also includes the present worth of the cost of 5 incandescent lamps, whose replacement is avoided during the life of a CFL.

Tab. 21: Economic calculation in the Energy User perspective
As can be seen from Table I, most measures have a greater than zero NPV that means during their lifetime they more than pay back the initial investment through the bill savings. On the other hand, installing a class A++ refrigerator requires a first cost which is still too high (NPV<0), in this case the amount in the column “Specific Net Present Value” (€/RPU) shows how much the cost of a very efficient refrigerator should be reduced (for example by means of an incentive) for a complete pay back.

One can also notice that some measures have a very high NPV, that obviously will take the top places in a merit order; these are the cases with the highest profitability, like the replacement of incandescent lamps with compact fluorescent lamps where the pay back time is less than one year.

Moreover, when the participation in a program takes place through an ESCO, the User receives a service (heating, cooling, lighting, …) and pays a rent (fee) for it, the rent remunerates the ESCO for installing and running the equipment that supplies the energy service. In this case the cash flows scheme is more simplified as can be seen in Fig. 23.

![Program](image)

![User](image)

![Rent](image)

**Fig. 23: Energy User perspective – Cash flows with an energy saving contract**

*Where:*

Rent = the rent (fee) paid to the ESCO

An energy service contract will be more convenient to the user than the direct (in-house) procurement and operation of the equipment, if the present value of all fees paid is less that the present value of all investment and operation costs otherwise incurred by the user, that is:

$$\sum_{t=0}^{N} \frac{Rent_t}{(1+r_c)^t} < \sum_{t=0}^{N} \frac{CE_{t} + MP_{t} + IP_{t} + PP_{t} - INC_t - CIp_t}{(1+r_c)^t}$$

**10.1.3 The perspective of the Distributor**

In the Italian White Certificates scheme, the Distributors have the task to implement energy efficiency measures so to save every year a number of toe (or White Certificates, 1 toe = 1 White Certificate) corresponding to the target assigned. Distributors are obliged parties, that means they can’t avoid running a program because it is not profitable, if this program is instrumental in the achievement of their target. They will have instead to appropriately rank the implementation programs, so to reach the objective at the minimum cost. For this reason, the analysis that follows doesn’t take into account the comparison between two alternatives (baseline and
program), but it rather focuses on the costs and benefits strictly related to the specific measures a Distributor has to implement to reach its target.

To this aim the Distributor will incur expenses to administer, promote, and incentivate the programs, as well as to buy on the market the Certificates needed to accomplish the obligation, while the Benefits will consist in the participants’ payments and the cost recovery foreseen by the scheme when a Distributor reaches its target. Differently from the perspective of the User that encompasses a multiyear horizon, the Distributor has to reach its target every year, therefore the economic analysis must take into account the measures to implement every year. The cash flows are shown in Fig. 23.

![Fig. 24: Yearly cash flows in the perspective of the Distributor](image)

Where:

- \( \Delta R \) revenues change (generally \( \Delta R < 0 \))
- \( \Delta C \) costs change (generally \( \Delta C < 0 \))
- \( Pp \) participants’ payments
- \( INC \) incentives paid to participants
- \( CRp \) acknowledged costs (Decision AEEG n. 135/04).
- \( TEE \) expenses for White Certificates purchase (alternatively, revenues from the sale of White Certificates)
- \( PRp \) promotion expenses
- \( GAp \) management and administration costs.

With reference to the above scheme, in a given year \( t \) the net cost \( CD_t \) for a Distributor is:

\[
CD_t = INC_t + TEE_t + \Delta C_t + PRp_t + GAp_t - Pp_t - CRp_t - \Delta R_t
\]

To simplify the above formula, it can be observed that both the change in revenues \( \Delta R_t \) and the change in costs \( \Delta C_t \) can be excluded from the sum, because the automatic balance between these two items is included in the rate making mechanism in effect in Italy\(^{27}\), therefore:

\[
CD_t = INC_t + TEE_t + PRp_t + GAp_t - Pp_t - CRp_t \tag{2}
\]

\(^{27}\) The Distribution tariff is fixed by the Authority in order to ensure in principle cost coverage with no appreciable profit.
Obviously, the Distributor’s strategy will be to minimize $CD$, under the constraint to reach the target, therefore he will have to choose among all possible projects (including the purchase of White Certificates) those showing the best ratio between cost and effectiveness.

Now, for what regards the appraisal of the various cash flows in eq. (2), the following criteria can be observed:

**INCI:** there are normally two groups of incentives:
- money grants, or discounts, and
- low interest loans, to be reimbursed by installments.

Incentives are awarded to the aim to reduce the initial investment bore by energy users and represent the participant’s compensation for the White Certificates that will eventually be credited to the Distributor. It should be noted that this compensation is necessary only when there is a need to stimulate a larger participation by increasing the economic convenience. In this case the amount of the incentive can be based on a unit payment $RU$ (€/toe) for the resulting savings, which when multiplied by the acknowledged unit energy savings $RR$ (toe/year/RPU) and by the number of units $UF$, installed in the year $t$ gives a proxy for $INCI$:

$$INCI = RU \times RR \times UF$$

Obviously, said operation will have to be repeated for each type of measure foreseen and, in this case, the overall incentive will result from the sum of the single measure incentives.

It is worth underlining that the specific energy savings totally acknowledged equals the number of White Certificates produced by every physical unit during its useful life, thus it corresponds to the Gross yearly Specific Saving, defined by means of the approved evaluation procedure, cumulated through the validity years of the project. As in general a project “produces” White Certificates for 5 years, if one disregards discounting the future savings to the present date the cumulate savings $RR$ (in toe/RPU) awarded to every physical unit of project will be:

$$RR = 5 \times RSL$$

As to the value to be considered for $RU$ in projects accruing Type I and Type II White Certificates, one can assume that in the case of financial grants or discounts the upper threshold is represented by the cost reimbursed to the Distributor net of the unit cost for promoting and managing the project. In the case of low interest loans, the above threshold can be increased with the present worth of the installments cashed by the Distributor for the repayment of the loan. Type III White Certificates instead don’t give right to any cost reimbursement and in principle Distributors will pay less attention to projects able to produce this kind of certificates, in this case the possibility of incentives will much depend on the scarcity on the market of the other two types of certificates.

**TEE:** Distributors may purchase on the market the White Certificates needed to reach the target, the cost is:

$$TEE = (OBI_t - UF_t \times RSL) \times PCB_t$$

where $PCB_t$ is the market price of the Certificates in the year $t$. The expression in the parentheses is the difference between the objective and the savings obtained with own projects and therefore represents the number of Certificates needed.

**PRpt** the costs for the promotion and information campaigns are meant to make participating customers aware of how to best use and maintain the appliances promoted through the projects. When information campaigns conform to specified requisites the projects to which they refer gain an extra 5% energy savings.
$GA_p_t$ project management involves a number of employees whose task is to report to the Regulator, keep track of the Certificates obtained, run the information campaigns, cooperate with partners, etc., the overall cost of the personnel involved represents therefore the project management expenses. It should be noted that in general these activities are common to the projects implemented by a Distributor, consequently the costs are spread across all projects. A possible way to charge every project with its management costs is to multiply the total cost by the ratio between the project expected saving and the sum of the savings expected from the projects implemented.

$Pp_t$ among the participants’ contributions are normally included also the repayments of the loans, in addition, it a participation fee may need to be paid occasionally. As mentioned earlier, in the case a Distributor means to incentivize the participation by means of low interest loans, the net cost for the Distributor results from the difference between the amount of the loan and the present worth of the participant’s repayment discounted at market interest rate.

$CRp_t$ the cost reimbursement is set at 100 €/toe for each redeemed White Certificate (1 White Certificate = 1 toe) of type I and type II up to the number of toe representing the target assigned to each Distributor. If the target is entirely reached with type I and type II White Certificates, the cost reimbursed amounts to:

$$CRp_t = OBI_t \times CU$$

10.1.4 The perspective of the Energy Service Company

Energy Service Companies (ESCOs) sustain, on behalf of their customers, the technical and economical risk related to the delivery of an energy end use service (heating, cooling, lighting, …). As they directly pay both the investment and the operation cost of the equipment, it is crucial for them to find a fair compromise between the additional cost of high efficiency equipment and the resulting savings in energy costs. In short, they have to solve the split incentives dilemma that rises every time the buyer and the user of a piece of equipment are two different entities. The Italian Legislation enforcing the energy efficiency obligation stated that the White Certificates can be awarded to ESCOs as well, this means that being ESCOS “non obliged” parties they qualify as main sellers both in the open market and in bilateral contracts. The revenues from the sale of the certificates will be a second income source, that joined to the fee for the service will more easily repay the ESCO for its costs (or ensure larger profit margins).

For what said above, the time horizon for the economic evaluation of the projects of an ESCO corresponds to the lifetime of the equipment, like in the case of the energy user perspective. The following Fig. 25 shows the cash flows of an ESCO performing a project that qualifies for White Certificates.

**Fig. 25: Perspective of the ESCO – Cash flows**
Where:

- \( Ip \) is the installation cost of the equipment producing the energy savings
- \( CE_p \) is the cost of the energy used
- \( Mp \) is the equipment maintenance cost

The ESCO reaches the economic profitability when the present worth of incoming cash flows exceeds the outcomes, that is:

\[
\sum_{t=0}^{N} \frac{Rent_t}{(1+r_E)^t} + \sum_{t=0}^{V} \frac{TEE_t}{(1+r_E)^t} > \sum_{t=0}^{N} \frac{CEp_t + Mp_t + Ip_t}{(1+r_E)^t}
\]

Where:

- \( N \) equipment lifetime (years)
- \( V \) period during which the project produces white certificates, generally \( V = 5 \).
- \( r_E \) ESCO’s discount rate

One immediately notices that, for a given profitability, the incomes from the sale of the white certificates contribute to lower the rent, this allows the give back to consumers a more or less important fraction of the adder paid in the bill for the Energy Efficiency promotion fund, from which the money is taken to reimburse Distributors for the cost they bore for the implementation of projects (or to buy white certificates). Obviously, the possibility to observe an actual rent reduction depends on the level of competition on the market of energy services. ESCOs may decide to either pass through a (fraction) of the white cert sale to their customers, or keep it in their own profit. The development of this kind of industry, which today is still in a very early stage, is strategic for the smooth operation of the white certificates mechanism, the market of which surely needs to be “liquid”, that is with an adequate level of products to be exchanged. Only in this way it will be possible to get a win-win result, that is to be able to offer competitive energy services while allowing Distributors to procure at market price the certificates.

10.2 Review and examples of different national evaluations of costs in Energy savings projects

10.2.1 Forewords

A comparison review of evaluation of costs connected to energy savings measures, performed France, Great Britain, Italy and the Netherlands, is considered below. Moving along the same lines pointed out in 9.4 and starting from the performed energy savings evaluations, the same three procedures were considered,

- Use of high efficiency electrical appliances (refrigerators, freezers, dishwashers, washing machines)
- Use of compact fluorescent light bulbs
- Wall insulation

For each measure, the information costs for implementing the measure and avoided operation costs due to the greater efficiency are pointed out. Comparisons were not carried on at all for costs, since the difference in views are even wider and meaningful conclusions would be hardly pursued on the matter.

These considerations are based on presentations G12, G13 and G14 referenced in Appendix C and on French, Italian, Dutch and UK experts' contributions.

10.2.2 Results of the review
10.2.2.1 Remarks on the French contribution

10.2.2.1.1 General

France synthesised the requested information into the annexed Tab. 22, where the available cost data were associated to the selected measures. It must be remarked that all these information are to be considered only as reference “working” values, since several energy savings measures are still under discussion among ADEME, Ministry of Industry and Professional Associations. These data can be subject to modifications with no engagement of any part.

<table>
<thead>
<tr>
<th>Measure identification</th>
<th>Lifetime (years)</th>
<th>Specific criteria</th>
<th>Over-cost by appliance (Euros)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CFL</td>
<td>7.5</td>
<td>No</td>
<td>4</td>
</tr>
<tr>
<td>Washing machine A+</td>
<td>10</td>
<td>No</td>
<td>270</td>
</tr>
<tr>
<td>Refrigerator A+</td>
<td>10</td>
<td>No</td>
<td>121</td>
</tr>
<tr>
<td>Deep freeze A+</td>
<td>10</td>
<td>No</td>
<td>118</td>
</tr>
<tr>
<td>Refrigerator+deep freeze A+</td>
<td>10</td>
<td>No</td>
<td>46</td>
</tr>
</tbody>
</table>

Tab. 22 – Preliminary cost data on envisaged French energy savings measures

Some more details on CFL and refrigerators measures are synthetically given below.

10.2.2.1.2 Case of CFL

- **Measure**
  To replace a theoretical incandescent lamp of 80W by a CFL of 18 W belonging to energy class A

- **Market**
  - 152 million of incandescent lamps by year
  - 8 million of CFLs by year ~ 5% of market share

- **Price of equipment**
  Price of an incandescent lamp: 1 euro
  Price of a CFL: 5 euros
  For 1€/kWh\(^{28}\), the system allows to finance 2.3 euros (57.5% of prices difference)

10.2.2.1.3 Case of refrigerators

- **Measure**
  To replace a refrigerator representative of current sales by a refrigerator belonging to energy class A+

- **Market**
  - 3 million of refrigerators, freezer and refrigerator+freezer sold by year
  - 10% of appliances belonging to energy class A+

- **Price of equipment**
  Prices difference: 88 euros
  For 1€/kWh, the system allows to finance 5.57 euros (15.8% of prices difference)

---

\(^{28}\) This value is assumed as the average unit cost for an energy savings measure in France
10.2.2.2 Remarks on the Italian contribution

10.2.2.2.1 General

Italy synthesised the information into the annexed Tab. 23.
## Table 23 - Preliminary cost data on envisaged Italian energy savings measures

Cases of specific yearly net benefits with a negative value were pointed out (e.g. washing machines, wall insulation in hot climatic zones). This was a consequence of high implementation costs not offset by energy cost savings; fostering these measures would require some incentives to the end-user from the organisation launching the energy saving programme.

The evaluation of the benefits/costs ratio depends on the choice criteria of the baseline in a quite critical and determinant way and modulation of baseline in standardised procedures can be even used as a tool to foster specific energy saving measures and to steer national energy policies. Beside these choices, which can be affected by some sort of arbitrary approach, other circumstances make it difficult to reliably evaluate the incremental costs of an efficient equipment with respect to a less efficient one: the fact that the greater costs of high efficiency devices depend on a mix of attributes (greater functionality, particularly attractive design, others) not related with efficiency but whose cost components often hide and mask the bare efficiency costs.

Some more details on CFL and refrigerators measures are synthetically given below (see 9.4.2.2.2).

### 10.2.2.2 Case of CFL

- **Costs (1st semester 2005)**
  
  Average price of a CFL: 7.6 €.

---

29 In fact, in this case the costs of substitution are given by the cost of the efficient equipment minus the market cost of the average equipment; this value is strongly dependent on how the average value is determined.
Average price of an incandescent lamp: 0.8 €.

**Benefits**
At a rate of 12.74 c€/kWh\(^{30}\) the present worthed (discounted) cumulated energy cost savings are:
- 41.6 €/CFL at 6% discount rate
- 44.4 €/CFL at 4% discount rate.

To these, the avoided replacement cost of 5 bulbs in the 6 year period is to be added. At 0.8 € per incandescent lamp this makes additional benefits of:
- €/CFL at 6%
- €/CFL at 4%.

**Net present Value**
NPV = Benefits-Costs = 41.6 + 3.3 - (7.6-0.8) = 38.1 €/CFL at 6%
NPV = Benefits-Costs = 44.4 + 3.5 - (7.6-0.8) = 41.1 €/CFL at 4%

**Market**
Some information on the lighting market sales in Italy is shown in Fig. 26.

![Lighting Market Sales](image)

**Fig. 26: Lighting market sales in Italy**

10.2.2.2.3 Case of refrigerators

**Costs (1st semester 2005)**
Extra cost of an efficient Refrigerator with respect to the average-on-the-market:
- Class A 58 €/Refrigerator
- Class A+ 172 €/Refrigerator
- Class A++ 369 €/Refrigerator

**Benefits**
At a rate of 12.74 c€/kWh the present worthed (discounted) cumulated energy cost savings are:

6 % discount rate

\(^{30}\) Average residential customer electricity rate for a consumption of 2500 kWh/yr, taxes included.
• Class A  111 €/Refrigerator
• Class A+  169 €/Refrigerator
• Class A++  232 €/Refrigerator

4 % discount rate
• Class A 122 €/Refrigerator
• Class A+ 186 €/Refrigerator
• Class A++ 256 €/Refrigerator

• Net present Value
  6 % discount rate
  • NPV= Benefits-Costs = 111 – 58 = 53 €/Refrigerator Class A
  • NPV= Benefits-Costs = 169 – 172 = - 3 €/Refrigerator Class A+
  • NPV= Benefits-Costs = 232 – 369 = - 137 €/Refrigerator Class A++

4 % discount rate
• NPV= Benefits-Costs = 122 – 58 = 64 €/Refrigerator Class A
• NPV= Benefits-Costs = 186 – 172 = 14 €/Refrigerator Class A+
• NPV= Benefits-Costs = 256 – 369 = - 114 €/Refrigerator Class A++

10.2.2.3.1 Market
Some information on the refrigerators market sales in Italy is shown in Fig. 27.

![Refrigerators Market Sales](image)

**Fig. 27: Refrigerators market sales in Italy**

10.2.2.3 Remarks on the Dutch contribution

10.2.2.3.1 General
Developments are in progress in the Dutch Ministry of Economic Affairs for a possible use of White Certificates in the near future.
The previously considered simple modelling with a discount rate of 6% (similar to the Italian table) for a period of 10 years (from 2000 to 2010) was carried on using the ICARUS database (see 9.4.2.3). Netherlands synthesised the requested information into the following Tab. 24.

