Italian
Energy Efficiency
Action Plan

July 2011

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List of abbreviations and acronyms

AEEG: Regulatory Authority for Electricity and Gas
AIRU: Italian Urban Heating Association
ANIE: National Federation of Electrotechnical and Electronic Companies
ASSOTERMICA: Association of Manufacturers of Equipment and Components for Heating Systems
AV: High Speed Rail
BAT: Best Available Technology
BAU: Business As Usual
BEMS: Building Energy Management System
BRT: Bus Rapid Transit
BUR: Official Regional Gazette
CAR: High-Efficiency Cogeneration
CB: White Certificate
CEI: Italian Electrotechnical Committee
CEMEP: European Committee of Manufacturers of Electrical Machines and Power Electronics
CEN: European Committee for Standardization
CFL: Compact Fluorescent Lamp
CNIT: National Infrastructure and Transport Report
COP: Coefficient Of Performance
CRB: Biomass Research Centre
CRESME: Construction Industry Economic, Social and Market Research Centre
CTI: Italian Thermotechnical Committee
DGR: Regional Council Resolution
DHW: Domestic Hot Water
DL: Decree-law
DPC: Data Processing Centre
DPR: Presidential Decree
EC: European Community
EEAP: Energy Efficiency Action Plan
EEF: Energy Efficiency Services (EN 15900
EER: Energy Efficiency Ratio
EGE: Energy Management Specialist (UNI CEI 11339:2010)
ELENA: European Local Energy Assistance facility
EMS: Energy Management System (EN UNI CEI 16001
ENAC: Italian Civil Aviation Authority:2009)
ENEA: Italian National Agency for New Technologies, Energy and Sustainable Economic Development
EPBD: Energy Performance of Buildings Directive (Directive 2002/91/EC in document EPBD 1 and Directive 2010/31/EC in document EPBD 2
EPC: Energy Performance Contracting:2010)
ERDF: European Regional Development Fund
ES: Energy Saving
ESCo: Energy Service Company (UNI CEI 11352
ESD: Energy Saving Directive (Directive 2206/32/EC)
ETP: Energy Technology Perspectives
ETS: Emission Trading System
EU: European Union
EUP: Energy Using Products Directive
FEC: Final Energy Consumption
FIRE: Italian Federation for the Rational Use of Energy
GD: Distributed Generation
GDP: Gross Domestic Product

GFC: Gross Final Consumption
GGE: Gross Grant Equivalent
GME: Electricity Market Operator
GPP: Green Public Procurement
GSE: Energy Services Operator
GURI: Official Journal of the Italian Republic
ICE: Internal Combustion engine
ICT: Information and Communication Technology
IEA: International Energy Agency
IND: Industrial
IRES: Corporate Income Tax
IRPEF: Personal Income Tax
ISFOL: The Italian Institute for the Development of the Vocational Training of Workers
ISTAT: National Institute for Statistics
ITABIA: Italian Biomass Association
JRC: Joint Research Centre
LCCA: Life Cycle Cost Analysis
LED: Light Emitting Diode
LPG: Liquefied Petroleum Gas
LPT: Local Public Transport
LT: Low Tension/Voltage
MATTM: Italian Ministry for the Environment, Land and Sea
MEF: Ministry of Economy and Finance
MF: Motive Force
MI U R: Ministry of Education, Universities and Research
MIBAC: Ministry of Cultural Heritage
MIT: Ministry of Infrastructure and Transport
MSE or MiSE: Ministry of Economic Development
MT: Medium Tension/Voltage
MVR: Mechanical Vapour Recompression
NGO: Non-Governmental Organizations
NREAP: National Renewable Energy Action Plan
NZE: Nearly Zero Emission buildings
PA: Public Administration
PES: Primary Energy Saving
PES: Primary Energy Saving
PEV: Plug-in Electric Vehicle
PHEV: Plug-in Hybrid Electric Vehicle
POI or POIn: Inter-regional Operative Plan
PV: Photovoltaic
REA: ENEA Energy and Environment Report
REAP: Renewable Energy Action Plan
RENAEL: Italian Network of Local Energy Agencies
RES: Renewable Energy Sources
RES: Residential
RH: Relative Humidity
ROP: Regional Operational Programme
RSE: Ricerca sul Sistema Energetico / Energy Systems Research
s.m.i.: and subsequent modifications and supplements
SEE: Sustainable Energy for Europe campaign:2009, in future ISO 50001:2011)
SET Plan: Strategic Energy Technology Plan
SMB: Small- or Medium-sized Business
SPF: Seasonal Performance Factor
STS: Special Tender Specifications

T5 – T8 and T12: types of fluorescent lamps
TEE: Energy Efficiency Certificates
TER: Tertiary
TOE: Tonne of Oil Equivalent
TPF: Third Party Funding
UNCEM: National Union of Mountain Municipalities, Communities and Authorities
UNI: Italian National Standards Body
UNRAE: Italian Foreign Car Association
UPS: Uninterruptible Power Supply
USC: Ultra Super Critical
USW: Urban Solid Waste
UTEE: Technical Unit for Energy Efficiency ENEA

1 General Context

Italy has placed the promotion of energy efficiency among the priorities of its national energy policy. To this it has combined the pursuit of the security of its energy supply, the reduction of energy costs for businesses and households, the promotion of innovative technological processes and the protection of the environment, all in association with the reduction of climate altering emissions.

The first National Energy Efficiency Action Plan (EEAP 2007), presented in July of 2007 in compliance with Directive 2006/32/EC, identified the direction the Italian Government intended to take in order to achieve the targets of improved energy efficiency and better energy services.

The European Energy Efficiency Action Plan 2011 points to the role of energy efficiency as an essential tool for reducing consumption among Member Nations, in order to achieve the more ambitious goal of a reduction of 20% by 2020 and to stimulate the efficient use of resources.

In parallel with this, the National Renewable Energy Action Plan (NREAP), issued by the Ministry of Economic Development and the Ministry of the Environment, as a consequence of Directive 2009/28/EC transposed through Legislative Decree 28/2011, provides further pointers for encouraging energy efficiency, as an essential prerequisite for achieving the renewable energy and CO_2 reduction targets, hence leading to an evaluation of the implementation of Directive 2006/32/EC within a strategic context even outside the sphere of its own sector. Consequently in drawing up EEAP 2011 due consideration was given both to the elements of the policy and to the specific elements introduced by Legislative Decree 28/2011 and by the correlated implementing regulations issued herein. In fact, the gross final reduction in energy consumption by 2020, to be achieved through energy efficiency improvement programmes and measures, will facilitate the effective pursuit of the goal of producing energy from renewable sources.

Similarly, the energy efficiency improvement measures included in this national Energy Efficiency Action Plan (EEAP 2011) also encompass renewable technologies capable of reducing the demand for primary energy. For example, the White Certificate mechanisms and the 55% tax allowances, aimed at projects that adopt efficient energy-saving technologies, enable the adoption of renewable technologies for heating, including: solar panels for the production of hot water, high-efficiency heat pumps, low-temperature geothermal systems, or systems that use vegetable products and organic or inorganic refuse, etc.

Hence EEAP 2011 lays the foundation for the strategic planning of the measures and for the reporting of all savings, not only in terms of final energy.

Since the 2007 plan was issued until now certain new legal dispositions, implementation standards and guidelines have been published, that all contribute to the attainment of the predetermined targets. Among the various provisions particular note should be taken of the following:

- Legislative Decree 115/2008 implementing Directive 2006/32/CE in relation to the efficiency of final energy usage and of energy services, that among other things sets up the Energy Efficiency Technical Institute-UTEE under the umbrella of ENEA (the National Agency for New Technologies, Energy and Sustainable Economic Development), with the task of carrying out technical-scientific support and consultancy activities for the State and Public Administration (regional and local bodies);
- DPR (Decree of the President of the Republic) 59/09, DM (Ministerial Decree) of 26 June

2009 and the National Guidelines for the Energy Performance Certification of Buildings implementing Legislative Decree 192/2005, that transposes Directive 2002/91/EC relating to the energy efficiency of buildings;
- Legislative Decree 28/2011, implementing Directive 2009/28/CE, that lays down provisions for immediate implementation, as well as medium and long-term provisions;
- the Revolving Fund set up with the 2007 Italian Finance Act with the aim of financing projects in the renewables, energy efficiency and forestry management sectors;
- the National Renewable Energy Action Plan, prepared on the basis of what is laid down in Directive 2009/28/EC.

According to the expectations of the European institutions, the introduction of policies that provide the greatest support for the development and diffusion of new technologies contributes directly to the increase in energy savings.

In awareness of this the Ministry of Economic Development (MiSE) has developed various programmes to promote and support research in this sector: in 2007 the Industry Programme 2015, the principal objective of which was to restorate industrial competitiveness, launched the Industrial Energy Efficiency Innovation Project for competitiveness and sustainable development; the financing from the electricity system research fund ensured public funding (about EUR 40 million during the period 2009-2011) for research programmes in that specific field, the extent of which can vary from 100% for projects on research carried out in the context of planned agreements with research bodies, down to 25-50% for pre-competitive and industrial research projects.

1.1 Specific aspects of calculating the national objective

Directive 2006/32/EC establishes that Member States must draw up an Energy Efficiency Action Plan aimed at achieving an overall national indicative energy savings target by 2016, equivalent to 9% for the ninth year of application. The target is to be reached by way of energy services and other energy efficiency improvement measures. The methodology for calculating the target lays down that the average annual quantity consumed by Member States be assessed as the average of the amount of energy distributed or sold to final customers during the years 2001-2005, not adjusted for degree days, nor for structural changes or production changes, with the exclusion of energy consumption sourced from activities covered by the Emissions Trading Directive (ETS)[1].

The national indicative energy savings target shall:

a) consist of 9% of the annual average amount of consumption referred to above;

b) be measured in 2016;

c) be the result of cumulative annual energy savings achieved[2] throughout the entire nine-year application period of this directive;

d) be reached by way of energy services and other energy efficiency improvement measures.

The national energy savings, compared with the national indicative energy savings target, shall be measured from 1 January 2008, but the effect of so-called “early actions”, i.e. activities

[1] Energy activities (thermal power stations and other combustion plants), production and transformation of ferrous materials, mineral product industries (cement, lime, glass, ceramic and brick products), paper and board.
[2] The unit of measurement in which data are expressed is GWh and the factor for the conversion of consumption into final energy is as follows: 1 GWh= 86 TOE (in the case of thermal energy).

carried out prior to that date, may be taken into account.

In EEAP 2011 the methodology for calculating the target remains unaltered from that of 2007, as does the total value of the energy savings expected by 2016. For this reason the types of actions have remained substantially the same, even though other areas of intervention that could add to the savings already defined for 2016 are listed within the document, albeit not exhaustively.

The NREAP issued in 2010 in transposition of Directive 2009/28/EC whose technical specifications and timescales differ from those of the EEAP, sets binding targets up to 2020 with regard to the amount of energy to be obtained from renewable energy sources (RES). The Directive lays down that each Member State must adopt a national renewable energy action plan (NREAP), and:

- set sectoral targets (electricity, heating and cooling, transport) for the consumption of energy from renewable sources;
- specify the measures adopted and to be adopted in order to achieve the targets and to comply with the provisions of the directive.

In particular, the calculation of the NREAP's overall target is based on the fact that the amount of energy from RES, that is the ratio of the gross final consumption of renewable energy (electricity, heating, transport) to the total gross final consumption-GFC$_{TOTAL}$[3] (energy products delivered for energy purposes to industry, transport, households, services, agriculture, forestry and fisheries, auxiliary services for electricity and heat generation, losses of electricity and heat during distribution) must be greater than or equal to 17%; a similar approach is to be taken for transport with the ratio to be maintained above 10%.

In this regard, a scenario (Primes 2009) has been prepared that takes account of the effect of the economic crisis and the measures planned in the EEAP (see p. 21) for containing consumption and estimates a gross final consumption for Italy by 2020 of 145.6 MTOE. As can be seen in the NREAP, to calculate the estimate of the gross final consumption by 2020, it was assumed that additional effort would be made with regard to energy efficiency, in line with what is laid down by Law 99/2009. On the hypothesis that an RES ratio of around 17% will have to be maintained and that the GFC$_{TOTAL}$ for Italy by 2020 is to all intents and purposes equal to 133 MTOE, as indicated in the NREAP, the further reduction of final consumption will be about 12 MTOE, as depicted in the following graph.

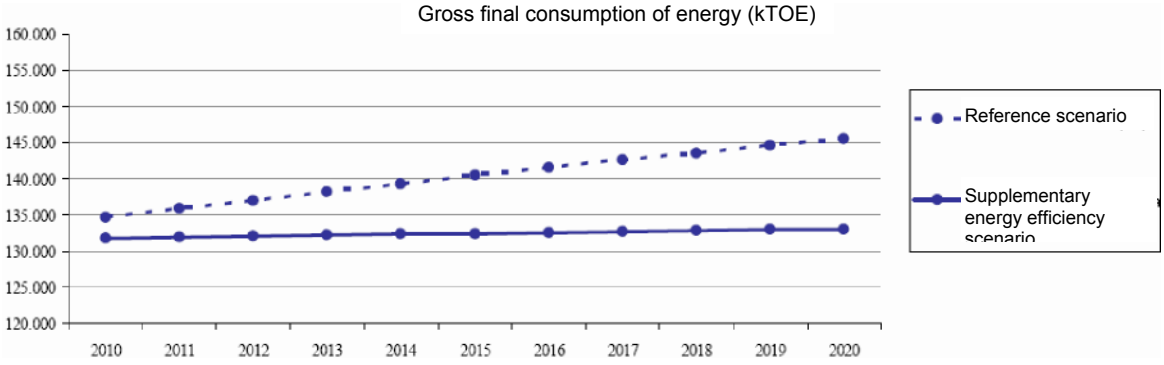


Figure 1.1 – Estimate of the evolution of final energy consumption for Italy through to 2020 (source: Primes)

[3] In this document all energy savings are calculated in terms of Gross Final Consumption (GFC).

Chapter 5 and Appendix A highlight areas for intervention and related proposals on which actions should be focused in order to harmonise the energy efficiency objectives of the EEAP 2011 with the broader goals of the NREAP.

The initiatives identified to produce the above-mentioned reductions involve the definition of a plan for improving the energy efficiency of public buildings and social housing, establishing a framework of incentives in the medium term, reinforcing Green Procurement, promoting the efficiency of data processing centres, implementing actions to develop electricity distribution networks (on the Smart Grid model) as well as improvements in efficiency in urban areas.

For the transport sector a programme will be put in place to improve the efficiency of the vehicles on the road, to increase the number of vehicles using alternative propulsion (electric and bio-fuel) and to finance rapid mass transit lines in metropolitan areas, also supporting the initiatives of the Regions and Local Bodies.

1.2 Principal features of EEAP 2011

The purpose of EEAP 2011 is to follow up, in a consistent and ongoing way, actions and initiatives already provided for in EEAP 2007 and it sets out to present medium to long term proposals based on innovative and reliable scenarios.

Within this perspective EEAP 2011 illustrates the results achieved with the measures presented in the first plan in relation to the energy saving objectives of 2010, that were easily reached, and in part updates the measures for achieving the 2016 general target that is being maintained at 9.6%.

In particular, in addition to the measures relating to White Certificates (or Energy Performance Certificates) and to incentives for energy efficiency improvement work on the building stock, the effects of Legislative Decree 192/2005, that transposes Directive 2002/91/EC concerning the energy performance of buildings, are also taken into consideration. This decree introduced important changes to the existing legal framework, to design methodologies, minimum standards and the inspection of plants as well as introducing the energy performance certification of buildings.

The decree, already comprehensive with regard to the part relating to winter climate control, also lays down provisions for implementation, among which the following standards have been issued: Presidential Decree No 59 of 2 April 2009, and the decree of the Ministry of Economic Development of 26 June 2009 relating to the national guidelines for the energy performance certification of buildings.

With regard to the principal results of EEAP 2007, from the monitoring carried out it was found that the target for the savings to be made by 2010 had been reached (47 809 GWh p.a. achieved against the 35 658 GWh p.a. budgeted). The detail revealed that some measures were more effective than others: the residential sector provided the greatest contribution in terms of savings with 31 525 GWh p.a., whereas the results from the services sector and transport were more modest. A detailed analysis of the results achieved will be made in paragraph 3.1).

The structure of EEAP 2011 has remained substantially the same as that of EEAP 2007 with the exception of certain changes aimed at optimising the stimulus measures and their related mechanisms as well as, in certain instances, revising the calculation methodology.

Specifically, as far as the residential sector is concerned, the replacement of single glazing with double glazed units and the installation of solar heating panels for hot water have had an excellent impact, whereas the insulation of opaque surfaces of residential buildings has achieved poorer results than expected, probably due to the higher costs common for this type of work. Nevertheless, new forms of incentive will be investigated and implemented in order to stimulate work on

the opaque fabric of buildings, the part of the building/plant package that offers the greatest potential for energy savings. In EEAP 2011 the work of insulating opaque walls has been replaced by the provisions of Legislative Decree 192/2005 (RES-1).

Two new types of actions have been introduced (RES-10, RES-11) that were not present in the preceding EEAP, relating to the installation of low flow aerator taps (including water kits), the decompression of natural gas and photovoltaic systems, (for that part not included in the feed-in tariff) that had been added into the White Certificate mechanism (type I and II).

In the services sector the measure relating to the transposition of Directive 2002/91/EC and the implementation of Legislative Decree 192/05 has been introduced.

In the industrial sector, however, the measures relating to the mechanical compression of steam produced a negative result.

Finally, in the transport sector a substantial change was made to the algorithm for assessing potential savings, also bearing in mind the results of the monitoring and of the new regulations that had come into force. These changes have resulted in the need to review the package of measures to be implemented and have made necessary the introduction of other measures, as shown in the following table.

The changes made in EEAP 2011 mean that the numbering of the codes of each of the types of action may differ from what was found in EEAP 2007.

Table 1.1 – EEAP 2011: Measures to improve energy efficiency

	Measures to improve energy efficiency	**Annual energy savings achieved by 2010**	**Annual energy savings expected by 2016**	**CO_2 Emissions avoided by 2016**
Measures		[GWh p.a.]	[GWh p.a.]	[m tonnes CO_2]
Residential Sector:				
RES-1	Actions for compliance with Directive 2002/91/EC and to implement Leg. Dec. 192/05	5 832	13 500	3.51
RES-2	Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs	*3 744	4 800	2.11
RES-3	Replacement of dishwashers with class A rated appliances	21	44	0.03
RES-4	Replacement of refrigerators and freezers with class A+ and A++ rated appliances	82	2115	0.93
RES-5	Replacement of washing machines with appliances rated higher than class A	2	420	0.18
RES-6	Installation of solar heating panels for hot water	1 400	2 200	0.97
RES-7	The use of efficient air conditioning systems	24	540	0.24
RES-8	The use of efficient central heating systems	3 929	26 750	6.66
RES-9	Balanced flues and wood-fired boilers	325	3 480	0.83
RES-10	Natural gas decompression, PV plant	190	300	0.13
RES-11	Low flow-rate water aerators	5 878	5 878	1.60
Total Residential Sector		**31 427**	**60 027**	**17.18**
Service Sector:				
TER-1	Upgrading energy efficiency of existing buildings	80	11 166	2.90
TER-2	Offering of incentives for the use of efficient air conditioning systems	11	2 510	1.10
TER-3	Low-energy lamps and control systems	100	4 300	1.89
TER-4	Low-energy lamps and luminous flux regulating systems (public lighting)	462	1 290	0.57
TER-5	Low flow-rate water aerators	385	340	0.11
TER-6	Transposition of Directive 2002/91/EC and implementation of Legislative Decree 192/05 on new buildings since 2005	4 004	4 984	1.30
Total Service Sector		**5 042**	**24 590**	**7.87**
Industrial Sector:				

IND-1	Low-energy lamps and control systems	617	1 360	0.60
IND-2	Installation of more highly efficient electric motors	16	2 600	1.14
IND-3	Installation of inverters on electric motors	121	300	0.13
IND-4	High-performance co-generation	2 493	6 280	1.26
IND-5	Refrigeration, inverters on compressors, replacement of boilers, recovery of thermal waste	5 023	9 600	3.08
Total Industrial Sector		**8 270**	**20 140**	**6.21**
Transport Sector:				
TRA-1	Government incentives 2007, 2008, 2009 to encourage environmentally friendly replacements for cars and commercial vehicles up to 3.5 tonnes	2 972	2 186	0.59
TRA-2	Application of Community Regulation EC 443/2009 that defines levels of performance in connection with emissions from new vehicles within the context of the integrated Community approach to the reduction of CO_2 emissions from light vehicles		19 597	5.30
Total Transport Sector		**2 972**	**21 783**	**5.89**
Total Energy Savings		**47 711**	**126 540**	**37.16**

(*This value is reduced to 50% of the registered figure, on the conservative hypothesis that the number of low-energy bulbs actually installed is at least half of the total of those sold/distributed with the EPC system; the RES-1 figure replaces the following specified in EEAP 2007: insulation of opaque surfaces on pre-1980 residential buildings; replacement of single glazing with double glazing; transposition of Directive 2002/91/EC and implementation of Legislative Decree 192/05; the PV included in RES-10 represents the proportion not incentivised by the feed-in tariff and contributes just 43GWh p.a. to the total figure; measure TER-1 reflects a low monitoring value, that does not take account of the coming into force of the new regulation;** the definition of this figure has been changed from the one given in EEAP 2007 for reasons of clarity).

In connection with achieving the primary energy savings targets by 2020, as established in the European Union's "Energy Package", the second plan, as required by the European Commission, also addresses the achievement of the target of a 20% reduction in the primary energy demand by 2020, even though to achieve such an ambitious target other measures may have to be brought into play.

With regard to achieving the intermediate target by 2010, defined at the time, the first plan made it possible to exceed the targets set for 2010 (3.6% against the 3% expected) and, since some measures were more effective than others (see paragraph 1.3), the overall trend of the savings in final energy usage is in line with the targets laid down by Directive 2006/32/EC for 2016.

In relation to the critical elements encountered, it should be pointed out that a sizeable part of the measures laid down in the Action Plan is linked to non structural incentive mechanisms. For this reason stable and financially viable incentive schemes (e.g. a review of the white certificates system with an upward revision of the targets and “thermal energy feed-in tariffs”) are being prepared to make it possible to achieve the ambitious energy efficiency targets that the European energy strategy sets for 2020[4].

Given that the majority of energy efficiency actions lead to a reduction in levels of CO_2 emissions and hence contribute to the achieving of the target, a column has been added to Table 1.1 to indicate for each action the quantity of CO_2 avoided; this value was calculated taking account of appropriate emissions factors[5] and, where the energy content was not from just a single source (e.g. RES-1, RES-8, RES-9, etc.), by considering the mix of energy types for each action with their respective percentages (e.g. 22% electricity, 10% diesel, 68% methane for RES-1).

[4] Legislative Decree: “Implementation of Directive 2009/28/EC on promoting the use of energy from renewable sources, containing modifications and subsequent abrogation of directives 2001/77/C/EC and 2003/30/EC implemented by Directive 2099/28/EC.”

[5] Emissions factors: petrol 270 g CO^2/kWh, diesel 263.8 g CO^2/kWh, LPG 224.6 g CO^2/kWh, methane 201 g CO^2/kWh, electricity 440 g CO^2/kWh.

1.3 Energy savings on a national scale

During the period 2007-2010 the primary energy demand in Italy fell from 194.5 to 185.2 MTOE, 83% of which was satisfied using fossil fuels, of which 39% was petroleum, 37% natural gas, and 7% coal and other solids, with the remaining part coming from renewable sources and the importation of electrical energy (respectively 12% and 5%). This reduction was caused by the lower demand from the industrial sector brought about by the economic crisis, the effects of which weighed heavily on both exports and domestic consumption, causing an increase in the cost of credit and a reduction in the flow of financing, hence contributing to the fall, in 2009, of gross domestic product and a reduction in the levels of employment.

In this context, the energy intensity of the GDP of the last four years fell further after the stability of the 1990-2006 period. Both the actual improvement in efficiency, and especially the gradual erosion of the Italian economy contributed to this reduction, along with the continual growth of the less energy-intensive services sector at the expense of industry.

The final energy demand

Energy consumption in the final use sector fell from 139.3 MTOE in 2007 to 137.5 MTOE in 2010 (provisional figures), displaying a particularly significant downward trend from 2008 to 2009 (-5.6 percent). Overall final energy uses increased by 8.7% during the period 2000-2005 and fell by 9.2% during the years 2005-2009.

This reduction can be attributed primarily to the industrial sector and to non energy uses, whereas there was an increase in consumption in the domestic sector (residential and service sectors) and a slight reduction in the transport sector.

An analysis of the consumption by individual source (Fig. 1.2) reveals a trend of diversification in the use of energy sources. Specifically, it shows a reduction in 2008 (-3.4%) and in 2009 (-5.5%) in the use of petroleum products, that were still the principal source of energy accounting overall for about 47% of the energy consumed (both in 2008 and 2009).

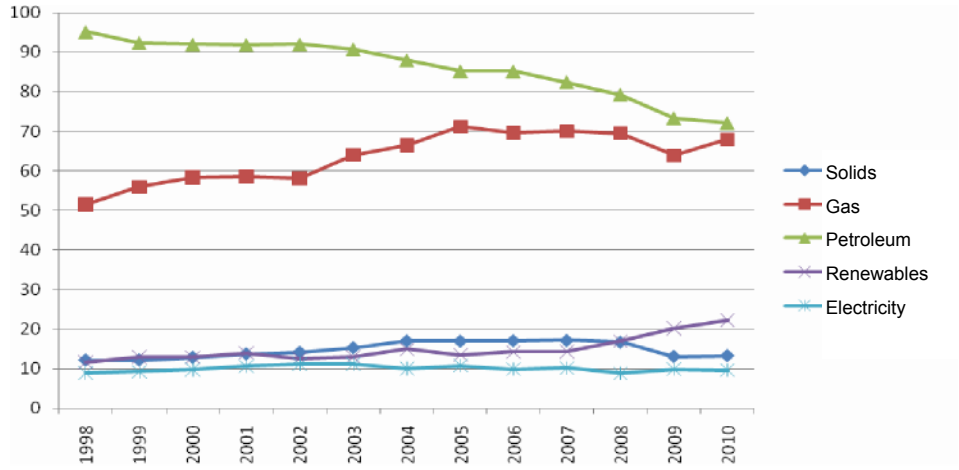


Figure 1.2 – Primary energy demand (MTOE) by individual source in Italy (Source REA2009[6])

In 2010, instead, although the figures are still provisional, we can see a reduction in the use of this source in the transport sector (-0.3%), industry (-0.1%) and for domestic uses (-4.8%). Furthermore, in 2010 there was an increase in the use of renewable sources (14.5% compared with 2009). The use of natural gas saw a recovery of 7% compared with 2009, due particularly to the industrial sector (+7.1%), transport (+13.2%) and domestic uses (+7.1%).

During the 2007-2009 triennium, the division between the various sectors remained more or less unchanged (Fig. 1.3), with domestic and transport uses each accounting for 31.5% of end-use, the industrial sector 26.5%, while 5.7% was consumed for non energy uses, especially in the petrol-chemical industry. The remainder was used in the agricultural sector and for bunkering.

In the industrial sector, the predominant forms of energy turn out to be gas and electricity (about 70% of the total consumption). In 2010 this sector partially recovered (+5.5%) the significant contraction in its consumption that was recorded in 2009 in line with the strong downturn in industrial production. The downturn had confirmed the negative trend of the 2007-2009 triennium following the slow-down caused by the dynamics of energy pricing, the introduction of more stringent environmental standards and structural factors such as the fall in the influence of heavy industry.

[6] ENEA, Energy and Environment Report, Analyses and Scenarios 2010

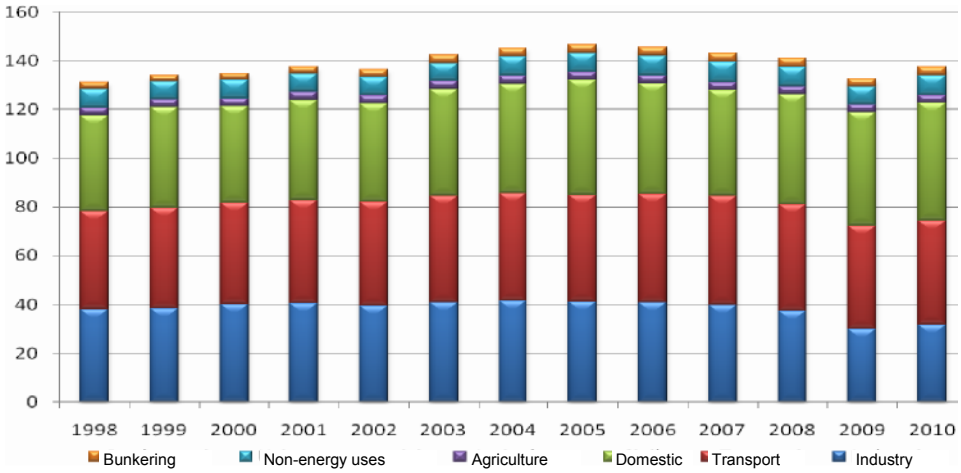


Figure 1.3 – Final Energy Consumption (MTOE) in the User Sectors (Source Stat 2009)

As far as final energy demand in the transport sector is concerned, this accounted for 31.5% of the total and had grown since 1990 at an average annual rate of 1.5%. Ninety percent of the demand was linked to the road transportation of persons and goods. Italy has a high number of cars per head of population (in 2007 it was 598 per 1 000 inhabitants, compared with the average for the EU of 464) with a typically low unit consumption of fuel (in 2007 it was 17.5% less that the European average). Commercial vehicles are numerous, but relatively inefficient from an energy point of view. As much as 86% of goods (73% in the EU) is transported by road, by a fleet of vehicles with an average age in excess of that encountered in the major European countries and carrying lighter payloads.

National policies after 2007

Since the 2007 Plan was issued new legal dispositions, implementation standards and guidelines have been published, that all contribute to the achieving of the predetermined targets. Among the various provisions special mention should be made of Legislative Decree 115/08, the Ministerial Decree of 26 June 2009 containing the National Guidelines for the Energy Performance Certification of Buildings in implementation of Legislative Decree 192/2005, Law 99/2009 and Legislative Decree 28/2011.

Legislative Decree 115/2008

Legislative Decree 115 published in 2008 implements Directive 2006/32/EC, by targeting the efficiency of end uses and energy services. The decree is of major importance since it addresses a large spectrum of diverse matters involving the energy sector. A summary of the key points is provided below:

- the adoption of measures for the harmonisation and distribution of State and regional functions relating to energy efficiency;
- provisions for the development of the white certificate mechanism;

- the laying down of a series of administrative and authorisational simplifications;
- the assigning of an important role to the public sector, which is called upon to make the best use of technical, economic and financial instruments to implement initiatives to improve efficiency and promote actions throughout the country;
- the promotion of the education and certification of the skills of individuals involved in the provision of energy services;
- the definition of energy service contracts and emphasis on the importance of the public sector appointing an energy manager;
- the definition of criteria for individuals authorised to carry out the energy performance certification of buildings;
- the assigning to ENEA-UTEE of the role of national agent for energy efficiency in support of the Ministry of Economic Development, for the monitoring and reinforcement of legislative action;
- the provision of a clear definition of ESCOs.

President Decree No 59 of 2 April 2011

Regulation 59/2011, implementing Legislative Decree No 192 of 19 August 2005 (Directive 2002/91/EC) contains the methodologies for calculating the minimum energy performance requirements for buildings and heating systems in connection with winter heating and summer air conditioning (with reference solely to the building envelope) and the production of hot water for personal use. This provision also regulates the installation, operation, maintenance and inspection of heating plants.

Ministerial Decree of 26 June 2009

The Ministerial Decree of 26 June 2009 containing the National Guidelines for Energy Performance Certification of Buildings gives effect to a key element of Directive 2002/91/EC of the European Parliament concerning the certification of a building's energy performance.

Law No 99 of 23 July 2009

In 2009 Italy published Law No.99, providing the regulatory basis for the formulation of a new energy policy, with the aim of creating a long-term global strategy for the development of the national energy sector that is consistent with the principles governing a free energy market, .

It provides, *inter alia*, for the Ministry for Economic Development (MiSE) to organise a national conference on energy and the environment in collaboration with the Ministry of the Environment and Protection of the Land and Sea. The MiSE is also assigned the task of drawing up a plan to be included in the document on the Government's triennial forecast.

Legislative Decree No 28 of 3 March 2011

The National Renewable Energy Action Plan provides directions and requirements within the field of energy efficiency leading to an evaluation of the objectives of Directive 2006/32/EC within a

strategic context even outside the sphere of its own sector.

More specifically, Legislative Decree No 28 of 3 March 2011, which is geared to the implementation of Directive 2009/28/EC on promoting the use of energy from renewable sources, integrates measures for energy efficiency and those for the use of renewables.

In relation to "Information and training", Article 14 under TITLE III indicates that a web portal must be created containing information of various kinds relating to the production of energy from renewable sources together with information about energy efficiency (incentives, benefits, trends, good practice, authorisational procedures, etc).

With regard to "Support schemes", under TITLE V, the way they are managed is redefined not only in relation to energy produced from renewable sources, but also energy efficiency, through the restructuring and broadening of existing incentive schemes.

In particular the decree specifies provisions to be implemented immediately and others for the medium to long term. For the medium term, transitional measures are laid down along with a series of implementational decrees with short timescales. For other measures over the longer term there are implementational decrees, some of which have no deadline.

