The Italian experience with white certificates

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Energy efficiency obligation (EEO) on electricity and gas DSOs: “concept” introduced in 1999 and 2000 (but no targets yet)

Legislative framework introduced in 2001; two core elements:

- EEO + energy efficiency certificates (TEE) trading

Regulatory framework developed throughout 2002-2004 via consultation of all interested parties

Limited revision of the legislative framework in 2004

Fully operational since January 2005 (first regulatory period 2005-2009)

Extended to 2012 and revised in December 2007

Few additional revisions in 2008 (e.g. eligible actors, sectoral and cost recovery coverage)

Further revisions foreseen in 2011 but yet to be defined
Governance

- **Government: core elements** (e.g. targets, obligated and eligible parties, apportionment criteria, eligible measures, trading options, general enforcement and cost-recovery criteria; crediting lifetime)

- **Regulator (AEEG):**
  - **technical and economic regulation** (e.g. M&V—measurement and verification of energy savings, qualitative requirements; cost-recovery, sanctions, rules concerning certificates and trading)
  - **day-to-day administration and enforcement** (e.g. project evaluation; energy savings certification; checks and inspections; annual compliance check with the targets)
  - **monitoring** of results and proposals to the Government in order to enhance its effectiveness via legislative actions (Annual Report; Interim Statistical Reports)

- **Electricity Market Operator (GME S.p.a.):**
  - **certificates (TEE) issuing** upon AEEG authorisation
  - administration of TEE Registry and trading platform (spot market)
  - proposals on trading rules to AEEG

- **Energy Agency (ENEA):** supports AEEG in projects evaluation; from mid-2011 also involved in the development of simplified M&V methods, to be approved by Ministry of Economic Development
EEO elements

- **Targets:** primary energy savings (toe); annual and ex-post; first regulatory period 2005-2009, extended till 2012 for the time being; cf. following slide

- **Obliged parties:** electricity and natural gas DSOs > 50,000 customers as of 31 December of year t-2 (previous threshold: 100,000 customers); individual target proportional to own market share (market served by obliged parties)

- **Scope:** all end-use sectors (*); only “hard” measures (e.g. technology changes (**)); banded obligation in the initial phase (50% of target from electricity and natural gas savings)

- **Enforcement:** financial penalties for non compliance with the target; no unitary penalty defined ex-ante; grace period of one year if compliance at least 60%; otherwise the penalty does not cancel the obligation;

- **Funding:** cost-recovery mechanism for obligated parties financed via electricity and natural gas tariffs; €/toe saved, updated annually (maximum level so far 100 €/toe)

(*) Except: PV < 20KW; from mid-2011 reduction in network losses may count towards the target, but no tariff contribution

(**) Only exception: information campaigns coupled with “hard” measures; cf following slides
National targets

Increase in targets: 1.8 Mtoe for electricity DSOs (=5.1% of distributed volumes) + 1.4 Mtoe for natural gas DSOs (=3.5% of distributed volumes)

Extension of targets:
- 2005: 0.2 Mtoe
- 2006: 0.4 Mtoe
- 2007: 0.8 Mtoe
- 2008: 1.5 Mtoe
- 2009: 2.9 Mtoe
- 2010: 4.3 Mtoe
- 2011: 5.3 Mtoe
- 2012: 6 Mtoe

Legend:
- Green: Ministerial decrees 2004
- Yellow: after MD 21/12/07
Market component

Eligible parties (other than obliged DSOs): DSOs < threshold, companies controlled by DSOs, energy service providers, big energy users + market intermediaries

Certificates trading:
- central element
- no authorisation needed
- spot market + OTC
- from 3 to 5 types of certificates
- banking
- electronic Registry, directly linked with the AEEG information system for administering projects evaluation
- electronic trading platform (one session per week)
- rules and procedures to access, to guarantee security of market deals, etc.
- full transparency on both volumes and prices (spot market and OTC)
M&V approach – 1
main issues

◆ What is “special” about M&V of energy savings?

- you have to measure the energy savings via a *comparison* of the energy consumption before and after the project

- in some cases the “before the project” scenario is not known (data, new installations) and you need to make assumptions; or you want to support only technologies more efficient than e.g. mandatory standard or market average (*baseline definition*)

- in other cases the “before the project” scenario is known, but you need to *net out* the impact on consumption trends of variables other than those on which the energy saving project have an influence

- in other cases *measuring everything is not cost-effective* (e.g. mass-market technologies)
2005-2011: *ex-post* accreditation of energy savings for 5 years (8 years for heating and A/C; 10 years for high efficient CHP). => impact on the relative stringency of targets and incentive structure cf. other national schemes.