<table>
<thead>
<tr>
<th>Measure identification</th>
<th>Sector</th>
<th>Functional Unit</th>
<th>Lifetime yrs</th>
<th>Energy savings GJ/yr</th>
<th>Fuel (gas, oil, heat) GJ/yr</th>
<th>Investment €/fu</th>
<th>Operating and maintenance €/fu</th>
<th>Primary Energy Saved PJ</th>
<th>Annual Cost €/fu</th>
<th>Cost effectiveness</th>
<th>Total Cost €/fu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wall insulation; cavity constr.</td>
<td>hh_dwellings &lt;= 1995 dwellings</td>
<td>30</td>
<td>11,394</td>
<td>563,63636</td>
<td>13,28</td>
<td>4,39</td>
<td>-7,57</td>
<td>-100,55</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall insulation; solid constr., external</td>
<td>hh_dwellings &lt;= 1995 dwellings</td>
<td>30</td>
<td>21,522</td>
<td>3418,1818</td>
<td>0,00</td>
<td>14,11</td>
<td>2,14</td>
<td>75,06</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall insulation; solid constr., internal</td>
<td>hh_dwellings &lt;= 1995 dwellings</td>
<td>30</td>
<td>21,522</td>
<td>326,12312</td>
<td>35,08</td>
<td>2,17</td>
<td>-9,81</td>
<td>-343,46</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wall insulation: upgrading to Rc 2.5</td>
<td>hh_dwellings &lt;= 1995 dwellings</td>
<td>30</td>
<td>2,532</td>
<td>3418,1818</td>
<td>14,50</td>
<td>119,92</td>
<td>107,95</td>
<td>1564,99</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Wall insulation (Rc = 3)</td>
<td>hh_dwellings &lt;= 1995 dwellings</td>
<td>30</td>
<td>0,633</td>
<td>85,208633</td>
<td>0,88</td>
<td>11,96</td>
<td>-0,01</td>
<td>-0,01</td>
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<td></td>
<td></td>
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<tr>
<td>Wall insulation (Rc = 5)</td>
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<td>3418,1818</td>
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<td>30</td>
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<td>2563,6112</td>
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<td>85,51</td>
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<td></td>
</tr>
<tr>
<td>Compact Flourescent Lamps, CFL's</td>
<td>both_dwellings</td>
<td>80% rel.</td>
<td>31,2</td>
<td>5,40</td>
<td>0,48</td>
<td>-26,62</td>
<td>-143,81</td>
<td></td>
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<tr>
<td>Washing machine, technical potential (2010)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,1</td>
<td>136</td>
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<td>28,72</td>
<td>1,92</td>
<td>0,68</td>
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<td>Dryer, technical potential (2010)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,45</td>
<td>549</td>
<td>0,72</td>
<td>67,14</td>
<td>40,03</td>
<td>28,96</td>
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<td></td>
</tr>
<tr>
<td>Dishwasher, technical potential (2010)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,01</td>
<td>136</td>
<td>0,09</td>
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<td>106,92</td>
<td>9,67</td>
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<td></td>
</tr>
<tr>
<td>Refrigerator, technical potential (2010)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,2</td>
<td>164</td>
<td>0,11</td>
<td>127,92</td>
<td>100,85</td>
<td>11,52</td>
<td></td>
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<td></td>
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<td>Deep freeze, technical potential (2010)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,07</td>
<td>154</td>
<td>0,29</td>
<td>48,09</td>
<td>5,98</td>
<td>20,96</td>
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<td>Combination refrigerator and freezer, tp 2010</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,3</td>
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<td>3,13</td>
<td>28,98</td>
<td>1,88</td>
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<td>15</td>
<td>0,6</td>
<td>549</td>
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<td>53,71</td>
<td>26,51</td>
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<td>Dishwasher, technical potential (2020)</td>
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<td>136</td>
<td>1,19</td>
<td>10,92</td>
<td>3,83</td>
<td>4,54</td>
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<tr>
<td>Refrigerator, technical potential (2020)</td>
<td>both_dwellings</td>
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<td>0,05</td>
<td>164</td>
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<td></td>
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<td></td>
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<tr>
<td>Deep freeze, technical potential (2020)</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,2</td>
<td>154</td>
<td>2,31</td>
<td>16,57</td>
<td>26,42</td>
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<tr>
<td>Combination refrigerator and freezer, tp 2020</td>
<td>both_dwellings</td>
<td>15</td>
<td>0,5</td>
<td>191</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 3)</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>50</td>
<td>0,06013</td>
<td>5,25</td>
<td>0,96</td>
<td>13,11</td>
<td>5,53</td>
<td>5,29</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc ~ 4)</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>50</td>
<td>0,0712</td>
<td>16,34</td>
<td>0,33</td>
<td>27,92</td>
<td>24,59</td>
<td>31,80</td>
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<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 5)</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>50</td>
<td>0,065</td>
<td>27,27</td>
<td>0,15</td>
<td>48,17</td>
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<td>58,35</td>
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<td></td>
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<tr>
<td>Efficient fluorescent lamps</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>4</td>
<td>0,016</td>
<td>0,45</td>
<td>0,43</td>
<td>5,47</td>
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<td>-3,90</td>
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<td></td>
</tr>
<tr>
<td>Energy efficient computers</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>10</td>
<td>0,15</td>
<td>100 E/GJ/yr</td>
<td>0,33</td>
<td>27,40</td>
<td>12,92</td>
<td>7,13</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy efficient printers</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>10</td>
<td>2%</td>
<td>100 E/GJ/yr</td>
<td>0,07</td>
<td>2,74</td>
<td>-11,84</td>
<td>-1,32</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy efficient copiers</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>10</td>
<td>10%</td>
<td>100 E/GJ/yr</td>
<td>0,35</td>
<td>2,74</td>
<td>-11,84</td>
<td>-5,92</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy efficient faxes</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>10</td>
<td>2%</td>
<td>100 E/GJ/yr</td>
<td>0,04</td>
<td>2,74</td>
<td>-11,84</td>
<td>-0,66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 3)</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>50</td>
<td>0,0613</td>
<td>3,63</td>
<td>0,13</td>
<td>46,08</td>
<td>34,82</td>
<td>12,56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 5)</td>
<td>serv.com.of &lt; 1995 m² floor surface</td>
<td>50</td>
<td>0,062</td>
<td>7,277</td>
<td>0,26</td>
<td>49,63</td>
<td>42,05</td>
<td>26,79</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 3)</td>
<td>education m² floor surface</td>
<td>50</td>
<td>0,0633</td>
<td>5,454545</td>
<td>2,39</td>
<td>12,94</td>
<td>5,29</td>
<td>12,66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 4)</td>
<td>education m² floor surface</td>
<td>50</td>
<td>0,0712</td>
<td>16,34</td>
<td>0,41</td>
<td>32,74</td>
<td>24,75</td>
<td>70,91</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insulation of walls (Rc = 5)</td>
<td>education m² floor surface</td>
<td>50</td>
<td>0,065</td>
<td>27,27</td>
<td>0,34</td>
<td>48,17</td>
<td>40,52</td>
<td>130,25</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Efficient fluorescent lamps</td>
<td>education m² floor surface</td>
<td>4</td>
<td>0,025</td>
<td>0,45</td>
<td>0,14</td>
<td>43,35</td>
<td>28,77</td>
<td>3,96</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy efficient office appliances</td>
<td>education m² floor surface</td>
<td>10</td>
<td>10%</td>
<td>62 E/GJ/yr</td>
<td>0,17</td>
<td>13,70</td>
<td>-0,88</td>
<td>-0,23</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Means that these technologies were excluded from the final results of the model, since they could not provide additional savings.
The numbers that are shown here refer to the case when measures were stand alone, without being substituted by others.

Tab. 24: Preliminary data on envisaged Dutch energy savings measures

These data will be updated when they are actually used for purposes of White Certificates schemes in the Netherlands.

Some more details on CFL and refrigerators measures are synthetically given below.

10.2.2.3.2 Case of CFL

CFL’s (almost 16% of domestic electricity consumption)

- Measure description
  Replacing an incandescent lamp of 60W with a CFL of 20W used for 3.5 hours per day. The CFL’s are distinguished for the households (<=1995) as an overall measure, for living room, for kitchen and remaining

31 The appliances for the other service sectors are not further analysed since the data are identical with the once already shown.
bulbs, with different energy saving potentials. We use here the overall measure. For the services (with all sub-sectors) they also have different values.

- **Market**
  7.3 million households
  Already 72% of total households have minimum one CFL installed. In 1999, the average number of CFL per dwelling was 4.8

- **Price**
  Average additional costs of a CFL to an incandescent bulb are 5.7 €
  For the overall measure, an estimation is 2 €/GJ/yr

10.2.2.3.3 Case of refrigerators

- **Measure description**
  Replacement of a refrigerator (technology 1998) of average energy demand 223.5 kWh, with a refrigerator of technical potential 2010 or technical potential 2020.
  The refrigerators are available in 3 forms, of conventional technology, technical potential 2010 and technical potential 2020. Furthermore, another category distinguished in the model are the combi-fridges and deep freezers (which are most common)

- **Market**
  7.3 million households
  Up to 2010 67% of the existing stock will be replaced by the best practice refrigerators of the time

- **Price**
  Almost 164 € as additional costs

10.2.2.4 Remarks on Great Britain contribution
Some information is available on Tab. 25, where cost/benefit analysis in the Energy Efficiency Commitment (EEC) 2005-2008 is shown.
<table>
<thead>
<tr>
<th>Illustrative mix of possible EEC measures</th>
<th>Number of installations by 31 March 2008</th>
<th>Unit cost per measure</th>
<th>Supplier contribution to cost of measure</th>
<th>One-off consumer or landlord financial contribution</th>
<th>Non-ongoing impact on annual energy prices, average over EEC period</th>
<th>Overhead costs incl. in column 6, average annual £EM</th>
<th>Ongoing annual energy benefit to households in 2010</th>
<th>Ongoing annual benefits by 2040 (including VAT)</th>
<th>Adjustment for “comfort taking” allowance in EEC</th>
<th>Annual Carbon Saving in 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cavity wall insulation - private</td>
<td>0.12</td>
<td>0.88</td>
<td>1.00</td>
<td>314</td>
<td>304</td>
<td>195</td>
<td>9</td>
<td>2.2</td>
<td>2.3</td>
<td>3</td>
</tr>
<tr>
<td>Cavity wall insulation - social</td>
<td>0.12</td>
<td>0.58</td>
<td>0.70</td>
<td>310</td>
<td>162</td>
<td>163</td>
<td>2</td>
<td>1.4</td>
<td>1.7</td>
<td>1.8</td>
</tr>
<tr>
<td>Loft ins - professional - private</td>
<td>(4)</td>
<td>0.07</td>
<td>0.04</td>
<td>0.70</td>
<td>250</td>
<td>252</td>
<td>192</td>
<td>6</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Loft ins - professional - social</td>
<td>(4)</td>
<td>0.02</td>
<td>0.40</td>
<td>0.42</td>
<td>251</td>
<td>126</td>
<td>135</td>
<td>2</td>
<td>13</td>
<td>21</td>
</tr>
<tr>
<td>Loft insulation DIY</td>
<td>(4)</td>
<td>0.23</td>
<td>0.23</td>
<td>0.46</td>
<td>132</td>
<td>75</td>
<td>60</td>
<td>5</td>
<td>63</td>
<td>14</td>
</tr>
<tr>
<td>Glazing E to C rated (m²)</td>
<td>0.06</td>
<td>4.50</td>
<td>4.56</td>
<td>10</td>
<td>7</td>
<td>6</td>
<td>3</td>
<td>4</td>
<td>10</td>
<td>0.2</td>
</tr>
<tr>
<td>B to A-rated boilers</td>
<td>0.09</td>
<td>0.93</td>
<td>1.02</td>
<td>50</td>
<td>60</td>
<td>49</td>
<td>0</td>
<td>0</td>
<td>22</td>
<td>0.4</td>
</tr>
<tr>
<td>A/B rated boilers (exceptions)</td>
<td>0.06</td>
<td>0.20</td>
<td>0.25</td>
<td>193</td>
<td>164</td>
<td>117</td>
<td>33</td>
<td>63</td>
<td>1</td>
<td>0.2</td>
</tr>
<tr>
<td>Fuel Switching</td>
<td>(5)</td>
<td>0.06</td>
<td>0.06</td>
<td>0.60</td>
<td>176</td>
<td>159</td>
<td>728</td>
<td>17</td>
<td>117</td>
<td>30</td>
</tr>
<tr>
<td>Heating controls - upgrade with boiler replacement</td>
<td>0.09</td>
<td>0.45</td>
<td>0.46</td>
<td>82</td>
<td>67</td>
<td>60</td>
<td>5</td>
<td>12</td>
<td>11</td>
<td>0.2</td>
</tr>
<tr>
<td>Heating controls - extra</td>
<td>0.06</td>
<td>0.09</td>
<td>0.09</td>
<td>134</td>
<td>111</td>
<td>82</td>
<td>26</td>
<td>69</td>
<td>4</td>
<td>0.0</td>
</tr>
<tr>
<td>CFLs - retail</td>
<td>5.92</td>
<td>3.88</td>
<td>9.7</td>
<td>3.70</td>
<td>1.11</td>
<td>1.11</td>
<td>2.94</td>
<td>2.94</td>
<td>4</td>
<td>0.09</td>
</tr>
<tr>
<td>CFLs - direct</td>
<td>12.90</td>
<td>20.06</td>
<td>32.9</td>
<td>3.90</td>
<td>3.00</td>
<td>1.95</td>
<td>0.03</td>
<td>1.95</td>
<td>33</td>
<td>0.71</td>
</tr>
<tr>
<td>Fridgesavers-type schemes</td>
<td>0.05</td>
<td>0.10</td>
<td>0.15</td>
<td>120</td>
<td>90</td>
<td>30</td>
<td>0</td>
<td>0</td>
<td>3</td>
<td>0.07</td>
</tr>
<tr>
<td>Appliances - Cold</td>
<td>0.09</td>
<td>0.00</td>
<td>0.09</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>0</td>
<td>0</td>
<td>7</td>
<td>0.14</td>
</tr>
<tr>
<td>Appliances - Wet</td>
<td>0.06</td>
<td>1.17</td>
<td>0.07</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>0.11</td>
</tr>
<tr>
<td>Appliances - Set Top Boxes</td>
<td>0.00</td>
<td>0.50</td>
<td>0.50</td>
<td>1.40</td>
<td>1.40</td>
<td>1.40</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0.01</td>
</tr>
<tr>
<td>Tank insulation - top-up</td>
<td>0.25</td>
<td>0.18</td>
<td>0.46</td>
<td>13</td>
<td>11</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>0.04</td>
</tr>
<tr>
<td>Draughtproofing</td>
<td>0.00</td>
<td>0.31</td>
<td>0.31</td>
<td>95</td>
<td>81</td>
<td>55</td>
<td>14</td>
<td>40</td>
<td>9</td>
<td>0.20</td>
</tr>
<tr>
<td>Total EEC</td>
<td>356</td>
<td>35.54</td>
<td>15.33</td>
<td>16.70</td>
<td>18.5</td>
<td>£20.84</td>
<td>£12.92</td>
<td>394</td>
<td>£15.45</td>
<td>0.68</td>
</tr>
</tbody>
</table>

Tab. 25– Great Britain EEC 2005-08 - Illustrative mix of possible energy efficiency measures; costs and benefits analysis

IEA DSM Task XIV Final Report 148 June 2006
10.2.3 Supplementary information about costs

Other information of different nature about costs were gathered from Countries' actual experiences. They are reported below, together with the indication of the assumed actor's viewpoint (obliged/eligible/regulator/end-user)

10.2.3.1 France

This information consider the viewpoint of an obliged implementer of EE projects (see presentation G9 of Appendix C).

A critical field was pointed out in France for thermal insulation of existing buildings. Retrofitting industry is nor so well organised yet: this involves high transaction costs for medium size market:

- tertiary: public & commercial buildings
- small industry

Main sources of transaction costs are info/call centres, manpower for audits and White Certificates issuing, contracting management. Expected transaction costs range between 10 and 15 €/MWh. But this is a promotional activity that needs to be done by thermal insulation manufacturers as business-as-usual if they want to penetrate these lucrative segments.

10.2.3.2 Italy

- Viewpoint of a household user
  Cost of Energy Savings policies is paid as a component of the distribution tariff (at present, 0.0213 €/kWh for electricity). If an electricity consumption of 3000 kWh/year per customer is assumed, the consequent amount of annual electricity bill paid to fund Energy Savings policies is 0.64 €/year per customer

- Viewpoint of an obliged implementer of EE projects
  1. A cost recovery for each certified saved toe was established of 100 €/toe. Being 0.1 Mtoe the electricity targets in 2005, a total involved cost recovery of about 10 M€ is forecast in 2005 against an annual electricity turnover of about 30,000$ M€
  2. The principles for penalty for non-compliance, which represents the upper limit for White Certificates price, was only qualitatively defined; according to them, penalty will be:
     - related to the number of not saved toe’s
     - proportional and greater than the investment required to compensate the non-compliance

- Viewpoint of an eligible implementer of EE projects
  The particular case of use of a measure involving substitution of low with high efficiency electric motors is considered in a real case. The cost of the project was evaluated as about 17 k€. Energy Savings of 116 MWh/year in final energy and 25.47 toe/year in primary energy were expected. The savings on the electricity bill were evaluated as about 11 k€/year. The gain from White Certificates trading was referred to the acknowledged cost recovery of about 2 k€/year (almost 20 % extra on top of electricity bill savings).

10.2.3.3 Great Britain

- Viewpoint of the Regulatory Agency - Ofgem
  Ofgem evaluated his costs of operating EEC in Great Britain in the period 2002-2005 for about £300,000 per year.
  The biggest costs were connected to the external auditors and to management of the database of obliged actors and performed measures.
  The cost of operating the EEC anyway less than 0.5% of the total Regulatory Agency’s budget (£400 million).

32 Assuming an annual consume of 300 TWh and an average electricity tariff of 0.1 €/kWh
• **Viewpoint of a household end-user**
  Some evaluations were made on the impact of EEC on the household users during the first and the second period of application:
  • EEC added ~£4 per year per fuel to energy bills in the period 2002-2005.
  • EEC will add ~£5 on top of this during the second period 2005-2008.
  Therefore, between 2005-2008 the total cost of EEC for a customer who uses electricity and gas would be ~£18 per year.