- Article 23 states that the "new regime sets out a general framework aimed at promoting the production of energy from renewable sources and energy efficiency to an extent that is appropriate to achieving the targets specified in Article 3, through the provision of criteria and measures that promote the effectiveness, efficiency, simplification and stability over time of the incentive programmes, while at the same time seeking to harmonise with other measures having similar objectives and to reduce the specific support charges borne by the consumer…", bearing in mind market forces and the development of technologies for renewable sources and energy efficiency.

  Furthermore:

  Article 27 provides for the incentivising of measures and actions for improving energy efficiency, together with the production of thermal energy from renewable sources, through contributions to be applied to natural gas tariffs for small-scale works and through the issuing of white certificates for works that "are not included in paragraph a), on the conditions and in accordance with the modalities laid down in Article 29".

- Articles 28 and 29 of the decree lay down incentive measures for small-scale energy efficiency works. For large-scale projects – that is those that produce savings in the order of tonnes of oil equivalent (TOE) – the White Certificate scheme is reaffirmed with some additions and modifications, including the following dispositions:

  "... 2: for the purposes of applying the white certificates system, the savings realised in the transport sector through the schedules referred to in Article 30 have the same validity as savings of natural gas.

  "... 3: Energy savings achieved through works to improve the efficiency of the electricity and natural gas networks identified in the schedules referred to in Article 30 contribute towards the meeting of the obligations resting upon distribution companies. White Certificates may be issued for these works."

- In relation to specific measures on the matter of energy efficiency, Article 30 requires that ENEA draw up at least 15 standard schedules[7] for quantifying savings in the context of the white certificates system, with particular regard to various sectors/works, as well as the preparation of case studies and standard parameters as a guide to facilitate the realisation and the replicability of time and materials works.

- Programmes in support of technological and industrial development are provided for in Article 32, to meet the need to guarantee a balanced development of the various sectors that combine to achieve the targets set out in Article 3, through the simultaneous stimulation of supply and demand for technology for energy efficiency and renewable sources.

With reference to "Guarantees of origin, statistical transfers and common projects", Title VI, Article 36 governs the modalities for supporting electricity from renewable sources imported from abroad and produced as a venture by bodies operating in the energy sector, on the basis of international agreements drawn up where necessary.

These agreements comply with the following criteria:

"…a) the support is provided through the granting, on the energy fed into the national grid, of an incentive that, in comparison with the incentive granted in Italy to the sources and to the types of systems by which the electricity was produced in the foreign country, is of equal duration and smaller in size, at the rate set in the agreements referred to in this article, taking account of the greater production capability and efficiency of the systems in the foreign countries and the average value of the incentives for renewable sources in Italy."

In relation to the "Statistical transfers between regions", as per Article 37, regions and autonomous provinces may enter into agreements about specific quantities of renewable energy in order to achieve their own targets, promoting energy efficiency in line with national regulations and offering incentives for the production of energy from renewable sources and for energy efficiency, within the limits set by the same national regulations on cumulability.

As fast as "Monitoring, control and reporting" activities are concerned, Title VIII, Article 40 lays down that the GSE (the energy services provider) must, *inter alia*, evaluate the results associated with the spread of energy efficiency, as well as of renewable sources, and in terms of the reduction of green-house gases. Furthermore, by 31 December 2011 and every two years thereafter, ENEA shall send to the Ministry of Economic Development and to the electricity and gas authority a report concerning the status and the prospects of the technologies for the production of electricity, heat and bio-fuels, as well as the status and the prospects of the major technologies for energy efficiency, paying particular regard to availability, commercial costs, innovative systems not yet on the market and the remaining national potential for renewable sources and energy efficiency.

Finally Attachment 2 of the decree (with reference to Article 10, paragraph 1) indicates the minimum performance requirements for plant and equipment powered from renewable sources to qualify for national incentives, in accordance with specific parameters such as COP (Coefficient of Performance) for electric heat pumps, EER (Energy Efficiency Ratio) for summer air conditioning and SPF (Seasonal Performance Factor).

With a view to the integration of the targets for reducing energy consumption and developing renewable sources, the contribution resulting from the implementation of new obligations on the matter of meeting the demand for energy from renewable sources introduced by the decree will be addressed, through specific implementation provisions that are in the process of being

[7] Appendix A shows the preliminary analysis carried out by ENEA in order to define 8 new standard schedules for quantifying savings within the White Certificate mechanism.

issued.

Legislative Decree No 20 of 8 March 2007

With regard to cogeneration, Legislative Decree No 20 of 8 February 2007 transposed Directive 2004/08/EEC at a national level and introduced the definition of high-efficiency cogeneration. Up until 31 December 2010 high-efficiency cogeneration was understood to refer to systems compliant with decision 42/02 AEEG and subsequent amendments, that is that the ESI (energy saving index) and TL (thermal limit) parameters must not be lower than specific preset values. With effect from 1 January 2011, high-efficiency cogeneration has been understood to refer to cogeneration that complies with the requirements laid down by Directive 2004/8/EC, and repeated by Legislative Decree No 20 of 8 February 2007: *a plant produces with HEC characteristics when its Primary Energy Saving index (PES) is greater than a preset minimum value.*

The Ministry of Economic Development, in conjunction with the Ministry of the Environment and Protection of the Land and Sea, is in the process of issuing the decree through which the technical attachments to Legislative Decree 20/07 are updated, in transposition of Directive 2004/08/EEC, in the light of the decisions taken in the interim by the European Commission on the methodologies applicable to the recognition of high-efficiency cogeneration, based on the demand for useable heat in the domestic energy market.

In particular:

- modifications are being made to the parts of DL 20/07 relating to: the definition of the various cogeneration technologies, the guidelines that establish the methodologies for calculating the production from cogeneration and the method for determining the yield of the cogeneration process;

- new calculation methods are being defined for the quantification of energy from cogeneration providing: the yield values to use both for the separate production of electricity and for the separate production of thermal energy, the correction factors, linked to the average climatic conditions at the plant's location, to use with the electricity yield reference values for the separate production and finally the correction factors linked to the losses avoided in the electricity distribution network.

Also in the process of definition is the decree of the Ministry of Economic Development that, pursuant to Law 99/09, defines the arrangements for supporting high-efficiency cogeneration plants, bearing in mind the level of support in place in other European countries and on the basis of the following contents:

- definition of the method for calculating primary energy savings and the consequent determination of the level of White Certificate to award;
- specification of the timescale for awarding White Certificates;
- criteria to be met in evaluating the running of the plant;
- criteria that determine the ineligibility for incentives or the partial suspension and/or loss of white certificates;
- incompatibility of the White Certificate system with other types of incentive programmes.

The role of the public sector

The goal of the Interregional Operating Programme, "Renewable Energy and Energy Savings" (POI Energia) 2007-2013, is to increase the amount of consumed energy derived from renewable sources and to improve energy efficiency and energy savings, by promoting opportunities for local developments, highlighting the interconnection between the production of renewable energy and the improvement of efficiency on the one hand and the social and economic fabric of the Convergence Objective Regions (Calabria, Campania, Apulia and Sicily) on the other.

The financial contribution granted to the MATTM (the Ministry of the Environment) within the scope of POI Energia is EUR 53 m for carrying out work to improve efficiency and save energy in public buildings by implementing emblematic and easily replicated programmes.

The resources set aside to-date amount to EUR 415 m and have enabled work to be started on school buildings (EUR 20 m), hospitals (EUR 60 m) and buildings owned by municipalities of up to 15 000 inhabitants (EUR 60 m). Still within the scope of POI Energy, work has started on improving the energy efficiency of cultural and valued assets (museums and archaeological sites) (EUR 40 m), military buildings, barracks, military academies (EUR 30 m) and airport facilities (EUR 17.3 m). Furthermore, of particular importance is the support for the creation of Sustainable Communities within the scope of which local development initiatives will be promoted through pilot projects on energy efficiency and the production of energy from renewable sources.

Another tool for economic policy through which public resources are made available for the granting of concessionary financing in support of investments contributing to the reduction of climate-changing emissions, thereby complying with the obligations of the Kyoto Protocol, is the Revolving Fund, set up with the 2007 Italian Finance Act. The resources available to the Fund amount to EUR 600 m; the method of dispensing the resources is governed by the decree adopted on 25 November 2008 by MATTM and MiSE.

The Revolving Fund will be made operational by the issuing of a Circular, through the banking circuit, that is applicable to all parties who will be able to obtain concessionary financing in the form of targeted loans, to be repaid at a special fixed rate (0.5% p.a.). The energy efficiency related measures that can be financed through the Fund are as follows:

- measures involving diffused micro-cogeneration;
- measures relating to electric motors;
- measures relating to "end-use".

Finally a series of announcements will be issued by the Regions in connection with the Regional Operational Programme (ROP) 2007-2013, co-financed by the European Regional Development Fund.

1.4 Report on the objectives and results relating to energy saving

This paragraph provides the results of the energy saving monitoring activity carried out as at 31 December 2010 for works realised within the scope of the principal instruments for energy efficiency improvement, in large part already provided for in EEAP 2007.

Directive 2006/32/EC on energy efficiency in end-use and in energy services required Member States to adopt an indicative energy saving target of 9% to be achieved by 2016, the ninth year of application of the directive, through energy services and other measures for the improvement

of energy efficiency.

EEAP 2007 provided for programmes and measures for the improvement of energy efficiency and energy services within the various sectors of the economy (residential, services, industry and transport) for an anticipated annual energy saving by 2016 of 126 327 GWh p.a. This saving, equal to 9.6% of the reference average annual amount consumed nationally (the average of the amount of energy distributed or sold to final customers during the last five years preceding the implementation of the directive, not adjusted for degree days nor for structural changes or production changes), is the result of the sum of the energy savings to be obtained in 2016 through lasting measures and actions carried out during the years of the reference period and that were fully effective as at 31 December 2016.

The quantitative assessment of the savings was carried out with reference to the following measures for the improvement of energy efficiency:

a) transposition of Directive 2002/91/EC and implementation of Legislative Decree 192/05;
b) allowing of tax deductions (55%) for improving the energy efficiency of existing buildings;
c) allowing of tax deductions (20%) for the installation of high-efficiency electric motors and inverters;
d) incentive measures to encourage environmentally sustainable replacement of cars and lorries up to 3.5 tonnes;
e) the mechanism for awarding White Certificates (WC) – or Energy Performance Certificates (EPC) – pursuant to the Ministerial Decrees of 20 July 2004.

In view of the types of measures introduced and the related (partial) overlap in certain cases, as well as the broad spectrum of possible actions considered, the *Bottom Up*[8] approach adopted during the modelling phase allowed a more reliable quantification of the energy savings from individual actions than for measures at a general level.

Table 1.2 presents the annual energy savings targets, overall and by sector, expected by 2010 (intermediate objective) and by 2016 (final objective) set out in EEAP 2007, as well as the results achieved by 2010; the annual energy savings achieved were 47 711 GWh p.a. equal to about 3.6% of the national target. From the table it can be seen that about 70% of the annual energy savings achieved by 2010, equating to 31 525 GWh p.a. come from the residential sector.

Table 1.2 Overall annual energy savings achieved by 2010 and expected by 2010 and 2016 (FEC) – Summary by Sector

Sectors	Annual energy savings achieved by 2010 [GWh p.a.]	Annual energy savings expected by 2010 – EEAP 2007 [GWh p.a.]	Annual energy savings expected by 2016 – EEAP 2007 [GWh p.a.]
Residential	31 427	16 998	56 830
Services	5 042	8 130	24 700
Industry	8 270	7 040	21 537
Transport	2 972	3 490	23 260
Totals	**47 711**	**35 658**	**126 327**

[8] Directive 2006/32/EC defines the methodologies that can be applied for the assessment of the savings achieved by 2016. These methodologies consist of two types: bottom-up and top-down. The first, applied in the Italian EEAP, is based on the calculation of the unit savings achievable through the application of specific measures (e.g. the installation of replacement low-energy bulbs, and efficient domestic electrical appliances). The calculation is based primarily on the number of actions taken and on the savings they achieved. The sum of these savings contributes towards the total required target.

The following table details the targets and the results achieved in relation to the execution of only those measures laid down in EEAP 2007, through which an overall energy saving of 32 334 GWh was achieved.

Table 1.3 – EEAP 2007: Annual energy savings achieved by 2010, expected by 2010 and by 2016 (FEC)

Measures		Annual energy savings achieved in 2010 (net of duplications)	Annual energy savings expected in2010 (EEAP 2007)	Annual energy savings expected in2010 (EEAP 2007)
		[GWh p.a.]	[GWh p.a.]	[GWh p.a.]
Residential Sector:				
RES-1	Insulation of opaque walls of residential buildings post 1980; Replacement of single glazing with double glazed units; transposition of Directive 2002/91/EC and implementation of Leg. Dec. 192/05	5832	3722	13730*
RES-2	Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs	**3744	1600	4800
RES-3	Replacement of dishwashers with class A rated appliances	21	305	1060
RES-4	Replacement of refrigerators and freezers with class A+ and A++ rated appliances	82	1 210	3860
RES-5	Replacement of washing machines with appliances rated higher than class A	2	31	410
RES-6	Installation of efficient electric water heaters	1400	700	2200
RES-7	The use of efficient air conditioning systems	24	180	540
RES-8	The use of efficient central heating systems	13929	8150	26750
RES-9	Balanced flues and wood-fired boilers	325	1100	3480
	Total Residential Sector	**25359**	**16998**	**56830**
Service Sector:				
TER-1	The use of efficient central heating systems	80	5470	16600
TER-2	Offering of incentives for the use of efficient air conditioning systems	11	835	2510
TER-3	Low-energy lamps and control systems	100	1400	4300
TER-4	Low-energy lamps and luminous flux regulating systems (public lighting)	462	425	1290
	Total Service Sector	**653**	**8130**	**24700**
Industrial Sector:				
IND-1	Low-energy lamps and control systems	617	700	2200
IND-2	Replacement of 1-90 kW class EFF2 electric motors with those of class EFF1	16	1100	3400
IND-3	Installation of inverters on electric motors of 0.75-90 kW	121	2100	6400
IND-4	High-efficiency co-generation	2493	2093	6280
IND-5	Use of mechanical steam compression	103	1047	3257
	Total Industrial Sector	**3350**	**7040**	**21537**
Transport Sector:				
TRA-1	The introduction of an emission limit of 140 g of CO_2/ Km (average of the range of vehicles sold)	***2972	3490	23260
	Total Transport Sector	**2972**	**3490**	**23260**
	Total Energy Savings	**32334**	**35658**	**126327**

(* This figure is the sum of the estimated values of EEAP 2007 in relation to measures Nos 1 and 2, the value of the monitoring also taking account of actions taken due to the implementation of Legislative Decree 192 and Directive 2002/91/EC on new buildings.
** This value differs from the corresponding figure contained in Table 3.5, i.e. it is reduced by 50%, on the conservative hypothesis that the number of low-energy bulbs actually installed is at least half of the total of those

sold/distributed under the EPC scheme;
*** The value achieved in 2010 through measure TRA-1, in reality relates to the monitoring of government incentives 2007, 2008 and 2009 promoting the environmentally sustainable replacement of cars and lorries up to 3.5 tonnes)

Table 1.4 shows measures that were not specified in EEAP 2007, that led to a significant additional contribution of 15 377 GWh (1.2% of the reference national consumption), thanks to which the total energy savings in 2010 amounted to 47 711 GWh p.a., equal to 3.6% of the reference national consumption.

Finally, other energy savings were achieved totalling 5288 GWh p.a., relating to maintenance operations on heat generators in the residential sector (not reported in the table because they were outside the calculation methodology used to assess the estimate of RES-1), which take the total savings achieved up to 53097 GWh p.a.

Table 1.4 – Annual energy saving achieved by 2010 (FEC) – Detailed by individual measure not laid down in EEAP 2007

Measures		**Annual energy saving achieved in 2010 (net of duplications)**
		GWh p.a.[GWh p.a.]
Residential Sector:		
RES-10	Decompression of natural gas, PV < 20kW, cogeneration, district heating systems	190
RES-11	Low flow-rate aerators for showers, water kits, aerators for taps	5878
RES-12	Automatic switch-off devices for appliances in standby mode	0
	Total Residential Sector	**6068**
Service Sector:		
TER-5	Low flow-rate aerators for showers in hotels and sports facilities	385
TER-6	Transposition of Directive 2002/91/EC and implementation of Leg. Dec, 192/05	4004
	Total Service Sector	**4389**
Industrial Sector:		
IND-6	Refrigeration, inverters on compressors, replacement of boilers, recovery of thermal waste	4920
	Total Industrial Sector	**4920**
	Total Energy Savings	**15377**

(The PV included in RES-10 equates to the part not covered by the incentives of the feed-in tariff and contributes only 43 GWh p.a. to the total figure.)

1.5 Impact of EEAP 2011 on primary energy and CO_2 emissions

1.5.1 Introduction

The package of measures laid down in the plan calls for a reduction in final energy consumption of 10.9 MTOE by 2016 compared with the figure without the actions laid down in the EEAP.

It would be of interest to quantify what the effects of those measures will also be on primary energy, on how the country's energy mix would be affected and on the elimination of CO_2 emissions.

To this end a scenario analysis was carried out, i.e. on the use of internally compatible descriptions of the evolution of the energy system that make it possible to "pull together" all the components of the system. Compliance with the scientific criteria of internal consistency – the values used for all the variables under consideration must be consistent in relation to each other – and transparency and replicability of each scenario, are guaranteed by the development of each scenario by means of 'formal' models.

ENEA's Study Unit carries out analyses and evaluations of the national energy system using formal models developed by means of the MARKAL-TIMES methodology. MARKAL and TIMES are partial economic equilibrium model generators developed by the International Energy Agency's Energy Technology Systems Analysis Program (IEA-ETSAP).

The TIMES-Italy model represents the Italian energy system in its entirety, from the supply of the primary sources to the transformation processes (refining and generation of electricity and heat), transportation and distribution of energy, through to the end use devices for the supplying of energy services (passenger*kilometres, building heating, cement products, etc.)

The ENEA scenarios are constructed using a codified methodology, used for example by the International Energy Agency of Paris in its ETP2010 report, and by many other analysis groups around the world.

1.5.2 Extension of the energy efficiency measures to 2020

Since 2020 is a reference year for the principal Community targets and for the commitments made at a national level, the evaluations of the impact of the plan on primary energy and CO_2 emissions were made using this timeframe. To this end the measures laid down by the plan were extended to 2020, keeping unchanged the hypotheses and the assumptions that under-pinned the measures specified for 2016 (e.g. the penetration and the rates of replacement of more efficient equipment, upgrading of plant efficiency, the application of regulations, etc.).

The extension of EEAP 2011 to 2020 led to a reduction in final energy of about 15.9 MTOE (Table 1.5).

Table 1.5 – Reduction of final energy consumption expected by 2016 and by 2020

Sectors	Reduction in final energy 2016		n Reduction in final energy 2020		n CO_2 avoided by 2020
	GWh p.a.	MTOE p.a.	GWh p.a.	MTOE p.a.	m tonnes
Residential	60 027	5.16	77 121	6.63	18.0
Services	24 590	2.11	29 698	2.55	9.45
Industry	20 140	1.73	28 678	2.47	7.20
Transport	21 783	1.87	49 175	4.23	10.35
Totals	**126 540**	**10.88**	**184 672**	**15.88**	**45.0**
(% compared to average GFC 2001-2005)	**(9.6%)**		**(14%)**		

In the residential sector the energy efficiency improvement measures identified in the EEAP relate to two categories of action, the energy performance of buildings (envelope and systems) and consumption by appliances (domestic electrical appliances and sources of light). In the case of the first, the measures (RES-1, RES-8, RES-9, RES-11) match the expectations introduced with the energy performance certification of buildings (Directive 2002/91/EC, Legislative Decree 192/05), whereas with the second (RES-2, RES-3, RES-4, RES-5) they take their cue from the existing European and national legislative framework on energy labelling (Directive 2005/32/EC Energy Using Products, EUP). The extension of the measures through to 2020 results in about 1.4 MTOE in additional savings over and above the value expected by 2016 (Table 1.5). Of these, more than eighty percent is attributable to actions relating to the demand for heating and hot water for personal use (RES-1, RES-6, RES-8, RES-9). Significant reductions are also expected on the main domestic electrical appliance front, where there is expected to be an acceleration in the improvements in average performance due to the rapid spread of new generation appliances (about 15% of additional savings in fact being attributable to measures RES-2, RES-3, RES-4, RES-5).

The efficiency improvement measures in the services sector relate to four categories of actions: energy performance of buildings, efficient air conditioning, and public and interior lighting. As with residential, these measures are derived from the transposition of the directive on energy performance certification of buildings (EPBD 1 and 2), the requirements for energy related products (ErP) and ecolabelling. The extension of the plan led to a reduction in consumption in the sector of more than 2.5 MTOE by 2020. The additional savings above the value expected by 2016 are about 0.45 MTOE, of which more than 70% is attributable to actions involving lighting and the use of efficient air conditioners (TER-2, TER-3, TER-4), and the remainder to measures for the structural / energy system refurbishment of the building stock (maintaining the already significant impetus as at 2016, it was estimated that by 2020 work would be carried out on only an additional 10% of buildings, such as schools, administrative buildings and hotels) and low flow aerators (TER-1, TER-5, TER-6).

In the industrial sector, the measures considered in the action plan involved the following categories: the illumination of buildings and work places, efficient transportation (Reg. 640/2009), variable speed drives, high-efficiency cogeneration, refrigeration, boiler replacement and the recovery of thermal waste. The extension of the measures results in a saving by 2020 of almost 2.5 MTOE. Of the additional reduction above the 2016 target (about 0.7 MTOE) 15% is attributable to actions involving lighting, motors and inverters on pumping systems (IND-1, IND-2, IND-3), 23% to high-efficiency cogeneration (IND-4), and the remainder to measure IND-5.

In the transport sector the measures affect the mobility of road transport users; in essence they relate to vehicle technology issues: the introduction of emissions limits (and hence consumption) for new vehicles (Reg. 443/2009) and low rolling resistance tyres. The extension of these measures results in a reduction in consumption of about 4.2 MTOE in 2020, against an expected saving in 2016 of almost 2 MTOE. The significant additional saving is attributable primarily to the intensification of the average emissions limits for new cars being brought to market (they in fact fall from 130 g CO_2/km in 2015 to 95 in 2020).

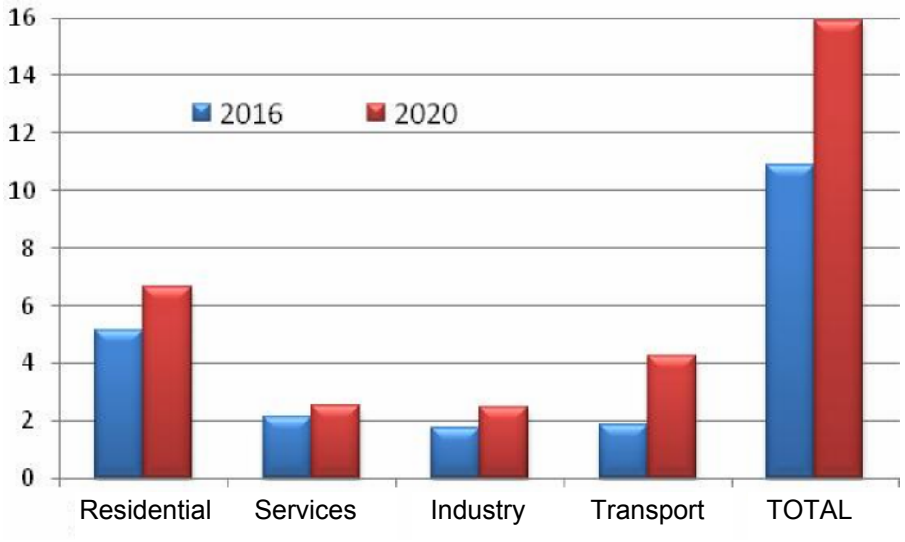


Figure 1.4 – Reduction in final energy, in total and by sector, in 2016 and 2020 (MTOE)

1.5.3 Analysis of the results

By applying the measures laid down in the plan (and the extension) to a reference scenario (that represents a development of the energy system that is neutral from a policy point of view, it being a projection of existing trends in technology and socio-economic dynamics) the reduction obtained by the year 2020 in terms of primary energy is more than 18 MTOE.

Of this 55% is attributable to natural gas: in 2020 the reduction in gas consumption between the two scenarios is in the order of 10 MTOE. This reduction is attributable essentially to lower consumption for heating in the domestic sector, due to the transposition of Legislative Decree 192/05 and the use of more efficient plants. Moreover, a significant contribution to the reduction in the consumption of gas comes from the amount of fuel used in generation, due to the fall in the demand for electricity: in the domestic sector, due to the adoption of better performing electrical appliances, air conditioners and lighting systems, in industry, due to the use of more efficient motors and inverters.

Instead, the anticipated reduction in the consumption of petroleum products, more than 7 MTOE in 2020 (about 40% of the total primary energy saved that year), is attributable primarily to the measures laid down for the transport sector.

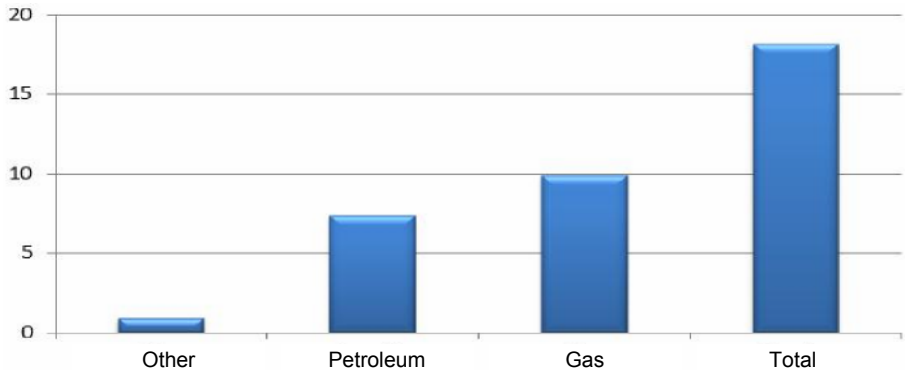


Figure 1.5 – Reduction in primary energy by source, 2020 (MTOE)

The 2020 forecast for CO_2 emissions avoided, due solely to the "extended EEAP 2011", exceeds 45 million tonnes; the contribution of each end-use sector to the elimination of emissions mirrors their respective expected reductions in consumption (Fig. 1.6).

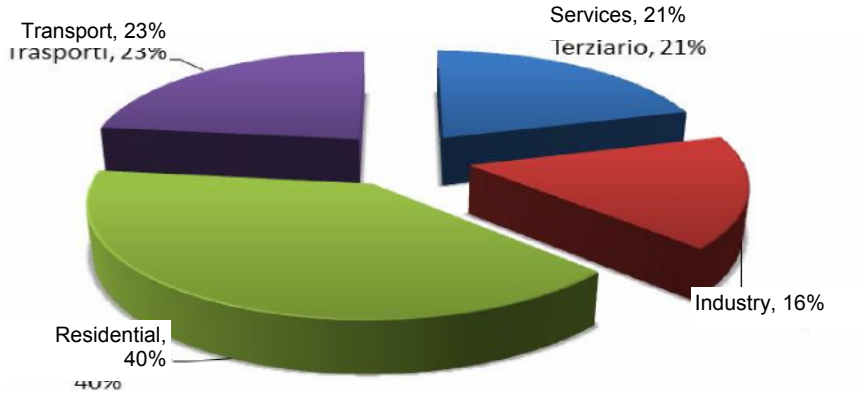


Figure 1.6 – Contribution to the elimination of CO2 by sector in 2020

This value in terms of reduction of CO_2 must be taken into account in the construction of CO_2 reduction scenarios relating to decision 406/2009/EC (effort sharing), that for Italy calls for a reduction of 13%, compared with 2005, in emissions of CO_2 in the non ETS sectors.

2 Savings in Primary Energy

2.1 Targets and strategies for reducing primary energy consumption

Italy, together with the other countries of the European Union, has committed to meeting targets set in March 2007 by the Presidency of the European Council in Brussels.
On the basis of the effort sharing agreement reached by Member States with the approval of the climate and energy package, by 2020 Italy must have achieved the following objectives:

- a level of renewable energy equal to 17% of gross final consumption (10% from renewable sources in the transport sector);
- a reduction of 21% in emissions in the ETS sector;
- a reduction of 13% in emissions in the non-ETS sector (compared with 2005).

The objective for 2020 of reducing primary energy consumption by 20% in relation to the projections of the trends for the same year is the only one not to be binding in nature[9].

Nevertheless, as indicated in the EU's policy documents[10], energy efficiency improvement is a fundamental instrument for achieving the targets for the development of renewable sources and, by means of them, for fulfilling the obligations for CO_2 reduction by 2020.

Energy efficiency and renewable sources are correlated tools in the battle against climate change, the success of which requires an integrated and global approach.

Paragraph 1.4, provided an assessment, made using the Times-Italy model for the 2020 timeframe, of the impact of the energy efficiency measures on the reduction of primary energy consumption and emissions of CO_2, in order to assess the achievement of the targets set by the EU.

In line with the methodological approach suggested for developing this plan, the idea is, through the use of modelling, to integrate energy efficiency into the broader energy policy, in particular the Community's energy and climate change package.
The use of the model makes it possible to draw together all the components of the system, an essential element in making quantitative assessments that take account of the interdependencies between the various EU goals.

[9] The Commission's package of legislative proposals on Energy and Climate of 23 January 2008 contains no legislation concerning the implementation of the 20% energy-saving target confirmed by the Council in March 2007, but merely a Communication (COM 2008, 11 final, of 23 January 2008). As stated by the title of the Communication itself, "First assessment of national energy efficiency action plans: moving forward together on energy efficiency", the Commission limited itself to an assessment of the national energy efficiency action plans.
[10] The communication *Energy 2020 - A strategy for competitive, sustainable and secure energy* published recently by the European Commission highlights how energy efficiency is the instrument with the best cost-benefit ratio for the reduction of emissions, the lowering of energy costs and the creation of new jobs.

2.2 Estimate of the savings achievable by improving the efficiency of the electricity distribution and transmission networks

The electricity network is an essential infrastructure enabling the producer to transfer power from the point of production to the end user. It is abundantly clear that the multiplicity of production sites and the number of end users has given rise to a system that is highly complex and in need of constant attention both to ensure its reliability and to optimise its efficiency from an energy point of view.

In this context the development and enhancement of the national transmission grid is a necessity, for two main reasons. The first is to overcome the bottle-necks that still develop in the Italian network, and that limit both the use of the power produced by the most economical plants and the creation of a single energy market. The second is to benefit from the prospect of potential new uses for electrical power in areas such as heating/air conditioning (through the increased use of heat pumps) and transport (electric vehicles), where its use today is marginal.

Of equal importance seem to be actions for expanding the transmission grid to connect the wind farms that are becoming widespread in the centre-south and the islands and to guarantee delivery of the power generated without creating congestion. It is also worth remembering that the availability of an adequate transportation system enables high-efficiency thermal power stations, such as cogeneration plants, to continue operating even when there is peak production of wind energy at the time of favourable meteorological conditions.

As far as the distribution network is concerned, the need to develop and upgrade it is justified not only by the continuing growth in demand from the residential and service sectors, but above all by the significant spread of generation by small-scale plants (from renewable sources – photovoltaic, biomass and mini-hydro – and from small and micro cogeneration plants). The need to connect these plants to the distribution network is putting great pressure on the current structure, which was designed primarily to serve clients who withdraw power. To meet this new demand the distribution network must evolve its functionality, ensuring that the input of electrical power produced locally by distributed plants does not adversely affect the quality of the service in terms of its continuity and stability.

The distribution network of the coming years must therefore be equipped with greater intelligence (from which comes the evocative term "*Smart Grid*", coined to refer to the grid of the future), which will be provided by means of a widespread communication and control system that will innervate the present network. In this regard the installation of intelligent meters and the implementation of a computerised support infrastructure, created by ENEL, has made Italy a major player globally in terms of the number of users involved. In fact, 32 million measurement points are now managed remotely with electronic transactions that enable the use of a new system of tariffs, featuring flexibility and adaptability to any demands with the potential for significant savings.

All in all, the modernisation and the enhancement of the network infrastructure is the condition needed to obtain a more secure electrical power system with lower CO_2 emissions, capable of guaranteeing the fullest use of the most efficient production units and in which there will be greater scope for renewable sources.

Finally, it should be emphasised that the improvement works on the electricity network bring energy benefits due to the reduction in leakages of electricity from the network. Although it should be remembered that the percentage of electricity lost from the Italian network, at little more than 6% of the power fed into the grid, is among the lowest on the European scene, it could be reduced further as a result of appropriate work to modernise and strengthen the network, which would

therefore contribute to increasing the efficiency of the national power system.

Below we examine in more detail the output of the production system and the effects on overall energy efficiency resulting from the actions to modernise and develop the electricity distribution and transmission networks.

2.2.1 Output of the electricity production system by 2020

During the last decade the Italian electricity production system was the subject of a thorough modernisation project, with 30 000 MW of new plants (both new and replacements for existing plants) entering production, primarily combined-cycle gas plants. As a result of these actions, today the Italian network of natural gas thermal power stations is among the most efficient in the world.