Reformed in late 2011: lifetime savings accredited over the crediting lifetime (5 years for most measures)

3 types of M&V methods:

1) *deemed* savings (no on-field measurement; pre-defined annual energy savings/installed unit = toe/year/unit);
2) engineering *estimates* (partial on-field measurement; pre-defined evaluation algorithm, with pre-defined values for some parameters)
3) complete energy *monitoring* plans (subject to pre-approval)

Information campaigns eligible only if associated to specific “hard” measures

- 2% “premium” on the amount of certified energy savings

No use of uplifts (except for the above premium)

Only “additional” savings are considered, i.e. over and above spontaneous market trends and/or legislative requirements

- *periodic updating* of deemed saving and engineering formula, to be applied according to a pre-defined schedule (“time-windows”)
To encourage third parties submission: guidelines and minimum requirements for deemed savings proposals and engineering methods

To ease the access to the system of measures for which no deemed savings or engineering method is available: diffusion of best practices and guidelines to develop energy monitoring plans for specific types of projects
M&V methodologies
coverage of approved deemed savings and engineering algorithms

- **Buildings** (wall insulation, double glazing, solar power, central heating and cooling)
- **Domestic equipment** (white appliances, air conditioners, boilers, heat-pumps, efficient shower-heads, aerated flow breakers, stand-by stop)
- **Industrial equipment** (motor drives, variable speed drives, natural gas decompression)
- **Private and public lighting** (retrofit or new street luminaries, light flow regulators, LEDs for cemeteries and traffic lights)
- **CHP plants and district heating systems**

**Further methodologies**
- energy efficient laser printers
- home broadband access gateways
- energy efficient UPS (Uninterruptible Power Supply) systems
M&V methodologies
examples of measures evaluated via monitoring plans

- Restructuring of the process lay-out in order to reduce the final energy need
- Replacement of combustion devices for heat production
- Replacement of big electric drives
- Application of variable speed drives to pumps, compressor, etc.
- Application of renewable energy sources for heat production (mainly biomass and vegetal oils)
- Retrofit of cooling systems
- Waste heat recovery and free cooling systems
- Application of CHP to industrial processes.
Cost-recovery mechanism for obliged DSOs:

- **financed via** electricity and natural gas rates
- **2005-2007:** only electricity and natural gas savings; since 2008: all fuels except transport; since 2011: all fuels including transport with deemed savings
- **up to the occurrence of the target**
- **€/unit of primary energy saved** => flat and technology neutral
- **adjusted annually** according to a pre-defined formula

\[ C_{t+1} = C_t \cdot (1 - e) \]

where:
- \( C_t \) is the unitary allowance applied to year \( i \) [€/toe]
- \( e \) is the average % increase in the prices of energy for residential customers (electricity, natural gas and gas oil for heating)

=> increases when energy prices (i.e. the avoided energy cost) fall and viceversa, so as to stabilise the overall incentive to invest in EE
RESULTS 2005-2011(*)

Average energy savings rate

Monthly TEE emissions rate

TEE/month

Target year

2005 2006 2007 2008 2009 2010 2011
The share of energy savings delivered in the industrial sector is constantly increasing. This means that the mechanism is gradually promoting investments in long(er) lifetime saving measures.

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Had Italy measured energy savings with a lifetime approach (cf. UK and France schemes) the breakdown of delivered energy savings would have been very different:

- **in a static picture**: the share of short-term saving measures (e.g. residential lighting) would have been much lower while the share of long(er) lifetime measures (e.g. building envelope, industrial measures), would have been much larger, since all their lifetime savings would have been accounted for in the first accounting year (as opposed to being accounted only for 5 years and ex-post)

- **in a dynamic picture** (i.e. taking into account the impact of such a different accounting method on investors’ incentives and choices): the share of long(er) lifetime measures would have been even larger also as a result of a greater number/size of those measures being implemented
merely comparing the energy savings achieved in the Italian system with those achieved by other systems with different measurement and verification rules is not correct and is strongly misleading.
Recent regulatory measures

- From *ex-post* accreditation of energy savings for the crediting lifetime (5 years for most measures) to accreditation of (discounted) lifetime savings over the crediting lifetime, so as to increase incentives for long-lifetime measures (without increasing the overall tariff burden)

\[ \tau = \sum_{i=0}^{T-1} (1 - \delta)^i \]

\( \tau = U \)

- Reduction of minimum project size
- *Simplification* of other rules and procedures
### Who is delivering?