10.2.3.4 **Others**
This information consider the viewpoint of implementers of EE projects within the New South Wales (Australia) scheme. The information are related to transaction costs undertaken in the phase of implementation of the energy savings projects.
Large transaction costs were evidenced for small energy efficiency projects due to audits: the average cost of an audit turned out to be about AUD 10,500 (EUR 6,250)
11 TRANSACTION VERSUS DIRECT COSTS IN WHITE CERTIFICATES SCHEMES

11.1 Background about Transaction Costs

11.1.1 Forewords

The results of the approach depicted herein are substantially based on the current research work done by the Swedish Task expert L. Mundaca (IIIEE- University of Lund), synthesised in the above presentation G8 and widely described in ref. [18].

The issue of transaction costs has been gathering attention of people involved in the all the fields of certification trading for some years. In fact, when DSM programmes are undertaken, fruitful and effective participation and involvement of all the actors is strongly subordinated to profitability of these programmes for all these parties. In these conditions, keeping into account this kind of cost items, sometimes not so patent in the first instance, could even shift the benefit/cost ratio towards unexpectedly low values which can allow policy makers and operators, involved in the implementation of these energy politics, for more cost-effective choices.

The subject was explicitly considered in the frame of this Task in Paris workshop (see presentation P5 referenced in Appendix C) and it was more extensively outlined in presentation G8 referenced in Appendix C.

11.1.2 Transaction costs: reasons to focus attention

In general terms, a transaction occurs when a good or service is transferred across a technologically separable interface (see ref. [15]). A transaction cost is any cost that is not directly involved in the production of goods or services but that it is essential for realising the trade as such (see ref. [16]); these cost are then characterised by:

- an ancillary feature with respect to the main costs specifically involved in the “construction” of goods or services
- occurrence connected to transferring these goods or services across an identifiable border.

Typical transaction costs are those connected to search of information, assessment of partners, costs of negotiation, legal advice, etc.

These costs sometimes are not correctly accounted for, owing to their additional character; this circumstance often misleads the analyses on economic effectiveness of projects and it is bound to lead to not exhaustive or deceptive profit evaluations. In fact, over- or under-evaluation of these costs involve a number of negative upshots:

- Lowering the expected profits and benefits
- Raising total costs of investments and policy programmes
- Discouraging participation of the possibly involved Parties
- Depicting profitable small-scale projects as unfeasible
- Reducing the performance of policy instruments

Under these circumstances, studies to determine systematically these costs and aimed at identifying ways to cut them down are envisaged in the future Task activities.
11.2 Transaction costs in the case of White Certificates schemes

This review is based on presentation G8 referenced in Appendix C, on ref. [18] and on the Task experts' contributions given during the Task events.

11.2.1 Life cycle of White Certificates

A first approach to transaction costs related to White Certificates was carried out with reference to the single phases of development involved in the life-cycle of the White Certificates themselves within a scheme of energy savings policies. These phases are synthetically recalled below, with reference to Fig. 28:

- **planning**: the features of a White Certificates scheme (e.g. targets, addressees, M&V, trading issues) are identified and established
- **implementation**: the planned scheme is accomplished operatively
- **M&V**: operations of measurement and/or evaluation are performed of the energy savings produced by the projects performed within the scheme
- **Issuance**: energy savings are acknowledged to the implementers of the projects and they are certified by issuing a corresponding amount of White Certificates
- **Trading**: a market occurs among obliged and eligible parties on excess or lacking quotas of White Certificates
- **Redemption**: the obliged Parties show to comply with their target delivering a corresponding amount of White Certificates to the Administrator of the scheme. Clearance of these certificates occurs after compliance verification

![Fig. 28 – Phases of lifecycle of White Certificates (Source [18])](image)

A non exhaustive and preliminary list of transaction cost voices (?), which will have to be further investigated and analysed in depth in next events of the Task, is outlined in the following sections.
11.2.2 Related transaction costs for the single phases of White Certificates lifecycle

11.2.2.1 Planning
Some of the transaction costs involved in the Planning phase are the following:
• Search of information/opportunity
• Feasibility studies
• Search of partners / contractors
• Negotiation / Agreement
• Administrative procedures
• Time\(^{33}\) spent to perform the above process

11.2.2.2 Implementation
Some of the transaction costs involved in the Implementation phase are the following:
• Procedure for approving the scheme and its administration
• Commissioning time (e.g. times related to orders, contracts, etc)
• Baseline setting (e.g. all the activities for inquiries, database etc)
• Opportunity costs

11.2.2.3 Monitoring and verification
Some of the transaction costs involved in the Monitoring and verification phase are the following:
• Search of information
• Energy efficiency audit
• Procedures for approval of projects and administration
• Time spent to perform the above process

11.2.2.4 Issuance
Some of the transaction costs involved in the Issuance phase are the following:
• Procedure for approving White Certificates issuing and it administration
• Time spent in performing the above process

11.2.2.5 Trading
Some of the transaction costs involved in the Trading phase are the following:
• Search of information
• Market analysis
• Search of partners
• Negotiation and contracting
• Legal services
• Procedures for approval of the above process and its administration
• cost related to political delays in decisions

11.2.2.6 Redemption
Some of the transaction costs involved in the Redemption phase are the following:
• Procedures for performing the above process and its administrations
• Putting into service the procedure
• Legal services

11.2.2.7 Supplementary information
Moving along the above lines, a similar classification of transaction costs and details on that for the phases of the lifecycle of a scheme involving White Certificates, was set up and made available by the Dutch Task expert [32]. It is shown in the following Tab. 26 and Tab. 27. It should be pointed out that

\(^{33}\) In this phase and in the following, “time” costs are substantially the cost connected to all possible deferments along the time extension of the considered lifecycle phase.
this scheme reflects transaction costs in general and it also contains reference to some direct costs. It
does not reflect only a proposed Dutch White Certificates scheme (i.e. not necessarily all these costs will
be included in the Dutch future scheme).
### Transaction costs under a White Certificates scheme

#### Obligated Market parties

<table>
<thead>
<tr>
<th>Phase</th>
<th>Obligated parties (energy suppliers)</th>
<th>Make or buy option</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase I</td>
<td>Realization of Energy Saving projects</td>
<td></td>
</tr>
<tr>
<td>Phase II</td>
<td>Trading of White Certificates</td>
<td></td>
</tr>
<tr>
<td>Phase III</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Phase IV</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Where?

- Households
- Services
- Others
- Registry
- Bilaterally

#### Transaction costs

- **Upfront**
  - Registration fees
  - Negotiation process
  - Opportunity costs
  - Communication with other parties
  - Legal preparations
  - Training costs

- **Realization of Energy Saving projects**
  - Search/Communication with other parties
  - Demonstration projects costs and information costs
  - Bedding procedure (e.g., hotline/fax for technical review of bids)
  - Cost inspection and post-installation verification of savings
  - Yellow pages listings for building performance contractor

- **Trading of White Certificates**
  - Training personnel costs
  - Costs of WhC generation (lower than labels)
  - Legal preparations
  - Reporting to the authority

- **Redemption of White Certificates**
  - Training personnel costs
  - Costs of WhC generation (lower than labels)
  - Reporting to the authority

#### Parameters that affect transaction costs

- Level of obligation
- Number of stakeholders and level of competition
- Legislative regime
- Cumulative experience from previous policies

<table>
<thead>
<tr>
<th>Parameters that affect transaction costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of consumers/services</td>
</tr>
<tr>
<td>Number of measure/Technologies</td>
</tr>
<tr>
<td>Confidence of consumers</td>
</tr>
<tr>
<td>Cumulative experience in energy efficiency projects</td>
</tr>
<tr>
<td>Existing contracts and legislative regime with other parties</td>
</tr>
<tr>
<td>Effectiveness of information campaigns</td>
</tr>
<tr>
<td>Verification ex-post/ex-ante procedure, use of EI/behavioral measures</td>
</tr>
<tr>
<td>Reporting necessities</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters that affect transaction costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volume of certificate trade</td>
</tr>
<tr>
<td>Electronic or paper trading</td>
</tr>
<tr>
<td>Borrowing/Banking provisions/limits</td>
</tr>
<tr>
<td>Registry provisions</td>
</tr>
<tr>
<td>WhC market integrated in Powerchange or separate</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Parameters that affect transaction costs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reporting necessities</td>
</tr>
<tr>
<td>Penalty level and enforcement procedure</td>
</tr>
<tr>
<td>Carryover provisions (per period)</td>
</tr>
<tr>
<td>Electronic redemption and/or administrative procedure</td>
</tr>
</tbody>
</table>

---

**Tab. 26: Transaction costs under a White Certificates scheme - Obligated Market parties ([32])**
Transaction costs under a White Certificates scheme

Non-Obligated Market parties

Phase I
- Non-Obligated parties
  - 'make of buy'-keuze

Phase II
- Realization of Energy Saving projects
  - Households
  - Services
  - Others
  - Registry
  - Bilaterally

Phase III
- Trading of White Certificates
  - Transaction costs
    - Accreditation costs
    - Connection electronically to the EI index and training
    - Opportunity costs participating or not
    - Communication with other parties and contracts
    - Legal preparations
    - Training costs

Phase IV
- Redemption of White Certificates
  - Transaction costs
    - Independent monitoring (if required)
    - Carry over of WhC certificates costs

Where?

Transaction costs Upfront
- Registration fee (e.g. For TGC, 25€ initially and 25€/y for participation)
- Accreditation costs
- Connection electronically to the EI index and training
- Opportunity costs participating or not
- Communication with other parties and contracts
- Legal preparations
- Training costs

Transaction costs
- Search/Communication with other eligible parties
- Search/Communication with consumers/services
- Contracts with parties and consumers
- Demonstration projects costs and information costs
- Bidding procedure (also e.g. Hotline/fax for technical review of tenders)
- Guarantee costs (Warranty claim, Banking, Performance risk)
- Post inspection and post installation verification of savings
- Yellow pages listings for building performance contractor
- Search/Communication with consumers/services
- Request for WhC (for TGC it was 0.007 €/MWh)
- Registration fee for transactions (for TGC it was 0.01 €)
- Market analysis costs
- Search for partners/negotiation
- Broker’s payments/commissions
- Borrowing WHC rents
- Banking WHC costs
- Training personnel costs
- Approval and administration procedures
- Accreditation costs
- Connection electronically to the EI index and training
- Opportunity costs participating or not
- Communication with other parties and contracts
- Legal preparations
- Training costs

Tab. 27: Transaction costs under a White Certificates scheme - Non-obliged Market parties ([32])
11.3 Early lessons learnt

Some results obtained from recent experiences are presented below. In these examples, a trial was done to get quantitative evaluations on transaction costs, from the viewpoint of either their share with respect to the total investment (see sect. 11.3.1) or the punctual values related to some specific phase of the White Certificates lifecycle (see sect. 11.3.3 and 11.3.4).

11.3.1 Transaction costs in a project

Some experience was gained in Sweden while dealing with the Green Certificates scheme still under way (see also next sect. 15.2), which showed interesting parallelisms with the White Certificates scheme herein considered.

Looking at EU level, the ADMIRE REBUS project attempted to estimate transaction costs related to RES-e (renewable electricity trade). By surveying RES-e developers, the related transaction costs were evaluated in terms percent with respect to the total investments required by an economically remarkable (?) project within that scheme (see ref. [17]). These results are synthesised in Fig. 29, with evidence of maximum, minimum and average values for each cost component.

![Graph showing transaction costs in RES-E](image)

**Fig. 29 - Transaction costs in RES-E (Source: [17])**

Lastly, supplementary general information were made available by UK on the scale of transaction costs related to overall period 2002-2005 for EEC scheme administration. According to Ofgem (see sect. 2.1.2 of ref. [3]), a rough breakdown of the costs of operating EEC in Great Britain for the first period of application 2002-2005 gives a total ~£ 300,000 per year [18]. The biggest costs were connected to the external auditor and to management of the database. The cost of operating the EEC anyway represented less than 0.5% of the total Regulatory Agency’s budget, i.e. it was a very small portion of Ofgem’s total budget of £ 400 million [18].
11.3.2 Related transaction costs for Planning and Implementation phases

11.3.2.1 Great Britain

Some evidence of transaction costs undertaken during White Certificates planning and implementation phases occurred in connection to the period 2002-2005 of the Great Britain EEC scheme. Only qualitative information exist on these costs, which tuned out to be related to [18]:

- search and persuasion of customers
- brokerage fees

11.3.2.2 France

Evaluations on transaction costs were expressed by France (see presentation G9 of Appendix C). In fact, costs of this kind are expected to occur during the phase of implementation of the energy saving measures in the frame of the French scheme for White Certificates.

More in particular, this would be the case of thermal insulation of existing buildings, which represents a critical field since retrofitting industry is not so well organised yet in France and high transaction costs occur above all for medium size market, made up of:

- tertiary: public & commercial buildings
- small industry

The main sources of TC have to be ascribed to info/call centres operation, manpower for audits and White Certificates issuing and contracting management.

The expected transaction costs range between 10 and 15 €/MWh (see remarks in 10.2.3.1).

11.3.3 Related transaction costs for Monitoring & Verification phase

Some data on transaction costs related to Monitoring & Verification phase were made available during the Task workshops (see e.g. presentations G8 and P3 in Appendix C). They are below considered:

- Energy Efficiency Commitment (EEC) in Great Britain [18]:
  Two audits were conducted on 2003 and 2005. They were based on a random selection of measures. The total relevant cost summed up ~£ 150,000, which represented about the 15% of the total budget for administering the programme in the period 2002-2005

- Energy efficiency certificates trading scheme in New South Wales, Australia:
  Knowledge gained on the Energy efficiency certificates trading scheme being applied in New South Wales (see chpt. 3 of ref. [4] and relevant annex) showed that a major issue has been the relatively large transaction costs (and the consequent negative impact) for small energy efficiency projects. In fact, applicants have to pay for audits and the average cost of an audit is about AUD 10,500 (EUR 6,250)
  The Scheme Administrator took the decision to minimise the transaction costs and the administrative burden.
  The Administrator has been working on this subject for some time with interested parties to sensibly structure energy efficiency projects. Chance are emerging to reduce transaction costs per project by combining small projects with different geographic locations, installation types, calculation methods, etc.

11.3.4 Transaction costs for Trading phase

Information exist for transaction costs in the trading phase performed in Italy.

The structure of these costs is based on:

1. A yearly fixed amount due of € 300 (+ VAT)
2. A variable amount due of € 0.2 (+ VAT) for each exchanged White Certificate

The amount of point 1 is directly invoiced by GME.

The amount of point 2 is requested on a monthly base to buyers and sellers of White Certificates for both marketplace bids and bilateral exchanges.

Much more essential and qualitative data were made available. In particular, Great Britain gave information on transaction costs involved in the Trading phase, gathered after the first period of EEC.
operation (see again chpt. 2 of ref. [3]). Strong feeling occurred of high costs related to search for information. Lack of formal platform for obligation/savings trading was a very likely reason of these unexpectedly high costs (the operators had to organise trading on their own; an institutional platform could possibly some transaction costs). Although much more difficult to identify, interviewees perceive damages at corporate/business level.

11.3.5 Experiences of transaction costs from EU labelling

Some information on to a sector different from White Certificates (EU labelling) are reported below, with the aim of giving further examples of transaction costs involved in energy savings policies. Reference should be paid to the presentation G10 of Appendix C.

The label is made up of a pre-established background and of a datastrip which is dependent on the particular equipment (see Fig. 30).

![Fig. 30: Typical label used for EU labelling](image)

All the considered costs are connected with operations performed on the label which characterises a specific electrical equipment and its class of efficiency:

- Costs for printing the datastrip.
- Costs for printing and distributing the background label.
- Costs for applying the label to the products, according to:
  - Number of retailers
  - Number of products per retailer

The estimated costs, according to the Dutch experiences reported by SenterNovem in G10, are summarised in the below Tab. 28.
<table>
<thead>
<tr>
<th>Transaction cost item</th>
<th>€</th>
<th>Paid by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printing the datatrap</td>
<td>?</td>
<td>Manufacturers (outside NL)</td>
</tr>
<tr>
<td>Printing and distributing background labels</td>
<td>€ 100 000/year</td>
<td>Importers</td>
</tr>
<tr>
<td>Applying labels to the product:</td>
<td>€ 87 500/year</td>
<td>Retailers</td>
</tr>
<tr>
<td>7.000 retail outlets</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25 products per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costs per application: 0.5 €</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of products involved (sold)</td>
<td>1 700 000/year</td>
<td>€ 0.12 per product</td>
</tr>
</tbody>
</table>

Tab. 28: Identified transaction costs for EU labelling

11.3.6 Final remarks
Some studies are being performed on the issue of transaction costs. No definite results are expected yet in this preliminary phase, though precise and shared opinions are emerging on the matter:

1. Nature and scale of transaction costs can be roughly ascribed at first instance to two categories:
   - Market-related costs
   - Institutional-related costs

2. Administrative burden seems to play a critical role on increasing the related transaction costs

3. At a first instance, chances are that potential commercial benefits may counteract transaction costs; this fact needs to be carefully verified with the practice

4. Ways are to be pursued to reduce transaction costs; doubts are on the sector (public or private actors) to be firstly involved. Presence of brokers may facilitate aggregation processes and perform cumulated economies on small size projects. A clearing house mechanism, managed by the public body (or the market operator) and containing publicly available info on trades, could trigger these processes as well.

5. A deeper insight of transaction costs is bound to maximise theoretical benefits of implementing White Certificates schemes involving trading.

Transaction costs deserve more attention. It has to be considered that obliged parties could face several transaction costs at once. In addition, transparency of the entire scheme may play a critical role in giving confidence to the market and to its agents. Of course, it depends on the peculiar national features of the considered market, where other issues (e.g. the level of competitiveness and similar factors) can play a more deciding role than transparency itself. Looking for instance at an already experimented market, as in Great Britain, no specific evidence is given of these costs34 so far, being their quota sunk in the overall commercial relationship between supplier and end-user according to competition requirements. In other words, transaction costs can be remarkable if considered out of the context, but energy suppliers could be reluctant anyway to transfer part or all of these costs to their clients and then to risk loosing market shares (especially with large consumers). In fact, a trading scheme on Energy Efficiency

34 Even if reasonable conjectures can be done (see e.g. 11.3.3)
Certificates is bound to penalise the supplier who is not capable of attaining market economy in his EE project and is oblige to transfer too high and not competitive costs to the end-user.

For the same above reasons, streamlined procedures need to be explored in order to reduce administrative costs involved in the considered EE schemes.