During the coming decade works are anticipated on the generation network in relation to the development of production from renewable sources, in accordance with what is laid down in the NREAP, the gradual spread of high-efficiency cogeneration plants (including small-scale) and the development of new clean coal (USC) units. Furthermore, it is hypothesised that the importance of electrical power from abroad (Member States and other states) will continue to play a significant role, (the NREAP anticipates the importing of more than 12 TWh of energy from renewable sources, including via new connections with Montenegro, Albania and Tunisia).

In keeping with this picture, below is defined a possible electricity production scenario as at 2020, assuming that the requirement of the Italian electricity network (including consumption for pumping) to satisfy internal demand at that date is 374 TWh. In order to meet the above-mentioned demand for electricity using the plants available in 2020, a possible split between the various production sources/technologies is illustrated in Table 2.1:

Table 2.1 – Possible breakdown between the various production sources/technologies

Net electricity production scenario in 2020	TWh
Renewable sources (including biomass cogeneration)	97
Non-cogeneration fossil fuel plants	168
Fossil fuel cogeneration plants	72
Pumping	7
Importation	30
TOTAL	374

In this scenario the use of primary energy for the production of electricity amounts to 750[11] TWh (this also includes about 60 TWh of heat produced through cogeneration) and the conversion yield of electrical power produced in Italy (i.e. excluding the 30 TWh imported) is 47.8 %.

With reference just to thermoelectric power generation, the electricity yield amounts to 41 %, which rises to 48.1 % if one considers solely non-cogeneration fossil fuel thermoelectric production.

[11] To calculate the primary energy corresponding to the electrical power produced from renewable sources, reference was made to the following conversion factors prepared by Eurostat statisticians: hydro-electric, wind, solar: 100 %; geothermal electricity: 18 %; biomass: 30 %. Equally, no transformation loss was associated with imported electrical power.

2.3.1 Distribution network

The electricity leakages from the medium and low-tension distribution networks represent about 60 % of the leakages overall from the electricity network and are concentrated on transformers and the cables of power lines. The possible paths to follow in order to further reduce network leakages involve: reducing the length of the lines, using low-loss components, standardising the voltage level on MT networks and increasing the power factor of the withdrawal by users.

Actions to reduce leakages in the distribution networks

Reducing the length of the lines This action, aimed particularly at MT lines, involves the construction of new transformer substations and is aimed at improving the quality of the service as a result of reducing the length of the MT lines and the number of users serviced from a primary substation. The reduction of the leakages is considered to be a positive result of actions for improving the quality of the service. The present regulatory framework defined by the authority for electrical power and gas already provides for measures aimed at raising the quality of service and hence, indirectly, the reduction of leakages.

The use of low-loss components This relates in particular to the installation of very low-loss transformers (see standard CEI EN 50464-1), that enable significant reductions in leakages (down 15-25 %) compared with the average that is standard in the marketplace. The current regulatory framework already provides incentives to distribution companies, through the granting of a rate of remuneration uplifted by 2 % for 8 years, for investments to replace existing transformers in MT/LT transformer substations with new low-loss transformers (cf. Resolution No 348/07 and subsequent modifications, paragraph 11.4, (b))[12].

Assuming:

a. an annual rate of replacement of MT/LT transformers of 3-4 %,
b. annual MT/LT transformation leakages of about 1.7 % of the transformed power (about 150 TWh in 2008),
c. a reduction in leakages of 20 % due to the replacement of transformers that have reached the end of their working lives, with new low-loss transformers,

one arrives at an annual reduction in leakages of 18 GWh p.a.; supposing that this situation were to continue for the next 10 years, by 2020 there would be a **reduction in consumption of 180 GWh p.a.**

The current regulatory framework excludes new installations from the incentive programmes (i.e. transformers in new secondary substations), that make up 1 % of the existing network. Assuming that low-loss transformers are also always used in new installations, there would be a further reduction of leakages of 5 GWh p.a. (50 GWh p.a. by 2020), compared with the use of traditional type transformers[13].

With regard to the reduction of leakages from cables (in particular overhead lines) through the use of low-resistance materials, the situation is markedly less favourable. In fact, the current trend is towards the use of aluminium cabling (as an alternative to copper cables), that offers lower installation costs, higher load carrying capability and is less susceptible to theft. On the other hand, aluminium cables have a higher resistance than similar cables made of copper and hence result in an increase in leakage.

[12] The increase in the rate of repayment and the duration as per paragraph 11.4 (b) are granted in the case in which the investments made relate to MT/LT transformers complying with the very lowest class of leakage under load "Ak" in accordance with the classification of standard EN 50464-1 and at least class "B0" for no-load leakages in accordance with the same standard

[13] It should be noted that a similar action could involve MT/LT transformers installed on client premises (the annual energy sold to MT clients equates to more than 100 TWh).

Standardisation of the voltage levels in distribution networks The most significant action involves MT networks with levels of voltage that vary but are in any case less than the standard of 15 kV (e.g. 5 kV, 6 kV, 8.4 kV etc.); it involves raising (also called "reclassifying") the voltage of these networks, bringing them up to a standard MT value (15 and 20 kV). MT networks with voltages lower than 15 kV are found as often in urban areas (particularly in the regions of the south) with high loads, as in rural areas. Since the leakages vary by the square of the current, the halving of the current as a result of increasing the voltage to standard values reduces the network leakage to ¼ of their previous level. From initial analyses it is estimated that nearly 6 % of the current distribution network is operated at voltage levels that are below the standard.

Assuming that the MT networks operating at non-standard voltages carry about 6 % of the energy on the national MT network and that as a result of raising the network voltage the current being carried on non-standard networks today is halved from the present values, and also that the value of the losses on the lines of the entire national MT network is 3 300 GWh p.a., then the reclassification of all MT networks with voltages below the standard level would result in a reduction in leakages of almost 500 GWh p.a.[14]

It should be noted that increasing the voltage level on the non-standardised networks would require investments by the distributors in order for the network to guarantee an adequate level of integrity across all its component parts. In particular the underground MT lines would need to be replaced together with MT/LT transformers and MT switchboards that are not capable of operating at standard voltage levels. Nevertheless, the most critical aspect of raising the voltage of the MT networks is the need to modify the clients' systems connected to these networks (as of today estimated at more than 5 000 connection points). There are two kinds of problems associated with these actions: interrupting the power supply in order to modify the plant to comply with the new characteristics of the power being supplied, and the costs of the modifications that the client could incur in the event that his equipment (MT switchboard, transformer) were not homologated to operate at the new voltage level. Current legislation stipulates that the costs of work on user equipment resulting from technical upgrading carried out to his network by the distributor (such as raising the network voltage) are to be borne by the user. The distributor's sole obligation is to give clients appropriate advance warning about the work being carried out on the network, to give them time to modify their systems to handle the new voltage. Many distribution companies have already built into their development plans the raising of the voltage of those networks presently operating at non-standard voltages. Nevertheless, the introduction of a measure to provide incentives to distributors (e.g. increasing the investment remuneration rate, awarding Energy Performance Certificates) could accelerate the rate at which the networks are upgraded and in a short timescale deliver the savings potential identified.

Finally, it should be noted that the raising of the voltage would also affect certain LT networks, specifically those networks in which the distribution voltage is 220 V (rather than 380 V). In these instances the upgrading action would involve solely the network (and hence the distributor) since the user plant is already rated at 220 V.

Increasing the power factor (cosφ) of user withdrawals The losses in the network are linked to the power factor (cosφ) of the load connected to the network, to be specific, the lower the value of the power factor the greater are the network leakages. Current regulations provide for a system of penalties for withdrawals from the network above a given maximum level of power, with cosφ less than 0.90. An increase in the power factor (e.g. by raising the cosφ from 0.90 to 0.95) through the rephasing of withdrawals by industrial and service clients would result in a reduction in the leakages from the network. To be effective, the rephasing must be carried out as close as possible to the point of use; naturally therefore it will be the client who has to rephase his load and bear the relative costs.

This solution (that is already being adopted) results in the party that bears the costs (the

[14] Saving obtained on a comparable network structure (same cables, withdrawals, etc.)

client) not being the same as the party enjoying the benefits (the distributor). This problem could be overcome in part by adopting a "reward/penalty" approach. A dual threshold system could be adopted: if the value of cosφ is below the lower threshold (0.90), the client must pay the distributor a penalty for the higher leakage caused to the network; on the other hand if the value of cosφ is higher (0.95) the client will receive a payment from the distributor in recognition of the lower leakages he has caused. In both instances the client's counterparty is the distribution company.

2.3.2 The transmission network

The actions on the national transmission network provided for in the development plan prepared by Terna[15] are oriented towards a higher level of efficiency of the national electricity system primarily for two reasons:

1. they enable a reduction in the leakages of power from the network;
2. by reducing instances of congestion, they enable greater use to be made of plants using renewable sources (particularly wind) and a more rational use of generation resources through the shifting of production quotas from plants that have a lower level of efficiency, but are needed in order to comply with the constraints of the network, to more efficient plants.

Furthermore, the anticipated development of interconnections with other countries, and in particular with the eastern seaboard of the Adriatic, could make it possible to import significant quantities of electrical power from renewable sources, contributing to the achievement of the national targets for the development of these sources and at the same time reducing CO_2 emissions by the Italian generating system.

[15] Terna S.p.A. manages the transmission of power in Italy and guarantees its security, quality and low price over time.

Works to improve the efficiency of the transmission networks

Reduction of network leakages With regard to the reduction of leakages of power from the national transmission network, it is estimated that the works provided for in the transmission network development plan could reduce the leakages at peak consumption by about 200 MW by 2020, equating to an **annual saving of electricity in 2020 estimated at about 1 200 GWh**, or about 0.1 MTOE of the Gross Final Consumption. Assuming that this reduction in leakage implies a reduction in production primarily by combined-cycle natural gas that has a yield in the order of 50 %, which would equate to a saving in primary energy terms in the order or 0.2 MTOE.

Use of energy produced by wind generators The Network Development Plan 2011 (data from Terna) provides for infrastructural works capable of increasing useable electrical power from wind and photovoltaic sources[16] by about 4 700 MW; estimating a production mix of wind and photovoltaic of 2 200 hours equivalent from wind and 1 500 hours equivalent from photovoltaic sources it can be seen that the very same works would enable an increase in the production of energy from renewable sources of about 11 800 GWh, that equates to approximately 1 MTOE.
Assuming that this increase in wind and photovoltaic production implies a reduction of production from combined-cycle natural gas, this would lead to a saving in terms of primary fossil energy in the order of **2 MTOE**.

Development of the national network and interconnections

The scenario analyses of the electricity system for the medium term (2015), which assume both an increase in the transmission capacity of the national network due to the development of the network and the establishing of new interconnections with foreign countries, highlight the environmental benefits to be derived from upgrading the network. According to these studies, the increase in the power imported and the use of more efficient generating units made possible by the development of the network, would lead to a reduction in the consumption of primary energy by the thermoelectric generating plants equal to about **1.6 MTOE**, corresponding to a reduction in CO_2 emissions of about **3.7 MtCO2e** p.a.

Investments in the transmission network

For the period 2011-2020 Terna has presented an investment plan of about 7.5 billion euros, that will result in a reduction in the instances of congestion between the market areas of about 5 000 MW, an increase in importing capacity at the northern border estimated at between 3 000 and 5 000 MW and from 1 500 to 4 000 MW on the other borders. Of this amount, about 3 billion euros is needed to make full use of energy from renewable sources in the regions of southern Italy and the larger islands (expanding the connections from Sicily and Sardinia to the mainland, upgrading the 380 kV network in southern Italy, developing new stations and creating new connections on the 150 kV network). The remaining investments provided for in Terna's plan for the period 2011-2020 will result in an increase in the carrying capacity of the internal network[17] and the interconnections allowing reductions in leakages from the transmission network and a reduction in CO_2 emissions.

[16] An assumption was made of 2 200 hours equivalent for wind power and 1 500 for photovoltaic, assuming an overlap of the two types for just the 8 daytime hours and weighting their simultaneous operation on the basis of the respective installed values as anticipated by 2020 in accordance with the NREAP target.

[17] Increase anticipated in the transmission capacity of the national grid: +400 MW between north and centre-north, +300 MW between centre-north and centre-south, +1 900 MW between south and centre-south, +1 000 MW between south and Sicily, +900 between Sicily and south, +400 MW between Sardinia and the mainland.

3 Energy saving in the end-use sectors

3.1 Summary of the end-use energy saving targets

This paragraph presents the results of the monitoring of energy savings achieved by 31 December 2010 through actions carried out in the context of the principal instruments for energy efficiency improvement, in large measure already laid down in EEAP 2007.

Table 1.3 (par. 1.4) reports the annual energy saving targets expected by 2010 (intermediate target) and by 2016 (final target) as specified in EEAP 2007. The values are expressed in terms of "amount of energy distributed or sold to final customers" (Final Energy Consumption – FEC). The quantification of the energy savings was carried out with reference to the measures detailed in paragraph 1.4, (a) to (e).

The monitoring period laid down by EEAP 2007 for assessing energy savings ran from 1 January 2008. However, the Directive allowed the inclusion of energy savings realised as a result of "early actions", measures with a lasting effect that were initiated from 1995 onwards (even prior to 1995, if the circumstances justified it, but in any case not earlier than 1991).

Since the energy efficiency improvement measures considered were started in large part prior to 1 January 2008, but in this case fell within the "early actions" described above, this monitoring reports the values of the annual energy savings by 31 December 2010, assessing the package of instruments applied from when each was initiated and effective up to 31 December 2010.

The choice of criteria for the quantification of the energy savings achieved was very conservative, in fact no account was taken of the positive effects resulting from:

- the implementation of Directive 2002/91/CE for refurbishments that did not take advantage of the 55% tax allowance[18];
- the replacement of domestic electrical appliances under the promotional campaign for more efficient appliances and in particular the 20% tax allowance for refrigerators in a class not less than A+, that ran from 1 January 2007 – 31 December 2010;
- other measures, aside from those considered, provided for by the Finance Acts of 2007-2010, among which were the incentives to replace analogue televisions with new digital sets laid down in Law No 296 of 27 December 2006 (Finance Act 2007);
- energy efficiency incentives in the domestic and industrial sectors, at national and regional levels;
- other specific incentive instruments such as the Piano Casa (Housing Plan), the *Conto*

[18] In this connection it should be remembered that in Italy the minimum requirements must be observed irrespective of the extent of the refurbishment (even in the case of replacing just one window, replacing a heater, or water-proofing a roof, etc.), and that tax allowances of 36% are in effect for general building refurbishments, that are easier to obtain; with regard to the replacement of heaters, an estimate was made combining data from CRESME, ASSOTERMICA and ENEA, while with regard to works carried out on the building envelope, it is still impossible to carry out a quantification of the related energy saving.

Energia feed-in tariffs, etc;

- incentives for the manufacturing sector (DL 40/2010) involving contributions towards the purchase of:

  a. new buildings of a class equal to or greater than B

  b. heat pumps for domestic hot water, dishwashers, cooker hobs, electric ovens and gas cookers

  c. high-efficiency electric motors and inverters

  d. electric or hybrid and euro 3 motorcycles

- regional and local laws and bills aimed at energy efficiency and the implementation of prescribed standards;
- information campaigns and training;
- awareness campaigns for technical support personnel in local PA;
- the action of those responsible for the conservation and rational use of energy (Energy Managers) appointed by the domestic and industrial sector pursuant to Article 19 of Law No 10 of 9 January 1991;
- the preparation of the technical report on compliance with the provisions of the law pursuant to Article 28 of Law No 10 of 9 January 1991;
- the design, installation, operation and maintenance of building heating systems with the aim of containing energy consumption as laid down in DPR 412/93 and subsequent modifications and supplements and in effect from October 1993 to October 2005;
- the installation of high-efficiency motors complying with the CEMEP 1997 agreement that preceded or did not make use of the 20 % tax incentive available during the period 1 January 2007 to 31 December 2010;
- works related to cogeneration or district heating systems for applications within the domestic sector in order to obtain White Certificates (schedules Nos 21 and 22 suspended during the course of 2006 and re-issued in an amended form with AEEG Resolution EEN9/10);
- other possible measures specified in EEAP 2007 for the transport sector[19] as well as further measures of various kinds that have been implemented[20].

The Regions are setting up systems for monitoring the energy savings achieved nationwide in relation to current regulatory provisions.

As far as buildings in the domestic sector are concerned, energy savings are calculated on the energy fed into the building-plant; in this regard, it is common practice in Italy to define the thermal

[19] Technical measures relating to vehicles, the penetration of biofuels, demand-oriented measures, certain infrastructural measures, etc.

[20] The commissioning of the High Capacity/High Speed railway network and rapid mass transit lines in urban areas, renewal of the local public transport road vehicle fleet, development and improvement of the local urban public transport offering, speed monitoring on the motorway network.

energy measured this way as "primary" energy, whereas in the European context, it is understood to be "final consumption" (FEC – Final Energy Consumption) based on the EC document, "*Non paper: technical background on the energy efficiency target in Europe 2020"*.

There follows a brief descriptive outline[21] of each of the energy efficiency improvement measures considered.

3.1.1 Transposition of Directive 2002/91/EC and implementation of Legislative Decree 192/05

Directive 2002/91/EC for increasing the energy efficiency of buildings was transposed by the Italian Government by means of Legislative Decree No 192 of 19 August 2005, coming into force on 8 October 2005. By means of this provision a regulatory framework was established within which the Regions can carry out their duties, develop the specifics and take advantage of their climatic and socio-economic circumstances.

The Decree, the part concerning winter heating already being in force, lays down implementing provisions. To date the following implementation standards have been issued: Presidential Decree No 59 of 2 April 2009 and the Decree of the Ministry of Economic Development of 26 June 2009 on national guidelines for the energy performance certification of buildings.

Compared with the preceding legislative framework on the matter, Legislative Decree 192/2005 and its implementing provisions (DPR 59/09 and Ministerial Decree 26 June 2009) present some new criteria, including the following:

- they set minimum mandatory requirements for Primary Energy Needs[22] for winter heating and for the energy needs of the building envelope in connection with summer air conditioning for all new constructions and for total refurbishments of large sized buildings (1 000 m^2 or more of useable floor area), with a phased-in application over 2006-2008-2010;
- they specify higher levels of thermal insulation for the building envelope and minimum requirements for buildings that are undergoing refurbishments (without limit to size or amount) with the same phased application as the preceding point;
- they call for energy certification;
- they promote the use of higher efficiency plant and equipment, (for example: heat pumps, three- or four-star gas boilers, for new buildings and refurbishments);
- they rationalise the checks on heating systems, updating the frequency of performance inspections to help contain consumption;
- they require, in the case of new constructions and the installation of new plants or the refurbishment of existing plants, that 50 % of the annual primary energy need for domestic hot water be met with the use of renewable energy sources (20 % for buildings in old town centres);
- they lay down a process of monitoring and comparison aimed at the harmonisation of legislation with the regions and autonomous provinces.

[21] For the methodology used to quantify the energy savings in final useful energy please see the document *Monitoraggio dei risparmi energetici relativi agli strumenti di miglioramento dell'efficienza energetica previsti dal PAEE 2007* (ENEA – 2010).

[22] Taken as the principal energy efficiency performance indicator associated with the standard use of the building.

The effects of these provisions could possibly overlap the 55% tax allowances and White Certificates, in particular:

- the energy savings relating to new buildings and to extensions of existing buildings in the residential and services sectors do not overlap the energy savings attracting the 55% allowance, whereas there is a modest potential overlap with regard to White Certificates;
- the energy savings relating to new buildings and to extension of existing buildings in the entire non-residential sector do not overlap the energy savings attracting the 55% allowance, whereas there is a modest potential overlap with regard to White Certificates;
- the energy savings relating to the replacement of heat generators could potentially overlap White Certificates;
- the energy savings relating to the maintenance of heat generators overlap neither the monitored energy savings attracting the 55% allowance nor White Certificates.

Table 3.1 reports the energy savings obtained as a result of these measures: a total of 24 307 GWh p.a. of which about 45% is derived from the replacement of heat generators.

Table 3.1 – Energy savings resulting from the transposition of Directive 2002/91/EC and the implementation of Legislative Decree 192/05 (FEC)

Measures	Energy savings (FEC) [GWh p.a.]						
	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**Total**
Residential sector[23]	186	877	847	849	721	646	**4 126**
Non-residential sector	-	1 144	858	858	572	572	**4 004**
Replacement of heat generators	-	2 306	2 321	2 089	2 086	2 086	**10 889**
Maintenance of heat generators[24]	-	5 288	5 288	5 288	5 288	5 288	**5 288**
Total	186	9 615	9 314	9 084	8 667	8 592	**24 307**

N.B. The data in relation to the non-residential sector, replacement of heat generators and maintenance of heat generators for 2010 are the same as those for 2009 because they are still being processed, since applications for authorisation for the incentive may be amended until September 2011.

3.1.2 Tax allowances (55%) for the energy upgrading of existing buildings

In force since 1 January 2007, this is a financial incentive consisting of an allowance against the taxable income of individuals (IRPEF) or companies (IRES), set up on the basis of Law No 296 of 27 December 2006 (Finance Act 2007) *et seq*.

In particular, the energy upgrading works on existing buildings provided for in paragraphs 344, 345, 346 and 347 of Article 1 of Law No 296 of 27 December 2006, supplemented and modified by subsequent regulatory provisions, allow for:

[23] Excluding energy savings derived from the replacement and maintenance of heat generators.
[24] Constant, non-cumulative annual figure.

- par. 344: the overall energy upgrading of the building;
- par. 345: works on the horizontal and vertical opaque structures and the transparent structures, inclusive of frame and glass;
- par. 346: the installation of solar panels for the production of hot water;
- par. 347: the replacement of winter heating systems with systems equipped with condensation boilers or, alternatively, with systems equipped with high-efficiency heat pumps, i.e. low-temperature geothermal systems.

This form of incentive can be accumulated with certain White Certificate schedules laid down by the Ministerial Decrees of 20 July 2004.

Table 3.2 provides a detailed analysis of the actions carried out[25], resulting in an energy saving in terms of final energy (Final Energy Consumption) of 5 204 GWh p.a., of which more than 40 % was derived from the use of efficient heating systems.

Table 3.2 – Energy savings achieved through the granting of tax allowances (55 %) for the energy upgrading of existing buildings (FEC)

Actions	EEAP Measure	Energy saving (FEC) [GWh p.a.]				
		2007	2008	2009	2010	Totals 2007-2010
Insulation of opaque envelope	RES-1	54	218	199	108	**579**
Replacement of doors and windows	RES-2	177	350	297	173	**997**
Installation of solar heating panels for hot water	RES-6	135	394	247	195	**971**
Use of efficient heating systems	RES-8	370	837	705	420	**2 332**
Balanced flues and wood fired boilers	RES-9	51	160	40	74	**325**
	Totals	**787**	**1 959**	**1 488**	**970**	**5 204**

N.B. The total value for 2010 takes account of the first half-year only because it is still being processed, since applications may be modified up to September 2011.

Article 28 of Legislative Decree 28/2011 provides the definition of a new incentive measure, still being finalised, for the production of thermal energy from renewable sources and for small-scale energy efficiency works.

3.1.3 Tax allowances (20 %) for the installation of high-efficiency electric motors and frequency inverters

In force from 1 January 2007 to 31 December 2010 (subject to further extensions), this is a financial incentive consisting of an allowance against the taxable income of individuals (IRPEF) or companies (IRES), set up on the basis of Law No 296 of 27 December 2006 (Finance Act 2007) and Law No 244 of 24 December 2007 (Finance Act 2008), supplemented and modified by subsequent regulatory provisions.

This form of incentive can be accumulated with certain White Certificate schedules laid down by

[25] The second column relates the EEAP 2007 measure to the action provided for by the mechanism in question.

the Ministerial Decrees of 20 July 2004.

Table 3.3 provides a detailed analysis of the actions carried out: an overall saving of energy (FEC) of about 137 GWh p.a.

Table 3.3 – Energy savings achieved through the granting of tax allowances (20 %) for the installation of high-efficiency electric motors and frequency inverters (FEC)

Measures in the industrial sector	Energy saving (FEC) [GWh p.a.]				
	2007	2008	2009	2010	Totals
High-efficiency motors	3.5	4.7	3.8	3.6	15.6
Variable-speed drives (*inverters*)	38.5	40.6	15.4	27	121.5
Totals	**42**	**45**	**19**	**31**	**137**

3.1.4 Incentive measures for the environmentally sustainable replacement of cars and commercial vehicles up to 3.5 tonnes

Below are reported the details of the incentive measures relating to vehicles, the overall energy savings (FEC) from which are reported in Table 1.3 against code TRA-1. They reflect the monitoring of the 2007, 2008 and 2009 state incentives to encourage the environmentally sustainable replacement of cars and commercial vehicles up to 3.5 tonnes.

In particular, these are financial incentives consisting of contributions towards the scrapping of vehicles, reimbursement of public transport season tickets, contributions towards a purchase and exemption from the payment of vehicle taxes. The incentives were administered by the authorised centres that carried out the scrapping, or by the manufacturers or importers of the new vehicle who refunded the vendor with the amount of the contribution, recovering the said amount as a credit against taxation solely for the purposes of the compensation as per Legislative Decree No 241 of 9 July 1997.

In the 2007, 2008 and 2009 Finance Acts, the Italian Government launched incentive measures for vehicle replacement aimed at encouraging the purchase of "low-consumption, low-emissions" vehicles and the scrapping of those causing higher pollution (in effect from 1 January 2007 until 31 December 2009 with the registration of vehicles being permitted up to 31 March 2010).

It should be noted that this environmentally oriented vehicle replacement incentive led to a further lowering of average CO_2 emissions of new vehicles to a level of 131.8 g/km (source UNRAE) in the first quarter of 2010.

Table 3.4 provides a detailed analysis of the effects of the eco incentives: an overall energy saving (FEC) of 2 908 GWh p.a.

Table 3.4 – Energy savings achieved through incentive measures promoting the environmentally sustainable replacement of vehicles (FEC)

Year	Eco incentive 2007 [GWh p.a.]			Eco incentive 2008 [GWh p.a.]			Eco incentive 2009 [GWh p.a.]			Totals [GWh p.a.]
	Saving from reduction of average specific emissions of new cars	Change in consumption through replacement of old vehicles	Total annual energy savings	Saving from reduction of average specific emissions of new cars	Change in consumption through replacement of old vehicles	Total annual energy savings	Saving from reduction of average specific emissions of new cars	Change in consumption through replacement of old vehicles	Total annual energy savings	Annual energy savings from the three measures
2007	326	-131	195	0	0	0	0	0	0	**195**
2008	326	-131	195	470	-44	426	0	0	0	**620**
2009	326	-131	195	470	-44	426	1 454	-39	1 414	**2 035**
2010	326	0	326	470	12	482	2 046	54	2 100	**2 908**

With regard to the incentives for the replacement of light commercial vehicles, monitoring of the energy effects was possible for only the measures in effect from 1 February 2009 to 31 December 2009 (with registering of vehicles being permitted up to 31 March 2010), since there was insufficient data available for the provisions of the preceding two years. The estimates made led to an energy saving figure for the year 2010 of approximately a further 64 GWh.

3.1.5 White Certificates

In force initially for the five-year period 2005-2009, this is an incentive mechanism consisting of the creation of a market in Energy Performance Certificates or White Certificates, that attest to the reduction in consumption of primary energy resulting from energy efficiency measures and actions, on the basis of the ministerial decrees of 20 July 2004 *New identifications of the quantitative targets for increasing energy efficiency in the end-uses of energy, pursuant to Article 9, paragraph 1, of Legislative Decree No 79 of 16 March 1999* and subsequent modifications and supplements.

This incentive can be accumulated with the tax allowances (of 55 %) for the energy upgrading of existing buildings and the tax allowances (20 %) for the installation of high-efficiency electric motors and inverters.

Table 3.5 reports the energy savings (FEC) certified using the Standard and Analytical Schedules. Since the list of measures laid down in EEAP 2007 has no direct relationship with the types of works carried out under the White Certificates mechanism, there was a need to regroup the latter in line with EEAP 2007 (second column): the data, consolidated and deduced from the annual reports of the Electricity and Gas Authority, have been processed in order to make an accurate

allocation to the measures laid down in the EEAP[26].

Table 3.5 – Energy savings achieved through White Certificates by 30 September 2010 - Standard and Analytical Schedules (FEC)

Standard/analytical schedules	EEAP reference	Energy saving (FEC) [GWh p.a.]
1. Compact fluorescent bulbs (up to 31/07/08) (excluding purchase vouchers)	RES-2	7 405
1-b Compact fluorescent bulbs (from 01/080/08 to 31/01/10)	RES-2	43
1-c Residential installation of high quality compact fluorescent bulbs with incorporated ballast (from 01/02/2010)	RES-2	39
2. Replacement of electric water heaters with gas water heaters	RES-6	1
3. Installation of 4 star efficiency single family natural gas-fired central heating boilers with a nominal thermal power not above 35 kW	RES-8	100
4. Replacement of gas water heaters with more efficient gas water heaters	RES-8	2
5. Replacement of single glazing with double glazing	RES-1	46
6. Insulation of walls and roofs	RES-1	12
7. Use of photovoltaic systems with a rating of less than 20 kW	RES-10	7
8. Use of solar panels for the production of domestic hot water (up to 31.01.2010)	RES-6	428
8-b Use of solar panels for the production of domestic hot water (from 01.02.2010)	RES-6	0
9. Installation of electronic frequency inverters on electric motors used for pumping having a power rating less than 22 kW	IND-3	1
10. Recovery of electrical energy from the decompression of natural gas	IND-6	9
11. Installation of more highly efficient motors	IND-2	2
12. Replacement of domestic electrical appliances with similar Class A products (up to 31/07/2008)	RES 3-4-5	105
13a. Installation of low flow-rate shower heads in residential buildings (up to 31/07/2008) (excluding purchase vouchers)	RES-11	4 341
13a-b. Water saving kits in residential buildings (from 01/08/2008 to 31/01/2010)	RES-11	73
13b-b. Installation of low flow-rate shower heads in hotels and guest houses (up to 31/01/2010)	TER-5	55
13c-b. Installation of low flow-rate shower heads in sports facilities (up to 31/01/2010)	TER-5	330
14. Installation of aerators for taps in residential buildings (up to 31/07/2008) (excluding purchase vouchers)	RES-11	1 464
15. Installation of air source electric heat pumps in place of boilers in newly	RES-9	0

[26] The energy savings expressed as primary energy in the annual reports of the Authority for Electrical Energy and Gas and quantified using electrical energy conversion factors as **primary energy** in relation to the years in which the projects were submitted (in accordance with what is laid down on the matter by the Ministerial Decrees of 7 July 2004 and by the Authority for Electrical Energy and Gas), in accordance with the formula 1GWh = 187 TOE.

constructed or refurbished residential buildings		
16. Installation of electronic frequency inverters on electric motors used for pumping having a power rating equal to or greater than 22 kW	IND-3	11
17. Installation of luminous flux regulators for mercury vapour bulbs and high pressure sodium vapour bulbs in installations designed for exterior lighting	TER-4	37
18. Replacement of mercury vapour bulbs with high pressure sodium vapour bulbs in public lighting installations	TER-4	141
19. Installation of high-efficiency external air conditioners with a refrigerating power of less than 12 kWf	RES-7	24
20. Thermal insulation of walls and roofs for summer cooling in residential and services buildings	RES-1	1
21-b. The application in the domestic sector of small cogeneration systems for winter and summer climate control and the production of domestic hot water	RES-8	0
22-b. The application in the domestic sector of district heating systems for environmental comfort and the production of domestic hot water	RES-8	15
23. Replacement of incandescent traffic lights with LED traffic lights	TER-4	141
24. Replacement of incandescent votive lights with LED votive lights	TER-3	0
25a. Installation of devices to automatically put appliances into stand-by mode in residential buildings	RES-12	0
25b. Installation of devices to automatically put appliances into stand-by mode in hotels	TER-6	0
26. Installation of centralised HVAC systems in residential and commercial buildings	RES-8	46
27. Installation of electric heat pumps for the production of domestic hot water in new and existing domestic plants	RES-8	0
	TOTAL	**14 881**

Table 3.6 reports the savings certified using the Time and Materials Project methodology. In this instance also the actions involved have been matched to the list of measures in the EEAP (second column): and in this case too, the Time and Materials Project data have been processed in order to make an accurate allocation to the measures paid down in the EEAP.

Table 3.6 – Energy savings resulting from White Certificates by 30 September 2010 - Time and Materials Projects (FEC)

Project and measure proposals	EEAP 2007 reference	Energy savings (FEC) [GWh p.a.]
GENERATION-INDUSTRIAL	IND-4	2 493
ELECTRICITY-INDUSTRIAL	IND 1-3-5-6	1 028
HEATING-RESIDENTIAL AND SERVICES	RES 1-9 / TER-1	796
HEATING-INDUSTRIAL	IND-6	4 706
GENERATION-RESIDENTIAL AND SERVICES	RES-11	182

PUBLIC LIGHTING	TER-4	142
ELECTRICITY-RESIDENTIAL AND SERVICES	TER 2-3	110
Total		**9 457**

3.1.6 Summary of the savings achieved (FEC)

Table 3.7 shows the overall energy savings achieved compared with the estimates set out in EEAP 2007 for 2010 and 2016 respectively for the residential, services, industrial and transport sectors.

In particular, the second column of table 3.7 contains the overall energy savings by 31 December 2010, excluding energy savings resulting from the overlapping of certain actions.