<table>
<thead>
<tr>
<th></th>
<th>TEE (% share over total)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>up to 31/5/06</td>
</tr>
<tr>
<td>Obliged electricity DSOs</td>
<td>9,1%</td>
</tr>
<tr>
<td>Obliged natural gas DSOs</td>
<td>23,8%</td>
</tr>
<tr>
<td>Non obliged DSOs</td>
<td>2,5%</td>
</tr>
<tr>
<td>Energy service providers (SSE)</td>
<td>64,6%</td>
</tr>
<tr>
<td>Final consumers with an energy manager (SEM)</td>
<td>-</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>31 dic 2008</th>
<th>31 dic 2009</th>
<th>31 dic 2010</th>
<th>31 dic 2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSE</td>
<td>165</td>
<td>196</td>
<td>270</td>
<td>297</td>
</tr>
<tr>
<td>SEM</td>
<td>0</td>
<td>2</td>
<td>9</td>
<td>12</td>
</tr>
</tbody>
</table>

*Autorità per l’Energia Elettrica e il Gas*
The key role of trading

Compliance strategies of obligated DSOs

DSOs with at least 100.000 final customers

<table>
<thead>
<tr>
<th>Year</th>
<th>% TEE rispetto all'obiettivo complessivo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>15%</td>
</tr>
<tr>
<td>2006</td>
<td>39%</td>
</tr>
<tr>
<td>2007</td>
<td>43%</td>
</tr>
<tr>
<td>2008</td>
<td>21%</td>
</tr>
<tr>
<td>2009</td>
<td>28%</td>
</tr>
<tr>
<td>2010</td>
<td>28%</td>
</tr>
</tbody>
</table>

% Emessi vs obiettivo
% Bilaterali vs obiettivo
% Borsa vs obiettivo

DSOs with at least 50.000 final customers

<table>
<thead>
<tr>
<th>Year</th>
<th>% TEE rispetto all'obiettivo complessivo</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>54%</td>
</tr>
<tr>
<td>2009</td>
<td>55%</td>
</tr>
<tr>
<td>2010</td>
<td>13%</td>
</tr>
</tbody>
</table>

% Emessi vs obiettivo
% Bilaterali vs obiettivo
% Borsa vs obiettivo

Compliance strategies of obligated DSOs
Percentage of TEE gained each target year via:
• own projects (“% emessi vs obiettivo”)
• spot market purchases (“borsa”)
• OTC purchases (“bilaterali”)

Market liquidity

<table>
<thead>
<tr>
<th></th>
<th>per il 2005</th>
<th>per il 2006</th>
<th>per il 2007</th>
<th>per il 2008</th>
<th>per il 2009</th>
<th>per il 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Obiettivi assegnati</td>
<td>155.911</td>
<td>311.758</td>
<td>633.382</td>
<td>2.200.003</td>
<td>3.200.000</td>
<td>4.300.000</td>
</tr>
<tr>
<td>% incremento obiettivo</td>
<td>-</td>
<td>100%</td>
<td>103%</td>
<td>247%</td>
<td>45%</td>
<td>34%</td>
</tr>
<tr>
<td>TEE scambiati</td>
<td>145.567</td>
<td>472.637</td>
<td>861.674</td>
<td>2.099.842</td>
<td>2.913.390</td>
<td>3.952.973</td>
</tr>
<tr>
<td>% incremento volume</td>
<td>-</td>
<td>225%</td>
<td>82%</td>
<td>144%</td>
<td>39%</td>
<td>36%</td>
</tr>
<tr>
<td>% scamb/obiettivo</td>
<td>93%</td>
<td>152%</td>
<td>136%</td>
<td>95%</td>
<td>91%</td>
<td>92%</td>
</tr>
</tbody>
</table>
Market Prices

Market prices are very important signals for decision-makers on the effectiveness and efficiency of the system as well as important reference indexes to set e.g. the tariff contribution, the sanctions of non compliances.
Market Prices and Legislative changes

- From banded to un-banded EEO
- Extension of the scope for the tariff contribution
- Proposal to extend the tariff contribution to other forms of energy

Graph showing market prices and legislative changes from March 2006 to April 2009, with different types of tariffs (Tipo I, Tipo II, Tipo III) and chiusure d'anno.
Cost-effectiveness of TEE versus other FER-E supporting tools

With reference to the year 2011 white certificates (TEE) have been from 5 to 23 times more cost-effective than other incentive tools designed to achieve similar sustainable development objectives (in previous years the comparison has been even more favourable to TEE).
Cost-effectiveness of TEE versus other EE supporting tools

The cost-effectiveness of TEE has been confirmed by the 2010 Energy Efficiency Report by ENEA (National Energy Agency) where it compares the costs or the State of the various policy tools introduced to promote end-use energy efficiency.