Design features are quite critical in deciding whether or not the scheme can be efficient and reduce the costs for obliged parties. The level of penalty and flow of information are very relevant.

11.4 Other remarks

11.4.1 Great Britain
Some estimates were performed about the share of financial aid that the EEC gives the Great Britain consumer. The cost that the consumers actually faced for the first phase of the commitment was estimated to be 4 pounds per fuel per year. The benefits for the consumers, as a part of the energy efficiency meters that have been implemented for the priority group, are estimated to be around 16 pounds per fuel, per year. This involves a net benefit for these groups of around 12 pounds. And for the non-priority groups the estimates are around 7 pounds per year per fuel. This means a net financial benefit for this group of around 3 pounds. Coming to a higher level of detail, it is more difficult to work out the advantage that EEC gives the Great Britain consumer with reference to a specific end-use, since the percentage of benefit is more widely variable: in fact, it would really depend on the individual area and the consumer uptake (priority or non-priority group) and on level of incentives the energy suppliers are willing to offer have to offer. In some case a 5% discount on boilers actually succeeded in encouraging large extents of customers, whereas a 20% or a 30% discount was needed in other cases.

11.4.2 Italy
ENEL (Italy) has made an agreement with a very large retailer of electrical appliances. Every ENEL customers, which has a fidelity card, gets a rebate of 10% on the any product bought in that shop chain. This mechanism, together with a suitable information campaign, could be used by ENEL as eligible measure, which fosters the purchase of efficient air conditioners and washing machines.
12 ROLE OF TRADING

This section of the document considers whether certificate trading helps in stating given energy savings. Apart from certification, role and meaning of the additional element of trading in the different countries and specific advantages envisaged in the trading issue of White Certificates are examined. Some national approaches to these problems are below described.

12.1 France

The White Certificates trading is shaping essentially as a compliance market, which could help the obligated suppliers to fulfil their obligations with a greater flexibility and at least costs, though danger is felt that the trading mechanisms involved by the French system will turn out to be particularly adapted to the obligated Agents.

More generally, there are doubts as to whether White Certificates trading itself can be considered a tool to make energy savings through competition. As in Great Britain, greater credit is rather given to the fact that the obligated suppliers are also competitors and are forced to choose solutions which decrease the costs of the project and the need of cost recovery in the competitive market. This could be obtained with a clever mix of measures, finding an optimum between costs, energy savings and compliance to the end-user needs. This incentive by competition would have more sense as competition would develop until households or final consumers like households.

There are doubts about the possibility in France to have a market without eligible agents as well, since it can be hardly assumed that an obliged supplier trades certificates with other suppliers with whom he is in competition. At present, there are not many new entrants yet, besides obligated players. Local authorities did ask strongly to be in the system and that was taken into account when the rules for the French scheme were defined. Nevertheless, danger is that other players than obliged Agents could perhaps implement actions at a lower cost than the energy suppliers, and that these eligible players might not want to do it by agreements with the supplier as they accepted to do in the Great Britain. Conversely, worries were also expressed by some eligible agents, who forecast some suppliers will prefer to develop the project themselves, to prepare a competitive position on the energy services market, rather than buying certificates from them. Then, intricate start-up of the market shows-up in France and need will be probably of further specific rules to actually make the market work.

The role of Municipalities in France should not be disregarded. They are potentially important players because more and more of them are taking an active role in promoting energy savings and their wish to be part of the White Certificate system has been clearly pointed out.

12.2 Great Britain

It is debatable whether the Great Britain scheme involves White Certificates in the strict sense of the term. A trading element exists, which directly involves alternatively the obligation itself or the credits derived from its compliance. However, certification of these operation by formal energy efficiency titles is not forecast.

Competition on trading is the most powerful incentive to lower the cost with respect to the obligation in Great Britain. The energy suppliers act in a free market and in principle would be free to pass (and then to recover) all the project costs to the consumers. Actually, it is very easy to switch energy supplier in Great Britain, with a substantial fidelity obligation of just one month. Then, the extent to which they pass those costs on to consumers is strongly dependent on the market itself: excessive cost recovery is likely to involve loss of business. So, the market mechanism encourages suppliers in keeping project costs as low as possible and in absorbing these costs as much as possible.
EEC was also intended as a suitable policy to encourage certain practices and products. In this context, operation of Energy Services Companies (ESCO) was considered with great attention, since it was seen as being the solution to effectively attain the targets.

An effective incentive in the EEC for energy services would be to award suppliers with more points (apply a multiplier for savings) for measures undertaken as part of energy services contracts. In general, EEC encourages ESCO in participating through a more “generous” award of the achieved energy savings.

12.3 Italy
Trading of White Certificates plays an important role for many of the involved actors:
- The obliged agents can find an alternative way to fulfill their targets without being involved in projects out of their usual business
- The eligible agents can find a supplementary source of income
- Institutional bodies entrusted to energy efficiency can find in White Certificates purchase a more immediate way of financing energy savings projects, in alternative to a tender procedure and with reduced transaction costs
- Ethical bodies entrusted of actions to promote energy savings can officially endorse their commitment and pursue possible “image” targets in this field though a certified purchase of Energy Efficiency Titles.

Main envisaged market advantages are connected to the greater chances offered to ESCO in their operation, who can perform energy savings projects more efficiently than distributors (then, at lower costs) and they can sell their gained certificates to the Distributors at marginal cost. This scheme can also encourage Distributors to reduce their own costs, e.g. promoting lower cost projects as a more economic alternative to buying certificates from ESCOs. So, a sort of competition, driven by the White Certificate market, is likely to be established towards a downward pressure on prices and on costs for the whole system.

The market can exist even without explicitly acknowledged eligible participants, but it is bound to be much less efficient.

12.4 Synthetic closing overview
Whether White Certificate can exist without trading is a very discussed subject. A general opinion was expressed in favour of independence, as a line of principle, between the concept of certificate and its trading. More precisely, belief was expressed that the objective of White Certificates schemes was not trading as such. White Certificates are above all a certification mechanisms relevant to a "volatile" and hardly measurable quantity as "Energy Savings".

Nevertheless, trading is an essential flexibility feature given by instruments to reduce costs to comply with savings obligations. It makes the White Certificates mechanisms a market-based alternative to the pure obligation of energy savings.

As a matter of fact, all existing White Certificate schemes involve at present a trading option.
13 RULES FOR TRADING

Some details on the trading rules were pointed out while describing the national schemes on White Certificates in France, Italy and Great Britain (see chapter 3). They are below synthetically recalled and collected together.

13.1 France

13.1.1 Certificates features

The White Certificates are negotiable property titles. A white certificate does not correspond to a certain amount of kWh saved. The unit of account and for trading is directly saved kWh discounted and cumulated (called in French “kWh Cumac”), according to the standard evaluation procedures described above (see 3.1.10.1). Moreover, in a frame of extensive use of these standard procedures, it should be reminded that an added value of saved energy (and the of White Certificates) results with respect to a plain “technical” evaluation when renewable energies are used or/and within some geographic (specific) zones where local critical conditions of the grid can be overcome by encouraging energy efficiency at a local scale (see 3.1.10.1 again).

For the moment there is no minimum amount of kWh Cumac to exchange but each operation will involve fee asked by the registry manager.

The White Certificates are delivered by a National Public Body (DRIRE - Directions Régionales de l'Industrie de la Recherche et de l'Environnement)

- in a single delivery for each project, for the total of the declared saved kWh
- on the base of the documentation of the programmes carried out - but before the realisation of the total energy savings

In case of transfer of obligation from a group of small residential fuel suppliers to a consortium, delivery is expected for an amount of White Certificates equivalent to the total kWh saved in the project performed by the consortium.

13.1.2 Trading parties

The parties involved in White Certificates Trading are the following:

- Obligation bound parties: Energy suppliers: electricity, gas, domestic fuels (not for transports), cooling and heating
- Eligible implementers: any economic actor who can make savings actions and get certificates, though restrictive conditions should limit eligible agents to local authorities.

13.1.3 Trading rules

The White Certificates must be returned by the obligated parties to the delivering Body (DRIRE) at the end of the compliance period, according to the relevant apportionment; after returning, clearance of these titles will then occur.

Before this date, the market may reconcile possible lack and excess of titles through a gradual and continuous exchange

An official national marketplace is not planned: only chance of bi-lateral exchange is expected. For the moment, no financial actor has planned to organise a formal market for white certificates. If necessary, actions to encourage the market of White Certificates will be launched by entrusted Bodies (as the Minister of Industry) to foster complete fulfilment of the obligations; to this purpose and to favour this process, a list of potential sellers of certificates will be set up and published by the Administrating Bodies (Minister of industry – Board responsible of the national certificates registry)

Price of transactions will depend on the market but an upper limit is given by the value of the penalty for non-compliance (see par. 3.1.12). The Responsible of the National Certificates Registry will publish the yearly average price of transaction for Certificates.

13.2 Great Britain

Chances are for trading between EEC suppliers. Trading in the EEC can be developed through two possible routes:
- **Trading of Energy Savings**
  Suppliers can trade energy savings from the energy efficiency measures already completed.
  Energy efficiency measures will be transferred from one supplier to another.

- **Trading of Obligations**
  Suppliers can trade their obligations.
  One supplier can pay another supplier to gain the right to transfer all or part of his target to him.
  One supplier’s target will increase while another’s will decrease.

In practice, the use of these mechanisms is limited to the final stages of each target period, when suppliers reconcile their achieved performance against their targets.

All these trades need to be approved by Ofgem.

Little formal trading of energy efficiency measures occurred through the legislation. Trading of EE did not involve in Great Britain a formal certification of the attained savings. In other words, the White Certificates issue was not considered for trading in EEC scheme.

The trading of Energy Efficiency (EE) obligations was performed by means of bi-lateral contracts in terms of saved TWh. Actually, trading has been limited to the final stages of each target period, when suppliers reconcile their achieved performance against their targets. As pointed out above, a more standardised platform of trade (e.g. by means of White Certificates in a suitable marketplace) has not been practised yet.

At present, there is very little incentive for suppliers to trade within the EEC scheme. In fact, with only six major EEC suppliers, the market for trading is not sufficiently liquid. Also, most of the suppliers use the same contractors to undertake the work, so it is unlikely any one supplier could run their scheme more cheaply than another.

The gained experiences showed that there are some issues of EEC scheme to be further discussed for more efficient trading:
- Possible use of different target metrics: e.g. absolute or percentage energy demand reduction, carbon reduction.
- Set up of different targets to be met within Priority Group.
- Measurement and Verification practices.
- Application in the commercial building sector.

### 13.3 Italy

#### 13.3.1 Certificates features

The purpose of White Certificates is twofold:

1. They serve as an accounting tool to prove that the corresponding amount of primary energy as been saved; to this aim, at the end of each compliance period, distributors will have to surrender to the Authority for Electricity and Gas a number of White Certificates corresponding, in energy value (ton of oil equivalent), to the obligation they were asked to meet in that period;
2. They are allowed to be traded either bilaterally or in a White Certificates market specifically set up to that purpose by the Electricity Market Operator.

Coherently with the framework designed by the Twin Decrees, three types of certificates are forecast, characterised by different degrees of fungibility between each other (see Tab. 29): a) type 1 certificate: they attest the achievement of primary energy savings through reductions of electricity consumption; b) type 2 certificates: they attest the achievement of primary energy savings through reductions of natural gas consumption;
c) type 3 certificates: they attest the achievement of primary energy savings through reductions in the consumption of other fossil fuels (fuel switching).

<table>
<thead>
<tr>
<th>Certificate type</th>
<th>Usability/Tradability/Fungibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electricity Decree</td>
</tr>
<tr>
<td></td>
<td>Achievement of the target related to the reduction of electricity consumption</td>
</tr>
<tr>
<td>Type 1 certificate</td>
<td>YES</td>
</tr>
<tr>
<td>Type 2 certificate</td>
<td>NO</td>
</tr>
<tr>
<td>Type 3 certificate</td>
<td>NO</td>
</tr>
</tbody>
</table>

Tab. 29 - Types of energy efficiency certificates issued by AEEG and degree of fungibility among each others

Lifetime of these certificates is strictly dependent on time persistence of the related energy savings Measure (5 or 8 years, see 3.3.10.3). Lifetime will turn out to spread out beyond the period 2005-2009 of application of the Twin Decrees. This circumstance was forecast in view of a likely reiteration of these Decrees over 2009.

As for the Certificates metrics, the equivalence:

1 Certificate = 1 toe

is assumed.

13.3.2 Banking

Being lifetime of each certificate set at 5/8 years, banking of certificates is allowed whereas borrowing\(^{35}\) is not. Banking will allow distributors some additional flexibility in meeting the obligation. No limits were planned for the bankable amounts of White Certificates.

13.3.3 Trading parties

The parties involved in White Certificates Trading are essentially the operators to whom the certificates will be awarded: all electricity and gas Distributors, companies controlled by Distributors and ESCOs. Besides these institutional parties, participation of financial intermediates, and voluntary buyers is expected as well.

Joint operation of the Authority for Electricity and Gas and of the Electricity Market Operator (GME) will occur in the trading frame according to the scheme of Fig. 31, with roles and duties specified in following sections.

---

\(^{35}\) That is, issuing of an amount of White Certificates prior to the implementation of the project they refer to.
13.3.4 Trading rules

White Certificates are issued once the related energy savings projects are approved by the Authority. The issued number reflects the acknowledged energy savings according to the rule:

\[ 1 \text{ Certificate} = 1 \text{ toe} \]

The White Certificates are to be assumed as the only valid document which entitles the obliged operators to assess compliance with their energy savings targets. They may be negotiated both via bilateral contracts and in the marketplace organised by the Electricity Market Operator, with trading rules (concerning the periodicity/frequency of trading, safety rules for buyers and sellers, etc.) jointly defined with the Authority. The main features forecast for the marketplace are the following:
- Continuous trading
- One trading book for each type of Energy Efficiency Certificate (electricity, gas, primary energy – see 3.3.11.1)
- Guaranteed deposit requested to buyers
- Real-time link with Register

An example of how the bid will work is shown in the following Fig. 32 and Fig. 33, which differ on the assumptions made on whether a price limit occurs.
**Trading Book**

<table>
<thead>
<tr>
<th>BID</th>
<th>PRICE</th>
<th>OFFER</th>
<th>PRICE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>180</td>
<td>185</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>175</td>
<td>189</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>172</td>
<td>194</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Bid with **price limit**: Buy 50 @ 190

**Trading Book**

<table>
<thead>
<tr>
<th>BID</th>
<th>PRICE</th>
<th>OFFER</th>
<th>PRICE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>180</td>
<td>189</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>175</td>
<td>194</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>172</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 32 – Example of bid with price limit

**Trading Book**

<table>
<thead>
<tr>
<th>BID</th>
<th>PRICE</th>
<th>OFFER</th>
<th>PRICE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>180</td>
<td>185</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>175</td>
<td>189</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>70</td>
<td>172</td>
<td>194</td>
<td>20</td>
<td></td>
</tr>
</tbody>
</table>

Bid **without price limit**: Buy 50 @ market

**Trading Book**

<table>
<thead>
<tr>
<th>BID</th>
<th>PRICE</th>
<th>OFFER</th>
<th>PRICE</th>
<th>QUANTITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>185</td>
<td>189</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>180</td>
<td>194</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>172</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Fig. 33 – Example of bid without price limit
14 WHITE CERTIFICATES VERSUS LIBERALISED MARKETS CONNECTED TO ENERGY

14.1 Possible conflicts between obligations and competition

At first, white certificates scheme is considered as an instrument very appropriate for liberalised markets, but UK experience has revealed that some conflicts are possible in fact.
A problem is felt in Countries where open market rules allows clients to change supplier in a relatively quick way. Under these circumstances, market tends to offer high flexibility to clients, who can change suppliers after a short fidelity period (28 day in Great Britain, even much less in Netherlands). Nevertheless, danger is of a conflict with suppliers’ expectations on more stable relationships (more in general, of trust/fidelity), strongly needed to limit the enterprise risk for the huge involved investments and remarkable resources exploited for projects planning and organisation. Suggestions were expressed on two separate contracts for the supplier – one for provision of electricity or gas (subject to the 28-day rule) and one for the provision of an energy service (longer duration).

The relevance of this subject has been widely pointed out by all the operators in the sector and many Countries and some corrective expediencies were devised with the aim of a fair balance between these two competing requirements. The Italian choice in favour of electricity and gas Distributors as obliged Operators also relied on possibly complying (at least, in principle) with the need of long-standing business, owing to the captive and monopoly role of these Distributors within their territory (see par. 12.3).
As for France, it is worth mentioning a procedure proposed in the past, which involved a sort of compensation from the new supplier to the old one in case the client decided a sudden change. This operation would have been designed just to involve only the two suppliers (under a possible aegis of a Regulatory Authority) and to be transparent by the client viewpoint.
The problem is being considered in Great Britain, where the above 28-days rule is operating. It must be noted that the suppliers become Obliged Operators only over a threshold of business; that is, only few large supply companies actually need to promote energy savings projects as an obligation. Under these circumstances, the risk on investments and on distortion of competition can be seen in a less critical perspective. Moreover, the large number of Great Britain schemes in addition to EEC involving energy suppliers gives them a chance to valorise energy savings measures even beyond EEC itself (and with a not so critical dependence on customers’ loyalty - see for example the Warm Front scheme in 16.1.1). However, an experiment is being performed in the U.K, where a trial on the 28-Day Rule is under way in one particular Great Britain region. The trial is based on packages of energy services tied up with a much longer-term contract, that the local energy suppliers are able to offer their customers. The outcome of this 28-Day Rule trial will be very probably communicated within 2006.

14.2 Possible impact on the stock market

Survey comments were given by Great Britain after reviewing the results of the first period of EEC. Not remarkable impact occurred in Great Britain on stock market as a consequence of the considered energy savings policies. In fact, even the largest scale EEC mechanism is only likely to have marginal impact in increasing prices (maximum increase of about 1.5% was worked out), which at the moment are more substantially linked to oil prices.

14.3 Specific national views

14.3.1 France

The evolution of the market of equipment and appliances will be carefully considered in France, since the base line for the evaluation of energy savings is fixed on the current state of the market and

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36 Following recorded French comments and contributions during roundtable of Paris workshop - see Appendix C
37 Following recorded British comments and contributions during roundtable of Paris workshop - see Appendix C
periodical revisions on it are to be planned regularly. The pace in which this revision is going to be made has not been discussed yet.