Table 3.7 – EEAP 2007: Annual energy savings achieved by 2010 and expected by 2010 and 2016 (FEC) – Detail by individual action

Activities		Annual energy savings achieved in 2010 (net of duplications)	Annual energy savings expected by 2010 (EEAP 2007)	Annual energy savings expected by 2010 (EEAP 2007)
		[GWh p.a.]	[GWh p.a.]	[GWh p.a.]
Residential Sector:				
RES-1	Insulation of opaque envelope of residential buildings post 1980; Replacement of single glazing with double glazed units; transposition of Directive 2002/91/EC and implementation of Leg. Dec. 192/05	5 832	3 722	13 730
RES-2	Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs	*3 744	1 600	4 800
RES-3	Replacement of dishwashers with class A rated appliances	21	305	1 060
RES-4	Replacement of refrigerators and freezers with class A+ and A++ rated appliances	82	1 210	3 860
RES-5	Replacement of washing machines with appliances rated higher than class A	2	31	410
RES-6	Installation of efficient electric water heaters	1 400	700	2 200
RES-7	The use of efficient air conditioning systems	24	180	540
RES-8	The use of efficient central heating systems	13 929	8 150	26 750
RES-9	Balanced flues and wood-fired boilers	325	1 100	3 480
	Total Residential Sector	**25 359**	**16 998**	**56 830**

Service Sector:				
TER-1	The use of efficient central heating systems	80	5 470	16 600
TER-2	Offering of incentives for the use of efficient air conditioning systems	11	835	2 510
TER-3	Low-energy bulbs and control systems	100	1 400	4 300
TER-4	Low-energy bulbs and luminous flux regulating systems (public lighting)	462	425	1 290
	Total Service Sector	**653**	**8 130**	**24 700**
Industrial Sector:				
IND-1	Low-energy bulbs and control systems	617	700	2 200
IND-2	Replacement of 1-90 kW class EFF2 electric motors with those of class EFF1	16	1 100	3 400
IND-3	Installation of inverters on electric motors of 0.75-90 kW	121	2 100	6 400
IND-4	High-efficiency co-generation	2 493	2 093	6 280
IND-5	Use of mechanical steam compression	103	1 047	3 257
	Total Industrial Sector	**3 350**	**7 040**	**21 537**
Transport Sector:				
TRA-1	The introduction of an emission limit of 140 g of CO_2/ Km (average of the range of vehicles sold)	2 972	3 490	23 260
	Total Transport Sector	**2 972**	**3 490**	**23 260**
	Total Energy Savings	**32 334**	**35 658**	**126 327**

(*This figure differs from the equivalent figure in Table 3.5, having been reduced by 50%, on the conservative hypothesis that the number of low-energy bulbs actually installed is at least half of the total of those sold/distributed under the EPC scheme; the definition of this measure as contained in EEAP 2007 has been modified for greater clarity.)

Table 3.8 considers certain activities not provided for in EEAP 2007, that resulted in a significant additional contribution of 15 377 GWh p.a., due to which the total energy saving by 2010 was 47 711 GWh p.a., equivalent to about 3.6 % of the national reference target.

Table 3.8 – Annual energy saving achieved by 2010 (FEC) – Detailed by individual measure not laid down in EEAP 2007

Measures		**Annual energy saving achieved in 2010 (net of duplications)**
		GWh p.a.[GWh p.a.]
Residential Sector:		
RES-10	Decompression of natural gas, PV < 20kW, cogeneration, district heating systems	190
RES-11	Low flow-rate aerators for showers, water saving kits, aerators for taps	5 878
RES-12	Devices to automatically put appliances into standby mode	0
	Total Residential Sector	**6 068**
Service Sector:		
TER-5	Low flow-rate aerators for showers in hotels and sports facilities	385
TER-6	Transposition of Directive 2002/91/EC and implementation of Leg. Dec, 192/05	4 004

	Total Service Sector	**4389**
Industrial Sector:		
IND-6	Refrigeration, inverters on compressors, replacement of boilers, recovery of thermal waste	4920
	Total Industrial Sector	**4920**
	Total Energy Savings	**15377**

(The PV included in RES-10 equates to the part not covered by the incentives of the Conto Energia feed-in tariff and contributes only 43 GWh p.a. to the total figure.)

Finally, other energy savings were achieved totalling 5288 GWh p.a., relating to maintenance activities on heat generators in the residential sector (not reported in the table because they fell outside the calculation methodology used for evaluating the RES-1 estimate), that took the total savings achieved to 53097 GWh p.a.

3.2 Additional actions having an impact on the demand for final energy

The Interregional Operating Programme "Renewable energy and energy savings" 2007-2013 (POI Energia) was set up with the goal of increasing the amount of consumed energy produced from renewable sources and of improving energy efficiency and energy saving, by promoting opportunities for local developments, integrating the incentive system put in place by practical politics, and maximising the interconnection between renewable energy production, efficiency improvement and the social and economic fabric of the Convergence Objective Regions (Calabria, Campania, Apulia and Sicily). The Ministry of the Environment and Protection of the Land and Sea (MATTM) has to-date published three public notices. The activities proposed, by specific type as laid down by each notice, are to be carried out on existing buildings located in the Convergence Regions that are publicly owned or conceded to public bodies for use without charge.

1. Public notice aimed at local health authorities and hospitals, actions on lines of activity 2.2 and 2.5. POI Energia amount EUR 60 m. Deadline for presentation of applications lapsed.
2. Notice issued jointly by the Ministry of the Environment and the Ministry of Education, Universities and Research (MIUR) aimed at schools. Overall amount EUR 240 m, of which EUR 20 m will come from POI Energia. Deadline for presentation of applications lapsed.
3. Public notice aimed at municipalities of up to 15000 inhabitants including historic and heritage villages, actions on lines of activity 2.2 and 2.5. POI Energia amount EUR 60 m. Deadline for presentation of applications lapsed.

NOTICES ON Interregional Operating Plan - ENERGIA

Some details about the analyses of the POI applications are reported below.

1. **Public notice aimed at local health authorities and hospitals** The deadline for the presentation of applications lapsed on 7 June 2010. Overall 54 projects were received with a request for resources of EUR 247 388 970.26.

The geographical distribution of the applications was as follows:

Calabria: 11 applications with requests totalling EUR 37 215 962.18;
Campania: 18 applications with requests totalling EUR 70 982 236.62;
Apulia: 8 applications with requests totalling EUR 56 258 258.54;
Sicily: 17 applications with requests totalling EUR 82 932 053.92;

At the conclusion of the phase for formally confirming admissibility and for carrying out the technical assessments, a ranking list was established, in accordance with the principles and criteria described in the notice. The first 10 project proposals in the rankings (Section 1), which contain a total of 21, were granted funding totalling EUR 59 156 555.48 (Official Gazette No 276 of 25 November 2010).

2. **Joint MATTM-MIUR notice aimed at schools.**

A total of 102 schools submitted applications with an overall request for resources of EUR 158 761 578.31. The geographical distribution of the applications was as follows:

Calabria: 17 applications with requests totalling EUR 24 993 684.19;
Campania: 41 applications with requests totalling EUR 65 126 771.10;
Apulia: 22 applications with requests totalling EUR 37 347 813.78;
Sicily: 22 applications with requests totalling EUR 31 293 309.24;

The current status is that MIUR and MATTM have defined the workgroups set up at the Education Offices of the convergence regions to confirm admissibility and to assess the merits of the applications.

3. **Public notice aimed at municipalities of up to 15 000 inhabitants.**

The deadline for presentation of applications lapsed on 18 December 2010. A total of 701 municipalities submitted applications, excluding those arriving after the deadline (5) and those substituted by updated applications (23). The geographical distribution of the 701 expressions of interest was as follows:

Calabria: 200 applications
Campania: 242 applications
Apulia: 118 applications
Sicily: 141 applications

The technical assessment phase will begin at the end of the formal checking phase, which is currently drawing to a close.

The efficiency improvement works on public offices and utilities or buildings for public use are of the following types:

- energy analysis and audit activities;
- activities on the building envelope, in particular of buildings of high value due their architecture, landscape, history or culture;
- renovation works and replacement of general plant and/or conventional heating and air conditioning systems.

Works on heat distribution networks, in particular from cogeneration and for district heating and cooling, involve:

- refurbishing and upgrading of the distribution networks for heating and cooling fed by cogeneration plants;
- the construction, renovation and upgrading of distribution networks for heating and cooling fed by biomass stations;
- the construction, refurbishing and upgrading of distribution networks for heating and cooling fed by geothermal plants.

Within the same context the Ministry of the Environment has signed a number of memorandums of understanding with other public institutions for financing purposes and/or to stimulate activities and actions on energy efficiency issues in the public sector.

Below is a list of the memorandums of understanding signed by MATTM with a brief description of their principal objectives.

Activities for energy production from renewable sources and energy efficiency for the minor islands and protected natural areas (Formez PA Convention)
On 26 January 2010 an agreement was signed between MATTM-DG SEC (Directorate of Economic Development and Climate) and Formez PA with a total value of EUR 4 200 000 for the carrying out of activities in relation to devising and experimenting with pilot projects on the issue of energy efficiency and renewable forms of energy in the minor islands and in protected natural areas, in accordance with the Sustainable Communities model.
The current status is that Formez PA has concluded the initial activities laid down, identifying the potential areas of the Convergence Regions that could become sustainable communities, and has prepared a draft "Sustainable Communities" model, establishing the set of socio-economic and energy indicators for measuring the development potential of each area.

Energy efficiency enhancement of airport facilities (ENAC Protocol)
On 12 April 2010, a memorandum of understanding was signed between MATTM–DG SEC and ENAC (the National Civil Aviation Authority) with the aim of initiating joint actions for enhancing the energy efficiency of airport facilities located in the regions of the "Convergence Objective".
Currently the projects proposed by ENAC are in the process of being assessed.

Energy efficiency improvement of museums and archaeological sites (MiBAC Agreement)

On 10 May 2010 a Programme Agreement was signed between MATTM-DG SEC and MiBAC (Ministry of Cultural Assets and Activities), for resources of EUR 40 000 000, with the objective of carrying out energy efficiency enhancement and energy savings activities for museums, archaeological sites and monumental and historical buildings of particular importance owned by MiBAC or for which it is responsible.
MiBAC is listing the buildings that are potential candidates for the works from which to select, together with MATTM, those on which the energy efficiency improvement works will be carried out.

Energy efficiency improvement of the buildings of the General Directorate for the Management and Maintenance of the Offices of the Judicial Complex of Naples (Ministry of Justice Protocol)
On 22 December 2010 a memorandum of understanding was signed between MATTM-DG SEC and the Ministry of Justice with an overall value of EUR 40 000 000, for the carrying out of energy efficiency improvement works on the buildings owned by the General Directorate for the Management and Maintenance of the Offices of the Judicial Complex of Naples.
The Ministry of Justice, in collaboration with MATTM, will identify the buildings on which the energy audit and energy efficiency improvement works will be carried out.

Energy efficiency improvement of the buildings of the State Police (Ministry of the Interior Protocol). On 7 September 2010 a protocol was signed between MATTM-DG SEC and the Ministry of the Interior for the carrying out of energy efficiency improvement works on the buildings under its ownership, and with particular regard to the buildings of the State Police.
The Ministry of the Interior, together with the Ministry of Transport and Infrastructure, is going ahead with the signing of an agreement for planning the activities and the management of an invitation to tender for the carrying out of the work.

Energy efficiency improvement of the buildings of the Armed Forces (Ministry of Defence Protocol)
On 15 November 2010 a memorandum of understanding was signed between MATTM-DG SEC and the Ministry of Defence, with an overall value of EUR 30 000 000, for the carrying out of energy efficiency improvement works on the buildings owned by the Armed Forces (Army, Air Force, Navy and Carabinieri).

The buildings on which the works will be carried out are in the process of being selected.

Energy efficiency improvement of the municipal building stock (ANCI Convention)
On 4 August 2010, a convention was signed between MATTM-DG SEC and ANCI (National Association of Italian Municipalities) for the implementation of the project "Analysis and energy efficiency improvement of municipal building stock and health service buildings" with an overall value of EUR 6 500 000. The current status is that ANCI has prepared a draft invitation to tender for carrying out an energy audit of health service buildings (excluding those already included in the public notice addressed to Local Health Authorities and Hospitals).

Energy efficiency improvement of the provincial building stock (UPI Convention)
On 16 April 2010, a memorandum of understanding was signed between MATTM–DG SEC and UPI (Union of the Provinces of Italy) with the objective of enhancing the energy efficiency and auditing the energy performance of public buildings located in the convergence regions. At the same time, MATTM undertook to select the first list of projects to be financed from POI Energia, making available an initial fund of EUR 12 000 000.
The current status is that all the 25 provinces of the Convergence Objective have identified proposed works to be agreed with the Ministry of the Environment.

Energy efficiency improvement of the building stock of marginal mountain communities (UNCEM Protocol)
On 28 July 2010, a memorandum of understanding was signed between MATTM-DG SEC and UNCEM (National Union of Mountain Municipalities, Communities and Authorities) for carrying out energy audits and feasibility studies for projects in individual and associated municipalities and in marginal mountain villages for an overall value of EUR 2 000 000. The current status is that the proposed plan has been approved and the procedures to start the activities have been initiated.

Energy efficiency improvement of industrial zones, supply chains and business areas (Studiare Sviluppo S.r.l. Convention)
On 22 December 2009 a convention was signed between MATTM-DG SEC and Studiare Sviluppo S.r.l., an in-house body of the public administration, with a value of EUR 4 200 000 the objective of which is the production of feasibility studies for the energy efficiency improvement of business clusters.

The 21 February 2011 saw the conclusion of the "Call for Ideas". It began on 7 January 2011 with the goal of gathering ideas for business systems projects on which to carry out feasibility studies. The current status is that 23 ideas were submitted by a similar number of business groups, comprised of a total of 189 member companies with an overall request for finance of EUR 176 582 500.

Another tool for economic policy through which public resources are made available for the granting of concessionary financing in support of investments that contribute to the reduction of climate-changing emissions thereby complying with the obligations imposed by the Kyoto Protocol, is the Revolving Fund, set up by the 2007 Italian Finance Act (Law No 296 of 27 December 2006).

The resources made available to the Fund amount to EUR 600 million, divided into three annual programme cycles and aimed at activities in the renewables sector, energy efficiency and forestry research and management. The resources are distributed by measure and geographical area.

The methods for dispensing the allocated resources for the first programme cycle, amounting to EUR 200 million, are governed by the decree adopted by the Ministry of the Environment and the Ministry of Economic Development on 25 November 2008 and published in the Ordinary Supplement of the Republic of Italy's Official Gazette No 92 of 21 April 2009.

The Revolving Fund will be made operational by the issuing of an application circular to be adopted by the Ministry of the Environment together with the Ministry of Economic

Development, in agreement with CDP S.p.A. (Cassa Depositi e Prestiti S.p.A.).

The entities that can benefit from the concessionary financing provided through the Rotating Fund are: businesses from all sectors, including ESCOs (energy service companies), private individuals, private legal entities including foundations and associations, public bodies and condominiums consisting of at least 10 dwellings.

These entities may obtain concessionary financing through the banking system in the form of targeted loans, to be repaid in equal half-yearly instalments paid in arrears, with the application of a highly advantageous fixed rate of interest set by the decree of the Finance Minister of 17 November 2009. The concessionary financing is for a period of not less than three years and not more than six years. Pursuant to Legislative Decree No 28 of 3 March 2011, Article 31, the maximum length of concessionary rate financing for public entities is one hundred and eighty months.

The “revolving” nature of the fund can be seen from the above, the fund having the capacity to replenish itself through the instalments received in repayment of the concessionary financing granted.

The decree of 25 November 2009 specifies the types of expenses that are admissible and that, therefore, contribute to determining the concessionary financing.

With regard to the above specified measures and the maximum admissible unit costs, the financing percentages are set at 70% for private bodies, whereas for public entities the figure is 90%; this is without prejudice to the fact that the extent of the benefit to companies cannot exceed the level of state aid, referred to as the “de minimis”, as per Regulation (EC) No 1998/2006.

The procedure for granting fiscal benefits is broken down into the following steps:

- application for acceptance;
- preliminary, technical and economic-financial assessment;
- acceptance or rejection.

A computerised system for managing applications and financed projects is being developed by CDP S.p.A. to enable management of the data on a regional basis.

The Ministry of the Environment, which is responsible for the Kyoto Rotating Fund has entrusted CDP S.p.A. with the management the Kyoto Fund, and in particular, collecting the applications for fiscal benefits and carrying out the preliminary and economic-financial evaluations. An Assessment Commission has been set up at the Ministry of the Environment to carry out the preliminary technical assessments. Furthermore, the decree of 25 November 2009 gives regions and autonomous provinces the option of accepting the applications, taking care of the preliminary phase and issuing the notification of acceptance or rejection, by making use of entities such as regional finance houses and regional development bodies, solely for the measures laid down for micro cogeneration, renewables and energy end-use.

REVOLVING FUND (Kyoto Protocol)

The energy efficiency related measures that can be financed through the Fund are as follows:

-**Measures for diffused micro-cogeneration:**
newly constructed plants, with a nominal power of up to 50 kWe which use energy sources including natural gas, solid vegetable biomass, liquid biofuel produced from vegetable matter, biogas and natural gas-biomass in co-combustion.

-**Measures for electric motors:**
replacement of motors with a nominal power greater than 90 kWe with high-efficiency equipment.

-**Measures for end-uses:**
on the envelope of existing buildings, parts of existing buildings or existing property units, involving vertical, horizontal or inclined opaque structures, transparent closures inclusive of fittings and glass, and openable and similar fixtures such as doors and windows even if not openable, that separate the heated volume of the building from the outside and from non-heated areas;

I) for direct environmental conditioning through district heating from cogeneration plants with a nominal power up to 500 kWe fuelled by natural gas, solid vegetable biomass, liquid vegetable biofuels, biogas and natural gas-biomass in co-combustion. These activities are admissible only if they involve both the construction of the cogeneration plant and the creation of the district heating network associated with it, including the connections to the buildings;

II) for direct environmental management through low-temperature geothermal plants up to 1 MWt;

III) cogeneration plants with a nominal power up to 5 MWe fuelled by natural gas, solid vegetable biomass, liquid vegetable biofuels, biogas and natural gas-biomass in co-combustion.

3.3 *Presentation and assessment of the measures for energy efficiency improvement in end-use – EEAP 2011*

This paragraph reports the list of energy efficiency improvement activities that contribute to achieving the national target in connection with Directive 2006/32/EC. Compared with the 2007 version, certain changes have been introduced due primarily to the following factors, depending on the sector involved,:

- a careful review was carried out of the estimated values as at 2016 of all the activities and related measures, based on the data gathered by monitoring the measures and from a series of ad hoc studies and analyses carried out since 2007 with the aim of constructing as realistic an image as possible of the principal indicators that characterise the sectors involved in energy efficiency improvement;
- for certain types the methodology for calculating the estimate has been modified.

These factors produced differences from the individual estimated values as at 2016 and as a result also from the overall target value, although not to a significant extent. In fact the total estimated savings of the EEAP 2007 amounted to 126 327 GWh p.a., and the readjusted value reported in this plan amounts to 126 540 GWh p.a.

The following paragraphs will describe in detail the revisions made to each of the types of activity.

Table 3.9 – EEAP 2011 energy efficiency improvement measures

	Measures to improve energy efficiency	**Annual energy savings achieved by 2010**	**Annual energy savings expected by 2016**	**CO_2 emissions avoided by 2016**
Measures		[GWh p.a.]	[GWh p.a.]	[m tonnes] CO_2]
Residential Sector:				
RES-1	Actions for compliance with Directive 2002/91/EC and to implement Leg. Dec. 192/05	5 832	13 500	3.51
RES-2	Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs	*3 744	4 800	2.11
RES-3	Replacement of dishwashers with class A rated appliances	21	44	0.03
RES-4	Replacement of refrigerators and freezers with class A+ and A++ rated appliances	82	2115	0.93
RES-5	Replacement of washing machines with appliances rated higher than class A	2	420	0.18
RES-6	Installation of solar heating panels for hot water**	1 400	2 200	0.97
RES-7	The use of efficient air conditioning systems	24	540	0.24
RES-8	The use of efficient central heating systems	13 929	26 750	6.66
RES-9	Balanced flues and wood-fired boilers	325	3 480	0.83
RES-10	Natural gas decompression, PV plant	190	300	0.13
RES-11	Low flow-rate water aerators	5 878	5 878	1.60
Total Residential Sector		**31 427**	**60 027**	**17.18**
Service Sector:				
TER-1	Upgrading energy efficiency of existing buildings	80	11 166	2.90
TER-2	Offering of incentives for the use of efficient air conditioning systems	11	2 510	1.10
TER-3	Low-energy bulbs and control systems	100	4 300	1.89
TER-4	Low-energy bulbs and luminous flux regulating systems (public lighting)	462	1 290	0.57

TER-5	Low flow-rate water aerators	385	340	0.11
TER-6	Transposition of Directive 2002/91/EC and implementation of Legislative Decree 192/05 on new buildings since 2005	4004	4984	1.30
Total Service Sector		**5042**	**24590**	**7.87**
Industrial Sector:				
IND-1	Low-energy bulbs and control systems	617	1360	0.60
IND-2	Installation of more efficient electric motors	16	2600	1.14
IND-3	Installation of inverters on electric motors	121	300	0.13
IND-4	High-performance cogeneration	2493	6280	1.26
IND-5	Refrigeration, inverters on compressors, replacement of boilers, recovery of thermal waste	5023	9600	3.08
Total Industrial Sector		**8270**	**20140**	**6.21**
Transport Sector:				
TRA-1	Government incentives 2007, 2008, 2009 to encourage environmentally friendly replacements for cars and commercial vehicles up to 3.5 tonnes	2972	2186	0.59
TRA-2	Application of Community Regulation EC 443/2009 that defines levels of performance in connection with emissions from new vehicles within the context of the integrated Community approach to the reduction of CO_2 emissions from light vehicles		19597	5.30
Total Transport Sector		**2972**	**21783**	**5.89**
Total Energy Savings		**47711**	**126540**	**37.16**

(*This value differs from the corresponding figure contained in Table 3.5, i.e. it is reduced by 50%, on the conservative hypothesis that the number of low-energy bulbs actually installed is at least half of the total of those sold/distributed under the EPC system; the definition of this figure has been changed from the one given in EEAP 2007 for reasons of clarity; the PV included in RES-10 represents the proportion not covered by the incentives of the *Conto Energia* feed-in tariff and contributes just 43 GWh p.a.).

3.3.1 Calculation methodology

The estimated savings as at 2016 were assessed using the Bottom Up calculation methodology, and involved the following steps for each activity:

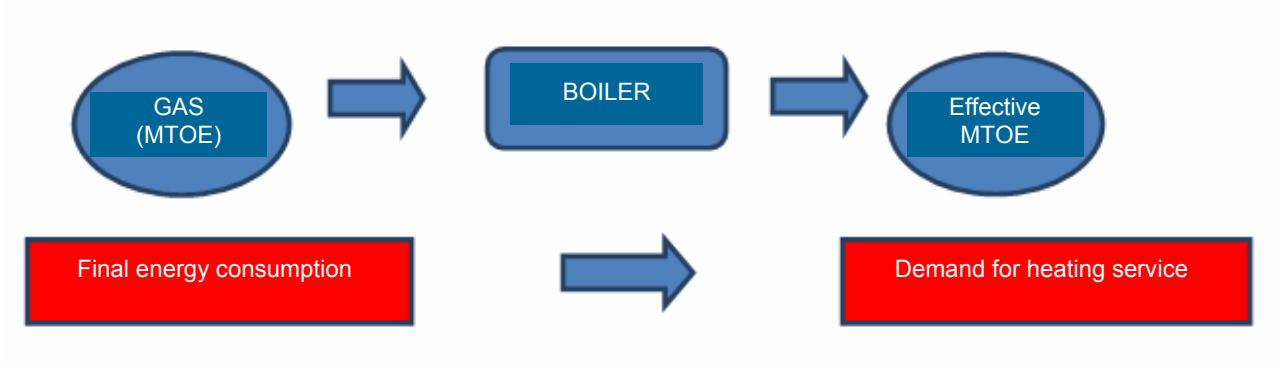
- calculation of the annual unit energy saving (in kWh p.a. per unit);
- definition of the potential for the total annual saving (taking into consideration the number of units involved in the activity, in terms of kW p.a.);
- calculation of the effect (in kWh p.a.) of the measures in the first year of its application;
- calculation of the effects of the measure as at 2016.

This choice was driven by the fact that the support measures that were put in place in order to achieve the target specified in EEAP 2007 were tracked with effective identifying and record-keeping tools, making it possible for the monitoring to be accurate. The following paragraphs provide a detailed description of each of the calculation procedures carried out for each type of activity and related measure.

3.3.2 Description of the individual measures

3.3.2.1 Measures to improve energy efficiency in the residential sector

In assessing the effects of applying Legislative Decree 192/05 to the energy needs for winter heating and summer air conditioning in new/totally refurbished residential buildings, “demand for heating service” refers to the effective energy required by the building (downstream of the heating plant) whereas “final energy consumption” refers to the energy used to power the plant.



In defining the demand for heating services through to 2016, reference was made to the estimates (ISTAT/CRESME/ANCE) relating to the surface area for which building permission was granted for new dwellings from the end of 2005 to 2009.

Table 3.10 – Estimate of surface areas of new dwellings constructed from 2005 to 2009

Year	Surface area of permits for new buildings (m^2)
2005 (1/5)	7 412 041
2006	34 863 786
2007	33 664 574
2008	26 931 659
2009	22 891 910

If one assumes that from 2010 onwards the surface area of newly constructed and/or totally renovated dwellings will amount to about 20.5 million square metres per annum (about 90% of the figure for 2009), in 2016 the surface area of dwellings covered by the buildings decree (Legislative Decree 192/05) will amount to about 270 million square metres, the value accumulated during the period 2006-2016.

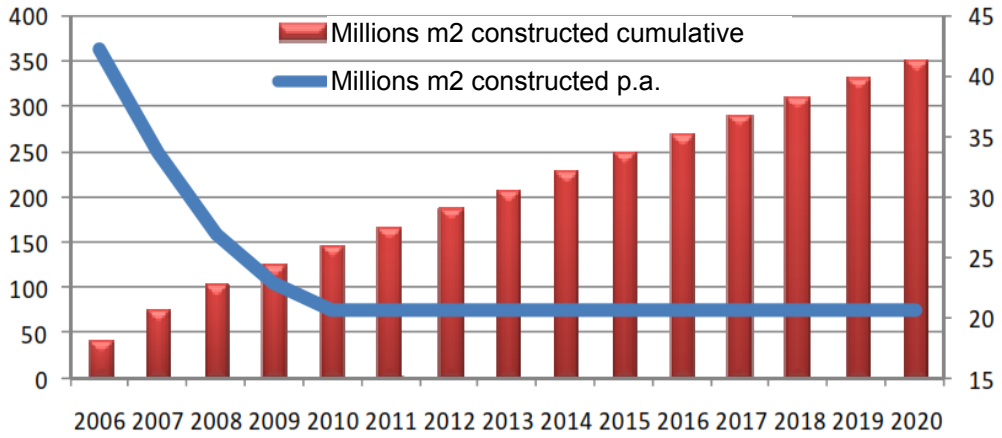


Figure 3.1 – Estimate of surface areas of newly constructed dwellings as at 2020

Table 3.11 shows the limits imposed by DPR 412/93 and Legislative Decree 192/05 on unit consumptions of energy (kWh/m^2 p.a.) (with reference to a building with S/V ratio=0.6, Climate Zone D, 2000 degree days). With reference to the values in Table 3.11 and the projection of the average performance of plants as per the graph (for Legislative Decree 192 an increase in performance was assumed up to a value of 0.87 in 2016 and 0.9 in 2020), two distinct heating service demand curves are formed, one relating to the limits imposed by DPR 412/93 and the other to decree 192/05. As the table shows, the mandatory limits chosen for buildings in 2015 and 2020 are the same as current levels with a view to basing the estimate on a conservative hypothesis, and it is also well-known that there will be a gradual move towards almost zero energy buildings with the transposition of Directive EPBD 2.

Table 3.11 – Limits imposed by DPR 412 and Legislative Decree 192

Annual consumption of new buildings (kWh/m^2 p.a.)	2005	2010	2015	2020
DPR 412/93	95	95	95	95
Legislative Decree 192/05	70	45	45	45

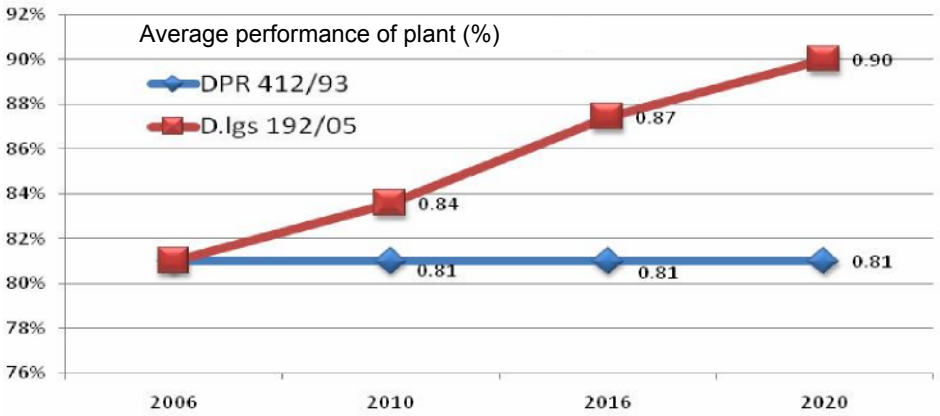


Figure 3.2 – Projected average performance of plants in new and/or totally refurbished dwellings,

In Figure 3.3 it can be seen that, with effect from 2010, the more stringent limits imposed by Legislative Decree 192/05 (which fall from 70 to 45 kWh/m^2 p.a.) and the setting of minimum levels for usage of renewable sources by Legislative Decree 28/2011 for newly constructed buildings, create a significant gap between the two service demand curves.

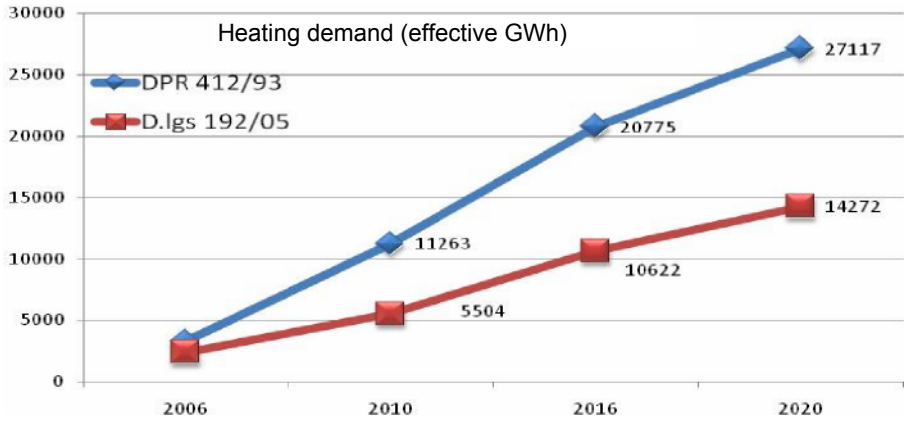


Figure 3.3 – Estimate of the demand for heat in new and/or totally refurbished

dwellings, with application of DPR 412/93 and Legislative Decree 192/05 (GWh)

Assuming that the number of new/totally refurbished dwellings remains constant from 2010 onwards (about 20 million m^2 p.a.), and estimating the heating demand in terms of the limits imposed by DPR 412/93 and Legislative Decree 192/05, the reduction in final energy as a result of the application of the buildings decree (Legislative Decree 192/05) amounts to about 13 500 GWh in the year 2016 (Table 3.12).