<table>
<thead>
<tr>
<th>misura</th>
<th>costo-efficacia investimento totale (€/kWh)</th>
<th>costo-efficacia per lo Stato (€/kWh)</th>
</tr>
</thead>
<tbody>
<tr>
<td>D.lgs.192/05</td>
<td>0,13</td>
<td>non applicabile</td>
</tr>
<tr>
<td>55%</td>
<td>0,10</td>
<td>0,05</td>
</tr>
<tr>
<td>20%</td>
<td>0,013</td>
<td>0,002</td>
</tr>
<tr>
<td>TEE</td>
<td>non disponibile</td>
<td>0,0012</td>
</tr>
<tr>
<td>Trasporti</td>
<td>0,82</td>
<td>0,10</td>
</tr>
</tbody>
</table>

*Tabella 3: Efficienza economica strumenti di incentivazione*
## TEE cost for an average-household

**Impact of TEE on electricity and natural gas tariffs:**
maximum impact 6,5 €/anno in 2012

<table>
<thead>
<tr>
<th>year</th>
<th>€/kWh</th>
<th>€/household/year *</th>
<th>€/mc</th>
<th>€/household/year **</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>0,00</td>
<td>0,1</td>
<td>0,01</td>
<td>0,2</td>
</tr>
<tr>
<td>2006</td>
<td>0,01</td>
<td>0,2</td>
<td>0,02</td>
<td>0,3</td>
</tr>
<tr>
<td>2007</td>
<td>0,01</td>
<td>0,3</td>
<td>0,05</td>
<td>0,7</td>
</tr>
<tr>
<td>2008</td>
<td>0,04</td>
<td>1,0</td>
<td>0,12</td>
<td>1,6</td>
</tr>
<tr>
<td>2009</td>
<td>0,05</td>
<td>1,4</td>
<td>0,16</td>
<td>2,2</td>
</tr>
<tr>
<td>2010</td>
<td>0,07</td>
<td>1,9</td>
<td>0,21</td>
<td>3,0</td>
</tr>
<tr>
<td>2011</td>
<td>0,09</td>
<td>2,5</td>
<td>0,26</td>
<td>3,7</td>
</tr>
<tr>
<td>2012</td>
<td>0,10</td>
<td>2,6</td>
<td>0,28</td>
<td>3,9</td>
</tr>
</tbody>
</table>

* annual consumption: 2700 kWh
** annual consumption: 1400 mc

**NOTE:** data in *dark blue* are estimates
Direct private benefits

The avoided energy cost has been from 11 to 19 times greater than the tariff contribution (that varied from 100 €/toe in 2005-2008 to 86,98 €/toe in 2012).
In the overall 2005-2012 period the costs/benefits ratio may be graphically shown by comparing the range of variation of energy prices (the benefits) with the range of variation of costs for different market actors (tariff contribution or average market prices for TEE).
TEE supply versus targets

Graph showing TEE supply versus targets from 2005 to 2010:
- Annual target (toe)
- Issued + banked TEE
- Issued TEE

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Effects of the Regulatory changes introduced in November 2011 (lifetimesavings)
AEEG has urged the Government to:
- fix future targets, at least up to 2020
- clarify TEE boundaries relative to other incentive mechanisms recently introduced (e.g. new support mechanism for high efficient CHP; feed-in tariff for renewable heat and small energy efficiency measures)
- clarify and rationalise the governance of the mechanism
- promote development of technical norms market studies, independent data and statistics to support M&V of energy savings

Meanwhile we are studying:
- approaches to promote the development of ESCOs, EPC, new business models
- ways to prevent opportunistic behaviour (e.g. hoarding) without interfering with the market
- possible alternative approaches to fix and update the cost recovery rate
A few references

http://www.autorita.energia.it/it/pubblicazioni_ee.htm
◆ Annual Reports on the White Certificates Mechanism (Sixth Annual Report plus a Summary of the first five years of implementation to be published also in English)
◆ Interim Statistical Reports on the White Certificates Mechanism (two every year)
Papers on the Italian White certificates scheme:
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(in Italian)