There is also a debate on what influence the system could have on the competition in the electricity and gas markets. Danger is of cross-subsides for some eligible operators. This matter anyway is closely monitored and legislation against cross-subsides is in force in France.

Moreover, chance was pointed out for some energy suppliers, offering services to their domestic customers, of possibly taking an advantage from the French scheme in building and strengthening their commercial positions on the services market. This fact would put them in a stronger position in 2007, when the electricity and gas markets will be completely open to competition. Concerns were expressed by some of the French stakeholders, though the debates showed that possible advantages, far from unfair, are in line with the spirit of the French scheme, where possible commercial market advantages act as compensation mechanisms to its mandatory features.

14.3.2 Great Britain
As for the first phase of EEC, liquidity in the market was not particularly high and few transactions occurred. The targets were actually fulfilled and there is banking a system to allow obligated suppliers to carry over any excess from the first period to the second period.

EEC is now in the second phase and Ofgem worked out the illustrative mix (see sect. 10.2.2.4), which took into account the fact that low-hanging fruits had already been picked. It is very difficult to know whether there will be any trading among suppliers in this second period; trading, if any, is likely to occur in the very last period, when the operators will reconcile their obligations by marketing residual (presumably small) credits.

Up till now, the ESCO operation in this field has not been developed on large scale. In fact, the take-up of energy services had been disappointing. A lack of consumer demand had made suppliers reluctant to invest in marketing. The principal reasons for the lack of interest were considered to be twofold.

- Consumers were reluctant to become tied into a long-term contract and lose the flexibility of the 28 day rule: the 28 day rule allows a household consumer for transferring to another supplier, giving the present supplier just 28 days notice. This is a barrier to energy services, as a supplier cannot have the guarantee to recover his investments before a customer of his moves to a competitor.
- Moreover, the energy services packages did not contain measures sufficiently compelling to make a long-term contract attractive (in other words, the clients still preferred products – bare-kWh - rather than services - dressed-kWh).

Some Great Britain Energy Companies have both energy sale/distribution and energy services. They must comply with Energy Efficiency Commitment requirements only if their state of suppliers and number of clients oblige them. They have to meet targets by means of energy savings measures relevant to domestic end users. To this purpose, they can operate as ESCO and take advantage of an increased award for the performed measures.

14.3.3 Italy
A key point specific to the Italian situation is that the obliged operators can get a tariff reimbursement for each saved ton of oil equivalent (toe) within his target. This reimbursement is equal to 100 Euro per toe. If a Distributor redeems a White certificate to comply with his obligation, he will get this reimbursement. The value of this reimbursement is bound to influence the market: an ESCO willing to sell certificates to the Distributors will set a price greater than the value of the reimbursement (which will be anyway granted to any complying Distributor). So, the White Certificate is a tool to transfer the value of the reimbursement from a Distributors to ESCOs or to the Agent who carries out projects.

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38 On average, the costs for a supplier to sign-up a new customer is ~£ 200 simply.
A mechanism of cost recovery is specific of the Italian scheme, where Distributors are the obliged Agents. This mechanism is aimed at partially compensating these Agents for obligations costs that otherwise they could be not entitled to recover from their distribution tariff. In fact, according to the present legislation, a price cap on the Distribution tariff is fixed periodically by the Regulatory Authority against a licence of 40 years which grants each Distributor a monopoly on operation on their network; in other words, Distribution companies will not have to compete within their distribution territory, but they have to accept a price cap on distribution tariffs.

Of course, market distortions could be expected if the class of Obligated Agent were extended to other categories of Operators (e.g. energy suppliers) in a competitive scenario.

The baseline for the procedures considered for the ex-ante evaluations of energy savings are also based on some definite assumptions on efficiency of the technologies available at present on the market. On the other part, continuous improvements of the average level of efficiency of these products occur and must be taken into account in the procedures, to allow for correct evaluation of additionality. To this purpose, the Italian scheme involves a customary updating of the procedures themselves.

Another remark is relevant to the overall business possibly involved. If the cost reimbursement of 100 Euro per saved toe is assumed as a reference for cost or price, the White Certificate business for an electricity Distributor of a town as Turin could be roughly worth 200,000 euros. Similarly, the overall business for Italy, could be evaluated as 10 million euros. These figures are very small in comparison with the electricity or gas business and absolutely negligible if compared with the gross domestic product.

14.3.4 Market opportunities offered by the Dutch scheme

The scheme for White Certificates which is being discussed in the Netherlands seems to offer some market opportunities, which are listed below:

- Housing companies executing strategic stock management already did a lot of Energy Performance Audits; they are ready to participate
- Local schemes are encouraged to improve housing stock and reduce overall housing costs
- Dormant potentials may find chances to form voluntary agreements and environmental permit assessments
- 'Overdue maintenance’ is a quite common situation in buildings. Insulators, installers, contractors, mortgage resellers are aware of this potential and they are eager to take part in this market
- Green mortgage or green finance schemes available but scarcely used may find greater chance of application in this context
15 NATIONAL VERSUS EU-WIDE WHITE CERTIFICATES SCHEMES

15.1 Forewords

A trading of White Certificates is primarily intended within national borders. A wider extension of it, which ranges over extra-national contexts, is an alternative feature of the scheme, which is attracting the attention of policy makers entrusted of the matter.

Pros and cons of these options are particularly interesting in a EU framework where, as a line of principle, their operations can be agreed more easily, over particularly wide international confines and with greater chances of flexibility in a market spread out over the national borders.

The concept of a White Certificates scheme featured to attain a EU-wide validity has been considered with increasing attention in the recent years and some EU-funded projects have been completed within SAVE programme (the White&Green project, see ref. [12]) or are still under way in the EIE programme (the EuroWhiteCert project, see ref. [14]). Advantages are envisaged from the economic point of view, owing to a larger potential for energy savings projects and greater flexibility in implementing them. However, a critical issue is to find common national objectives, in terms of both nature of savings (primary or final energy, CO₂ related savings, etc) and quantities. Apart from the challenges associated to the harmonisation of M&V methodologies, convergence on views on this matter is considered a really complicated process at both political and technical levels.

The types and levels of benefits depend very much on the border of the analysis considered to identify the addressees of an energy savings project. In fact, if reference for costs is done to the actor who bears the obligation to save energy, then it might be cheaper to buy a certificate in another country; the conclusion could be the opposite in case the cost/benefits ratio were considered from a wider societal viewpoint.

Complexity in this matter is particularly challenging when monitoring and verification of energy savings are considered. In fact, as it was repeatedly remarked, evaluation rather than measurement can only be reasonably undertaken for energy savings and the adopted approaches are strongly dependent on the specific national views. In other words, unlike REC procedures, the subjective sides underlying the evaluation of the energy savings connected to a project are even amplified by the national specificities. This is particularly critical in the cases when the amount of saved energy (or number of certificates delivered) possibly depends (as in France) on the specific targeted geographical area (e.g. to cope with problems of local grid congestion or new building capacity, the fight against poverty, etc).

Very shared opinion is that an extensive use of procedures for ex-ante evaluation of energy savings is bound to be the actual Achilles' heel in cross-border trading: forcedly common procedures are likely to lack actual meaning, whereas too country-specific evaluations risk to advantage a nation with respect to others. However, the idea of common approaches in view of pan-European exchanges may possibly have chances of success for a selected short list of projects for which harmonised approaches can be identified.

Very definite positions are stated in favour of priority securing national interests over an international scheme. In other words, need was felt for a national exploitation of energy savings benefits earlier than any extra-national operations (because many of the benefits of energy savings are genuinely local by nature). These requirements are also connected to the opportunity to exploit the national potential of energy savings as much as possible prior to any extra-national purchase of them by White Certificates trading.

Moreover, EU-wide schemes for White Certificates trading might create unfair advantage of a country at the expense of another country. In fact, EE measures usually are very effective in deferring investments on grid due to their capability in lowering the increase rate of the peak load; in this case, the costs of these EE measures are very often well balanced by the benefits (i.e. by the avoided costs for the grid
investments). If payment is made of EE measures performed abroad, the advantage on the local grid is lost and the cost/benefit ratio may become inconvenient at a national level. These inconveniences are not likely to occur in other trading schemes (as ETS), where the benefits are less tied to regional aspects. In addition, danger is in a extra-national scheme that a consumer pays in his country for energy savings improvements on the premises of consumers in another country, where energy savings are much cheaper due to larger inefficiencies: a mechanism like that would penalise the most efficient countries.

By looking at the former Great Britain GHG trading system and its harmonisation into the current EU ETS, many difficulties were faced (see presentation LO5 of Appendix C). The analysis of these difficulties could act as a guideline to cope with the more complicated process relevant to White Certificates.

The need of harmonisation among national energy savings targets and among the procedures for their evaluation is one of the most critical and cumbersome tasks to be undertaken.

In lack of significant experiences already gained, studies are in progress on this subject. Some contributions to approach the matter were given in the frame of Task XIV during the Lund workshop:
- The former contribution (see presentations L5 and L6 of Appendix C) is handled in sect. 15.2. It outlines the studies performed in Sweden by the Swedish Energy Agency (STEM) in view of an international trading of Green Certificates (REC) with Norway, aimed at regulating and compensating short- and medium-term shortage of REC of a Country with the excess of REC of the other. These experiences are expected to bring about useful suggestions in handling the matter of international exchange to be extrapolated to White Certificates issue.
- The latter contribution (see presentation L9 of Appendix C) is handled in sect. 15.3. It describes some preliminary studies undertaken in the frame of EU EIE EuroWhiteCert project, which considered principle benefits and disadvantages of trading-based schemes with respect to out-of-trade ones and highlighted some subjective sides of the benefit/disadvantage evaluations, which are not so evident in a first approach and need to be carefully considered.

### 15.2 The example of Green certificates

#### 15.2.1 Forewords

The Swedish Government has instructed the Swedish Energy Agency (STEM) to investigate the expected consequences of an expanded electricity\(^{39}\) certificate trading market. The work was performed and a synthesis of the results is presented below. The main purpose of the work was to identify and assess the consequences of short-term and long-term effects, to identify and analyse the basic criteria that will need to be fulfilled by the countries, and to present and evaluate possible models for assigning quotas to the countries. The work also included consideration of the implications of EU legislation on an expanded market, together with a presentation of any necessary legal changes that will be required. Though a scheme entailing cross-border exchange seems to be shelved for the moment, the remarks are presented anyway as a useful contribution to approach the subject. The present synthesis is based on the workshop presentations n. 5 and 6 and on the detailed document issued by STEM (see ref. [19]).

#### 15.2.2 The Swedish Energy Agency's overall conclusions

1. **Objectives and purposes of cross-border electricity certificates trading**

The main goal of the study was to assess the way to extend the national approach to a broader geographic perspective while keeping objectives and purposes (i.e. national production and security of supply).

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\(^{39}\) “Electricity certificate” is handled as synonym of “Renewable Electricity Certificate” or “green certificate”
On an expanded market, the objective/ambition would be expressed in terms of the total quantity of renewable electricity (TWh) produced on the joint market.

The objective/ambition of each individual country would be expressed in terms of how much renewable electricity production each individual country is prepared to finance. Individual countries would no longer be able to determine where new investments should be made.

2. Reasons for expanding the electricity certificate market to more countries
Renewable electricity production objectives can be achieved with better cost efficiency. Calculations indicate that the resulting total system costs would be lower on a common Swedish/Norwegian market than on two separate markets.

A number of other benefits arise in the way in which the market operates (e.g. greater liquidity, reduced price swings, lesser political risks for the parties involved).

3. Requirements to be satisfied before expanding the existing electricity certificate market
An expanded electricity certificate market requires some changes if it is to operate effectively, to fulfil its objectives and to be accepted in the wider society.

Some factors listed below must be co-ordinated between the countries concerned:
the system must be based on quota obligations,
• the quota obligation applies to the user side,
• definite decisions are to be taken on:
  • declaration and cancellation dates
  • system life and long-term quota setting,
  • quota obligation fee,
  • the validity, value and life of certificates,
  • linking of the registers,
  • controlled exit from the market.

Moreover, it is advisable that the countries' ambition levels and quotas should be determined in such a way as to achieve stable pricing on the joint market. Avoiding substantial changes in price helps to create stability and the ability to look ahead on the original market, thus in turn creating confidence in the system and creating the right conditions for long-term investments. STEM suggested a model to produce a range of reasonable ambition levels. Opinion is expressed that, within this range, any country joining the system should be able to decide its own exact ambition level.

4. Long-term structural effects of an expansion of the market to include Norway
The long-term structural effects on investments and pricing depend on the aggregated ambition level on the joint market and on the production conditions in the individual countries. STEM performed model calculations to illustrate these effects.

The worked example using the lower aggregated ambition level suggests that a greater proportion of certificate-entitled electricity production would probably occur in Norway (from hydro power and wind power), rather than in Sweden. Electricity certificate prices would be low, as the 'cheap' electricity production would suffice to meet the objectives.

The worked example for a higher aggregated ambition level suggests that Sweden would produce more renewable electricity, entitled to certificates, than would Norway, as Swedish offshore wind power and bio-fuelled power would be cheaper than the more expensive Norwegian wind power alternatives. Electricity certificate prices would be higher when more expensive production facilities are required.
5. **Short term uncertainties for Swedish parties**
In the short term, expansion of the market to include Norway would involve some uncertainties for Swedish parties. The main short-term effects on the Swedish market of creating a joint market with Norway would be primarily pricing uncertainty, which could affect willingness to invest in the short term.

6. **Needs of legislative changes for an expanded market**
Legislative changes would be needed for an expanded market. The Agency points out that several changes would be required in the Act (2003:113) concerning Electricity Certificates and in the Ordinance (2003:120) concerning Electricity Certificates.

7. **EU legislative aspects of an expanded market**
The Swedish National Board of Trade\(^{40}\) expresses the opinion that there should not be a problem if only two countries participate at first, although they feel that this arrangement should be checked with the European Commission. The proposal also needs to be reviewed in the light of Directive 98/34/EC, relevant to information procedures between EU EAA and decentralised national Agencies. Departures from the requirements of Directive 2001/77/EC, relevant to the promotion of electricity produced from renewable sources in the internal electricity market, could possibly occur and they will have to be motivated. Advice was from National Board of Trade of careful accomplishment of this task.

### 15.3 Preliminary studies within EU projects

#### 15.3.1 Forewords

At present level of experience on White Certificate schemes, need is felt for in-depth analysis of the consequences of two alternative possible approaches:

- implementing directly and locally energy savings projects (with consequent local benefits but with all the costs involved by that the operational aspects of the performed project) without trading or at most with national trading of White Certificates
- buying energy efficiency certificates abroad (avoiding then the costs for a direct implementation of an energy savings project but with a possible loss of national/local social/economic advantages which otherwise could be gained)

This part of the document then examines whether benefits obtained from energy savings projects are in conflict with international trading of White Certificates.

Many of the following considerations rely on the outcome of the EU SAVE White&Green project (see ref. [13]), attended by some of Parties (Lund University, Utrecht University) also directly or indirectly involved in Task XIV. Other contributions rely on presentation L9 of Appendix C and of the paper of ref. [20]) presented at the first international workshop of EU EIE EuroWhiteCert project.

#### 15.3.2 Energy efficiency without international trading

*In-house* performed energy savings measures bring about some local benefits at both private and societal levels.

At a *private level*, any EE scheme tends to encourage highly cost-efficient energy savings projects. Some evidences of positive outcomes in this sense come from experiences gained in UK after completion of Great Britain 1994-1998 EE Programme, which was analysed ex-post by the UK National Audit Office. The analysis (see ref. [20]) showed that economic benefits occurred four times greater

\(^{40}\) The National Board of Trade is the central Authority having jurisdiction for foreign trade and trade policy.
than the total costs, owing substantially to a low average cost of saving a unit of energy (1.8 p/kWh) compared with the price of electricity (7.1 p/kWh on-peak; 2.7 p/kWh off-peak).
Moreover, a more dynamic exploitation of energy efficient equipment fostered by EE scheme leads to market transformations phenomena (see also below) and is bound to bring about costs reduction of technologies (decreases from 30% to 50% are reasonably expected).

At a societal level, benefits arise in environmental and social externalities:
1. A reduction occurs in negative environmental effects
2. Standard and comfort conditions are improved, in particular for low income customers
3. Greater opportunities for employment occur. Two significant examples are pointed out below:
   - In Germany, Trade Unions, Government, NGO and employers federations are cooperating under the push of EE programmes, with the aim of renovating about 300,000 apartments and of creating about 200,000 jobs.
   - ESCO industry can rely on increased business and greater involvement of specialised personnel
4. Technology improvements are encouraged, which involve relevant market transformation at national level. Quantitative evidences of this fact can be obtained from UK experiences, where the market transformation brought about remarkable decrease in the real costs of energy efficiency measures. According to the data shown by DEFRA in connection to concluded schemes for energy efficiency (the so called Energy Efficiency Standard of Performance – EESoP 1, 2 and 3), this decrease (actually, a small increase for cavity wall insulation) is expressed in costs trend of EE measures from 1996 to 2001, normalised at the unit value at the year 1999, as it is shown in the below Fig. 34.
Fig. 34 – Great Britain costs of energy efficiency measures
5. Cost reductions for saved kWh occur, due to delaying the need for new power generation and network infrastructures. An evaluation relevant to the Italian system showed an increase of the external costs from generating 1kWh of electricity in a power plan oil fuelled (see ref. [21]), as in the following Tab. 30.

<table>
<thead>
<tr>
<th></th>
<th>L/kWh '95</th>
<th>L/kWh 2005</th>
<th>€ cents 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>external environmental costs</strong></td>
<td>16,5</td>
<td>20,2</td>
<td>1,0</td>
</tr>
<tr>
<td><strong>reduction of Gross Natiopnal Product due to expenditure for oil import</strong></td>
<td>26,8</td>
<td>32,7</td>
<td>1,7</td>
</tr>
<tr>
<td><strong>political risk of oil-dependency</strong></td>
<td>8,9</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total external costs</strong></td>
<td>52,9</td>
<td>2,7</td>
<td></td>
</tr>
</tbody>
</table>

**Tab. 30 - External costs from generating 1 kWh of electricity**

These data can give an idea of the avoided costs (and then, of the related benefits) obtained from displacing the generation of 1 kWh of electricity by means of energy efficiency measures.