Table 3.12 – Development of final consumption (MTOE) as at 2020

Final consumption (MTOE)	2006	2010	2016	2020
DPR 412/93	4 016	13 905	25 648	33 477
Legislative Decree 192/05	2 959	6 587	12 149	15 858
Delta	1 057	7 318	13 500	17 600

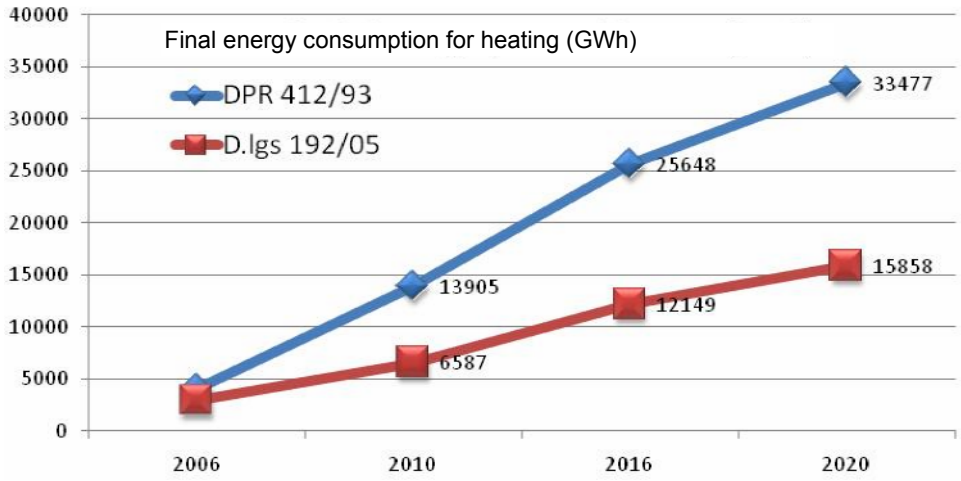


Figure 3.4 – Final consumption of energy in new/totally refurbished dwellings, with the application of DPR 412/93 and Legislative Decree 192/05, years 2006-2016 (GWh)

Title		***Actions for compliance with Directive 2002/91/EC and to implement Leg. Dec. 192/05***
Code		RES-1
Description	**Type of efficiency improvement measure**	Legislation: implementation of Directives EPBD 1 and 2
	Timeframe	Start: 8 October 2005 (date when Legislative Decree 192/05 became effective) End: measure active (5th year of application) Anticipated changes: transposition of the instructions from the recasting of Directive 2002/91/EC and 2006/32/EC on energy services
	Brief description of the measure	Directive 2002/91/EC for increasing the energy efficiency of buildings was transposed by the Italian Government by means of Legislative Decree No 192 of 19 August 2005, which came into force on 8 October 2005. This decree introduced important changes to the existing legal framework, in particular to design methodologies, minimum standards and the inspection of installations as well as introducing the energy performance certification of buildings. Directive 2006/32/EC on energy services was transposed by the Italian Government by means of Legislative Decree 115/08 which came into force on 4 July 2008. This decree provided market incentives for ESCOs and streamlined the procedures for the installation of solar heating panels and mini wind-generators on buildings.
	Final sector involved	RESIDENTIAL
	Target group	Owners
	Regional application	A process of integration and harmonisation with the regions and autonomous provinces is planned.
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	- New mandatory minimum requirements for primary energy needs for winter heating and summer air conditioning for all new buildings and for the total refurbishment of medium-large buildings (1 000 m^2 of useable floor space), with a phased application 2006-2008-2010 (a conservative choice in consideration of the fact that from 2012 to 2020 there will be a move towards virtually zero energy buildings for new constructions); - Higher levels of thermal insulation for the envelope and minimum requirements for buildings that are undergoing refurbishment (without limit to size or amount) with the same phasing as the previous point; - Mandatory energy performance certification in compliance with Directive EPBD 2; - Promotion of the use of more efficient plant and equipment (e.g.: heat pumps, three- and four-star rated gas boilers, for new buildings and refurbishments); - Rationalisation of the controls on thermal systems: for heating and air conditioning. - Obligation to cover 50% of the annual energy needs for domestic hot water with the use of renewable energy sources (in compliance with the provisions of Article 11, paragraph 1 of Legislative Decree 28/11);
	Budget and source of financing	Provision for the revision and integration of the incentives system with particular regard to the 55% tax allowances and the new “conto energia termico” feed-in tariff provided for by Articles 27 and 28 of Legislative Decree 28/11. There are plans to evaluate the possibility of strengthening the measures for energy upgrading at a condominium level (the entire envelope and/or plant). Until now these actions, which offer the greatest potential for reducing consumption, have been carried out in only a modest number of instances.
	Authority responsible for implementation	MiSE, the Regions

	Authority responsible for monitoring	MiSE, the regions, ENEA and the RENAEL Energy Agencies
Energy saving	**Calculation methodology**	Bottom up
	Saving achieved by 2010	11 119 GWh p.a.*
	Saving expected by 2016	13 500 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	Description in par. 3.3.2.1
	Overlap with other measures	No overlap

(*This value differs from the figure stated in Table 1.1 on page 6 (5 832 GWh p.a.) because it refers to an estimate of the effects of applying decree 192/05 on energy consumption in the residential sector for the year 2010.
Instead, the value in Table 1.1 relates to an energy saving actually achieved and certified through monitoring of the White Certificate measures and the 55% tax allowances. This value is very conservative because it does not include activities resulting from the application of Legislative Decree 192/05, which will in future be monitored through the relevant regional land registries.
If we add to the value in Table 1.1 the estimated value of the energy savings resulting from the maintenance of heat generators (amounting to 5 288 GWh p.a., see page 16) we obtain a value of 11 120 GWh p.a., which matches the estimate in this schedule).

Title		***Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs***
Code		RES-2
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information / education programmes - Adoption of minimum efficiency requirements (EC Regulation) - Labelling
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Replacement of incandescent (GLS) bulbs with fluorescent (CFL) bulbs Consumption of CFL bulbs = 20% of GLS bulbs (for the same level of performance)
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE, AEEG, GSE and ENEA
	Authority responsible for monitoring	GSE – ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	3 744 GWh p.a.*
	Saving expected by 2016	4 800 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Business as usual 2016** No of dwellings: 24.1 m **EEAP 2016 Scenario** Replacement of 3 GLS bulbs per dwelling with the same number of compact fluorescent bulbs; CFL bulbs installed in the period 2008 – 2016: 72.3 m Total annual consumption in the sector: 7 100 GWh **Unit saving:** 66 kWh p.a. for each bulb replaced
	Overlap with other measures	No overlap

(*This value differs from the corresponding figure contained in Table 3.7, i.e. it is reduced by 50%, on the conservative hypothesis that the number of low-energy bulbs actually installed is at least half of the total of those sold/distributed under the EPC system).

Title		***Replacement of dishwashers with class A+, A++ and A+++ rated appliances***
Code		RES-3
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes to promote the systematic and exclusive purchase of Class A+, A++ and A+++ dishwashers - Adoption of minimum efficiency requirements (Regulation 1016/2010/EU) - Implementation of energy labelling (Delegated Regulation 1059/2010/EU)
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Replacement of dishwashers with class A rated appliances
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE, AEEG, GSE and ENEA
	Authority responsible for monitoring	GSE – ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	21 GWh p.a.
	Saving expected by 2016	44 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Market trend:** Sales 2008-2010: 2.5 million (ref: GFK sales database) Estimated sales for 2011-2016: 5 million (3.5 million additional appliances and 1.5 million replacements) Appliances in use at the end of 2010: 9.5 million Appliances in use at the end of 2016: 11 million **Business as Usual Scenario 2016** Total consumption: 3 069 GWh p.a. Average unit consumption: 279 kWh p.a./appliance **EEAP 2016 Scenario** Total consumption: 3 025 GWh p.a. Average unit consumption: 275 kWh p.a./appliance
	Overlap with other measures	No overlap

Title		***Replacement of refrigerators and freezers with class A+, A++ and A+++ rated appliances***
Code		RES-4
Description	**Type of efficiency improvement measure**	-Financial and legislative instruments: White Certificates - Information programmes - Adoption of minimum efficiency requirements (Regulation EC 643/2009) - Implementation of energy labelling (Delegated Regulation 1060/2010/EU)
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from efficiency measures and activities
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Replacement of refrigerators and freezers with class A+, A++ and A+++ rated appliances
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE, AEEG, GSE and ENEA
	Authority responsible for monitoring	GSE-ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	82 GWh p.a.
	Saving expected by 2016	2 115 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Market trend:** Sales 2008-2010: 7.5 million (ref. GFK sales database) Estimated sales 2011-2016: 15.5 million (10.8 million replacements and 4.7 million additional appliances) Appliances in use at the end of 2010: 31.5 million Appliances in use at the end of 2016: 33.3 million **Business as Usual Scenario 2016** Total consumption 2016: 10 273 GWh p.a. Average consumption per appliance: 308 kWh p.a. **EEAP 2016 Scenario** Total consumption 2016: 8 158 GWh p.a. Average consumption per appliance: 245 kWh p.a.
	Possible overlap with other measures	No overlap

Title		***Replacement of washing machines with Class A+, A++ and A+++ rated appliances***
Code		RES-5
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programme to promote the systematic and exclusive purchase of Class A+ washing machines - Adoption of minimum efficiency requirements (Regulation EC 1015/2010) - Implementation of energy labelling (Delegated Regulation 1061/2010/EU)
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Adoption of Class A+(*) washing machines: **Reference consumption: 0.85 kWh/cycle** Reference usage: **266 cycles p.a.** (*)5 kg; 0.17 kWh/kg/cycle
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE, AEEG, GSE and ENEA
	Authority responsible for monitoring	GSE-ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	2 GWh p.a.
	Saving expected by 2016	420 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Market trend:** Sales 2008-2010: 2.8 million (ref. GFK sales database) Estimated sales 2011-2016: 6 million (1.7 million additional appliances and 4.3 million replacements) Appliances in use at the end of 2010: 23.3 million Appliances in use at the end of 2016: 25 million **Business as Usual Scenario 2016:** Total consumption: 6 148 GWh p.a. Average unit consumption: 244 kWh p.a./appliance **EEAP 2016 Scenario:** Total consumption: 5 720 GWh p.a. Average unit consumption: 227 kWh p.a./appliance
	Overlap with other measures	No overlap

Title		***Installation of solar heating panels for hot water***
Code		RES-6
Description	**Type of efficiency improvement measure**	Financial and legislative instruments: White Certificates - Agreements with the domestic electrical appliances industry for the development and sale of innovative products - Information programmes - The adoption of minimum efficiency requirements is in the discussion phase ("Ecodesign" Directive 2009/125/EC) - Implementation of energy labelling (measure implementing Directive 2010/30/EU)
	Timeframe	Start: 2005 for White Certificates, 2007 for 55% tax allowances End: still in force (55% tax allowances until 31.12.2011, unless renewed)
	Brief description of the measure	- Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities - Tax allowances against IRPEF (tax on the income of individuals) or IRES (corporation tax on profits of companies) of 55% of the costs incurred for certain types of energy upgrading work on existing buildings. Voluntary measure.
	Final sector involved	RESIDENTIAL and SERVICES
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Adoption of electric water heaters using various technologies: - solar water heaters - heat pump water heaters
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG for White Certificates MiSE for 55% tax allowances
	Authority responsible for monitoring	AEEG – ENEA for White Certificates ENEA for 55% tax allowances
Energy saving	**Calculation methodology**	Bottom up From monitoring of the databases of White Certificates and 55% tax allowances and other measures
	Saving achieved by 2010	1 400 GWh p.a.
	Saving expected by 2016	2 200 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Market trend:** Estimated sales for 2008-2016: 10.6 million (standard devices) of which 0.4 million are new units and 10.2 million are replacements Units in use at the end of 2007: 11.2 million Units in use at the end of 2016: 11.6 million (100% standard)

		Business as Usual Scenario 2016 Total consumption: 17 400 GWh p.a. Average unit consumption: 1 500 kWh p.a./appliance **EEAP 2016 Scenario** Estimated sales of efficient devices from 2008-2016: 7.1 million • improved efficiency 5.8 m • solar powered 1.0 m • heat pump powered 0.25 m Total consumption: 15 200 GWh p.a. Average unit consumption: 1 293 kWh p.a./device **Unit saving:** 136 kWh p.a. for improved efficiency water heaters 1 206 kWh p.a. for solar powered water heaters 754 kWh p.a. for heat pump powered water heaters (for each efficient device sold in the period 2008-2016)
	Possible overlap with other measures	No overlap

(The definition of this measure in EEAP 2007 has been changed for greater clarity.)

Title		***The use of efficient air conditioning systems***
Code		RES-7
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Programmes of information on the role of energy certification - air conditioning implementation of EPBD 2 and the incentive measures laid down (55% and thermal feed-in tariff) - Energy certification of air conditioning plants - Adoption of minimum efficiency requirements already established ("Ecodesign" Directive 2009/125/EC) - Implementation of current energy labelling directive (2002/31/EC) and new implementation measures (in the process of being adopted) within the context of Directive 2010/30/EU - Promotion of cooling services provided by ESCOs from centralised plants
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from efficiency measures and activities.
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	In collaboration with the State for the part relating to the implementation of the buildings directive
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Installation of air conditioning equipment and systems with a seasonal EER (Energy Efficiency Ratio) of at least: standalone plant: **3.3** centralised plant: **4.1** The energy efficiency action may be carried out using the various technologies available on the market that make it possible to achieve the performance required.
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE, AEEG, GSE and ENEA
	Authority responsible for monitoring	GSE – ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	24 GWh p.a.
	Saving expected by 2016	540 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Demand for conditioning satisfied in 2005: 10 TWh f p.a., equating to 500 m m^2 conditioned (unit consumption: 20 kWh f/m^2 p.a.) average EER (individual plant): 2.39 Giving an energy consumption of: 4.2 TWh **Business as Usual Scenario 2016** *Stand-alone plants:* Demand for conditioning satisfied: 23.1 TWh f p.a. (1 155 m m^2 conditioned) By plants with an average EER = 3.05

		For an energy consumption of: 7.99 TWh p.a. *Centralised plant* Demand for conditioning satisfied: 0.2 TWh f p.a. (9.4 m m^2 conditioned) By plants with an average EER = 3.6 For an energy consumption of: 0.05 TWh p.a. **EEAP 2016 Scenario** *Stand-alone plants:* Demand for conditioning satisfied: 22.9 TWh f p.a. (1 145 m m^2 conditioned) Overall consumption: 7.21 TWh p.a. Equipment with average EER = 3.2 *Centralised plant* Demand for conditioning satisfied: 0.37 TWh f p.a. Overall consumption: 0.1 TWh p.a. (18.7 m m^2 conditioned) Equipment with average EER = 4.1 **Unit saving:** *Stand-alone plants:* 90 kWh p.a. for each kWf of efficient refrigerating power installed *Centralised plant:* 100 kWh p.a. for each kWf of efficient refrigerating power installed
	Overlap with other measures	No overlap

Title		***The use of efficient central heating systems***
Code		RES-8
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Tax allowances of 55% and related modifications and supplements with other measures (thermal feed-in tariff). - Implementation of Legislative Decree 192: Imposition of more stringent constraints on the performance of heating plants in new or refurbished buildings. - Incentives for the replacement of inefficient boilers - Energy Performance Certification of Buildings - Programmes of information and of the role of energy certification - Promotion of heating services provided by ESCOs from centralised plants
	Timeframe	Start: 2005 for White Certificates; 2007 for 55% tax allowances; 2005 for Legislative Decree 192. End: still in effect
	Brief description of the measure	- Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities. - Tax allowances against IRPEF (tax on the income of individuals) or IRES (corporation tax on profits of companies) of 55% of the costs incurred for certain types of energy upgrading work on existing buildings. Voluntary measure
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Heating using non-renewable sources: installation of efficient plants, with the following average seasonal energy efficiency values (in relation to primary energy): **Existing buildings:** Average seasonal energy efficiency of the plant>=0.85 **New or completely refurbished buildings:** Average seasonal energy efficiency of the plant>=0.90 The energy efficiency action may be carried out using the various technologies available on the market (e.g. condensing boilers, heat pump systems using compression or absorption technology, high-efficiency cogeneration plants, systems integrated with solar energy) that make it possible to achieve the performance required.
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	- MiSE, AEEG, GSE and ENEA - MiSE for 55% tax allowances - MiSE, Regions for implementation of Legislative Decree 192
	Authority responsible for monitoring	GSE-ENEA
Energy saving	**Calculation methodology**	Bottom up From monitoring of the databases of White Certificates and 55% tax allowances (paragraph 347).

		The figures include the energy savings resulting from the replacement of heat generators in transposition of Directive 2002/91/EC; the savings achieved by 2010 were reduced to exclude plants accounted for under the White Certificates mechanism in order to avoid duplication in the statistics.
	Saving achieved by 2010	13 929 GWh p.a.
	Saving expected by 2016	26 750 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Demand for heating: 16 MTOE p.a., equating to 19.5 m heated dwellings Average seasonal energy efficiency of the plant of 0.68 Giving an energy consumption of: 22.7 MTOE (1.16 TOE p.a./dwelling) **Business as Usual Scenario 2016:** Demand for heating: 17.7 MTOE p.a., equating to 21.5 m heated dwellings (of which 2 m dwellings will be new). Average seasonal energy efficiency of the plant: 0.76 Equating to an energy consumption of: 22.4 MTOE (1.04 TOE p.a./dwelling) EEAP 2016 Scenario: Demand for heating services: The same figure as the BAU scenario. Average seasonal energy efficiency of the plant: 0.86 Giving an energy consumption of: 20.1 MTOE (*) (0.93 TOE p.a./dwelling) **Unit saving: 0.25 TOE p.a./dwelling**
	Possible overlap with other measures	Possible overlap of 55% tax allowances and White Certificates

Title		***Balanced flues and wood-fired boilers***
Code		RES-9
Description	**Type of efficiency improvement measure**	- Incentives and tax allowances for the replacement of inefficient boilers - Imposition of more stringent constraints on the performance of heating plants in new or refurbished buildings - 55% tax allowance - Promotion of heating services provided by ESCOs from centralised plants - Programmes of information and of the role of energy certification
	Timeframe	Start: 2007 for 55% tax allowances. End: still in force (55% tax allowances until 31.12.2011, unless renewed)
	Brief description of the measure	- Tax allowances against IRPEF (tax on the income of individuals) or IRES (corporation tax on profits of companies) of 55% of the costs incurred for certain types of energy upgrading work on existing buildings and related modifications and integrations with other measures (heat feed-in tariff). Voluntary measure.
	Final sector involved	RESIDENTIAL
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Installation of balanced flues and wood-fired boilers for domestic use (heating, domestic hot water, cooking) with the following average seasonal energy efficiency (in relation to primary energy): Classification of balanced flues and wood-fired boilers: Class C – Plant efficiency rating = 0.53 Class A – Plant efficiency rating = 0.75
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	MiSE - ENEA
	Authority responsible for monitoring	MiSE, the Regions, ENEA
Energy saving	**Calculation methodology**	Bottom up From monitoring of the database of 55% tax allowances (paragraph 347).
	Saving achieved by 2010	325 GWh p.a.
	Saving expected by 2016	3 480 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Consumption of renewable fuels in the domestic sector: 12.79 TWht p.a., equating to 1.1 MTOE. Domestic sector demand for heating obtained from renewable fuels amounting to 6.8 TWht p.a. (average Class C plant). Unit demand for heating for an average dwelling 0.75 TOE p.a. Assumption that 780 000 dwellings will be heated totally by wood.

		Business as Usual Scenario 2016: Situation unchanged **EEAP 2016 Scenario:** Demand for heating services: unchanged. Replacement of boilers and hearths in 780 000 dwellings; with Class A equipment Energy consumption: 9.31 TWht (0.8 MTOE) **Unit saving:** 4.45 MWht p.a. per dwelling (0.38 TOE p.a./dwelling)
	Overlap with other measures	No overlap

N.B. In this sector it is essential to promote regular maintenance to confirm the efficiency in terms of the plant certification, pursuant to DPR 59/09, also for domestic biomass installations, the only exclusion being for open hearths.

3.3.2.2 *Measures to improve energy efficiency in the services sector (including the public sector)*

Knowledge about the size and the energy characteristics of the national building stock for non-residential use is, at present, very imprecise. Characterised by a disparate make up (construction, plant engineering and intended use), this sector currently provides minimal data on its property and there are large gaps in the information on operational and maintenance matters.

The current status of the energy efficiency of the buildings was assessed in reference to what was laid down until 2005 in Law 373/76 and DPR 412/93. Assessment of possible improvements, however, was made in reference to the requirements of Legislative Decree 192/05 and subsequent modifications.

In order to determine the extent of the building stock and its distribution across the country, reference was made to the ENEA-CRESME data, with regard both to schools and to buildings used for offices and hotels. It should be pointed out in connection with offices, that only buildings fully occupied by bodies involved in public administration were taken into consideration, excluding therefore all buildings occupied by public bodies, but located in apartments or other buildings not fully public-owned.

Office buildings in particular form a significant part of the building sector, and are also of great significance in terms of energy consumption.

Within this context, public administration has the duty to carry out works on the buildings for which it is responsible, in keeping with the policy of reducing consumptions and rationalising the use of energy, without forgetting that activities carried out in public can also serve as a good example to the private sector as well as being a factor for raising the quality of the market. This action finds impelling support in Directive EPBD 1 and Legislative Decree 192/05. The very same obligations are made even more stringent by Directive 2010/31/EC (EPBD 2).

To this end, for the categories of buildings for which there is a significant amount of data, schools, hotels and offices, ENEA has developed a methodology that has made it possible to determine the characteristics of “typical buildings” in order to carry out an assessment of the feasibility of the various kinds of energy upgrading works. The energy analysis of the building stock reviewed was carried out using different models of building types characterised by distinct layouts and structural types (see the panel below), in accordance with the eras of construction into which the building stock has been sub-divided.

Schools

The educational sector is one of the most well-studied, for various reasons (among them safety), hence its size is fairly certain being in the order of 52 000 units, of which 40% are in the north, 22% in the centre and 38% in the south. The majority of school buildings are not of recent construction, nearly 35 000 schools (67%) in fact pre-date Law 373/76.

Characteristic	UOM	Value
Volume	m^3	11 700
Building plan	m^2	900
Envelope surface area	m^2	3 490
Opaque surface area	m^2	1 183
Transparent surface	m^2	507
Building height	m	13
S/V	(1 /mq)	0,3

In order to determine the energy consumed for heating, a typical building was defined as being representative of the entire building stock, the characteristics of which are shown in the table above.

Public Administration

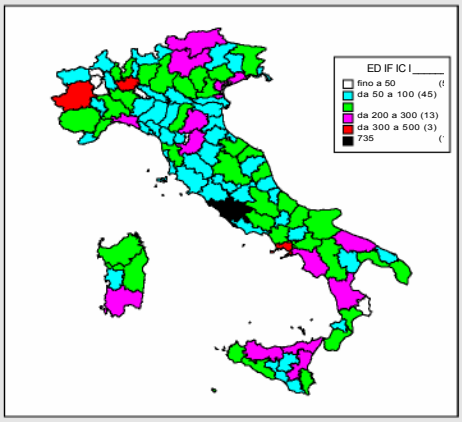
The "Public Administration" sector is absolutely the least known: it is known that there are about 15 000 bodies issuing contracts in Italy and that the total number of "Administration" buildings occupied solely for non-residential activities (public and private) is about 80 000 units.

The number of buildings used "totally as offices" is 13 580, equating to a covered surface area of 23.4 million m^2. The breakdown of public buildings by sector is shown in the following table:

	Buildings	Surface
Local Government	9 550	16 811 119
Education	2 025	2 594 456
Health	508	2 285 834
Research and Development	247	491 701
Electricity, gas, water	129	100 312
Buildings and constructions	128	189 469
Other	993	955 683
Totals	**13 581**	**23 428 573**

Source CRESME-ENEA

At a provincial level, Rome has the highest number of buildings (735) followed by the provinces of Turin (426), Naples (376) and Milan (371). These first 4 provinces account for 14% of the entire national building stock. The covered surface areas are primarily concentrated in the provinces of Rome (3.1 million m^3) followed by Milan (920 thousand), Naples (833 thousand) and Turin (799 thousand). In terms of surface areas, 50% is concentrated in the first 16 provinces, this datum being of significant importance in determining the target for any actions to improve efficiency and raise awareness. The national distribution, by province, is shown on the accompanying map.



A "typical building", representative of the entire building stock, has also been defined for offices: the average volume was set at about 6 000 cubic metres, the floor plan at 500 square metres and the surface/volume ratio at 0.35.

Hotels

The overall number of hotels was estimated at 25 845 buildings, of which 14 781 are in the north (57%), 5 319 in the centre (21%) and 5 745 in the south (22%). With regard to hypothesising on a reference building, the average volume was set at about 6 450 cubic metres, the surface area at 537 square metres, the height between floors at 3.2 metres and the S/V ratio at 0.4.

For each of the aforementioned end-uses, the estimate of the savings by 2016 in relation to measure TER-1 was made by simulating a set of 6 different types of building, differentiated by local climate (north, central, south) and by age (pre-373/76 and post-373/76).

The consumption was then calculated for each of these buildings, taking the building type as a reference and multiplying the value obtained by the corresponding number of units. From an energy point of view, the activities anticipated match the standards laid down by Legislative Decree 192/05 and subsequent implementing decrees. The activities were applied to the various end-uses, considering only those actually applicable and capable of being carried out while ensuring the continuity of use of the buildings involved.

The activities taken into consideration were:

- thermal insulation of the roof space;
- thermal insulation of the roofing and heat-dispersing opaque outer walls;
- replacement of doors and windows;
- upgrading the conditioning plant's regulation system (thermostatic valves, etc.);
- replacement of heat generator;
- solar panels for the production of DHW;
- external solar screens on south-facing sides of the building.

Current consumption for heating the buildings examined amounted to about 2.5 MTOE. The actions proposed cover about 42% of the buildings and produce savings of 0.95 MTOE, equating to 11 166 GWh p.a.

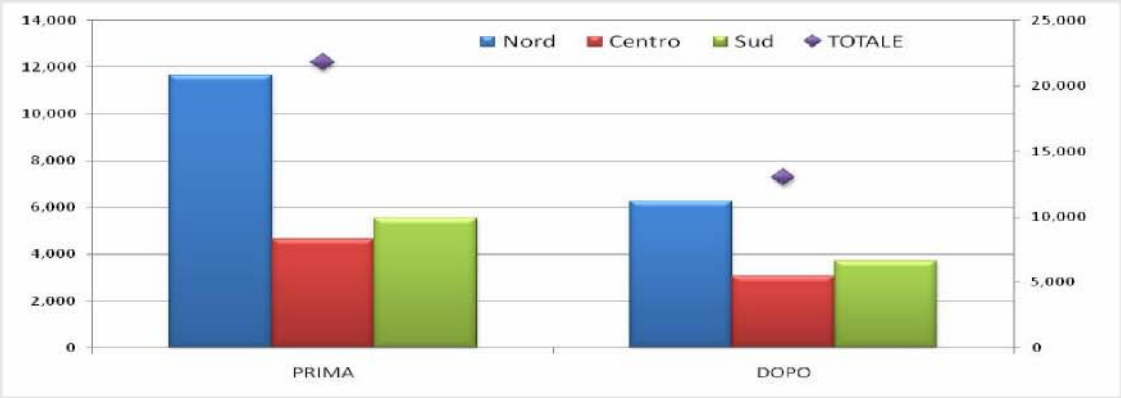
Table 3.13 – Consumption for heating the buildings considered: schools, administration and hotels

Building type	No of buildings	No buildings worked on	%	Millions cubic metres	Consumption of bldings worked on GWh p.a.		Reduction in consumption GWh p.a.
					Before	After	
Schools	52 000	22 095	42	259	11 434	2 636	8 798
Admin	13 581	6 073	45	36	1 475	403	1 072
Hotels	25 845	10 577	41	68	2 275	979	1 296
TOTALS	91 426	38 644	42	363	15 165	4 013	11 166

Detail of the calculation of the energy saving potential in the buildings considered

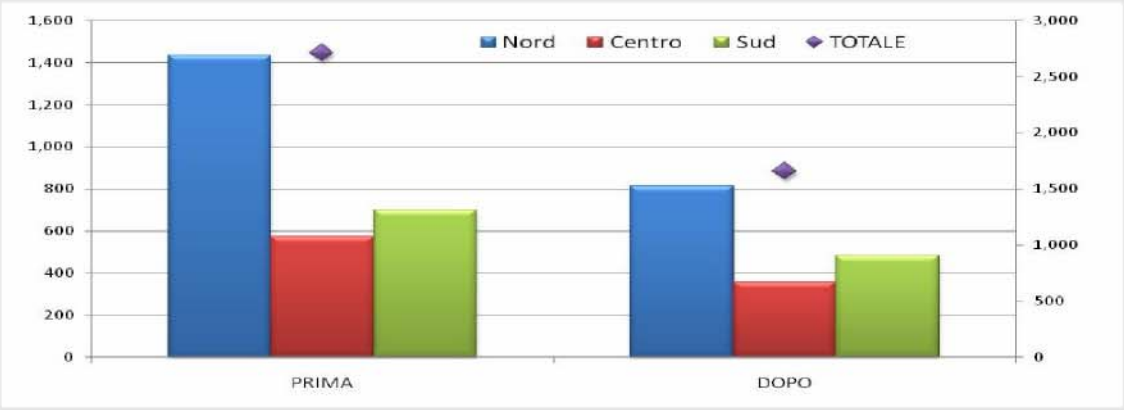
In the case of the school buildings it was assumed that actions were carried out on about 22 000 buildings (42% of the total), weighted towards the older buildings. The reduction in (final) energy consumed just for heating, obtainable with the intervention strategies described in the preceding paragraph, is about 8 800 GWh (0.76 MTOE).

The following graphic shows the results broken down by geographical area: naturally, the greatest savings were obtained in the north, by virtue of the higher number of operating hours per annum of the heating systems.



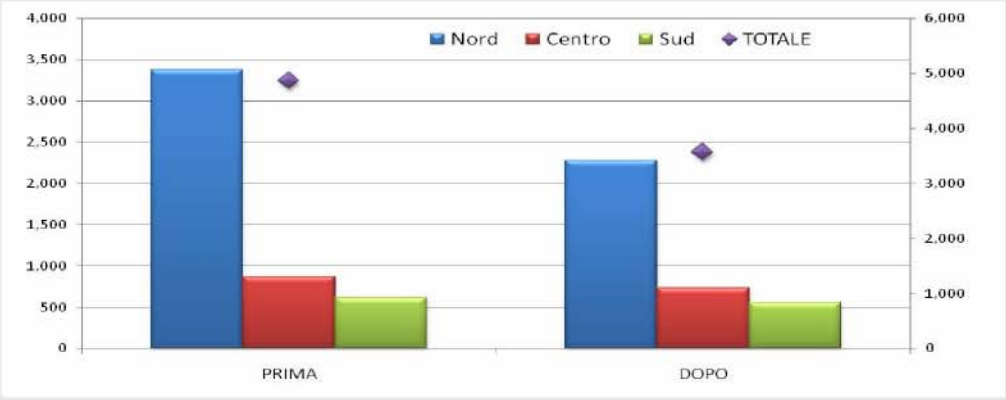
Comparison of consumption of schools before and after the efficiency upgrade

Given the Public Administration's role of setting an example, an assumption was made that work would be carried out in about 45% of buildings used for administration purposes, over 6 000 buildings. Energy consumption for winter heating (summer air conditioning was excluded) of the entire building stock was estimated at about 2 700 GWh (0.23 MTOE): after carrying out the proposed work on 45% of the buildings, this consumption fell to 1 640 GWh (0.14 MTOE).



Comparison of consumption of public offices before and after the assumed efficiency upgrade

In the light of the energy efficiency incentives provided for in the recent Legislative Decree No 28/2011 in transposition of Directive 2009/28/EC, for hotels an assumption was made that work would be carried out on about 10 500 buildings (about 40%). As can be seen in the graphic, due to the works carried out on the envelope of the buildings involved, the final energy consumption for heating (it should be noted that air conditioning was excluded) falls from the current 4 861 GWh (0.42 MTOE) to little more than 3 500 GWh (0.31 MTOE).



Comparison of consumption of hotels before and after the assumed efficiency upgrade

Title		***Upgrading energy efficiency of existing buildings***
Code		TER-1
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes - Incentives for the replacement of inefficient boilers - Imposition of tighter constraints on the performance of heating plants in new or totally refurbished buildings - Energy Performance Certification of Buildings - Promotion of heating services provided by ESCOs from centralised plants
	Timeframe	Start: 2005 for White Certificates; End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	SERVICES
	Target group	State sources of finance
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Heating using non-renewable sources: installation of efficient plants, with the following average seasonal energy efficiency values (in relation to primary energy): Existing buildings: Average seasonal energy efficiency of the plant>=0.85 New and totally refurbished buildings average seasonal energy efficiency of the plant >= 0.90 The energy efficiency action may be carried out using the various technologies available on the market (e.g. condensing boilers, heat pump systems using compression or absorption technology, high-efficiency cogeneration plants, systems integrated with solar energy) that make it possible to achieve the performance required.
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	80 GWh p.a.
	Saving expected by 2016	11 166 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	Described in par. 3.3.2.2.
	Overlap with other measures	No overlap

Title		***Incentives for the use of efficient air conditioning systems***
Code		TER-2
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes - Incentives to replace obsolete equipment - Promotion of cooling services from centralised plants
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	SERVICES
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Installation of air conditioning equipment with a seasonal EER (Energy Efficiency Ratio) of at least: standalone plant: 3.3 heat pump driven plants: 4.1 The energy efficiency action may be carried out using the various technologies available on the market (e.g. condensing boilers, heat pump systems using compression or absorption technology, high-efficiency cogeneration plants, systems integrated with solar energy) that make it possible to achieve the performance required.
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	11 GWh p.a.
	Saving expected by 2016	2 510 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Demand for conditioning satisfied in 2005: 41.87 TWh f p.a. Satisfied by plants with average seasonal EER: 2.9. Giving an energy consumption of: 14.5 TWh **EEAP 2016 Scenario:** Demand for conditioning satisfied: the same figure as the BAU scenario. Satisfied by plants with average seasonal EER: 3.55. Giving an energy consumption of: 19.1 TWh p.a. **Unit saving** Stand-alone plants: 90 kWh p.a. for each kWf of efficient refrigerating power installed. Centralised plant: 100 kWh p.a. for each kWf of efficient refrigerating power installed
	Overlap with other measures	No overlap

Title		***Energy-efficient lamps and control systems***
Code		TER-3
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Energy performance certification of lighting installations - Financial assistance (reduced VAT, tax rebates) for modernisation of lighting installations - Concessions for the running of public lighting services by ESCOs. - Adoption of minimum efficiency requirements (EC Regulation)
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	SERVICES
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	- Replacement of type T12 and T8 linear halophosphate fluorescent lamps with magnetic ballasts, with type T5 linear fluorescent lamps with electronic ballasts (savings achievable of at least 35%). - Introduction of control systems with motion detectors and flux regulation integrated with natural light (savings achievable of 40% on consumption levels in the absence of a control system). - New and refurbished plants must conform to the minimum energy efficiency values in compliance with the parameters laid down in standard UNI EN 12464-1 and EN 15193.
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	100 GWh p.a.
	Saving expected by 2016	4 300 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** consumption for lighting in the services sector in 2005 was 21.9 TWh. It is assumed that 75% of this consumption is attributable to systems with inefficient fluorescent lamps that have no control systems. - Average power per light point of current systems: (2xT8+VVG): 90 W - Hours of operation per annum: 2 250 - No of light points: 82 m **Business as Usual Scenario 2016:** No action on existing light points.

		EEAP 2016 Scenario: Replacement with T5 lamps and electronic ballasts on 60% of existing light points Addition of control systems with motion sensors and flux regulators integrating natural light on 20% of light points **Unit saving:** - Replacement with T5 lamps and electronic ballasts: **annual saving per light point: 70 kWh p.a.** - Control systems with motion sensors and flux regulators integrating natural light: **additional annual saving per light point: 52 kWh p.a.**
	Overlap with other measures	No overlap

Title		***Energy-efficient lamps and luminous flux regulating systems (public lighting)***
Code		TER-4
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information / education programmes - Taxation of mercury vapour bulbs - Concessions for the running of public lighting services by ESCOs
	Timeframe	- Start: 2005 - End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	SERVICES
	Target group	Owners, tenants
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Replacement of mercury vapour bulbs with new technology bulbs (metal halide / sodium HP)
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	462 GWh p.a.
	Saving expected by 2016	1 290 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Installed base of mercury vapour lamps of 80, 125, 250 and 400W: 5 760 million Consumption of above-mentioned lamps: 2.86 TWh p.a. (out of 6.1 TWh p.a. of overall consumption for public lighting). Average consumption per mercury vapour lamp: 498 kWh p.a. **Business as Usual Scenario 2016:** Same number of mercury vapour lamps as installed today **EEAP 2016 Scenario:** Complete replacement of installed mercury vapour lamps as at 2005. Overall consumption of lamps replaced as a result of the proposed measure: 1 809 GWh p.a. **Unit saving:** Average saving for each mercury vapour lamp replaced: **314 kWh p.a.**
	Overlap with other measures	No overlap

Title		***Transposition of Directive 2002/91/EC and implementation of Leg. Dec. 192/05;***
Code		TER-6
Description	**Type of efficiency improvement measure**	Legislation
	Timeframe	Start: 8 October 2005 (date when Legislative Decree 192/05 became effective) End: measure active (5th year of application) Anticipated changes: transposition of the instructions from the recasting of Directive 2002/91/EC with the publication of Directive 2010/31/EU and revision of 2006/32/EC on energy services
	Brief description of the measure	Directive 2002/91/EC on the increasing of the energy efficiency of buildings was transposed by the Italian Government by means of Legislative Decree No 192 of 19 August 2005, which came into force on 8 October 2005. This decree introduced important changes to the existing legal framework, in particular to design methodologies, minimum standards and the inspection of plants as well as introducing the energy performance certification of buildings. Directive 2006/32/EC on energy services was transposed by the Italian Government by means of Legislative Decree 115/08 of 30 May 2008. This decree provided incentives for the ESCO market, streamlined the procedures for works on buildings to install thermal solar panels, mini wind generators and cogeneration plants with a power of less than 300MW, and raised the required building energy performance levels of public buildings and buildings for public use.
	Final sector involved	SERVICES
	Target group	Property owners
	Regional application	A process is anticipated for harmonisation with regions and autonomous provinces that have already enacted a legislative instrument in transposition of the directive.
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	- New mandatory minimum requirements for primary energy needs for winter heating and for the energy needs of the building envelope with regard to summer air conditioning for all new buildings and for the total refurbishment of medium-large buildings (1 000 m^2 of useable floor space), with a phased application of the performance standards 2006-2008-2010; - Higher levels of thermal insulation for the envelope and minimum requirements for buildings that are undergoing refurbishment (without limit to size or amount) with the same phasing as the previous point; - Mandatory energy performance certification of new and refurbished buildings and in the event of sale; - Promoting the use of more efficient plant and equipment (e.g. heat pumps, three- and four-star gas boilers, for new and refurbished buildings); - Rationalising of checks on heating systems, updating the performance inspection intervals in order to contain consumption;

		- Mandatory covering of 50% of the annual primary energy needs for domestic hot water by means of renewable energy sources (20% for buildings in old town centres);
	Budget and source of financing	No specific financing provided for (legal obligation)
	Authority responsible for implementation	MiSE and the Regions
	Authority responsible for monitoring	MiSE, the Regions and ENEA
Energy saving	**Calculation methodology**	Bottom up
	Saving achieved by 2010	4 004 GWh p.a.
	Saving expected by 2016	4 984 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	For the calculation methodology adopted see par. 3.3.2.2.
	Overlap with other measures	No overlap

3.3.2.3 Measures to improve energy efficiency in the industrial sector

As far as the industrial sector is concerned, the figures for the energy savings anticipated by 2016 from the measures relating to high-efficiency electric motors (IND-2) and the installation of inverters on electric motors (IND-3) have been changed from those in EEAP 2007.

The expected annual savings targets in EEAP 2007 for electric motors were:

- Measure IND-2 (high-efficiency motors): 3400 GWh p.a. by 2016, (1100 GWh p.a. by 2010).

- Measure IND-3 (installation of inverters): 6400 GWh p.a. by 2016, (2100 GWh p.a. by 2010).

These estimates were based on scenarios that assumed that the 20% fiscal incentives would be in place for a minimum of 5 years, whereas this incentive was abolished in 2010, and in general they were not a good representation of the evolution of the Italian market during those years. As a consequence, there is little correlation between the energy savings targets estimated in EEAP 2007 and the certified data from the 20% tax allowances and the White Certificates.

The savings actually recorded – as at 2010 – from the 20% tax allowances (over 4 years) were 16 GWh p.a. for IND-2 (2 GWh p.a. from White Certificates), and 121 GWh p.a. (116 from WC) for IND-3, data that can be considered to be understated but, nevertheless, consistent with the calculations made by ENEA on the ANIE[27] data, which indicate the number of high-efficiency motors installed in Italy (in 2006) to be in the order of 3% of the total.

It can be seen that the electric motor sector offers enormous potential for energy efficiency that has not yet been exploited, since end users do not have a natural tendency to invest in energy efficiency, even when there is a clear financial benefit in doing so.

Assuming that the general conditions, from here until 2016, remain unchanged from those of the last four years, the new EEAP targets for energy saving can be calculated on the basis of projections made on the 2010 monitoring data.

The numerical results of these projections of Energy Savings (ES) by 2016 are:

$$ES_{IND-2} = 40 \text{ GWh p.a. (for high-efficiency motors)} \quad (1)$$

and

$$ES_{IND-3} = 304 \text{ GWh p.a. (for inverters)} \quad (2)$$

The concurrence of a particular baseline[28], and the recent issuing of a fairly restrictive European Regulation, allow projection (1) to be viewed as a good approximation of the savings that will be produced by the incentives (White Certificates), but not representative of the actual improvement in energy efficiency of the installed motor base in Italy as at 2016.

[27] ANIE: the Confindustria federation that represents the electricity sector

[28] Bertoldi, P. and Rezessy, S.: Recommended bottom-up calculation model in the scope of Directive 2006/32/EC. Presentation for the European Energy Efficiency Action Plan scopes. Joint Research Centre – Institute of Energy, Ispra, 2011.

The benefit deriving from Regulation 640/2009[29] is twofold: an initial effect is that all the motors of the installed base (normally class EFF3) that reach their end of life will be replaced by more efficient machinery (IE2 or IE3); the second effect is the fact that the new motors, purchased for new plants, will be at least Class IE2 (rather than EFF2).

Energy efficiency benefit on the installed motor base

According to the EEAP baseline required by the European Commission and the conditions outlined above, the energy savings attributable to Community Regulation 640/2009 amount to the energy consumed by the installed machines in 2007, multiplied by a Savings Factor (SF) that takes account of the differences between the average performance of the installed base and the performance of the new motors installed, and by an appropriate Rate of Replacement (RR) that is dependent on the length of life of the machines.

$$ES_{640\text{-}2009} = E_{2007} \times SF \times RR \qquad (3)$$

Consider the following illustrative and cautious assumptions:

- the reference data are correct and in line with those available in the ISTAT-RSE databases; the reference year is 2005 (cautious assumption);
- the installed motor base is sub-divided into the following 5 power classifications: 0.75-3.00 kW; 3.01-7.50 kW; 7.51-22.0 KW; 22.1-90.0 kW; above 90 kW;
- the performance of the installed motor base is taken to be totally EFF3;
- out of prudence, correction factors were not applied to account for the natural drop in performance of machines at the end of their lives (typically down 2%);
- the performance of new motors, acquired to replace old motors in the installed base is: IE2 for all from mid-2011 to the end of 2014 (phase 1); IE2 for P<7.5 kW and IE3 for P>=7.5 kW for the years 2015 and 2016 (phase 2);
- the performance figures for the power classes were calculated with a weighted average as in [12].
- the RR depends on the average life of the machine being used, for the various power classes, and is that of the source[30].

[29] Directly applicable and valid in all Member States, without the need for transposition by national laws.
[30] U. Ciarniello: MOTORI. Una procedura per la previsione del numero di motori elettrici dei comparti dell'industria (*MOTORS. A procedure for forecasting the number of electric motors in the industrial sector.* CESI-Ricerca, Report A07005492, 2008

According to the assumptions and the sources indicated above, the energy saving represented by formula (3) may be calculated fairly accurately by using a simple spreadsheet.

The results of the calculations are summarised below.

Phase 1: Starting from 16 June 2011 and until the end of 2014 there will be a saving of 422 GWh p.a. This annual saving, for 3.5 years, will produce an energy saving of: 1 477 GWh p.a.

Phase 2: Starting from 1 January 2015 and until the end of 2016 there will be a saving of 502 GWh p.a. This annual saving, for the two remaining years covered by the EEAP, will save: 1 004 GWh p.a.

The benefit that Regulation 640/2009 will produce for the purposes of the EEAP on the installed motor base as at 2005, can be quantified as at least (1 477+1 004) 2 481 GWh p.a. by 31 December 2016.

Energy efficiency benefit on new plant

For motors installed on new plant the following saving can be estimated:

Phase 1: Starting from 16 June 2011 and until the end of 2014 (all IE2) there will be a saving of 17 GWh p.a**.** This annual saving, for 3.5 years, will produce an energy saving of: 60 GWh p.a.

Phase 2: Starting from 1 January 2015 and until the end of 2016, instead, there will be a saving of 28 GWh p.a. During the two remaining years covered by the EEAP (2016), this will produce a saving of another 56 GWh p.a.

The benefit that Regulation 640/2009 will produce for the purposes of the EEAP on new plant can be quantified as at least (60+56) 116 GWh p.a. by 31 December 2016.

Overall energy efficiency benefit of the regulation

In accordance with the assumptions listed above, by 31 December 2016 Regulation 640/2009 will have produced an energy saving (calculable for EEAP purposes in accordance with the baseline) of: 2 481+116 ≅ 2 600 GWh p.a.

In accordance with the assumptions listed above, summing the projections of the monitored data to the benefits produced by Regulation 640/2009 it is possible to identify the following new savings values expected for EAP purposes by 2016:

ES_{IND-2} = 2 640 GWh p.a.
ES_{IND-3} = 300 GWh p.a.

Title		***Energy-efficient lighting and control systems***
Code		IND-1
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Energy performance certification of lighting installations - Financial assistance (reduced VAT, tax rebates) for modernisation of lighting installations - Concessions for the running of public lighting services by ESCOs - Adoption of minimum efficiency requirements (EC Regulation) New energy labelling under discussion
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	INDUSTRY
	Target group	User companies, ESCOs
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	1. Replacement of type T12 and T8 linear halophosphate fluorescent lamps with magnetic ballasts, with type T5 linear fluorescent lamps with electronic ballasts (savings achievable of at least 35%). 2. Introduction of control systems with motion detectors and flux regulation integrated with natural light (savings achievable of 40% on consumption levels in the absence of a control system). - New and refurbished plants must conform to the minimum energy efficiency values in compliance with the parameters laid down in standard UNI EN 12464-1 and EN 15193
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	617 GWh p.a.
	Saving expected by 2016	1 360 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Consumption for lighting in the industrial sector in 2005 was 13 TWh. It is assumed that 75% of this consumption is attributable to systems with inefficient fluorescent lamps that have no control systems. Average power per light point of current systems: (2xT8+VVG): 90 W Hours of operation per annum: 3 000 Number of light points: 36 million **Business as Usual Scenario 2016:** No action on existing light points.

		EEAP 2016 Scenario: Replacement with T5 lamps and electronic ballasts on 50% of existing light points Addition of control systems with motion sensors and flux regulators integrating natural light on 20% of light points **Unit saving:** -Replacement with T5 lamps and electronic ballasts: annual saving per light point: **95 kWh p.a.** -Control systems with motion sensors and flux regulators integrating natural light: additional annual saving per light point: **70 kWh p.a.**
	Overlap with other measures	No overlap

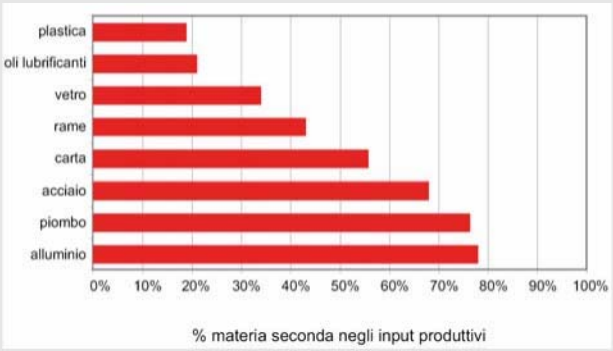
Title		***Installation of more efficient electric motors***
Code		IND-2
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes - 20% tax incentives for the installation of high-efficiency equipment (from 2007 to 2010 but not beyond) European Regulation 640/2009
	Timeframe	Start: 2007 End: 31 December 2016 Anticipated changes: from 1 January 2011 the 20% tax incentives were no longer available; from 16 June 2011 the impact of this measure will cease due to the coming into effect of European Regulation 640/2009.
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	INDUSTRY
	Target group	User companies, ESCOs
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	The installed motor base involved from 2011 has the following characteristics: asynchronous three phase squirrel cage motors; low tension; 2, 4 or 6 pole (2 and 4 pole until 2010); nominal power between 0.75 kW and 375 kW (between 1.1 kW and 90 kW until 2010) The minimum efficiency required of new electric motors entering the market is rising over time. In particular: - with effect from 16 June 2011 all motors must have a minimum efficiency level of at least class IE2 (comparable to the old class EFF1); - with effect from 1 January 2015 motors with a capacity greater than 7.5 kW must have a minimum efficiency level equal to IE3 (currently the highest class of efficiency); - with effect from 1 January 2017 all motors must have a minimum efficiency level of IE3 (but this requirement goes beyond the time limit of the EEAP).
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring through the White Certificate mechanism and Confindustria-ANIE sales data
	Saving achieved by 2010	16 GWh p.a.
	Saving expected by 2016	2 600 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	Description in par. 3.3.2.3
	Overlap with other measures	Possible overlap between White Certificates and the tax incentives (20%). Only the higher value of the two mechanisms is considered.

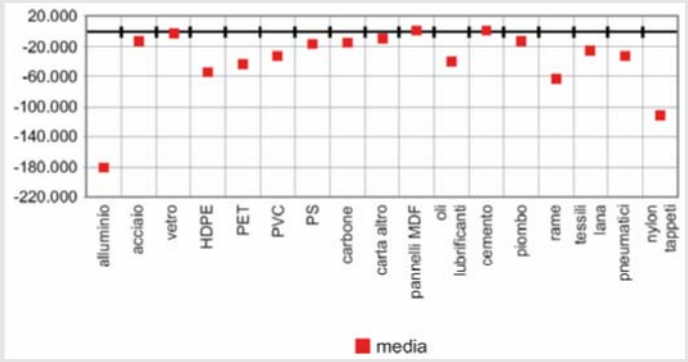
Title		***Installation of inverters on electric motors***
Code		IND-3
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes 20% tax incentives for the installation of high-efficiency equipment (from 2007 to 2010 but not beyond)
	Timeframe	Start: 2007 End: 2016 Anticipated changes: new standard schedules will be prepared that broaden the scope of the machines covered by the measure.
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	INDUSTRY
	Target group	User companies, ESCOs
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Installation of inverters on electric motors. The installation of inverters on electric motors that operate under low load factor conditions enables an improvement in the performance. To this end standard schedules applicable to pumping systems are in effect
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring through the White Certificate mechanism: standard schedules available solely for pumping systems (numbers 09 to 16). ANIE sales data not available.
	Saving achieved by 2010	121 GWh p.a.
	Saving expected by 2016	300 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	Description in par. 3.3.2.3
	Overlap with other measures	Possible overlap between White Certificates and the tax incentives (20%). Only the higher value of the two mechanisms is considered.

Title		***High-performance co-generation***
Code		IND-4
Description	**Type of efficiency improvement measure**	- Financial and legislative instruments: White Certificates - Information programmes Incentives for high-efficiency cogeneration in an industrial environment
	Timeframe	Start: 2005 End: still in effect
	Brief description of the measure	Creation of a market in Energy Performance Certificates or White Certificates, attesting to the reduction of primary energy consumption resulting from energy efficiency measures and activities.
	Final sector involved	INDUSTRY
	Target group	User companies, ESCOs
	Regional application	No
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Characteristics of high-efficiency cogeneration systems: - Energy utilisation factor: 80% - Power-to-heat ratio: 0.66
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	AEEG
	Authority responsible for monitoring	AEEG - ENEA
Energy saving	**Calculation methodology**	Bottom up Monitoring of White Certificates database
	Saving achieved by 2010	2 493 GWh p.a.
	Saving expected by 2016	6 280 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	**Situation as at 2005 and market trend:** Useful heat cogenerated: 4.6 MTOE **Business as Usual Scenario 2016:** The situation as at 2005 **EEAP 2016 Scenario:** Additional production through cogeneration of: - 1 MTOE p.a. of electrical power - 1.5 MTOE p.a. of thermal energy **Unit saving:** 0.36 MTOE p.a. for each MTOE of useful heat (co-produced)
	Overlap with other measures	None

Estimate of the impact on final energy consumption of the recycling of waste and exploiting of secondary materials

Among the various national strategies that have an impact on final energy consumption, the policies on the recycling of waste and the exploitation of secondary materials play an important role.
In fact, the industrial reuse of materials, as well as making great sense financially, delivers significant environmental benefits with particular regard to the reduction of energy consumption and green-house gas emissions. A recent study entitled *Ambiente Italia*[31] made an evaluation of the impact of recycling in Italy on the environment and on energy by analysing the life-cycle of individual materials.
The estimate made on the effects of recycling, in relation to a total of 40 million tonnes of material (from consumption and production cycles) reused in Italian industry, shows an average value of energy savings, compared with the demand in the absence of recycling, of about 15 million TOE of primary energy, and lower emissions of about 55 million tonnes of CO_2 equivalent.





Source: Ambiente Italia

Fig. A – Rate of recycling in specific industrial sectors

Fig. b – Reduction in energy consumption through recycling MJ/t produced)

The energy savings are concentrated principally in the area of the production and processing of metals. About 44% of savings, in fact, result from the secondary production of steel and about 25% from the secondary production of aluminium, which is the material for which recycling produces the biggest savings in absolute terms. The other most important types of materials are cellulose materials, which benefit from an overall reduction in energy needs of about 12% as a result of recycling, and plastic materials, which account for more than 9% in savings.
Furthermore, allowing for an increase of 15% in internal industrial recycling by 2020 in the sectors that show potential for increase (in other words, rising from a recycling rate of 48% to one of 55%), a further saving would be made of 2.3 million TOE in energy and a reduction of 8.2 million tonnes of CO_2.
If the benefits that could be derived from a more efficient management of residual urban waste handling procedures were also added to the direct contribution made by industrial recycling, by 2020 there would be a further reduction of 9.3 million tonnes of CO_2 compared with the situation in 2006 and an energy saving of 2.6 million TOE.
By adding together the effects of recycling and of the new approach to urban waste management, the processing of waste accounts for 32% of the energy efficiency targets and 18% of the overall targets for the reduction of CO_2 emissions.

[31] Duccio Bianchi, "Eco-efficient recycling: performance and economic, environmental and energy scenarios" Edizioni Ambiente 2008

3.3.2.4 Measures to improve energy efficiency in the transport sector

In comparison with EEAP 2007, the energy efficiency improvement measures in the transport sector have also been modified in the light of certain changes made at a regulatory level. A detailed description of the calculation methodology that was used to obtain the new estimates is given below.

Estimate of the reduction in consumption following the application of Community Regulation 443/2009: the effect of the imposition of an average emission limit for new cars of 130 g CO_2/km in 2015 and 95 g CO_2/km in 2020

A basic assumption for the analysis was that the regulation, issued in 2009, would begin to influence the car market from 2010, even though the regulation itself only called for the application of any sanctions from 2012. It was furthermore assumed that the regulation in itself would be effective in achieving the reduction targets for specific average emissions of new cars (130 g CO_2/km by 2015, 95 g CO_2/km by 2020), without taking account either of any variations due to the variable vehicle population (that in Italy, however, in view of the predominant leaning of the market towards models with small to medium engine sizes, should have a marginal impact) or of the real possibility that the automobile industry might agree to assume responsibility for the fines laid down in the event of the exceeding of its target, calculated on the basis of the algorithm specified in the regulation.

The reductions in annual consumption by 2016 and 2020 were calculated starting from the estimate of the reduction in the specific average consumption of new vehicles in comparison with the reference scenario, and from certain assumptions on the trend in the car market in Italy through to 2020 and on the annual mileage of vehicles purchased from 2010, taking account of the age factor in relation to the year of analysis (2016 or 2020).

As far as the overall trend in the sales of cars is concerned, a recent analysis by Centro Studi Promotor[32] was taken as a reference point, according to which the car market will begin a slow recovery from 2012, until it reaches a sales volume of 2.35 million vehicles in 2016; for the years 2017 to 2020 an assumption was made that sales will remain constant at 2.4 million units.

The average specific consumption in the reference scenario was estimated using the previous trend line as at 2007, the year from which the first incentive measures took effect for the purchase of cars with reduced CO_2 emissions, through to the first quarter of 2010. The trend of the average unit consumptions of new cars through to 2020 thus obtained, extrapolated from the figure recorded for emissions per unit of CO_2, is reported in the following table.

[32] December 2010

Table 3.14 – Assumptions on the trend of the average specific consumption of new cars

2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
48.94	48.80	48.66	48.52	48.38	48.24	48.10	47.96	47.82	47.68	47.56	47.43	47.31	47.18

In reality, from 2007 lower consumption figures than those of the previous trend were already being recorded due to the effects of the government incentives referred to above. These effects were taken into consideration when assessing the reduction potential of this measure.

To estimate the reduction in the average specific consumption of a new car in connection with the implementation of the regulation, an assumption had to be made about the penetration both of the technologies aimed at increasing vehicle efficiency and of alternatives to traditional fuels, while also ensuring that these assumptions were consistent with the targets for the reduction of average specific emissions of CO_2 introduced by the regulation itself.

The assumption was made that all the technologies offering alternatives to engines fuelled by diesel, petrol (including among the latter hybrid solutions with electric batteries, at varying levels of hybridisation, though not powered through the grid) and LPG would maintain their current rate of penetration. Furthermore, it was assumed that there would be a gradual increase in the penetration of plug-in electric vehicles (vehicles powered totally by electricity – PEV or in combination with internal combustion engines – PHEV).

This presupposes that the success of electric vehicles is also the result of complementary measures, especially relating to the provision of an adequate recharging network for those requiring external charging. Nevertheless, since the actions required in this regard are still yet to be fully defined, the assumption on the penetration of electric vehicles was kept fairly prudent.

The hybridisation of conventionally fuelled vehicles (petrol and diesel) was considered overall to be a suitable technological option for improving the energy efficiency of this type of vehicle. Due to the adoption of the combination of petrol and diesel engines with batteries, conventional fuelling is succeeding in maintaining a good level of competitiveness with alternative fuels at an energy efficiency level, enabling them to maintain their market share.

It should be pointed out that the split between petrol and diesel was assumed to be 45/55% throughout the period 2011-2020. It was assumed that the efficiency of all vehicle technologies would improve, differing depending on the level of maturity of the technology and concentrated particularly in the period 2016-2020, following the achieving of the target of 130 gCO_2/km in 2015.

For engines running on gas, a reduction in specific consumption was assumed of 15 percentage points over ten years. With regard to conventional fuels, for which the industry already has numerous options of great potential under research (including hybridisation), a reduction of almost 30 percentage points in 10 years (2011 to 2020) was assumed.

Since the Community regulation calls for a higher commitment after 2015, in order to reach the target of 95 gCO_2/km set for 2020, it was assumed that there would be an acceleration in the progress made on traditionally fuelled engines from 2016 onwards. Finally, as far as the evolution of plug-in vehicle technology is concerned, in line with the assumptions for the study carried out by RSE in 2010, a gradual reduction in consumption was assumed of one

percentage point per annum (compound) from 2010 to 2020 with initial values of 11 to 30 GOE/km respectively for pure electric vehicles (in the city car category) and for hybrid plug-in vehicles (in the medium-large category).

On the basis of UNRAE's figures on vehicles sold in 2010[33], the initial values of average emissions for petrol and diesel vehicles were set at 132 and 138 gCO_2/km. The corresponding consumption figures were extrapolated from them by applying suitable conversion coefficients[34] (see note). The base values for gas vehicles as at 2010 were also those provided by UNRAE's sales monitoring during 2010: 124 gCO_2/km for LPG vehicles, 115 for methane.

The following graph summarises the assumptions made on the energy performance development of the different classes of technology considered in the analyses.

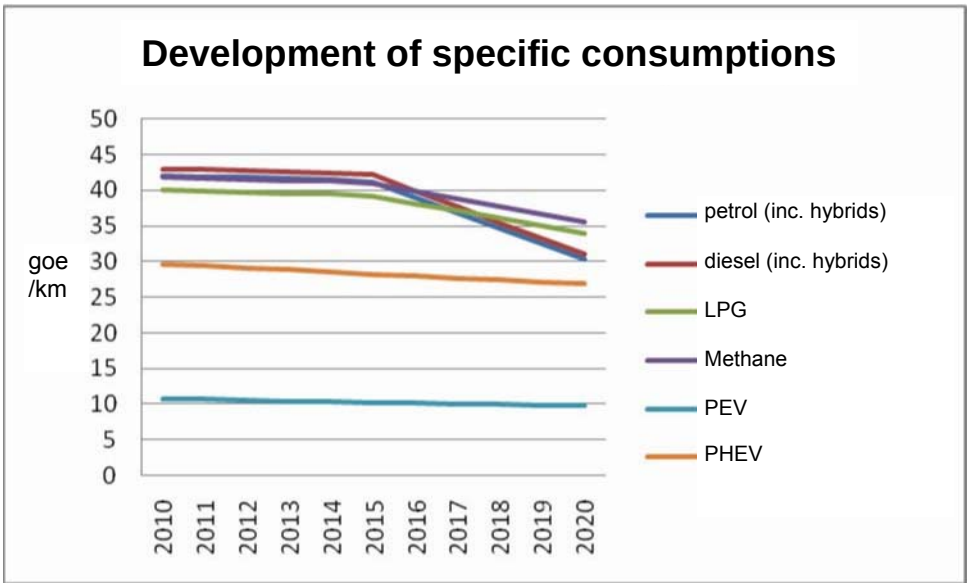


Figure 3.5 – Energy performance development of the different classes of technology

It can be seen that, due to the lower calorific value of the fuel, vehicles running on gas have a lower energy efficiency than those using petrol and diesel, although they produce lower levels of noxious atmospheric emissions[35]; the rapid efficiency improvement process assumed for conventional vehicles further increases the difference in energy efficiency over time, until it results in emissions of carbon dioxide that are more or less equal by 2020.

Based on the above-mentioned assumptions about the penetration of the different technologies and the trend in the relative energy performances, the average emissions of new cars turn out to be about 130 gCO_2/km in 2015 and about 95 gCO_2/km in 2020, values that are in line with the targets of the Community regulation, the impact of which is being assessed.

[33] Despite diesel engines being more efficient than petrol engines, they recorded a higher average level of emissions due to a different distribution of the engines sizes of new cars that on average are higher for diesels

[34] 3.14 g CO_2/GOE for petrol and 3.2 gCO_2/GOE for diesel

[35] The benefits of gas-powered vehicles must be seen in relation to the differentiation of the energy sources and the lower running costs when compared with conventional fuels.

With regard to annual vehicle mileage, it was deemed appropriate to take account of the effect that the age of the vehicle itself has of reducing the mileage year by year, having set a maximum age limit of 13 years, a value that finds support in literature and statistics on the average age of vehicles whose registrations have been cancelled (cf. figure 3.7).

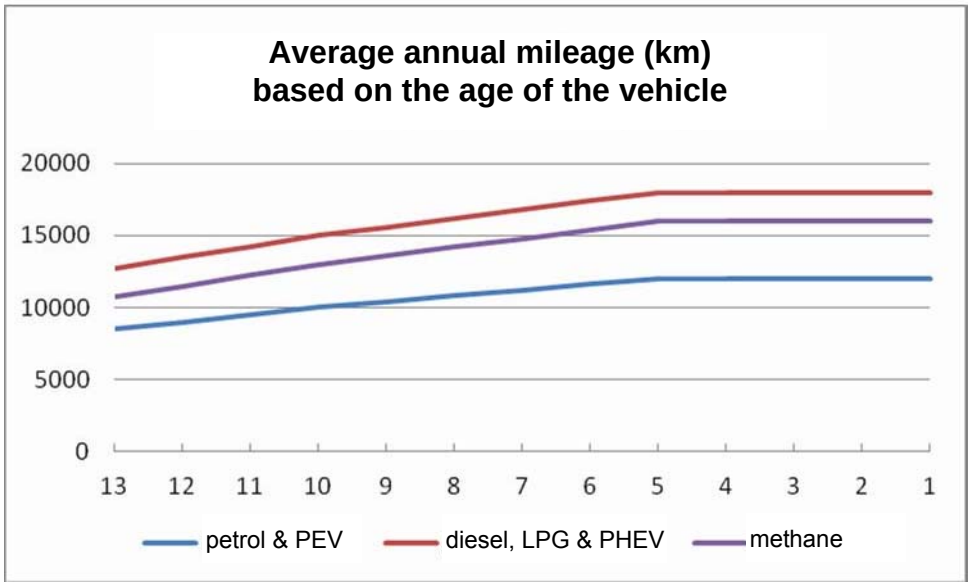


Figure 3.6 – Annual mileage (km) of vehicles based on age

On the basis of the assumptions about new cars, the penetration into the market of various new technologies and the trend of the relative average energy performances, it was estimated that there will be a reduction in consumption compared with the reference scenario of about 13 254 GWh p.a. (this quantity, together with the 6 342 GWh p.a. relating to the measures described below, constitute the reduction potential of Community regulation measure TRA-2 of Table 3.11 amounting to 19 597 GWh p.a.) in 2016 and of about 32 443 GWh p.a. in 2020.

Effect of the imposition of a further reduction of 10 g CO_2/km in average emissions of new cars

Regulation 443/2009 states that, within the context of the integrated Community approach, provisions will be made to bring about a reduction (in addition to the previously discussed targets) of 10 CO_2/km in the average emissions of new cars.

In the absence of further specifications, it is assumed that these provisions will become mandatory from 2012; it is further assumed that the reduction in CO_2 emissions at the point of use will result in a substantial reduction in the final consumption of conventional fossil fuels.

On the basis of the assumptions outlined above, for each of the two analysis timescales a calculation was made of the average mileage of new cars from 2012 onwards, from which the reduction in overall consumption resulting from the reduction of specific emissions of CO_2 was calculated, giving a value of about 6 342 GWh by 2016 and about 11 464 GWh by 2020.