6. Finally, chance exists to reduce market prices of energy through a more elastic demand curve

**15.3.3 Energy efficiency with international trading of White Certificates**

On the other side, energy efficiency measures involving international trading are expected to bring about significant additional benefits, hopefully complementary and not in conflict with those already obtained without any trading. This is not so obvious as it was remarked for in-house projects and the matter is being considered more in depth. The present debate led to the following comments.

At a private level, the most remarkable voices to be examined are the following:
1. **Avoided costs to perform an energy savings projects.** An obliged agent could not be in the condition of performing such projects and a chance to buy abroad low cost White Certificates could be attractive to comply with his obligations. This is an advantage for the obliged party.
2. **Cost-efficiency of energy savings.** No special need would be of pursuing these requirements, since trading mechanisms rather than energy economy drive the private decisions at this level. This is an advantage for the private but a loss of effectiveness at a wider social level.
3. **Transaction costs of trading.** The costs of setting up and running a market could be considerably high (see sect. 11.3.4). This could be a disadvantage for the private.

Low income customers. Special focus on this category of customers would not be possible under a certificate trading arrangement. This could be a disadvantage for the private.

At a societal level,
1. Trading can potentially create cross-subsides between customer classes. For instance, in Italy all customer classes will contribute to funding the energy savings programmes, though savings may be concentrated only on large customers.
2. Inability to deal in a focused way with low income customers programmes brings disadvantages also from the social viewpoint
3. In international trading, many of the social, environmental and technological advantages (pointed out in sect. 15.3.2) which can be normally expected in absence of trading, are likely to be lost.
15.4 Synthetic closing overview
The preliminary analysis performed allows for some preliminary remarks.

- The matter is worth being analysed more deeply, since chances of conflict may actually arise between private and public requirements when energy savings are traded across the national borders. In other words, international trading may threaten the fulfilment of some national goals which could be otherwise attained with in-house energy savings projects. This goes back to a deeper issue: what one wants to achieve via a system of energy obligations and white certificate trading: whether the lowest cost savings (then international trade should be allowed) or the local benefits (then trading should be kept national or even limited to certain customer types).

- When speaking of advantages and disadvantages of trading, it should be specified very well the perimeter enclosing the interested actors in the trading itself:
  - An international market envisages very likely benefits within the overall international involved perimeter. Danger is that too an extensive international market, though beneficial from a overall viewpoint, turns out not to be evenly so advantageous for some of the involved Countries or for some of the involved actors
  - In particular, international trading very probably brings about losses of societal benefits (otherwise present without trading) at a national level, since it prevents for complete exploitation of the local potentiality of energy savings and the related advantages.
  - Nevertheless, beside these social inconveniences, an actor who bears the obligation to save energy could find more convenient and cheaper to buy White Certificates in other Countries than performing a savings measure on his own. Thus, regional distribution of cost-effective EE measures drive the White Certificates market.

- Countries adopt different approaches for the evaluation of the energy savings, such as:
  - different energy accounting systems (e.g. for discount rate, lifetime of a measure),
  - different conversion criteria from final to primary energy (that is utterly relevant for electricity), which are very site-specific; that is, they depend on the characteristics of the country electric generation system: in some Country, the amount of White Certificates corresponding to a given amount of saved energy depends also on the geographic site of savings (e.g. PACA districts in France)
  - different baseline criteria: the definition of the terms of reference for the calculation of the energy savings is the keystone which an evaluation procedure is built on; in fact, the perimeter including the eligible measures (and the related evaluations of their technical potential and penetration) is strongly dependent on the criteria adopted to choose this baseline

Harmonisation among these criteria becomes dramatically important in view of an international trading of White Certificates, where a common and agreed value of saved energy must be assigned to a White Certificate regardless of the Country who produced it. Nevertheless, common opinion of experts and stakeholders is that difference in evaluations are inescapable and harmonisation is still to be considered a not resolved challenge, which prevents for implementing at present actual mechanisms of cross-border exchange of White Certificates.
16 INTERACTION WITH OTHER ENERGY EFFICIENCY POLICIES

Interactions are expected among White Certificates schemes and other national policies aimed at energy efficiency and energy savings. Some not exhaustive examples of such policies and of their possible interaction with White Certificates are reviewed in 16.1. A comprehensive study of these interaction has not been undertaken yet in a systematic way, though some general approaches are available and are synthetically reviewed in 16.2.

16.1 Review of national policies to approach energy efficiency

16.1.1 Great Britain

The national policies adopted up till now in Great Britain to approach energy efficiency (see presentation L01 of Appendix C for sources and further details) were so identified:

- Product Standards
- Building Standards
- Voluntary Agreements
- Energy Efficiency Commitment (EEC)
- Grants
- Public Sector Leadership
- Financial Incentives
- Energy Services
- Persuasion
- Information and Advice
- Emission Trading

EEC was mainly considered as connected to the White Certificates like market of energy efficiency and its obligations herein considered

A comprehensive plan named Energy Efficiency Action Plan was implemented with the aim of saving 12 million tonnes of carbon per year by 2010. The involved sectors and the relevant savings figures are shown in Tab. 31.

<table>
<thead>
<tr>
<th>Energy Efficiency Action Plan</th>
<th>Carbon savings (M€ pa) for 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business and Public Sector</td>
<td>7.9</td>
</tr>
<tr>
<td>Households</td>
<td>4.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.1</strong></td>
</tr>
</tbody>
</table>

Tab. 31 – Carbon savings planned within Energy Efficiency Action Plan

The framed measures are expected to bring about savings in the business and household sectors of over 3 · 10^9 € per year.

The following measures are particularly devoted to the household sector:

- Energy Efficiency Commitment – doubled from 2005
- Revised Building Regulations
- Fiscal measures
- Decent Homes
- Energy Services
- Fuel Poverty programme

The relevant carbon savings are shown in Tab. 32.
<table>
<thead>
<tr>
<th>Measures already in the UK Climate Change Programme</th>
<th>Carbon savings (MtC pa) 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy Efficiency Commitment 2005-11</td>
<td>1.4</td>
</tr>
<tr>
<td>Fuel Poverty programmes</td>
<td>0.2</td>
</tr>
<tr>
<td>CHP - Community Energy</td>
<td>0.1</td>
</tr>
<tr>
<td>Building Regulations from 2005</td>
<td>0.8</td>
</tr>
<tr>
<td>Other measures</td>
<td>0.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4.2 MtC</strong></td>
</tr>
</tbody>
</table>

**Tab. 32: Carbon savings deriving from Energy Efficiency Action Plan in the household sector**

As for interactions between EEC and other policies, a general viewpoint was stated in ref. [24] according which "the Government considers that there will be benefits from suppliers’ EEC schemes linking up with other energy efficiency programmes, as well as with fuel poverty and wider sustainable energy programmes and initiatives. This would build on activity that is already taking place under the current EEC.

Under the EEC it is open to suppliers to provide energy efficiency measures that are additional to those provided under the Warm Front scheme and its devolved equivalents. Where more than one Warm Front measure has been installed in a household, suppliers will also be able to meet the cost of the additional Warm Front measures, and will be able to claim the relevant EEC energy saving.

It should be noted that energy efficiency measures paid for through Warm Front or other Government programmes are not eligible to count towards EEC obligations."

**Warm Front** is a Great Britain scheme connected to the Fuel Poverty Scheme. It’s entirely separated from the Energy Efficiency Commitment and it works in the private sector. Warm Front basically provides grants, which are administered by two companies around the U.K. and targets the poorest households. Warm Front implements into these households a large range of measures: boilers installation, cavity wall insulation, loft insulation, draught-proofing etc. A limit was fixed on number and size of the measures on a single house.

A Company operating in the EEC with an obligation to perform some of these above mentioned measures finds a real incentive to tie up with a Warm Front Agent. A typical paradigm of joint venture could involve the Warm Front Agent as the already working party on a housing estate, e.g. installing cavity wall insulation and draught-proofing. In the case that the Warm Front Agent reached the size limit for his intervention in that household, the EEC agent would offer to complete the project (e.g. by installing loft insulations) at a lower price than what a completely independent company would require. In fact, this activity of EEC agent is to considered a marginal portion of the an already designed and operating project that the Warm Front Agent is performing in those houses; only marginal costs are then likely to be involved. Each party finds benefits from this operation:

- the Warm Front Agent can perform interventions even beyond the size limit he would have to comply with
- the household benefits of less financial constraints on the number of measures that can be put into a particular house

the obliged EEC supplier takes advantage from the lower expenses he will have to cope with, since he operates in an already started-up project at marginal costs
16.1.2 The Netherlands
A large variety of energy savings measures were undertaken in the Netherlands, possible connected in the future with the White Certificate scheme which is being discussed. Many information can be found in the presentation G6 Appendix C. A synthesis is presented below, as a complement to the contents of the presentation.
The most remarkable energy savings measures undertaken in the past or at present are relevant to buildings, in both household and commercial sectors:
- MJA: Long term agreements: Evaluation of Long Term Agreements on Energy Efficiency in the Netherlands
- EPA: Energy Performance Advice
- EIA: Fiscal measures: evaluation of the Energy Investment Deduction Scheme (a fiscal measures) in the Netherlands
- EINP: Similar to EIA but tailored for non-profit sectors
- EPR: Energy premiums
- MAP: Environmental action plan: voluntary scheme of the energy companies (1990 – 2000) with the government
- REB: Energy tax (households)
- Wet Milieubeheer: law on licence on boilers, connected to restrictions on emissions
Some interaction was envisaged in the Netherlands between the White Certificates scheme under definition and EPN, in particular as for the use of the energy index EI for M&V purposes. Pros and cons of this choice were discussed in 9.2.4.

Some technologies diffused in the market as a result of the previous energy efficiency policies could be summarised as following, where data were available:

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sector</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>EPN</td>
<td>Housing</td>
<td>Gas use (heating and hot water)</td>
</tr>
<tr>
<td></td>
<td>Utilities</td>
<td></td>
</tr>
<tr>
<td>MAP</td>
<td>Housing</td>
<td>Insulation, Lighting, HR-heating, energy efficient white goods, change of electrical to gas boilers, sun boilers, energy performance in rent buildings</td>
</tr>
<tr>
<td></td>
<td>Utilities</td>
<td>Insulation, HR-boilers, Lighting, energy saving devices</td>
</tr>
<tr>
<td>EPA</td>
<td>Housing</td>
<td>Insulation, HR-glass, sun boilers, HR-boilers, PV</td>
</tr>
<tr>
<td>EPR</td>
<td>Housing</td>
<td>Energy saving devices, Insulation (all), PV, sun boilers</td>
</tr>
<tr>
<td>EIA</td>
<td>Utilities</td>
<td>Insulation, Lighting, Heat pump boiler, HR-glass, HR-boiler, energy monitoring systems</td>
</tr>
<tr>
<td>EINP</td>
<td>Utilities</td>
<td>Lighting, HR-glass, HR-boiler, Insulation, heat pump, ventilation</td>
</tr>
</tbody>
</table>

Source: adapted from Joosen et al. 2004 [29]

16.2 Different effectiveness of White Certificates with respect to other policies
A comprehensive study of these interaction has not been undertaken yet in a systematic way. Some study based on general approaches are anyway available (see e.g. presentations T6 and T7 of Appendix C and ref. [25] and [27]); a synthesis of these contributions and of the remarks gathered in the last Trondheim workshop, devoted to this specific subject, is below reported.

16.2.1 Review on instruments promoting energy saving
A review of instruments promoting energy savings, other than White Certificates, is considered in the below Tab. 33, together with qualitative evaluation of involved Transaction Costs and remarks on possible pros/cons.
<table>
<thead>
<tr>
<th>Energy savings policy</th>
<th>Impact on Transaction Costs</th>
<th>Envisaged pros/cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Taxes on energy carriers</td>
<td>Low</td>
<td>Quite effective in heavy industry. Not so effective outside productive sectors (possible prevalence of comfort reasons with respect to economic ones)</td>
</tr>
<tr>
<td>Income tax deductions (households, companies)</td>
<td>Medium to high (for receiver)</td>
<td>Effectiveness depends on many features e.g. income level Easy opportunity for free riding</td>
</tr>
<tr>
<td>Subsidies on energy saving investment</td>
<td>Medium to high (for both financial supported and receiver): preliminary hearing, administrative, advice</td>
<td>Easy opportunity for free riding</td>
</tr>
<tr>
<td>Support for green loans; interest support</td>
<td>Low to medium</td>
<td>It depends on willingness of banks Need is to be fairly strict on ‘green’ content Within the above limits, it is cost-efficient &amp; fairly effective</td>
</tr>
<tr>
<td>Voluntary agreements</td>
<td>Switches some aspects of TC for other ones (as TWC does)</td>
<td>Possible trade-off: among efficiency, effectiveness and coverage</td>
</tr>
<tr>
<td>Education towards environment-oriented attitudes (e.g. eco-driving)</td>
<td>High (implicit) acquisition cost, otherwise modest TC</td>
<td>On the whole, it appears quite cost-effective</td>
</tr>
<tr>
<td>Performance standards/Labelling</td>
<td>High TC cost (at supply side &amp; regulator), especially if to maintain meaningful and cost-effective standards</td>
<td></td>
</tr>
<tr>
<td>CO₂ cap-and-trade systems (EU ETS)</td>
<td>Interaction via energy market (less demand = less CO₂: emission permit price changes accordingly)</td>
<td></td>
</tr>
</tbody>
</table>

**Tab. 33: Instruments promoting energy savings**

Interaction with other policies plays an important role for an effective White Certificates system: in fact, among the other things, the price of a White Certificate depends on items like:

- The overall energy saving target imposed
- The prices of the energy carriers, which will be saved
- The shape of the curve of the marginal cost of energy saving (the envelope of all sectors)
- The transparency of the White Certificates market
- Possible changes in other policies affecting the White Certificates market (e.g. EU ETS; tax policies)

which are also affected by other possibly energy savings policies under way

**16.2.2 Main remarks and suggestions**

According to the above review and trying to summarise the gained experience into somehow general principle (though still under discussion - see ref. [14]), the following remarks can be expressed:

- The best options for energetic *AND* economic efficiency gains from White Certificates trading seems to occur in sectors where neither taxes nor plain Voluntary Agreements work well, e.g. service sector, buildings, SME’s,
- The introduction of White Certificates tends to:
  - reduce the need for publicly funded subsidies
  - reduce the revenues from energy taxes, owing to TWC’s higher effectiveness and the consequent assumed lower consumes
  - reduce the sales and increase the administrative costs of the obligated parties, even though the *impact on profit is case dependent* since they may find compensation in the power market
• The territory of operation of a White Certificate scheme should correspond with the territory in which the power market is operating

Very schematically (see also paper T6 - Appendix C), the most effective and profitable applications of White Certificates schemes are expected in connection to the following circumstances:

• **where energy taxation mechanisms are less effective** in encouraging savings; this may typically occur in sectors as the residential and in the tertiary/service, which are outside the context of the heavy industry (where on its turn EU ETS might show more efficiency)

• **instead of investment subsidies and tax deduction options**; this alternative looked to work:
  - when these policies showed not to be successful or effective enough,
  or
  - in national contexts where a too marked subsidiary role of the institutional bodies could be considered inappropriate/unfair in energy savings policies

• **together with / instead of detailed performance standards** (the White Certificates mechanisms are focused anyway, in principle, to optimised mixes of highly effective versus cheap measures), though labelling and minimum standards for new products is still helpful to be used in the standardised M&V procedures

• **in conjunction with voluntary agreements** (but check must be assured in this case on coherent assumptions on energy savings targets, baselines, etc.)

• **in presence of an intensive policy of support for energy audits**, in order to identify actual and responsive segments of energy savings and to encourage actions of the specialised operators as ESCOs
17 INTERACTION WITH OTHER TRADING SCHEMES (REC, ET)

Market-based policy instruments as:
- **White Certificates**: Energy Efficiency trading schemes – end-use energy efficiency programmes - considered herein;
- **Black Certificates**: Carbon trading schemes - programmes for reducing CO₂ emissions;
- **Green Certificates**: Renewable Energy Commitment trading schemes – increased use of renewable energy sources in power generation.

are based on a same principle of certificates trading in Countries having mandatory quantitative targets to be met:
- in a verifiable way
- inside national or extra-national obligation programmes
- within a fixed period

When considering interactions (and even considering integration), an important difference among these schemes is that emission allowance trading is a cap-and-trade regime, while white certificates are baseline-and-credit (project credits) regime.

Some interactions among these schemes may occur, when simultaneously active within a given frame. For plain example purposes, the case of domestic CHP is considered, which facilitates generation at point of use with close to the same thermal efficiency as conventional boilers. From the users’ point of view, they have a space heating system with electricity produced as a useful by-product.

- A CHP unit running on Bio-fuel could be regarded as renewable generation and attract **Green Certificates**.
- In addition, losses associated with the transmission and distribution of centrally generated electricity are avoided. The installation could be regarded as an energy efficiency measure and attract **White Certificates**.
- Although the efficiency of electricity generation with these systems is low compared to conventional generation, virtually all the energy input is converted to useful energy. When these factors are taken into account, the effective efficiency of the local generator, measured in terms of CO₂ produced per kWh electrical and kWh thermal consumed, can be competitive in comparison with more conventional domestic boilers and central generation. The lower CO₂ / kWh emissions could then influence the emissions of a party under the EU ETS.

The matter of interaction/conflict among the above trading scheme, the problem of double accounting and other similar issues may arise and these questions may need further exploration.

Despite of the relevance and the weight of this subject but in order to avoid overlapping, a very definite choice was taken to refer completely to the studies performed in the already completed EU SAVE White&Green project (see ref. [13]), where the matter is handled extensively, to the results which will be made available of the ongoing EU EIE EuroWhiteCert project (see ref. [14]) and to other specialised references (e.g. see ref. [26]).

In the present context, it should just be remarked that at present the French, Italian and British schemes do not entail substantial interactions with other schemes. Conversely, the New South Wales scheme is fundamentally part of a GHG emission abatement scheme and then its interactions are structural in it.
PART IV - CONCLUSIONS AND LEARNED LESSONS
18 WHAT TO DEDUCE AND WHAT TO GATHER FROM THE TASK XIV EXPERIENCES

The comments given by the Experts and by the national stakeholders who contributed the Task, while attending the Task workshops and/or writing this document, can be summarised into conclusions and suggestions to be offered to policy makers and specialist to frame the White Certificate issues and to cope with it.

These closing remarks will focus first of all on different views on implementations aspects, like obliged/eligible agents, trading, additionality. Opinions on cross-border trading and experience on costs occurring during White Certificates lifetime are then summarised as well. Advice and suggestions to the addressees of the Final Report are finally pointed out.

18.1 General

18.1.1 Reasons for adopting a White Certificates system

The reasons why to adopt a White Certificate system differ from Country to Country. Most evidence was paid to the following:

- Kyoto requirements
- Wide public consent/approval, due to the related image, connected to energy savings and environmental issues
- New opportunities within an already existing and more general “environmental market”, including Green Certificates and Emission trading.
- Needs to comply with requirement to certify an attribute (energy efficiency), which is a volatile and hardly measurable entity, rather than a quantity
- Need to comply with Perhaps in the recent EU Energy Efficiency and Energy Service Directive

18.1.2 White Certificates and trading

The fundamental issue of discussion of this item is relevant on whether White Certificate can exist without trading. A general opinion was expressed in favour of independence, as a line of principle, between the concept of certificate and its trading. More precisely, it is believed that the objective of White Certificates schemes was not trading as such. White Certificates are above all a certification mechanisms relevant to energy savings, which is considered a "volatile" and hardly measurable quantity.

Nevertheless, trading is an essential flexibility feature given by instruments to reduce costs to comply with savings obligations. It makes the White Certificates mechanisms a market-based alternative to the pure obligation of energy savings.

As a matter of fact, all existing White Certificate schemes allow at present some kind of trading.

18.1.3 Obligation bound actors

A variety of choices exists for the actors who are obliged to attain energy savings targets.

The most common choice regards the Energy Suppliers. Other less common choices are:

- Distributors (owners of the grid - Italy)
- Producers with direct contracts with customers
- Large or eligible electricity consumers

The involved energy carriers/services are:

- Electricity
- Natural gas
- Domestic fuel, cooling, heating

always
very often (France, Great Britain, Italy)
specific of France

Chances of conflict were pointed out by some experts between target obligation and competitive market of White Certificates. According to some experts, the obligation on energy savings targets distorts competition, since it creates an artificial demand (but can also encourages the development of other product and services).
Some obliged and eligible actors are prevented by law from exploiting measures beyond the meter, as in the present Italian practice. This fact creates a further and unfair distortion of competition.

18.1.4 Eligible actors
A variety of choices exists as well for the actors who can perform eligible energy savings projects, i.e. those measures which are formally acknowledged as capable of triggering off actual, remarkable and recognisable energy savings.
General trend is to widen this category as much as possible and to extend it to the maximum number of participants, but careful analysis is required, as distortions with other energy savings instruments can be amplified.
At present, accepted actors are energy suppliers (France, Great Britain), ESCO's, owners of electricity and gas networks (i.e., distributors in Italy), end-users consortia (France)

18.1.5 Additionality of energy saving measures
The approaches to prove additionality, i.e. the characteristic of an energy savings project to produce energy savings in addition to those obtained anyway even in absence of that project (the baseline), strongly depend on the particular national scheme:
- As for France, two types of corrections are made. Firstly, the baseline take into account existing standards and the current state of the market for equipment. Secondly, agents already involved in market of efficient materials or equipment can not receive certificates.
- As for Great Britain, additionality should be demonstrated for each measure; actually, it is included in the targets as dead-weight.
- As for Italy, the baseline is included in already available standard tools, which are finalised to a lump evaluation of energy savings: reference is made to:
  - existing standards (in the case of insulation in buildings),
  - the most diffused or the most traded or the most encouraged energy efficiency classes (for electrical appliances).

18.2 Pros and cons of cross-border trading of White Certificates
The Task XIV activities gave the chance to focus pros and cons of national Energy Efficiency systems where trading of White Certificates - when occurring - is confined at the most at a national level, versus a chance of wider cross-border trading. Profit was also taken of some learned lesson gained from experiences on Tradable Green Certificates gained in EU Northern Countries. Though all the experiences are still in progress, some definite positions and advice were expressed as warning for countries that are setting up or are tuning their national schemes on Energy savings with involvement of White Certificates trading. These positions can be summarised as it follows:

- Advantages are envisaged in cross-border from the economic point of view, owing to a larger potential for energy savings projects and greater flexibility in implementing them.
- The types and levels of benefits depend very much on the border of the analysis considered to identify the involved actors in an energy savings project.
  With reference to costs for the actor who bears the obligation to save energy, it might be cheaper to buy a certificate in another country.
  The conclusion could be the other extreme in case the cost/benefits ratio were considered from a wider societal viewpoint. In particular, international trading would very probably bring about losses of societal benefits at a national level, such as:
  - Local reduction of environmental effects
  - Local opportunities of employment
  - Local technological improvement, increased customers welfare and reduced number of fuel poor
  - Avoided costs at national level for grid expansion
  (otherwise present without international trading), since it would prevent for complete exploitation of the local potentiality of energy savings and the related advantages. In other words, priority should be
paid to securing national interests over an international scheme and to guarantee a national exploitation of energy savings benefits earlier than any extra-national operations.

• Complexity in this matter is particularly challenging when monitoring and verification of energy savings are considered. In fact, unlike REC procedures, the subjective sides underlying the evaluation of the energy savings connected to a project are even amplified by the national specificities. This is particularly critical in the cases when the amount of saved energy (or number of certificates delivered) possibly depends (as in France) on the specific targeted geographical area (e.g. to cope with problems of local grid congestion or new building capacity) or on social issues (as poverty policies in Great Britain)

• Countries adopt different approaches for the evaluation of the energy savings, such as:
  - different energy accounting systems (e.g. for discount rate, lifetime of a measure),
  - different conversion criteria from final to primary energy (that is utterly relevant for electricity), which are very site-specific; that is, they depend on the characteristics of the country electric generation system: in some Country, the amount of White Certificates corresponding to a given amount of saved energy depends also on the geographic site of savings (e.g. PACA districts in France)
  - different baseline criteria: the definition of the terms of reference for the calculation of the energy savings is the keystone which an evaluation procedure is built on; in fact, the perimeter including the eligible measures (and the related evaluations of their technical potential and penetration) is strongly dependent on the criteria adopted to choose this baseline

Harmonisation among these criteria becomes dramatically important in view of an international trading of White Certificates, where a common and agreed value of saved energy must be assigned to a White Certificate regardless of the Country who produced it.

• The idea of common approaches in view of pan-European exchanges may possibly have chances of success for a selected short list of projects for which harmonised approaches can be identified. Nevertheless, common opinion of experts and stakeholders is that difference in evaluations are inescapable and harmonisation is still to be considered a not resolved challenge, which prevents for implementing at present actual mechanisms of cross-border exchange of White Certificates. Very common opinion is that an extensive use of procedures for ex-ante evaluation of energy savings is bound to be the actual Achilles' heel in cross-border trading: in fact, on one side forcibly common procedures are likely to lack actual meaning, whereas on the other side too country-specific evaluations risk to advantage a nation with respect to others.

18.3 Direct and transaction costs

Obliged agent operating in the energy market, as the energy suppliers, have to cope with direct and transaction costs occurring in all the phases of White Certificates lifecycle. When cost recovery is not regulated, they have to transfer part or all of these costs to their clients. These operators could be reluctant to adopt this approach extensively and then to risk loosing market shares. In fact, a trading scheme on Energy Efficiency Certificates is bound to penalise the supplier who is not capable of meeting a given energy savings target and/or is obliged to transferring his cost inefficiencies to the end-user; however, high costs may reduce his customer portfolio.

For the above reasons, streamlined procedures need to be explored in order to reduce administrative costs involved in the considered EE schemes. For the same reasons, a continuously growing attention is being paid more in general to transaction costs as a somehow hidden and less evident component – unlike direct costs - of the total costs of energy saving projects. Transaction costs are supplementary to those of plain realisation of the project and they make up a sort of significant overheads undertaking all the phases of White Certificates lifecycle. Transaction costs deserve more attention, even because they can be unexpectedly remarkable, but very often they are not given any specific evidence, so their quota
sunk in the overall commercial relationship between supplier and end-user, according to competition requirements.

18.4 Early lessons from studies and on-field experiences

The process of implementation of White Certificates schemes is quite recent and long-established practice has not been gained yet in any Country. Overall, little ex-ante evaluation exists and documented experience will tell more about the actual performance of these schemes. From a theoretical point of view, analyses have been made (e.g. in the frame of EU research projects, see [14]) or on the base of ad-hoc national feasibility analyses (see ref. [8] on recommendations related to implementation on the Dutch scheme).

From a general point of view, the following remarks can be pointed out:

- Trading of White Certificates represents in general a market-based approach to Energy savings problems but need is to discourage improper expectations and ambitions, since this policy instrument is not capable of handling and solving the problem of energy inefficiency and existing barriers to the energy efficiency projects as a whole. It remains to be seen whether the theoretical benefits claimed by the implementation of the schemes will be actually achieved.

- Different policy drivers and national conditions have led to different design schemes. Furthermore, with the exemption of Great Britain, very little ex-ante evaluation has been carried out.

- A very important and commonly remarked aspect is that energy efficiency is almost invariably extraneous to the core-business of the obliged agents and the mandatory energy efficiency/saving goals - with the option of White Certificates schemes - are bound to involve supplementary (and often not statutory) operation for them [31]. This circumstance, far from being a burden, was rather deemed a challenge for these actors to face new markets

- Transparent, clear and simple rules of a White Certificates scheme are highly desired, in particular on the political side, to be able to rely on stakeholders’ consensus as much as possible and to favour straightforward implementation of this policy.

- Monitoring and verification approaches for energy savings remain as a challenging element to better ensure the theoretical efficiency of White Certificates schemes

- Strong involvement of industry of efficient equipment and high quality building should be considered since the beginning of the process of establishing a White Certificates trading scheme and the implementation of standardised evaluation procedures. Participation of manufacturers in particular should be assured as well, as they are some of the most interested operators in boosting energy efficient technologies.

- As energy efficiency is a moving target, permanent development is required of databases on technical characteristics and costs of high efficiency equipment.

- Improvement is needed for legal standards on performance and efficiency

- Energy suppliers must be encouraged in undertaking long-term energy savings projects.

Some specific opinions expressed of some experts follow (ref. [8]):

- Have a thorough consultation of all stakeholders involved.

- Intensify the exchange with policy makers and those responsible on the subject of White Certificates in the involved countries.
• Set up a reference group with representative people of the most important stakeholders (i.e. energy supply companies, fitters, financial institutions, suppliers of saving options) that will be involved in the design of the system from the very beginning.

• Utilise the knowledge, methods and systems that are already available (concerning savings options, savings calculations, certification, monitoring and trade in certificates)

• Reward active participation in a pilot phase by making pre-scheme energy savings eligible after the formal start of the scheme.

• Initially, maintain synergy with other existing energy savings instruments; in this phase, these existing instruments should be kept unmodified, in order to avoid unpredictable interference

• Initially, accept some free-riding effect from a large amount of "autonomous" saving measures

18.5 Gained experiences
The above reviews allow for summarising the gained experiences into somehow general (though still under discussion) principles, which have inspired already some outcome of other projects (see presentation T6 of Appendix C), which were widely shared and are below expressed.

• The comparison of cost efficiency of the White Certificates scheme with cost efficiency of other policy instrument addressing energy efficiency is a very challenging task. However, policy evaluation is about comparison and studies are needed to determined if these schemes can performed better than other policy instruments.

• In theory, the best options for energetic AND economic efficiency gains from White Certificates trading seems to occur in sectors where neither taxes nor plain Voluntary Agreements work well, e.g. service sector, buildings, SME’s (see presentation T6 of Trondheim workshop - Appendix C)

• The introduction of White Certificates tends to:
  • reduce the need for publicly funded subsidies
  • reduce the revenues from energy taxes, owing to higher effectiveness of White Certificates and the consequent assumed lower consumes
  • reduce the sales and increase the administrative costs of the obligated parties, even though the impact on profit is case dependent since they may find compensation in the power market

• The territory of operation of a White Certificate scheme should correspond with the territory in which the power market is operating

Very schematically (see also paper T6 - Appendix C), the most effective and profitable applications of White Certificates schemes are expected in connection with the following circumstances:
• where energy taxation mechanisms are less effective in encouraging savings; this may typically occur in sectors as the residential and in the tertiary/service, which are outside the context of the heavy industry (where on its turn EU ETS might show more efficiency)
• instead of investment subsidies and tax deduction options; this alternative looked to work:
  - when these policies showed not to be successful or effective enough,
  or
  - in national contexts where a too marked subsidiary role of the institutional bodies could be considered inappropriate/unfair in energy savings policies

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41 i.e. originated outside the White Certificates scheme
• together with / instead of detailed performance standards (the White Certificates mechanisms are focused anyway, in principle, to optimised mixes of highly effective versus cheap measures), though labelling and minimum standards for new products is still helpful to be used in the standardised M&V procedures

• in conjunction with voluntary agreements (but check must be assured in this case on coherent assumptions on energy savings targets, baselines, etc.)

• in presence of an intensive policy of support for energy audits, in order to identify actual and responsive segments of energy savings and to encourage actions of the specialised operators as ESCOs
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- Conclusions and Recommendations
Lund University/Utrecht University/Italian Association of Energy Economists/Syd Kraft
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## GLOSSARY AND ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Meaning</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additionality</td>
<td>Characteristic of an energy savings project to produce energy savings supplementary to those obtained anyway even in absence of that project</td>
<td></td>
</tr>
<tr>
<td>Baseline</td>
<td>The term of reference for the energy consumption in a given context, to be used to evaluate the energy savings produced by an EE project</td>
<td></td>
</tr>
<tr>
<td>BAU</td>
<td>Business As Usual</td>
<td></td>
</tr>
<tr>
<td>CFL</td>
<td>Compact Fluorescent Lamp</td>
<td></td>
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<tr>
<td>DEFRA</td>
<td>UK Department for Environment Food and Rural Affairs</td>
<td></td>
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<tr>
<td>EE</td>
<td>Energy Efficiency</td>
<td></td>
</tr>
<tr>
<td>EEC</td>
<td>Energy Efficiency Commitment</td>
<td>Energy efficiency policy set up in GB to attain savings on the energy end-uses in the household sector</td>
</tr>
<tr>
<td>EPA</td>
<td>Energy Performance Advice</td>
<td>An energy efficiency policy undertaken in NL</td>
</tr>
<tr>
<td>EI</td>
<td>Eligible Implementers of Energy savings projects</td>
<td>the operators who are accredited for carrying on effectively the eligible projects</td>
</tr>
<tr>
<td>EI</td>
<td>Energy-efficiency Index</td>
<td>Approach of EPBD based on the use of energy-efficiency index</td>
</tr>
<tr>
<td>ES</td>
<td>Energy Service</td>
<td></td>
</tr>
<tr>
<td>ESC</td>
<td>Energy Saving Certificates</td>
<td>The same as White Certificates</td>
</tr>
<tr>
<td>ESCO</td>
<td>Energy Service Company</td>
<td></td>
</tr>
<tr>
<td>Free drivers</td>
<td>Customers who tie DSM programmes or commended actions, but do not participate directly in the program (i.e., they are out of the advantages involved by explicit participation and they create not hidden additionality).</td>
<td></td>
</tr>
<tr>
<td>M&amp;V</td>
<td>Monitoring and Verification</td>
<td></td>
</tr>
<tr>
<td>NPV</td>
<td>Net Present Value</td>
<td></td>
</tr>
<tr>
<td>OB</td>
<td>Obligation Bound Agents</td>
<td>the operators who are obliged by law to comply with mandatory energy savings obligations</td>
</tr>
<tr>
<td>Ofgem</td>
<td>Office of Gas and Electricity Markets</td>
<td>The UK Regulatory Authority for electricity and gas markets</td>
</tr>
<tr>
<td>SME</td>
<td>Small and Medium-sized Enterprise</td>
<td></td>
</tr>
<tr>
<td>toe</td>
<td>Tons of oil equivalent</td>
<td>Measure unit of primary energy 1 toe = 41.86 GJ</td>
</tr>
<tr>
<td>TPF</td>
<td>Third Part Financing.</td>
<td>Financing made by a “Third Party” referred to the ESCO, the first party being the owner and the second party the user.</td>
</tr>
<tr>
<td>WhC</td>
<td>White Certificates</td>
<td>Certificates issued by independent certifying Bodies confirming the claims of market actors for savings of energy, as a consequence of end-use efficiency measures. White Certificates are negotiable goods.</td>
</tr>
<tr>
<td>Acronym</td>
<td>Meaning</td>
<td>Details</td>
</tr>
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<td>---------------------------------</td>
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</tr>
<tr>
<td>energy savings national targets</td>
<td>the goals to be attained within the issuing Country; these goals can be expressed in terms of final or primary energy to be saved yearly.</td>
<td></td>
</tr>
<tr>
<td>eligible energy savings projects</td>
<td>projects which are officially acknowledged as those capable of triggering off actual, remarkable and recognisable energy savings</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX A: EXPERTS PARTICIPATING IN THE IEA DSM AGREEMENT, TASK XIV

France

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APPENDIX B: OVERVIEW OF THE INTERNATIONAL ENERGY AGENCY (IEA) AND THE IEA DEMAND-SIDE MANAGEMENT PROGRAMME

The International Energy Agency

The International Energy Agency (IEA) acts as energy policy advisor for its 26 member countries in their effort to ensure reliable, affordable and clean energy for their citizens. Founded during the oil crisis of 1973–74, its initial role was to coordinate measures in times of oil supply emergencies. But during the last decades, the energy markets have changed, and so has the IEA. It now focuses well beyond oil crisis management on broader energy issues, including climate change policies, market reform, energy technology collaboration and outreach to the rest of the world. With a staff of around 150, mainly energy experts and statisticians from its 26 member countries, the IEA conducts a broad programme of energy research, data compilation, publications and public dissemination of the latest energy policy analysis and recommendations on good practices. To support these core issues, the IEA created a contract – the Implementing Agreement – and a system of standard rules and regulations, that would allow interested Member and non-Member governments to pool resources and research the development and deployment of particular technologies. The basic aims of the IEA are:

- To maintain and improve systems for coping with oil supply disruptions;
- To promote rational energy policies in a global context through co-operative relations with non-member countries, industry and international organisations;
- To operate a permanent information system on the international oil market;
- To improve the world’s energy supply and demand structure by developing alternative energy sources and increasing the efficiency of energy use;
- To assist in the integration of environmental and energy policies.