Title		***Government incentives 2007, 2008, 2009 to encourage environmentally friendly replacements for cars and commercial vehicles up to 3.5 tonnes***
Code		TRA-1
Description	**Type of efficiency improvement measure**	Legislation
	Timeframe	Start: 1 January 2007 End: 31 December 2009 (with the possibility of registering vehicles up to 31 March 2010)
	Brief description of the measure	Financial contribution and/or exemption from payment of vehicle taxes for the purchase of low emissions vehicles, depending on the performance of the vehicle and the possible scrapping of a vehicle over 10 years old. The incentives are advanced by the authorised centres carrying out the scrapping, or the manufacturers or importers of new cars that will refund the vendor with the contribution, recovering the said amount as a tax credit solely for the purposes of the compensation.
	Final sector involved	TRANSPORT
	Target group	Owners of cars and light commercial vehicles (vans), private individuals and companies
	Regional application	Incentives cannot be accumulated with other concessions that may exist at a regional level, but that are not the subject of this assessment
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Accelerated replacement of the light vehicle population and higher rate of sale of vehicles having a low impact on the environment and energy
	Budget and source of financing	Finance Acts 2007, 2008 and 2009
	Authority responsible for implementation	None
	Authority responsible for monitoring	Ministry of Finance
Energy saving	**Calculation methodology**	Bottom up from actual data available in 2010 Detailed description in par. 3.3.2.4.
	Saving achieved by 2010	2 972 GWh p.a. (including the effect of the incentives for light commercial vehicles)
	Saving expected by 2016	2 186 GWh p.a. (the effect is gradually reduced due to the reduction in annual mileage based on the age of the vehicle; furthermore the effect of the incentives for commercial vehicles is ignored)
	Assumptions for the assessment of the energy efficiency activities	Description in par. 3.3.2.4
	Overlap with other measures	None

Title		**Application of Community Regulation EC 443/2009 defining levels of performance in connection with emissions from new vehicles within the context of the integrated Community approach to the reduction of CO_2 emissions from light vehicles**
Code		TRA-2
Description	**Type of efficiency improvement measure**	Legislation
	Timeframe	Start: 28 December 2009 (setting up of monitoring arrangements) End: not defined
	Brief description of the measure	Creation of appropriate structures for implementing and monitoring the application of Community Regulation 443/2009
	Final sector involved	TRANSPORT
	Target group	The automotive industry
	Regional application	
Information on execution of the measure	**List and description of the energy saving actions relating to the measure**	Manufacture and sale of light vehicles with low CO_2 emissions
	Budget and source of financing	State sources of finance
	Authority responsible for implementation	Government authority to be set up
	Authority responsible for monitoring	Government authority to be set up
Energy saving	**Calculation methodology**	Bottom up
	Saving achieved by 2010	Not monitored
	Saving expected by 2016	19597 GWh p.a.
	Assumptions for the assessment of the energy efficiency activities	Detailed description in par. 3.3.2.4.
	Overlap with other measures	The possible spread of plug-in electric vehicles may increase the need for electricity production with multiplicative effects on the energy efficiency measures in this sector

3.4 Public Sector

3.4.1 The exemplary role of the public sector

In order to promote and support the energy efficiency activities in the public sector, an observatory will be set up with the objective of creating a reference framework on the status of the nationwide implementation of the energy efficiency programmes and their effectiveness, in support of the process of defining policies and identifying implementation measures, with a view to collaboration and interchange between institutions and stakeholders, both public and private.

In compliance with what is laid down in Directive 2006/32/EC and Article 5 of Legislative Decree

115/08, the activities of the observatory will relate primarily to:

- monitoring the actions carried out, by sector of the economy and by geographical area

- measuring the savings achieved following the actions, by sector and geographical area

- checking the overall levels of savings achieved against the indicative national targets

- identifying the best practices that are replicable and significant in terms of levels of energy savings achieved

- identifying the different players involved in the process of implementing the activities and their methods of operation in order to strengthen the links between them.

In order to provide technical and operational support for the decisions in the energy efficiency sector, the observatory when fully operational must also identify, collect and coordinate the body of data/information necessary for the different phases of the development process of energy efficiency plans, in particular through:

- development of a cognitive framework, aimed at identifying the geographical areas/sectors of the economy that are key targets for actions, and assessing the relative potential for achievable savings;
- identification of the activities, the instruments for carrying them out and the related implementation measures;
- assessment of the economic and financial benefit of the activities identified;
- assessment of the impact of the activities identified on the evolution of the demand for energy.

The monitoring must be transparent and comply with methodological standards and criteria to guarantee appropriate levels of uniformity and integration of the system. The results of the processing will be made available to the public through the internet in order to encourage the exchanging of experiences, with particular reference to best practices, opening up to debate even the possibility of their exportability.

In addition, in order to provide technical-scientific support and consultancy to the State, the regions and to local bodies, the UTEE will carry out activities to:

1. arrange for the preparation of the annual energy efficiency report and national plans for energy efficiency;
2. arrange for the checking and monitoring of the projects carried out and the legislative measures adopted, gathering and coordinating the necessary information;
3. arrange for and support the regions in the preparation of strategic plans for promoting energy efficiency and energy services, to be implemented within the context of regional energy plans;
4. facilitate and implement the exchange of best practices between public bodies;
5. promote and disseminate the best practices.

With a view to the definition of a reference framework on the status of the application of current regulations and on the implementation and effectiveness of energy efficiency programmes being carried out, as well as the provision of proposals for the development of coordinated

policies on the matter, the following activities will be carried out:

- monitoring the application of regulations for energy efficiency in all sectors of the economy and by geographical area;
- participation in the 'round-table' for comparisons and coordination between the State, the regions and the Autonomous Provinces of Trento and Bolzano, set up pursuant to Article 5 of the Ministerial Decree of 26 June 2009, concerning the national guidelines for the energy performance certification of buildings;
- setting up a computerised system for collating: data relating to the measurement of energy savings achieved, (by sector and in total) and their comparison with the national targets, the corresponding data and environmental impacts and the most significant best practices in terms of projects, promotions and information;
- carrying out of studies on the impact of current regulations with particular regard to the costs to the public, the simplification of procedures, the development of energy services and the competitiveness of our manufacturing sector;
- carrying out a census of compatible national laboratories with the market checks for compliance with the minimum energy efficiency requirements set by the European regulations for implementing the Ecodesign Directive (2009/125/EC) for energy-consuming products;
- formulating an organisational proposal consistent with the diverse types of products to be subjected to checking;
- formulating proposals for complying with current regulatory provisions and for the transposition of new Community directives within a planned and integrated framework;
- formulating proposals for the development of coordinated initiatives to provide information to the public, workers and businesses, encouraging the provision of common instruments at a national and regional level, and optimising the available resources.

Finally, provision has been made for a special technical-scientific workgroup to be set up by the Ministry of Economic Development, the Ministry of the Environment, the Ministry of Transport and the Ministry for the Regions that, being assigned to prepare the schedules of the provisions, will follow up the aforementioned priority through the revision of Legislative Decree 192/05 and related provisions for implementation aimed at the application of Directive 2010/31/EC.

National results of the European "Covenant of Mayors" initiative

With the aim of increasing awareness on energy issues, in November 2005 the European Commission launched the *Sustainable Energy for Europe* (SEE) initiative, a campaign open to public and private bodies that has four principal goals:

1. to increase the awareness of decision-makers in the various sectors (public, private, NGO, etc.) and at different levels (local, regional, national and European);
2. to disseminate best practices and to contribute to the goals of the EU's energy policy, improving the security of energy supplies and combating climate change;
3. to ensure an appropriate level of information and adequate support in order to achieve a high level of public awareness;

4. to stimulate an increase in private investment in the sustainable energy technology sector.

All (public and private entities) who present projects and initiatives that meet the objectives listed above may become partners in the SEE campaign, operating within one of a series of working areas of the campaign itself, coordinated in Italy by the Ministry of the Environment. The national action plan for renewable sources identifies the SEE campaign as one of the principal awareness initiatives in operation in our country. The Local and Regional Energy Agencies also support the public authorities and the municipalities in the activities specified in the Covenant of Mayors.

Within the ambit of the SEE campaign, a special role has been assigned to cities, which, as is well known, use more than 50% of the energy consumed in Europe, with high levels of CO_2 emissions. Hence, their role in the fight against climate change is of primary importance. Therefore in 2008 the European Commission launched the Covenant of Mayors with the goal of involving cities in reaching, if not actually exceeding, the targets for the reduction of CO_2 emissions by 2020. At present over 2400 European cities have joined this initiative, including over 800 Italian cities that have ratified their commitment to the Covenant of Mayors by approving suitable resolutions in their council meetings. This commitment will be cemented still further within a year from the adoption of these resolutions since the cities must present their own Sustainable Energy Action Plan (SEAP) in order to achieve the Covenant's objectives. In fact, with the SEAP, cities undertake to present their own policies and measures for the fight against climate change and, for the first time ever, take on a quantitative commitment to the reduction of emissions, in the same way as the national governments with which they of necessity have to collaborate in order to reach the ambitious targets set for 2020 together. This initiative also focuses on the concept of a *smart city*, where urban space, properly managed under a far-sighted policy, takes on the challenge of globalisation and sustainable development with particular attention to social cohesion, to the dissemination and availability of knowledge, to creativity, to real liberty and mobility and to the quality of the natural and cultural environment.

In this regard the European Commission, within the ambit of the initiatives for the European SET Plan, is about to launch the *Smart Cities and Communities Initiative* with the purpose of giving greater effect and structure to the activities for promoting the Smart City concept.

The collaboration between national and local government could be brought about, within the scope of the "climate and energy" package, through the promptings of the decision of the European Parliament and the Council of the European Union on the effort-sharing that Member States will have to pursue to achieve the 2020 emissions reduction targets in the non ETS sectors, sectors such as residential, transport and services that relate more directly to the national confines.

The high number of Italian cities and towns that have so far subscribed to the Covenant of Mayors is also due to the role being played by the support structures (in the main, the provinces of our country) that, always in concert with the European Commission, are providing support to the towns in their areas. To date about thirty SEAPs have been approved by Italian councils, but many others are in their final stages, due also to the information and training work carried out by the support structures and by the Ministry of the Environment, which run an ongoing nationwide programme of events, in collaboration with various SEE partners. These include the annual cycle of conventions and seminars that target the promotion and further expansion of the Covenant of Mayors and, above all, the provision of instruments for the effective drafting of SEAPs based on the guidelines drawn up by the European Commission.

Also, in its recent 2011 financing announcement, the Intelligent Energy Europe programme proposed interesting financing arrangements for providing technical assistance to local bodies to enable them to carry out the investments called for by the SEAPs.

Analysing the SEAPs already approved by certain Italian councils, and solely in the public sector, reveals great potential for energy efficiency improvement. For example, for public lighting there is estimated to be a potential for reducing consumption by at least 10% by simply optimising the hours of operation. In addition there is the saving obtainable through the replacement of inefficient lighting units (for example from 125 W mercury to 100 W sodium), that could range from 5% to 15%. A further 10% reduction in consumption could be obtained by changing from sodium lamps to LED systems. The overall potential for containing consumption in this sector is around 35%.

As far as heating is concerned, by careful management and a target agreed on with the maintenance provider, especially in northern Italy, the saving resulting just from optimising the operation can be estimated at 10%. With ad hoc investments in the energy efficiency of plants, a further 10% could probably be saved.

Another area of interest is that of lighting and equipment inside public offices where it could be estimated that, through careful management and with investments to gradually replace obsolete plant and machinery, there is the potential for a 3-5% reduction in consumption.

European Energy Efficiency Fund

During the course of the 2009 financial year the European Union, in the context of the initiatives aimed at countering the effects on Europe of the financial-economic crisis, appropriated about 4 billion euros to support infrastructure projects in the energy sector and for projects on renewable energy (European Energy Programme for Recovery – EEPR). A part of the fund, amounting to about EUR 140 m (the EU Contribution), is currently still unused and must be employed within the next few months, otherwise the unused funds will have to be returned to the EU's Member States.

In May 2010, therefore, the European Commission proposed to the EIB that the above-mentioned residual funds be used for the creation of a debt fund to support energy efficiency and small renewable energy projects submitted by public bodies in the EU 27 context. This proposal by the Commission was motivated by both a specific desire to increase the initial EU contribution, and also the existence of a similar fund, the Green for Growth Fund for the Western Balkans and Turkey, successfully launched by the EIB itself at the start of 2010.

The fund's mission is to contribute, in the form of a public-private partnership, to the development of projects in the field of renewable energy and energy efficiency improvement in the EU 27, primarily through debt instruments (direct or through intermediary financiers).

The principal beneficiaries of the initiative are local, regional and national bodies, or private companies that operate on behalf of these bodies, (utilities, public transport operators, social housing associations, ESCOs, etc.) which, also because of the crisis, are encountering many difficulties in obtaining forms of financing for projects in the field of renewable sources and energy efficiency, primarily because of a strong aversion to risk by commercial banks and a worsening of their own credit rating.

In particular, the projects that qualify for financing from the fund will be:

- EE and ES projects for public and private organisations
- cogeneration projects
- delocalised renewable energy projects
- clean urban transport projects
- local infrastructure for EE and ES projects (public lighting, intelligent meters, etc.).

These projects must be of an average size of EUR 15-20 m (maximum EUR 50 m, minimum EUR 5 m) with an average duration of about 15 years, and should be spread geographically in a fairly balanced way across the various Member States of the EU-27.

As far as the possible forms of financing are concerned, the principal instruments that are currently being considered (and that will subsequently be shared with selected fund managers) are as follows:

- medium-long term senior loans
- subordinated loans
- letters of credit
- guarantees
- leasing structures / forfeiting loans
- mezzanine financing.

There will also be the possibility of direct equity investments up to an amount that must not exceed 20% of the total size of the fund.

The structure of the fund provides for the formation of a SICAV – Luxembourg SIF, with the issuing of various classes of shares, each with a different risk/yield and governance profile, in order to attract additional private investors; the following are specifically provided for:

- notes: reserved for institutional investors
- class A shares (*senior*)
- class B shares (*mezzanine*)
- class C shares (*junior*)

The class C shares, subscribed to by the European Commission, are a first loss class of shares and are entirely subordinate to all the other classes of shares; in order of subordination, they are followed by class B shares and then those of class A.

The First Closing of the Fund, on the first of July, was certified at EUR 265 m due to the commitment of the European Commission (EUR 125 m first loss class C shares) and the EIB (EUR 75 m of which EUR 65 m was for class A shares and EUR 10 m for class B), Cassa Depositi e Prestiti (EUR 60 m of which EUR 52 m was for class A shares and EUR 8 m for class B) and Deutsche Bank in its capacity as fund manager (EUR 5 m class B shares).

On the basis of what was expressly requested by the European Commission, the entire amount accumulated by the first closing must be invested within 3 years (June 2014) and with a view to prompt execution of the scheme that, it should be remembered, came about in the context of a much larger programme of response to the crisis.

The target size of the fund is set at between EUR 500 m and EUR 800 m, to be achieved through additional closings within the space of 5 years. The fund has an unlimited life, with a timescale of 25 years.

3.4.2 Specific measures for public contracts

National action plan on "green public procurement"

The adoption in 2008 of the *Piano d'azione per la sostenibilità ambientale dei consumi nel settore della pubblica amministrazione (National Action Plan on Green Public Procurement – NAP GPP)*, approved by Inter-ministerial Decree No 135 of 11 April 2008 (Official Gazette No 107 of 8 May 2008), will require the public sector to play an exemplary role with the goal of reducing environmental impact and improving the energy efficiency of its purchases.

The promotion of green public purchases is consistent with the instructions provided and often repeated by the European Commission since 2001, and the national action plan on GPP sets

certain strategic environmental targets; they include energy saving, with particular reference to the reduction in consumption of energy from fossil sources – through the promotion of the demand for energy from renewable sources – and the reduction of CO_2 emissions.

In order to achieve these objectives the plan provides operating instructions for public bodies awarding contracts for the purchase of products, services or works that have a reduced environmental impact throughout their entire life-cycle and that have an efficient energy profile.

Specifically it sets out definitions of "minimum environmental criteria" or environmental considerations to be introduced into the various definition phases of public tender procedures for those categories of products, services and works identified as priorities in terms of both the scale of the environmental impact and the volume of public expenditure involved. A part of these criteria was adopted by a Ministry of the Environment decree, issued in conjunction with the Ministry of Economic Development and the Ministry of Finance and a part is in the process of being defined and will be adopted in the coming months (see Appendix C).

They also lay down that the minimum environmental criteria must be integrated into invitations to tender published by the national central procuring agency CONSIP S.p.A., by the bodies managing the national parks and the protected marine areas that report to the Ministry of the Environment and by at least 30% of the regions, provinces, metropolitan cities and municipalities with over 15 000 inhabitants. Instead, to identify the targets for the number and the financial value of green contracts (contracts that incorporate the minimum environmental criteria) to be met from all the contracts for the category in question, reference should be made to the documents on the minimum environmental criteria for individual products or services.

For categories of products and services for which minimum environmental criteria have already been adopted, a target has been set that 50% of all public contracts must be green contracts.

The application of the minimum environmental criteria to invitations to tender and the achievement of the specified targets has been monitored since October 2010 by the public contracts watchdog, Autorità di Vigilanza sui Contratti Pubblici (www.avcp.it), which, through its computerised tender monitoring system, reports the number and type of green products procured, in addition to the financial value. These data will make it possible to calculate the environmental benefit derived from the adoption of minimum environmental criteria, including the saving in energy, as laid down in paragraph 7.3.1 of the NAP GPP.

It is anticipated that the first data on green contracts and hence the first estimates of their environmental effect will be available in mid-2012.

The environmental benefits will become greater the more widespread the integration of the minimum environmental criteria into public administration tendering processes becomes, although that process depends on the commitment of the individual authorities since the GPP is still a voluntary initiative[36].

A study carried out in 2008 by the Green Management Institute estimated the savings in energy and in CO_2 emissions that could be achieved by replacing 1 000 000 electrical and electronic appliances with appliances having an Energy Star energy efficiency level. The estimates are reported in the following table.

[36] A general commitment has been set by our law-makers, Article 68 "technical specifications" of Legislative Decree 163/2006 that contains the "code for public contracts" establishing that 'whenever possible the "technical specifications must be defined in such a way as to take account " … omissis … "of the protection of the environment"'.

Table 3.15 – Estimate of savings in energy and CO2 of electrical and electronic appliances in data processing centres

Replacement of 1 000 000 electrical and electronic appliances	**Energy saving**	**CO_2 emissions avoided**
Desktop PC - Energy Star energy efficiency level	34 300 MWh p.a.	18 899 tonnes
Printers - Energy Star energy efficiency level	137 500 MWh p.a.	75 762 tonnes
Multi-function devices – Energy Star energy efficiency level	26 610 MWh p.a.	14 662 tonnes

Mandatory energy efficiency measures for public contracts

In addition to the minimum environmental criteria set out in connection with the NAP GPP, that are voluntary provisions as already pointed out, public administration is required to comply with the dispositions of Articles 13 and 14 of Legislative Decree 115/08.

The specific obligations resting on public administration in relation to the efficient uses of energy in buildings, consist of:

- the use, even when activities are outsourced, of financial instruments for energy saving in order to carry out upgrading work, including energy performance contracts, that provides for a measurable and predetermined reduction in energy consumption in implementation of the measures of Attachment VI, letter a) of Directive 2006/32/EC;

- energy audits of public buildings or buildings for public use, in the event of work to refurbish heating systems, including the replacement of generators, or building refurbishment involving at least 15 percent of the external surface of the building envelope enclosing the gross heated volume, that refer in part to the measure in Attachment VI, letter e) of the directive;

- the energy performance certification of public buildings or buildings for public use, in cases in which the total useable space is greater than 1 000 square metres, with proof of the certification displayed in a part of the building itself that is easily accessible to the public, pursuant to Article 6, par. 7 of Legislative Decree No 192 of 19 August 2005.

Furthermore, Article 14 of Legislative Decree 115/08, establishing that "*in relation to appliances, plant, vehicles and equipment that consume energy, public administration is also obliged to procure products with reduced energy consumption, in all modes*", implements in principle, even if in a generic way, the measure set out in Attachment VI, letter b) of Legislative Decree 115/08.

With reference to vehicles, this measure is integrated by Article 4, par. 4 of Legislative Decree No 24 of 3 March 2011 "*Implementation of Directive 2009/33/EC on the promotion of clean and energy-efficient road transport vehicles*" which lays down the requirement for public bodies awarding contracts to take account, at the time of procurement, of the energy and environmental impacts of operating the vehicles, referring to the definition of the ways in which to implement this provision for the minimum environmental criteria that, as stated above, are in the process of being defined.

The criteria defined on the basis of the European legislative provisions referred to above, may be made binding with regard to those aspects that are not yet so. Here reference is made specifically to Attachment VI, letter c) of Directive 2006/32/EC (*requirements to purchase equipment that has energy-efficient consumption*… using, where it exists, energy labelling and/or voluntary agreements on energy certification).

Finally, for letter d) of the same annex (requirements to replace or retrofit existing equipment and vehicles…), arrangements can be made for the introduction of gradual replacement targets, in keeping with the available financial resources, taking account however of the savings in running costs achievable in the short to medium term through the replacement of obsolete equipment and vehicles with those that are more efficient.

3.5 Dissemination and Information

To achieve the targets of this plan, and to direct and accelerate the changes taking place in the energy paradigm, informing and educating the public and those working in the various sectors of the economy takes on a key role, requiring a corresponding change in the training offered in order to satisfy the requirements demanded by the market.

In the energy efficiency field there is a need to stimulate the transition to an appropriate number of green jobs (green workers and jobs), through the coordination of three fundamental factors: the direct cultural and educational aspect (setting up ad hoc training courses and programmes to support the dynamics of the labour market, providing for and identifying the needs of the sector in terms of totally or partially new skills), collaboration with the world of business (setting up flexible training arrangements in agreement with businesses and training organisations, correlating supply and demand), and the definition of policies for the development of skills in synergy with the strategies for industrial production, commerce and technology and the macro-economic and environmental objectives for managing their dissemination.

Since 2003 there has been a certain vitality in Italy in the offering of eco-sustainable training that is reflected in the number of courses (an average of about 2 000 per annum) and the multiplicity of training bodies (more than 500 between the public and private sectors, schools and universities) involving about 50-55 thousand people every year[37]. The predominant characteristic of the current panorama of training being offered appears to be that of favouring the updating of existing professionals rather than training new ones.

The transition to new technologies and innovative production processes calls for a basic scientific and technical competence, with degrees in fields such as engineering, mathematics and the scientific disciplines, on which to build the more specific skills through higher education and specialisation. The profile of a worker in this field would be someone who is able to integrate the requirements of basic training/instruction with other personal characteristics matching the demands of a dynamic labour market – in terms of willingness to be flexible (including geographically) and adaptable to change through training and on-going education.

Since 2007 MiSE and MATTM have sponsored a multiplicity of initiatives to inform the public and those working in the field about the technologies and the instruments available for carrying out energy efficiency improvements.

A portal called Obiettivo Efficienza Energetica, *Target Energy Efficiency*, maintained by UTEE –

[37] IFOLAMB (Informazione Formazione Orientamento Lavoro AMBientale – *Environmental Work Information, Training, Guidance*) computer system from ISFOL 129, a project to provide information and guidance on environmental training and employment; using a multi-disciplinary approach, the various bodies active in evaluating and classifying training have been put on-line in order to construct a reference framework that will permit individuals to outline specific lines of development and methodical approaches on the matter.

ENEA has been set up, to provide information on the regulatory framework, incentive mechanisms, technological solutions, training being offered, good practice and simplified methods for achieving energy efficiency improvement targets.

An internet site[38] has been set up on the opportunities open to all members of the public to save energy and money through tax allowances, as a result of current incentives, and a toll-free number has been created to provide users with information to enable them to take full advantage of these opportunities. In the almost five years during the which the site has been in operation, there have been about 100 000 visitors, about 3 300 per day with an average of 4 500 visitors on weekdays. Overall, it is estimated that so far the site has had about 4 million visitors from 57 different countries around the world, even though 99% obviously were people in Italy. Through the dedicated page where visitors can send technical queries, solutions have been provided to more than 80 000 problems sent by email, which is an absolute record for Italian PA. With regard to the service operating on the toll-free number, during the year 2010 there were 552 telephone calls per day on average (with peaks of 1 500 calls during critical months, such as December 2010), 11 600 per month. It is estimated that over the total time that it has been in operation, about 302 400 callers have been answered.

In November 2005 the European Commission launched the Sustainable Energy Europe campaign (SEE) with the goal of promoting a more intelligent use and production of energy. The SEE campaign is also aimed at promoting a better lifestyle, stimulating economic development, creating new jobs and generally improving the competitiveness of European industry in world markets.

During the course of 2006 and at the invitation of the European Commission, the MATTM became an Associate of the SEE campaign and today acts as a focal point for the campaign at a national level. The principal objectives of the SEE campaign in Italy are:

- to initiate firm partnerships within the context of the campaign, starting with those relating to Sustainable Communities, transport, and 'promotion and communication';
- to highlight and disseminate the best practices as pointers for sustainable projects;
- to demonstrate that the time has come for every stakeholder (public and private sector, research, industrial sector, policy-makers, the media, etc.) to adopt new strategies for working, communication and training for a more sustainable future.

During the course of the first triennium (2005-2008) of the SEE campaign, just as now at the beginning of the second triennium (2009-2011), many publications and documents have been written by Italian partners as part of the process of getting their partnerships started. They consist of informational material for the general public to promote the individual partnerships started up in Italy on the issues related to the SEE campaign. The most important documents have been made available to anyone interesting in implementing similar best practices in their area, by means of a dedicated internet site.

In this context, January 2008 saw the launch of the Covenant of Mayors initiative (see par. 3.4.1) to actively involve the cities of Europe in the journey towards sustainability from both an energy and an environmental point of view.

Finally, a structured plan will be implemented to communicate this EEAP 2011, in order to promote and empower the strategies and methodologies for disseminating it to the public and to those working in the field and to accelerate the achievement of the predetermined targets.

[38] http://efficienzaenergetica.acs.enea.it

Energy Managers and Energy Management Specialists

In relation to energy efficiency improvement in all the manufacturing sectors, Law 10/91 lays down that all companies operating in the industrial, services and transport sectors, that have a significant energy consumption, are required to appoint an energy manager, that is a technician who will be responsible for the conservation and the rational use of energy.

Article 16 of Legislative Decree 115/08 implements Directive 2006/32/EC concerning efficiency in energy end-uses and energy services. It specifies that, following the adoption of an appropriate UNI-CEI standard, the Ministry of Economic Development will approve a voluntary certification procedure for ESCOs and for EGEs – Esperti in Gestione dell'Energia *Energy Management Specialists* (individuals who have the skills, the experience and the capability necessary to manage the use of energy in an efficient manner) and a certification procedure for Energy Management Systems (EMS). The goal of this initiative is to promote a process to raise the technical skill levels of providers of energy services.

Energy managers and energy management specialists operate within companies, various public entities, both central and local (municipalities and provinces), in local health authorities and hospitals, in universities and in ESCOs or as independent consultants.

Within this legislative context, ENEA's UTEE organises week-long courses on various subjects, for officers responsible for energy, for their colleagues and in general for all those professionals who wish to expand their field of activity, to provide training and professional updating, that will enable them to handle specific problems and situations in all kinds of businesses in the field of energy management.

These courses and the related appointments are coordinated in collaboration with FIRE (the Italian Federation for the Rational Use of Energy) that, through an agreement with the Ministry of Economic Development supports Energy Managers in carrying out their activities and disseminates good practices for the sensible use of energy in Italy. FIRE has also initiated SECEM (Sistema Europeo di Certificazione in Energy Management) a procedure for certifying the skills of EGEs, in order to promote professional qualification.

Theoretical information is backed up by practical applications for handling and resolving the specific problems and situations found in different kinds of entity in the manufacturing and services sectors; at the end of the course an attendance certificate is awarded. Between 2003 and 2010 ENEA ran about 54 courses/seminars with 2 804 participants (about 350 participants per annum).

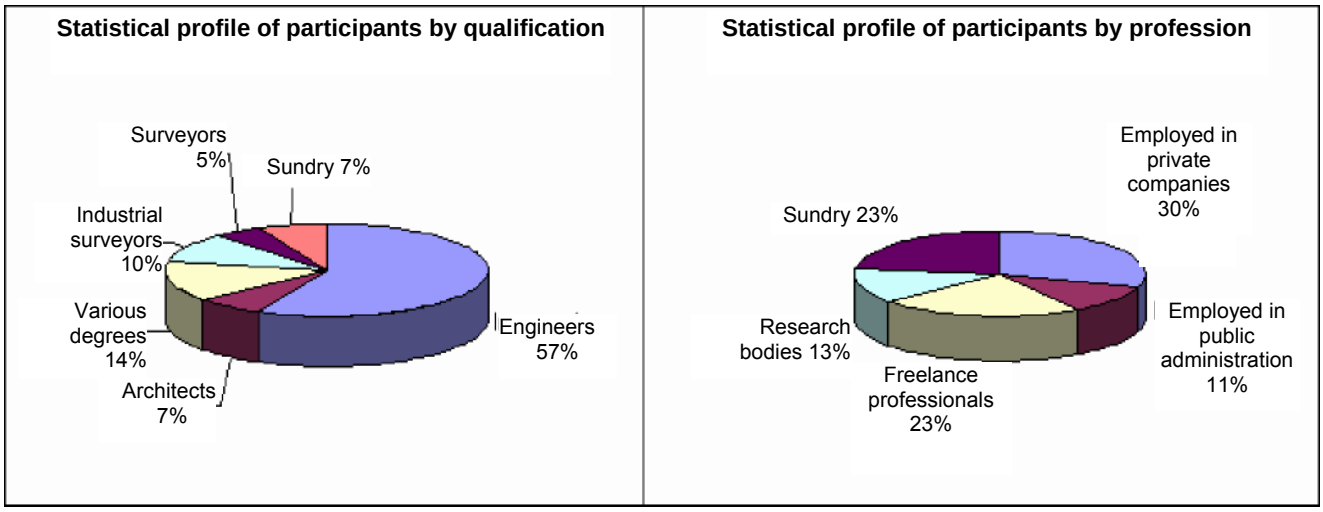


Figure 3.7 – Average statistical profile of participants in ENEA courses for Energy Managers and Energy Management Specialists (Source: ENEA processing of ISFOL data)

Taking account also of the participants' needs as observed during the training and professional updating courses for energy managers and energy management specialists, a new type of course was instituted for the "introduction to the implementation of Energy Management Systems (EMS) – UNI CEI EN 16001 (that will shortly be replaced by international standard ISO 50001)". The potential offered by UNI CEI EN 16001 is aimed at all bodies, both domestic and industrial, with differing levels of energy consumption, but with a particular interest in reducing their energy bills through an improvement in energy efficiency, directly linked to a reduction and an optimisation of consumption.

The implementation of an EMS can enable, not just the achieving of energy efficiency targets, but above all the ability to maintain and exceed them. Key points in the cycle consist of: defining a company energy policy, refining procedures and internal actions for energy saving and energy efficiency and implementing an on-going cycle of monitoring and reviewing of the results. UNI CEI EN 16001 differs from other Management Systems by guaranteeing a financial return to the company or organisation within a short timescale due to financial results achievable through energy saving and the optimisation of consumption.

Bear in mind also that in Italy standard UNI CEI 11339 was issued on EGEs, energy management specialists (in January 2010 the first energy management specialists were certified in accordance with this standard by an accredited body, and certification sessions are now being held on a weekly basis). Energy managers certified as EGEs can play an important role in raising the quality of the consultancy product and the assistance given to end users in the field of energy efficiency.

With a view to promoting the function of the energy manager more effectively and as a result the achieving of energy savings, it is intended to implement the following initiatives:

- the promotion of UNI CEI EN 16001 and the new standard ISO 50001 (energy management systems) and the package of standards associated with it – in particular EN 15900 (efficient energy services), UNI CEI 11339 (EGE), UNI CEI 11352 (ESCOs) and the UNI CEI regulation on energy audits currently in the consultation phase – through the issuing of the decree called for in Article 16 of Legislative Decree No 115 of 30 May 2008;
- the starting of an informational campaign for the promotion of the energy manager –

EGE and the tools for energy management, directed particularly at Public Administration, where recent experience also shows a broad need to raise awareness and understanding about the opportunities for action;

- the greater involvement of the network of energy managers – EGEs in institutional consultations in relation to provisions that impact energy efficiency;
- commencement of the certification by EGEs of the company energy accounts of businesses that have implemented the ISO 50001 system. In this way the energy savings achieved year by year will be certified, enabling them to contribute to achieving the 20% increase in energy efficiency required by 2020;
- the carrying out of training activities to update energy managers, to be carried out in collaboration with ENEA and FIRE and the starting of a summer school dedicated to the training of energy managers to provide specific preparation for taking the EGE certification examination;
- the identification of new measures suitable for encouraging the appointment of energy managers and the periodic gathering of information about the network of appointed individuals;
- to provide incentives for the proposals for certified ESCOs or energy managers certified as EGEs, to obtain white certificates, possible resulting in an increase in the certificates awarded (in line with the proposals in connection with which informational campaigns have been carried out, that resulted in a 5% increase in certifications).

3.6 Requirement of energy companies to encourage energy savings in end-uses

On 20 July 2004 two ministerial decrees were issued, electricity and gas, that instituted the White Certificates (WC) or Energy Performance Certificate (EPC) scheme in Italy. A large part of the national policy for achieving the energy efficiency targets laid down in the 20-20-20 energy and climate package is based on this instrument. The mechanism lays down that White Certificates will be issued by the electricity market operator in response to energy savings verified by ENEA[39] and certified by the electrical power and gas authority (AEEG). The bodies affected (large distributors of electricity and/or gas) can obtain WCs by implementing energy saving measures at end-user sites, or by sourcing them through the exchange set up by the GME, or by way of a bilateral contract for the certificates with willing entities that have obtained them as a result of their own initiatives. A feature of the mechanism is that it rewards additional energy savings, i.e. savings obtained other than through the normal advances in technology or standards, which are categorised as improvements of a reference technique, or baseline. During the course of 2010 the certificates enjoyed an average increase in market value of about EUR 87 per TOE, with variations depending on the dynamic contingencies of supply and demand.