To achieve these goals, the IEA carries out a comprehensive program of energy co-operation and serves as an energy forum for its member countries. For more than 30 years, technology collaboration has been a fundamental building block among IEA Member and non-Member countries in facilitating progress of new or improved energy technologies. There are currently 40 Implementing Agreements working in the areas of Fossil Fuels, Renewable Energies and Hydrogen, End-Use (Buildings, Industry and Transport), Fusion and Cross-Sectional Activities. The IEA Committee on Energy Research and Technology (CERT) and its Working Parties review the effectiveness, achievements and strategy of each Implementing Agreement.

IEA Demand Side Management Programme

The Demand-Side Management (DSM) Programme, which was initiated in 1993, deals with a variety of strategies to reduce energy demand. The following 17 member countries and the European Commission have been working to identify and promote opportunities for DSM:

Australia
Austria
Belgium
Canada
Denmark
Finland
France
Greece
Italy
Japan
Korea
The Netherlands
Norway
Spain
Programme Vision: In order to create more reliable and more sustainable energy systems and markets, demand side measures should be the first considered and actively incorporated into energy policies and business strategies.

Programme Mission: To deliver to our stakeholders useful information and effective guidance for crafting and implementing DSM policies and measures, as well as technologies and applications that facilitate energy system operations or needed market transformations.

The Programme’s work is organised into two clusters:
- The load shape cluster,
- The load level cluster.

The ‘load shape” cluster includes Tasks that seek to impact the shape of the load curve over very short minutes-hours-day) to longer (days-week-season) time periods. The “load level” cluster includes Tasks that seek to shift the load curve to lower demand levels or shift loads from one energy system to another.

A total of 16 projects or “Tasks” have been initiated since the beginning of the DSM Programme. The overall program is monitored by an Executive Committee consisting of representatives from each contracting party to the Implementing Agreement. The leadership and management of the individual Tasks are the responsibility of Operating Agents. These Tasks and their respective Operating Agents are:

- **Task I** International Database on Demand-Side Management & Evaluation Guidebook on the Impact of DSM and EE for Kyoto’s GHG Targets - *Completed*
  Harry Vreuls, SenterNovem, the Netherlands

- **Task II** Communications Technologies for Demand-Side Management - *Completed*
  Richard Formby, EA Technology, United Kingdom

- **Task III** Cooperative Procurement of Innovative Technologies for Demand-Side Management – *Completed*
  Dr. Hans Westling, Promandat AB, Sweden

- **Task IV** Development of Improved Methods for Integrating Demand-Side Management into Resource Planning - *Completed*
  Grayson Heffner, EPRI, United States

- **Task V** Techniques for Implementation of Demand-Side Management Technology in the Marketplace - *Completed*
  Juan Comas, FECSA, Spain

- **Task VI** DSM and Energy Efficiency in Changing Electricity Business Environments – *Completed*
  David Crossley, Energy Futures, Australia Pty. Ltd., Australia

- **Task VII** International Collaboration on Market Transformation- *Completed*
  Verney Ryan, BRE, United Kingdom

- **Task VIII** Demand-Side Bidding in a Competitive Electricity Market - *Completed*
  Linda Hull, EA Technology Ltd, United Kingdom

- **Task IX** The Role of Municipalities in a Liberalised System- *Completed*
  Martin Cahn, Energie Cites, France
Task X  Performance Contracting- Completed  
Dr. Hans Westling, Promandat AB, Sweden

Task XI  Time of Use Pricing and Energy Use for Demand Management Delivery  
Richard Formby, EA Technology Ltd, United Kingdom

Task XII  Energy Standards  
Frank Pool, New Zealand

Task XIII  Demand Response Resources  
Ross Malme, Retx, United States

Task XIV  Market Mechanisms for White Certificates Trading  
Antonio Capozza, CESI, Italy

Task XV  Network Driven DSM  
David Crossley, Energy Futures Australia Pty Ltd, Australia

Task XVI  Competitive Energy Services  
Jan W. Bleyl, Graz Energy Agency, Austria and Seppo Silvonen, MOTIVA, Finland.

For additional information contact the DSM Executive Secretary, Anne Bengtson,  
Scandinavian Tuff Traders AB, Box 47096, SE-10074 Stockholm, Sweden.  
Phone: +46 8 510 50830, Fax: +46 8 510 50830. E-mail: anne.bengtson@telia.com

Also, visit the IEA DSM website:  http://dsm.iea.org
APPENDIX C - REFERENCES TO THE PRESENTATIONS OF THE TASK 14 WORKSHOPS
<table>
<thead>
<tr>
<th>N.</th>
<th>TITLE</th>
<th>AUTHOR</th>
<th>CONTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>LO1</td>
<td>UK energy efficiency – drivers, policies and measures</td>
<td>Paul Chambers- Defra (UK)</td>
<td>UK general policies for Energy Efficiency</td>
</tr>
</tbody>
</table>
• Energy Efficiency Commitment – II period 2005-2011: outline and targets |
| LO5 | Lessons learned from UK ETS and EU ETS                             | Chris Dodwell - Defra (UK)   | UK gained experiences in Emission Trading and plans in view of a wider EU scheme                                                      |
| LO6 | THE MARKET OF ENERGY EFFICIENCY - Nature and measurement of the commodity | Walter Grattieri - CESI (Italy) | Italian policies for Energy Efficiency                                                                                              |
| LO7 | Market mechanisms for WHITE CERTIFICATES: issues and challenges in developing new policy measures | Antonio Capozza - CESI (Italy) | Overview on White Certificates and structure of IEA-DSM task XIV                                                                    |

Tab. 34 – Summary of the presentations - London workshop

All these presentations are available in pdf format in:  
http://dsm.iea.org/NewDSM/Work/Tasks/14/task14.asp
<table>
<thead>
<tr>
<th>N.</th>
<th>TITLE</th>
<th>AUTHOR</th>
<th>CONTENT</th>
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</thead>
<tbody>
<tr>
<td>P1</td>
<td>Market Mechanisms for White Certificates: a IEA-DSM International Activity</td>
<td>Antonio Capozza (CESI - Italy)</td>
<td>Overview on White Certificates and structure of IEA-DSM task XIV</td>
</tr>
<tr>
<td>P2</td>
<td>Les certificats d’économies d’énergie : Le dispositif français</td>
<td>Claudie Sagnac (Ministry of Economy, Finance and Industry - France)</td>
<td>The envisaged French scheme on White Certificates</td>
</tr>
<tr>
<td>P3</td>
<td>The White Certificate Scheme in New South Wales, Australia</td>
<td>David Crossley (Energy Futures Australia Pty Ltd-Australia)</td>
<td>White certificates in New South Wales (Australia) as part of a larger scheme, the NSW Greenhouse Gas Abatement Scheme, involving Obligations to reduce GHG emissions.</td>
</tr>
<tr>
<td>P4</td>
<td>Preliminary remarks on the implementation of a market for White Certificates: the experience of Fondazione per l'Ambiente in Piedmont region</td>
<td>Franco Becchis (Fondazione per l'Ambiente - Università del Piemonte Orientale - Italy)</td>
<td>Preliminary actions for implementation of White Certificates in an Italian Region (Piemonte): set up of rules for interaction among Local government, energy distributors and ESCO</td>
</tr>
<tr>
<td>P5</td>
<td>A succinct synthesis of the French Academic Workshop on White Certificates held on March 9th, 2005, at École des Mines, Paris</td>
<td>Jean-Pierre Tabet (ADEME - France)</td>
<td>French contribution to the subject of the workshop (principle/policy issues)</td>
</tr>
<tr>
<td>P6</td>
<td>Stepwise Towards Effective European Energy Efficiency Policy Portfolios Involving White Certificates (EuroWhiteCert 2005-06 – EIE project)</td>
<td>Lorenzo Pagliano (Politecnico di Milano – Italy)</td>
<td>Description of the EuroWhiteCert Project under way, finalised to analyse the conceptual and technical development of tradable White Certificates Systems at a European level</td>
</tr>
</tbody>
</table>
| P7 | Round table                                                         | Chairman : Lorenzo Pagliano (Politecnico di Milano – Italy); Speakers : Dominique Finon (CIRE - France), Stefano Alaimo (Electricity Market Operator - Italy), Virginie Schwarz (ADEME - France), Tina Dallman (DEFRA - UK) | • Why a white certificates system ?  
• Eligible and obliged agents and the role of the trading  
• How to evaluate ex-ante energy savings ? |

Tab. 35 – Summary of the presentations - Paris workshop

All these presentations are available in pdf format in:  
http://dsm.iea.org/NewDSM/Work/Tasks/14/task14.asp
<table>
<thead>
<tr>
<th>N.</th>
<th>TITLE</th>
<th>AUTHOR</th>
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</thead>
<tbody>
<tr>
<td>L1</td>
<td>Market Mechanisms for White Certificates: a IEA-DSM International Activity</td>
<td>Antonio Capozza (CESI - Italy)</td>
<td>Overview on White Certificates and structure of IEA-DSM task XIV</td>
</tr>
<tr>
<td>L2</td>
<td>The Energy Efficiency Commitment (EEC) in Great Britain</td>
<td>Martin Devine (DEFRA – UK)</td>
<td>Description of the Great Britain scheme in first and second phase of the Energy Efficiency Commitment</td>
</tr>
<tr>
<td>L3</td>
<td>Energy Efficiency obligations: the Italian scheme</td>
<td>Walter Grattieri (CESI – Italy)</td>
<td>Description of the Italian scheme for White Certificates trading</td>
</tr>
<tr>
<td>L4</td>
<td>White Certificates: the French System</td>
<td>Bertrand Rabany (Ministry of Economy, Finance and Industry - France)</td>
<td>Description of the French scheme for White Certificates trading</td>
</tr>
<tr>
<td>L5</td>
<td>Introduction to and first experiences of Green Electricity Certificates in Sweden</td>
<td>Mathias Normand (STEM – Sweden)</td>
<td>• Why a green certificates system in Sweden?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Objectives and rules</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>• Market Development and fulfilment of goals</td>
</tr>
<tr>
<td>L6</td>
<td>Prospects for a common Green Certificate market in Norway and Sweden</td>
<td>Mathias Normand (STEM – Sweden)</td>
<td>• Why international certificate market?</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Political challenges</td>
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<td></td>
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<td></td>
<td>• Minimum design criteria</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• The Swedish-Norwegian case</td>
</tr>
<tr>
<td>L7</td>
<td>RECS: Renewable Energy Certificates System</td>
<td>Claes Hedenström</td>
<td>• Mission of RECS International and AIB (Association of Issuing Bodies)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Trade possibilities and practices</td>
</tr>
<tr>
<td></td>
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<td>• Cross border trade and legislation</td>
</tr>
<tr>
<td>L8</td>
<td>Transaction Costs and White Certificates Schemes</td>
<td>Luis Mundaca (IIIEE – Sweden)</td>
<td>• Background about Transaction Costs</td>
</tr>
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<td>• The case of White Certificates schemes</td>
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<td></td>
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<td></td>
<td>• Early lesson learnt (Sweden, UK, Australia)</td>
</tr>
<tr>
<td>L9</td>
<td>White Certificates: will local benefits and international trading be coherent?</td>
<td>Lena Neij (IIIEE – Sweden)</td>
<td>Review of possible conflicts between forecast local benefits and economic savings in adopting a White Certificate international trading</td>
</tr>
<tr>
<td>N.</td>
<td>TITLE</td>
<td>AUTHOR</td>
<td>CONTENT</td>
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<tr>
<td>L10</td>
<td>EuroWhiteCert: stepwise towards effective European Energy Efficiency Policy Portfolios Involving Certificates</td>
<td>Lena Neij (IIIEE – Sweden)</td>
<td>Review on goals and organisation of the EU EIE Project aimed at supporting the conceptual and technical development of tradeable White Certificates schemes</td>
</tr>
</tbody>
</table>
| L11 | Panel discussion: national or international systems of certificates? | Moderator: Urban Kärrmarck (STEM – Sweden)  
Speakers: Stéphaine Monjon (ADEME – France), Walter Grattieri (CESI – Italy), Mathias Normand (STEM – Sweden), Martin Devine (DEFRA – UK) | • Why energy efficiency and White Certificates  
• Compliance and transaction costs  
• A pan-European or a national White Certificates scheme?  
• Experiences, conclusions and recommendations |

**Tab. 36 – Summary of the presentations - Lund workshop**

All these presentations are available in pdf format in:  
http://dsm.iea.org/NewDSM/Work/Tasks/14/task14.asp
<table>
<thead>
<tr>
<th>N.</th>
<th>TITLE</th>
<th>AUTHOR</th>
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<tbody>
<tr>
<td>G1</td>
<td>Market Mechanisms for White Certificates: a IEA-DSM International Activity</td>
<td>Antonio Capozza (CESI - Italy)</td>
<td>Overview on White Certificates and structure of IEA-DSM task XIV</td>
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<td>The Energy Efficiency Commitment (EEC) in Great Britain</td>
<td>Martin Devine (DEFRA – UK)</td>
<td>Description of the Great Britain scheme in first and second phase of the Energy Efficiency Commitment</td>
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<tr>
<td>G3</td>
<td>Energy Efficiency obligations: the Italian scheme</td>
<td>Walter Grattieri (CESI – Italy)</td>
<td>Description of the Italian scheme for White Certificates trading</td>
</tr>
<tr>
<td>G4</td>
<td>The French energy savings certificates system</td>
<td>Stéphanie Monjon (ADEME- France)</td>
<td>Description of the French scheme for White Certificates trading</td>
</tr>
</tbody>
</table>
| G5 | Tradable Energy Saving Certificates (ESC) in the Netherlands - considerations & possible design | Hans Schneider (CEA - the Netherlands) | • Policy background  
• Existing EE policy instruments  
• Characteristics of the intended Dutch scheme  
• Envisaged advantages and disadvantages |
| G6 | Evaluation previous energy saving policies in Netherlands             | Peter Niermeijer (ECOFYS - the Netherlands) | • Review of Energy savings policies adopted in the past in Netherlands in the building sector  
• Outline of cost efficiency of these policies  
• M&V costs in comparison with green certificates |
| G7 | Measuring energy savings in buildings                                 | Bart Poel (EBM-consult - the Netherlands) | How to assess energy savings versus reality  
• Effect of internal and external conditions  
• Effects of inspection errors  
• Balancing accuracy, reproducibility and cost |
| G8 | Transaction Costs of White Certificates Schemes                       | Luis Mundaca (IIIEE – Sweden)     | • Background about Transaction Costs  
• The case of White Certificates schemes  
• Early lesson learnt (Sweden, UK, Australia) |
<table>
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<tr>
<th>N.</th>
<th>TITLE</th>
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<th>CONTENT</th>
</tr>
</thead>
</table>
| G9 | Transaction costs for an energy supplier under obligation in a White Certificate system | Paul Baudry (EdF - France)                   | • Review of transactions costs envisaged for an obliged energy supplier as EdF  
• Criticality in implementing measures in medium size markets in industry and tertiary sectors |
<p>| G10| Transaction costs. Some experiences from EU labelling                | Hans-Paul Siderius (Senternovem - the Netherlands) | Some experiences of transaction costs gained in NL from EU labelling                                                                    |
| G11| Energy efficiency obligations. Gross to net savings                 | Walter Grattieri (CESI - Italy)              | How additionality of savings with respect to a baseline is taken into account in the Italian scheme                                      |
| G12| Energy efficiency obligations. Consumer's cost/benefit analysis     | Stéphanie Monjon (ADEME - France)            | Comparison among cost/benefit analyses performed by France, Italy and Netherlands for two energy savings measures                      |
| G13|                                                                      | Vlasis Oikonomou (Groningen University - the Netherlands) |                                                                            |
| G14|                                                                      | Walter Grattieri (CESI - Italy)              |                                                                            |</p>
<table>
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<td>Market Mechanisms for White Certificates: a IEA-DSM International Activity</td>
<td>Antonio Capozza (CESI - Italy)</td>
<td>Overview on White Certificates and structure of IEA-DSM task XIV</td>
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<tr>
<td>T2</td>
<td>The Energy Efficiency Commitment (EEC) in Great Britain</td>
<td>Martin Devine (DEFRA – UK)</td>
<td>Description of the Great Britain scheme in first and second phase of the Energy Efficiency Commitment and updates</td>
</tr>
<tr>
<td>T3</td>
<td>The French energy savings certificates system</td>
<td>Stéphanie Monjon (ADEME- France)</td>
<td>Description of the French scheme for White Certificates trading and updates</td>
</tr>
<tr>
<td>T4</td>
<td>White Certificates: the case of Italy</td>
<td>Antonio Capozza (CESI - Italy)</td>
<td>Description of the Italian scheme for White Certificates trading and updates</td>
</tr>
</tbody>
</table>
| T5 | Options for a White Certificate scheme in the Netherlands            | Vlasis Oikonomou (University of Groningen - the Netherlands) | • Policy background  
• Existing EE policy instruments  
• Characteristics of the intended Dutch scheme  
• Envisaged advantages and disadvantages |
| T6 | White Certificate Systems – Interaction with other policy instruments | Adriaan Perrels (Government Institute for Economic Research VATT - Finland) | • Other instruments promoting energy saving  
• Examples of interactions |
| T7 | Triple somersault in regulating energy supply and demand            | Torstein Bye (Statistics Norway SSB - Norway) | Advantages, disadvantages and effects of interaction among policies as:  
• commodity tax  
• commodity subsidy  
• Green Certificates  
• White Certificates  
• externality tax |
| T8 | A review on Task XIV activities: first experiences and open issues  | Antonio Capozza (CESI - Italy)  | Comparisons among different national approaches on:  
• obliged and eligible operators (competition issues)  
• procedures for M&V energy savings (additionality)  
• direct and transaction costs |

Tab. 38 – Summary of the presentations - Trondheim workshop

All these presentations are available in pdf format in:  
http://dsm.iea.org/NewDSM/Work/Tasks/14/task14.asp