Each year the Authority divides the national energy saving target between the various obligated parties, on the basis of the criteria set out by the Ministerial Decree of 21 December 2007. Compliance with the set limits is rewarded through a tariff-based contribution, the annual updating mechanism of which was established by the AEEG with Resolution EEN 36/08. The certificates still in an operator's possession after the date of the verification by the AEEG may be accumulated since they are guaranteed to be bankable with no expiry date. Should the

[39] With Resolution 04/06, the AEEG decided to use ENEA to carry out a series of activities, specifically: the checking and monitoring of energy saving actions, the approval of proposed projects and programmes of measures, the development of technical data sheets for the standardised and analytical assessment of energy saving actions, and the updating of existing technical data sheets. The previous agreement was renewed by Resolution GOP 26/09 of 26 May 2009, in the light also of the instructions contained in Legislative Decree No 115/08 in transposition of Directive No 32/06 on energy services.

electricity or gas distributor not reach its target, it has one year to correct the non-compliance[40], otherwise monetary sanctions will be imposed, without prejudice to the requirement to pay compensation by the end of the following year.

The AEEG has codified the White Certificates mechanism in Annex A to Decision 103/0341 (guideline), which defines timescales and methods for gaining access to the system, as well as the process for assessment, certification and awarding of the WC. Three methods have been defined for assessing energy savings: standardised, analytical and consumption-based assessments.

The standardised method is the most immediate and simple to adopt since there is no requirement of applicants to apply measures or measurements during operation in order to certify the savings. They are permitted to define the energy savings *a priori* merely on the basis of the number of basic actions carried out. By mid-2011 21 *standardised assessment technical data sheets* were available.

The analytical method quantifies the energy saving achievable on the basis of a predefined assessment algorithm and the direct measurement of certain parameters provided by means of "analytical technical data sheets". At present 5 analytical schedules are available.

The consumption assessment method calculates the energy saving by comparing the consumption measured before and after an action, on the basis of a measurement programme put forward by the applicant and approved in advance by ENEA. The contents and minimum requirements that must be met are specified in the AEEG guidelines.

There are 4 types of certificate available: type I is for savings of electricity, type II for natural gas, type III for other fuels and type IV is for vehicle fuels. Type IV cannot be traded on the market at present as they do not give rise to the tariff-based contribution.

The Ministerial Decree of 21 December 2007 extended the mechanism for three years (2010-2012) and Legislative Decree No 115/08 provided for a further extension in line with the national energy savings targets identified in the Energy Efficiency Action Plan as per the previously mentioned Directive 2006/32/EC.

The Italian White Certificates mechanism is internationally recognised as a benchmark, since no other country has implemented such a well-defined system, based on efficiency certificates tradable on an organised market (the GME exchange).

The positive aspects achieved by the mechanism lie primarily in having stimulated the meeting of significant energy savings targets, encouraged the opening of an energy services market (84% of WCs issued were the result of initiatives by ESCOs), made available a satisfactory number of easy-to-use standardised schedules, encouraged the implementation of actions that are marginally more advantageous from a financial point of view.

There are still some critical areas, linked in part to the need for the development of the instrument and in part to the management methods implemented to-date, that will be addressed and resolved by means of the ministerial decree defining the next national targets after 2012. These critical elements are related primarily to the complexity and to certain characteristics of the system, that have limited the participation of operators; in particular:

[40] If the obligated distributor does not achieve 100% of the target, but is nevertheless at a level above 60% of the target, the amount of the shortfall may be made up during the following year without incurring any sanctions.
[41] Subsequently amended and supplemented by Resolutions No 200/04 of 11 November 2004, No 123/07 of 31 May 2007 and EEN 1/09 of11 February 2009.

- the management of the proposals based on the consumption method, involving administrative complexities and long investigation times, seems to be problematical
- the standardisation of the reporting period (5 or 8 years) appears to limit the opportunity of access by complex actions
- the existence of market problems relating to the availability of certificates.

In order to take advantage of the potential for energy savings derived from initiatives in the field of transportation, the market for certificates will be extended to type IV certificates.

The participation of industry in the mechanism has been growing over time. The 14% of WCs generated overall by actions in industry rose to 29% in the second half of 2010. Initiatives in this sector are generally promoted by the ESCOs, whereas there is little possibility of individual companies participating. The access to the system that is also permitted to energy managers (EM) appointed pursuant to Article 19 of Law 10/91 is not actually producing significant results (only 9 entities with EMs have participated in the system, obtaining 1.4 of the certificates issued since 31 December 2010). Procedures could be introduced to allow individual companies, industrial or service related, to be able to participate independently in the system irrespective of whether they have an EM.

An additional problem associated with White Certificates is the matter of *double accounting*, in view of the fact that for certain types of actions there are other financing channels, both national (e.g. photovoltaic systems in the *conto energia* feed-in tariff, insulation of buildings, and in the past electric motors and inverters through tax allowances) and regional, creating the risk of seeing the final results in term of savings achieved being multiplied artificially. For the purpose of a simpler assessment of savings achieved, the different incentive initiatives need to be compartmentalised as much as possible in order to minimise any overlapping.

Finally, for informational purposes, ENEA has made available a White Certificates User Guide, that can be freely downloaded from the 'energy efficiency' link on the enea.it home page. The purpose of the site is to act as a procedural reference point for operators wishing to participate in the system and as a collection point for requests aimed at the ongoing improvement of the system.

3.7 The energy services market

The ESCOs market in Italy is still in an embryonic phase although the energy savings sector is growing rapidly, due primarily to a number of factors: the strong technological innovation that is producing numerous new solutions with application in various fields (residential, agricultural, industrial, domestic, etc.), the prospect of significant returns on investment, favoured also by the current high energy prices and the presence of numerous public incentives in terms of both taxation and tariffs, as well as the growing awareness of environmental issues at all levels (members of the public, companies and institutions).

Legislative Decree 115/2008, in implementation of Directive 2006/32/EC concerning efficiency of the end-uses of energy and energy services, defines an ESCO as a "*physical or legal person providing energy services or other measures for improving energy efficiency in the installation or at the premises of users and in doing so accepts a certain margin of financial risk. The payment for the service rendered is based, either totally or partially, on the energy efficiency improvement achieved and on the satisfying of other preset performance criteria".*

ESCOs are entities that specialise in carrying out activities in the energy efficiency sector, in distributed generation (small energy production plants close to the points of consumption) and

in renewable energy, generally removing from the client the need to find the financial resources to carry out projects and the technological risk, since they manage both the planning and the installation and maintenance activities for the entire duration of the contract (usually running for from five to ten years), by means of arrangements such as EPCs (Energy Performance Contract). In this regard, the Third Party Financing[42], provided for by Legislative Decree 115/2008, the use of which is strongly advocated by various international bodies[43], is a financial instrument that enables the end user to carry out energy efficiency activities without having to lay out the capital in advance. ESCOs carry out the energy efficiency works using resources advanced by the banking system, and they enter into agreements with the end user on what part of the energy savings achieved must be used to repay the investment, thereby defining the repayment schedule. At the end of the repayment period, the end user assumes ownership of the installation and enjoys in full any further savings derived, even though climate altering emissions may have been eliminated immediately.

A crucial aspect for the correct development of a flourishing market, that can fully exploit the financial potential made available by the banking system, lies in the qualification and validation of the improvements achieved. The voluntary certification technical standard for ESCOs, UNI CEI 11352:2010, was issued with a view to this and with reference to Decree 115/08.

Through the satisfying of objective criteria, the certification process aims to validate the ESCO arrangement in general, the system for managing energy used and energy audits. This procedure is viewed favourably, especially by small- to medium-sized operators, and is considered to be a valuable instrument for promoting the quality of their service.

In fact, although the financial and technical risk of the activity always rests on the shoulders of the ESCO, the implementing of instruments that make it possible to define certain elements more definitely and precisely leads to a generalised qualification of the market potential of the energy services offering and hence into a reduction in the uncertainties for the operators and more effective and clear proposals for end-users.

The certification of ESCOs also has the effect of stimulating the financial support of the banks, who are generally diffident about granting financing without the necessary guarantees:

- on the solidity of the ESCO from both a balance sheet/revenue and a professional point of view, and its track record in the sector. The professional profile of the shareholders and directors and their credit ratings take on great significance, especially when an ESCO may not have been in existence for long.

- on the risk capital invested in the project. Banks will rarely provide debt financing for 100 % of the resources needed for a business venture: without a major change to the current system, it is therefore necessary for a part of the overall investment, typically of 10-20 %, to be represented by the ESCO's own resources invested in the project as risk capital. In some cases it is however possible for a part of the risk capital to be represented by public funds intended for the types of activity involved or by guarantees issued by a public body that will be the beneficiary of the project.

[42] Directive 93/76/EEC defines it this way: '"Third-party financing" means the overall provision of auditing, installation, operation, maintenance and financing services for an energy efficiency investment, with recovery of the cost of these services being contingent, either wholly or in part, on the level of energy savings.' Third Party Financing was confirmed by Directive 2006/32/EC and by Action Plan for Energy Efficiency: Realising the Potential.

[43] Directive 2006/32/EC, at point (22) sanctions: 'The use of third-party financing arrangements is an innovate practice that should be stimulated.' The Intergovernmental Panel on Climate Change (IPCC), in the Fourth Assessment Report (Working Group III - Summary for Policymakers, page 17), places incentives to ESCOs among the environmentally effective instruments, and the use of the Third Party Financing mechanism among the key factors for success.

- once the project's debt/equity ratio has been established, depending on the type of work, it may be possible to identify specific income streams that could act as guarantees for the financing.

ESCOs, understood as entities that take on the financial risk of a project by means of their own resources (including through the TPF methodology) and that participate in part in the financial benefits produced over the period of the project itself, are a driving force of great importance to the development of energy saving in Italy, especially in the public sector.

To be able to play this role, it is necessary that ESCOs are able to combine technical skills, nationwide business relationships, a sound financial structure and the ability to broaden their capital base in the future for the growth of their activity.

Another significant element concerns transparency of information, often in fact information asymmetry, where one party having more or better information than the other, in this instance the user and the supplier, leads to incorrect decisions being made. For example, in the energy sector, the client is satisfied with the financial result obtained through negotiation, that is the saving in comparison with previous costs, but the basis for the decision is in the hands of the supplier who might not apply the best technologies for efficiency for the sake of a better financial return. The removal of information asymmetry is of fundamental importance to the development of an effective energy policy initiative.

The existence and development of ESCOs is fuelled by the ongoing monitoring and updating of information, technologies and financial innovations and their being fully and totally shared with the client, as governed by specific requirements for notification of the recording and invoicing of energy consumption and of the opportunities made available for the development of renewable energy and energy savings[44].

According to the data contained in the ISPRA JRC report, "Energy Service Companies Market in Europe - Status Report 2010" – which cites AEEG, FIRE, AGESI and Databank data – there are between 100 and 150 ESCOs active in Italy, of whom about two thirds are small companies, in the main established within the last four years, and only 9 are large companies. In any case, only about fifty companies are capable of offering guaranteed performance contracts and have the technical and financial capability to be called ESCOs. As at 1 April 2011, there were 1 847 entities accredited as ESCOs with the electricity and gas authority, an increase of 25 % over the preceding year. Nevertheless, it was seen that of these entities, only 295 (16 % of those accredited) had obtained an Energy Performance Certificate (WC)[45], in other words had presented at least one energy saving project to the AEEG.

With reference to this latter category of companies, the market for energy services with Energy Performance Contracting (EPC) was estimated to be worth in the order of EUR 520 m in 2010, rising to EUR 1 710 m when taking into more general account the companies active in energy services.

It is estimated that the overall turnover of companies offering energy services is in the order of 5-6 billion euros (source FIRE on data from AGESI, Federesco, Assoesco and Cogena). This figure, when set against the approximately 7.5 billion euros spent on the 55 % tax allowances between 2007 and 2009 appears inadequate in comparison with the market expected in order to reach the targets by 2020, which can be estimated to be between 50 and 100 billion euros of new investments.

The sector in which the highest number of actions can be seen is that of renewable energy sources; the large impetus given to the market comes primarily from the incentive mechanisms,

[44] cf. Articles 7 and 13 of Directive 2006/32/EC of the European Parliament and of the Council of 5 April 2006.
[45] Source: AEEG, Annual report of the status of the services and activities carried out, 6 July 2011

such as the *conto energia* feed-in tariff for photovoltaic power. In the context of these actions the most common activities relate to energy audits, project planning, and the supply, installation and running of plants.

It was found that the importance to the beneficiaries/end-users of the actions for optimising consumptions was perceived primarily in terms of the resulting financial savings; for this reason the most frequently used methodology for the financial analysis of the action was the payback period, followed by the net current value calculation.

In the execution of the actions, use was often made of financial instruments of various kinds linked to investments by third parties or to project financing solutions in which a number of parties, including ESCOs, purchaser and finance institutions, are structured in such a way as to achieve the ideal apportionment of the resulting financial benefits.

The current paucity of ESCOs that are sufficiently well-structured from a financial point of view calls for a rethink at a system level.

With a view to promoting the more effective functioning of ESCOs and as a result, the achieving of energy savings, there are plans to implement the following initiatives:

- the promotion of the UNI CEI 11352 standard on the certification of ESCOs and the package of standards associated with it – in particular ISO 50001 (energy management services), EN 15900 (efficient energy services), UNI CEI 11339 (EGE) and the UNI CEI regulation on energy audits currently in the consultation phase – through the issuing of the decree called for in Article 16 of Legislative Decree No 115 of 30 May 2008;
- the setting up of a commission composed of technical members, associations from the ESCO sector and consumers in order to define behavioural guidelines, to disseminate the qualifications for operators and to encourage the wider use of Energy Performance Contracting (EPC) and quality Third Party Financing (TPF);
- to encourage greater integration between the White Certificates mechanism and ESCOs, providing for reward mechanisms for ESCOs certified on the basis of the UNI CEI 11352 standard, that adopt energy service contracts plus and operate in accordance with EPC schemes;
- the refining of innovative funding systems (e.g. the issuing of Green Bonds by public bodies) to finance energy efficiency actions;
- the starting up of the national revolving fund as per Article 31 of Legislative Decree No 28 of 3 March 2011;
- the start up of an informational campaign aimed at promoting the involvement of banks in the financing of energy efficiency actions;
- the carrying out of a campaign aimed at illustrating typical actions and creating types of contracts favouring users in the residential and services sectors.

3.8 Strategy for increasing Nearly Zero Emission buildings

Increasing the efficiency of the public administration building stock is considered to be a target of national import on which to focus in order to meet the need to accelerate a national policy in the energy field and, at the same time, to create the conditions for the resurgence of productive sectors that have a significant impact on the national economy.

The objective of the criteria for the works and the mechanisms needed to make it possible to realise this plan of action for upgrading the energy efficiency of public buildings, is to meet and exceed new legal standards, as well as to achieve a significant reduction in energy costs.

The benefits resulting from the intervention measures have to do primarily with savings in energy consumption. Hence actions need to be carried out in concert with companies providing energy services that can take advantage of the support measures made available in these instances, such as access to the Revolving Fund.

The implementation of the plan produces important financial effects both in the execution phase of the works and in the operational phase in terms of the growth in production stimulated, the creation of added value, employment and an overall increase in GDP.

In order to identify the measures contained in this action plan, reference was made to the current legislative framework, to provisions in the course of approval (national and European), and to various reports on energy efficiency produced by public and private associations and bodies, both national and European.

Specific measures are proposed below for accelerating national energy efficiency policies in the domestic sector with particular reference to the public sector in order to:

- create a more effective process to coordinate public and private entities operating in the field of energy efficiency;
- simplify the regulations and/or procedures for overcoming the barriers that slow down the penetration process of efficient systems and technologies;
- increase the number of bodies and/or technologies that can take advantage of the support or incentives for entering the energy efficiency market.

3.8.1 Promotion of new highly energy-efficient construction for new and existing buildings

Regulations implementing Legislative Decree No 192 of 19 August 2005 (transposition of Directive 2002/91/EC) and in transposition of Directive 31/2011/EC

The drafting and approving of the provisions implementing Legislative Decree 192/05 and its subsequent modifications and supplements and the provision of a decree in transposition of Directive 2010/31/EC are a priority of this plan for implementing measures to stimulate energy efficiency actions, especially for buildings in the public sector.

In this regard special ‘round tables’ are being set up, promoted by the Ministry of Economic Development and coordinated by ENEA, with the participation of the sector’s stakeholders, for the purpose of preparing proposals and outlines of provisions and measures, to accelerate the process of realising high-efficiency and Nearly Zero Emission buildings.

Enhancing the energy efficiency of the public administration’s building stock is an objective that must be targeted in order to respond to the demands of a highly practicable national policy that can be applied in an exemplary manner in the public sector in the energy field, at the same time creating the conditions for the resurgence of productive sectors that have a significant impact on the national economy.

The objective of the criteria for the actions and mechanisms directing the execution of this action plan for enhancing the energy efficiency of public buildings is to achieve the legal standards that, phased over time, lead to the realisation of new NZE buildings and the upgrading of the existing building stock in such a way as to achieve the highest levels of efficiency, taking account of the cost-benefit factor.

To this end, assessments and preliminary studies must be carried out that enable an effective transposition in the light of innovative technologies and components and the use of renewable

sources.

The principal measures to direct these actions are summarised below, in relation also to existing legislation and the new directive:

1. to reinforce the concept that the minimum energy performance requirements for buildings, set by Member States, must satisfy the cost-benefit analyses in terms of ideal costs;

2. to ensure that the aforementioned requirements are compared with the corresponding values calculated using a comparative methodology (bearing in mind the differences in climate, costs, etc.) refined by the European Commission, and that they justify any variations in the said values;

3. to ensure that from 31 December 2020, all newly constructed buildings (from 2018 for public buildings) have the highest energy performance (nearly zero energy buildings), ensuring that a significant part of the energy needs are met from renewable sources.

In this regard the Ministry of Economic development is preparing provisions that establish, *inter alia*:

a. the definition of "nearly zero energy buildings" for each type of building, in relation to specific parameters (climatic environment, socio-economic context) expressed in kWh/m^2 p.a.;

b. a gradual introduction of the minimum requirements through to 2020, 2018 for public buildings, bearing in mind the different types of buildings, with the specification of intermediate energy efficiency limits at least until 2015;

c. a reinforcement of their guiding role in the public sector through refurbishments in the direction of "nearly zero energy buildings";

d. the definition of an information framework on the financial measures to support the achieving of the goal of "nearly zero energy buildings", and on measures relating to the use of renewable sources in new constructions and existing buildings (only if undergoing major refurbishment);

e. a reinforcing of the role of the energy performance certification of buildings.

To give greater impetus to these measures an overall information framework will be defined relating to the financial incentives brought into play and initiatives capable of eliminating market barriers that prevent the energy efficiency enhancement of buildings and more generally to pursue the targets of the Community directive.

On the basis of the aforementioned considerations a technical and financial 'round table' will be set up between the Ministry of Economic Development and the Ministry of Finance.

The objective of this 'round table' is the planning and ongoing management of the system to promote and provided energy efficiency incentives, paid for from taxation.

To monitor the effectiveness of the actions, an observatory will be established with the purpose of constructing a reference framework on the implementation status and the effectiveness of the energy efficiency programmes carried out nationally, and of supporting the process of defining the policies and the provisions implemented in the energy field, with a view to collaboration and interchange between institutions and stakeholders.

Finally, for the creation of buildings with a high potential for integration with renewable sources and distributed generation systems (DGS) and with a very high energy performance, new performance standards will be defined with particular reference to building heating and cooling together with a new approach for determining the energy efficiency of buildings. To be specific, new reference parameters will be set in relation to energy needs, (useful energy needs for heating and useful energy needs for cooling expressed in kWh/m^2 p.a.) and systems applications and innovative devices will be identified (domotic systems, natural, mechanical or hybrid room ventilation systems, high-efficiency winter heating and summer cooling systems and renewable sources).

For social housing, measures are being evaluated to reward those actions which, as well as meeting the energy and environmental performance limits set out in the current regulatory framework for buildings, involve the application of solutions and components that make a significant improvement to the energy performance of the building-plant system such as to bring the values closer to NZE.

Particular reference is made to innovative solutions for works on the building envelope (cool-roofs, doors and windows, active envelopes, etc.) and on plants promoting the application of solar heating systems and technologies integrated with renewable sources (solar cooling, PV, biomass, etc.). In carrying out these actions the use of environmentally-friendly materials and components will be promoted, with the goal of optimising the country's financial resources.

Forms of rewards will be devised that will be promoted by the round table activities mentioned above.

For public offices or those adapted for public use that are newly built or have undergone refurbishment work, the use of a Building Energy Management System (BEMS) is considered to be a particularly effective way to monitor and manage heating and cooling systems, where installed.

The devices will also be integrated with systems for controlling comfort levels in homogeneous areas and with manual/automatic control and management systems for artificial lighting installations (taking advantage of natural light), using high-efficiency equipment.

Particular attention will be given to residential buildings constructed before 1976 (about 70% of the national building stock) that register high energy consumption due to the poor quality of construction and that are destined, even if subjected to upgrading work, not to achieve high levels of energy performance.

For these buildings use could be made of the financing made available by a revolving concessionary loan fund, should the upgrading work result in their achieving a level of energy savings greater than 50% of the average consumption, confirmed by reference to the utilities bills of the preceding 5 years.

This provision will be directed primarily at works at a condominium level (involving the entire building).

3.8.2 New directions and prescriptions for energy saving works

Non-residential buildings for commercial and services use

For buildings intended for commercial or services use, with the aim of containing the growing consumption of electricity for air conditioning, the possibility should be considered of carrying out an energy analysis with the goal of installing passive screening, either fixed or mobile, onto

the building envelope.

For these actions, where there are no aesthetic or architectural constraints, simplified procedures could be developed to overcome the obstacles that currently limit or hinder the execution of the works and access to concessions.

State school buildings

For state school buildings the implementation of procedures that facilitate the use of ESCOs for energy efficiency works is deemed to be highly effective, since in these types of structures there are heating and electrical systems that are not very complex, and therefore result in a highly advantageous cost-benefit ratio of the works carried out.

The public bodies or other entities that own the school buildings could also enhance the savings achievable through efficiency enhancing works by making use of the white certificates mechanism.

To facilitate the use of this procedure the UTEE of ENEA in collaboration with CONSIP is developing and refining “ad hoc” contractual instruments for state school buildings.

3.8.3 Implementation of a national plan for the energy efficiency enhancement of the public administration building stock

In order to enable administrations to satisfy the prescriptions laid down, the plan proposes the carrying out of a pilot project on a central PA building that will have the goal of producing standard replicable procedures.

The measures identified to implement the programme, which do not involve heavy expenditure for the public body owning it, are as follows:

- a contract for the procurement of energy services in which the owning body, as the customer of the services delivered, undertakes to pay a fixed amount for the entire duration of the contract, calculated on the basis of the amount of the energy bills from the preceding years, and the supplier undertakes to carry out the energy efficiency enhancement works on the building, aimed at achieving the highest level of energy savings. The economies thus obtained will be the company’s profit margin.
- a new system of financing that includes the involvement of the banking system, of the supplier of energy services and access to the revolving fund to carry out the energy efficiency improvement works on the building envelope and on the building plant as laid down in the improvement project. The revolving fund could be used primarily for covering the preliminary investigations, such as the energy audit and the certification at the conclusion of the works.

For implementing the measures it will be necessary to provide a standard Capitolato Speciale d’appalto (CSA) *Special Contract Specification*, for the supply of energy services and the carrying out of energy efficiency improvement measures for buildings, and plant of public buildings or buildings for public use. To facilitate the standardisation process to bring about uniformity of the bodies awarding contracts, of the buildings and of the contracts in being, guideline specifications will be drawn up in order to provide a useful reference tool for administrations.

4 Institution of competent bodies and authorities

The support bodies and the authorities assigned to implement the energy saving strategies are the Ministry for Economic Development (MiSE), the Ministry of Finance (MEF), the Ministry of the Environment and Protection of the Land and Sea (MATTM), the Ministry of Infrastructure and Transport (MIT), the Authority for Electrical Energy and Gas (AEEG), the Regions, the Provinces, the Municipalities, the national agency for new technologies, energy and sustainable economic development (ENEA), GSE, RSE, GME, the standards organisations (UNI and CEI), the committee for managing Directive 2003/87/EC, the Biomass Research Centre (CRB) and RENAEL.

The Ministry of Economic Development, MiSE, is the reference administrating body for the sectors underpinning the Italian economy, both in terms of the promotion and the development of the national manufacturing system's competitiveness, and in terms of the harmonising and monitoring of the internal market. It provides, *inter alia*, the development of the lines of energy policy of national importance and coordinates the activities associated with national and regional planning activities in the energy and mining sectors. The responsibility for organising the process of developing the EEAP2 (2011) falls upon MiSE, due to its duties on the issues of energy and energy efficiency, in particular on the general directorate for nuclear energy, renewable energy and energy efficiency of the Department of Energy. ENEA carries out an activity aimed at research and technological innovation as well as the performance of advanced services in the energy sectors, with particular reference to the nuclear sector, and sustainable economic development.

To the end of carrying out the monitoring and coordinating of the instruments of Legislative Decree 115/08, ENEA-UTEE cares for the preparation of the annual report on energy efficiency and the EEAP, which MiSE approves and submits to the European Commission. Furthermore, ENEA-UTEE is the national delegate for Concerted Actions I and II on Service Directive 06/32 (ESD CA).

The State-Regional Conference operates within the context of the national community to encourage cooperation between the activities of the State and those of the Regions and Autonomous Provinces, making up the "star chamber" of the policy negotiations between central administration and the system of autonomous regions.

MATTM, in implementing the national environmental policy, carries out functions on matters of the environment, the eco-system, protection of the marine and atmospheric heritage as well as environmental impact assessments (EIA), strategic environmental assessments (SEA) and integrated environmental authorisations (IPPC). It is responsible for soil protection and desertification issues, as well as for the water resources.

There follow other bodies that in varying degrees and ways carry out functions in support of the implementation of energy policies.

The Authority for Electrical Energy and Gas (AEEG) carries out regulatory and monitoring functions on the electricity and gas energy sectors with the task of guaranteeing competition and efficiency in the electricity and gas sectors, as well as ensuring an appropriate level of quality of the services.

The Ministry of the Economy and Finance carries out functions on the issue of economic, financial and budgetary policy, public investment planning, coordination of public expenditure and checking on its progress, fiscal policies and the taxation system, government property and state assets.

The Ministry of Infrastructure and Transport has responsibility for the infrastructural networks (roads, motorways, railways, ports and airports) serving the needs of the means of transportation, and interprets the general plan for transport and logistics, as well as the sector plans for transport, including urban mobility plans.

Gestore dei Mercati Energetici S.p.A. (GME) is charged with the organisation and financial management of the electricity market, in accordance with criteria of impartiality, transparency, objectivity and competition between the producers and ensures, moreover, that an adequate level of reserve power is available and managed economically. GME has the role of encouraging competition in the potentially competitive activity of the production and sale of electrical power, through the creation of a market platform as well as encouraging the greatest efficiency in the management of the despatching of power through the creation of a market for the purchase of resources for despatch services.

Gestore dei Servizi Energetici S.p.A. (GSE) works to promote sustainable development through the provision of financial incentives for the production of energy from renewable sources and through the dissemination of information aimed at spreading the culture of using energy that is compatible with the demands of the environment.

The company Ricerca sul Sistema Energetico - RSE S.p.A. develops research activities in the electricity energy sector, with particular reference to strategic national projects of interest to the general public, financed by the Fondo per la Ricerca di Sistema (Electricity System Research Fund).

The standards bodies (UNI and CEI) collaborate with the ministries responsible for the development of the technical standards needed to implement EPBD Directives 1 and 2 and other relevant directives.

The Comitato Termotecnico Italiano (CTI) collaborates with the Ministry of Economic Development in the development of the technical standards needed for the implementation of EPBD Directives 1 and 2, participates on the bodies reviewing legislative provisions, checks the quality of commercial software for the calculation of the energy performance of buildings, organises information events on the subject (national forum on energy certification and others) and publishes informational reports (reports on energy certification).

On the basis of an agreement with the Ministry of Economic Development, FIRE, the Italian Federation for the Rational Use of Energy, manages the network of energy managers appointed pursuant to Article 19 of Law No 10 of 9 January 1991, carrying out activities of communication, information and support of operators in the market in the implementing of good practices for energy efficiency.

The committee for managing Directive 2003/87/EC and for supporting the management of project activities under the Kyoto protocol carries out all activities pertaining to CO_2 management: the authorisation of plants subject to the “emissions trading” directive, the updating of authorisations, assigning, issuing, monitoring and communication, authorising of auditors, and the monitoring of activities and sanctions; it is also involved in all matters pertaining to the reduction of CO_2, which is achieved through the increasing of energy efficiency as well as through projects on renewable sources and on CO_2 storage.

The Biomass Research Centre is the Italian reference point for research into biofuels and biomass for energy uses and collaborates with MATTM in the sustainable development of the use of biomass for energy purposes and in the development of the regulations necessary for the implementation of Directives 2009/28/EC (RES) and 2009/30/EC, participating with departmental representatives on legislative provisions review bodies.

The Network of Local Energy Agencies (RENAEL) participates on behalf of the Ministry of Economic Development in “Concerted Action EPBD 1 and 2”.

5 Additional proposals for the improvement of energy efficiency

The particularly intensive commitment needed to achieve the energy saving targets as at 2020 requires a reinforcement and expansion of the tools for energy efficiency.

Other measures must be added to those already in place and those already approved but yet to be made operative, that will enable the long-term objectives to be met effectively and in a financially sustainable manner.

Below are reported, with reference to points already addressed in this text: initiatives to be adopted in the coming months; issues that will be reinforced in the regulatory instruments (existing and yet to be defined); areas with a high potential for efficiency in which, taking account of the direction spelled out at a European level, actions will need to be taken, defining specific regulatory and financial methods.

Plan for the energy efficiency upgrading of public buildings and social housing: even in advance of the instructions contained in the proposals of new directives on energy efficiency, actions will be initiated to identify the areas of the public building stock and social housing on which activities could be carried out for greater financial sustainability, and to identify the most appropriate kinds of activities. Financial and regulatory instruments will be developed that are capable of encouraging the carrying out of the required activities.

Stabilisation of the incentive framework within a medium-term timescale: this is a process that is already in progress and that should be given greater emphasis, starting with the implementation of the provisions on the matter of efficiency contained in Legislative Decree 28/11. The stability of the incentive framework is based on effective, justified and financially sustainable incentives. One of the stable elements of the incentive framework is the White Certificates mechanism that overall has proved to be an effective instrument, but that needs to be reformed in order to eliminate certain critical issues that have appeared, and to strengthen and extend it.

For the transport sector: in addition to the gradual increase in efficiency of the vehicle population resulting from the regulations in force, it will be important, from a number of points of view, to implement measures that encourage the transfer of a proportion of traffic to more energy-efficient methods and technologies, including water-borne transport and electric power, and that support the initiatives of regions and local bodies.

Reinforcement of Green Procurement for efficiency There will be an ongoing commitment to the continual reinforcement of efficiency improvement through “green procurement” by public administration.

Actions for the development of Smart Grids: actions to spread smart grids as an infrastructure that enables the more efficient use of energy will be continued.

Among the specific tools, it will be necessary:

- to make monitoring more effective and systematic (and with low levels of intervention by administration), particularly where there are incentives or regulations on minimum performance criteria
- to promote effective forms of energy audits
- to enforce the mandatory energy performance certification of buildings, by also

implementing the related framework of sanctions
- to carry out the measures for simplifying administrative procedures on efficiency issues.

More detailed programme information follows in relation to:

1. energy efficiency in urban areas;
2. energy efficiency in data processing centres (DPC);
3. energy efficiency improvement in the transport sector:
    - promotion of vehicles with alternative forms of propulsion (electricity and biofuels);
    - financing of rapid mass transport lines in metropolitan areas.

5.1 Energy efficiency in urban areas

About three quarters of the population of the European Union lives in built-up areas in or around a city and this urbanisation is destined to increase. These urban areas consume 80 % of the energy in the European Union and emit about the same proportion of the greenhouse gases. Devising the model for energy consumption in urban areas is primarily a matter for regional authorities and local administrators. Local and regional authorities are called upon to make strategic planning choices for managing the available resources and the use of energy and transport, in other words to make the cities they administer “smarter”.

Cities have differing characteristics and hence must be allowed to define their own strategies, in order to make initiatives more effective and less wasteful in their use of financial resources. By way of introduction, the principal features typical of a smart city are:

- energy efficiency enhancement of buildings;
- transportation systems with low CO_2 emissions;
- surface and underground transport systems, built with light, highly energy-efficient materials;
- E-mobility (car sharing, info-mobility);
- creation of Smart Grids for the integration of renewable energy sources and electric vehicles;
- district heating and district cooling networks;
- LED public lighting;
- the production and distribution of energy derived from local energy sources (micro generation, photovoltaic, biomass, solar heating, heat pumps, geothermal sources and heat from waste).

Preliminary activities are needed at a city level that municipalities can carry out to confirm the feasibility of their plans for defining objectives, the involvement of all interested parties and the actual execution of the projects, in order to ensure the success of the initiative:

- the preparation of CO_2 emissions data: only through the gathering of accurate data is it possible to define the objectives of the initiative;
- the development of a Sustainable Energy Action Plan (SEAP): this document must highlight the concrete measures and the initiatives through which the local body intends to meet the energy efficiency targets;
- the selection of technologies, taking account of the specific characteristics of the city;
- the definition of the project financing model: the identification of sources of financing is a key task and the financial sustainability of the initiatives is a fundamental prerequisite for

their distribution and replicability.

Each technology has different financing elements, depending on its characteristics and level of innovation. The resources may be obtained from European or national funds, equity, debt or fiscal incentives. The net asset/debt ratio is that typical of all kinds of investments, depending on the specific level of risk. The net assets, that is the risk capital, comes from various partners – industry, finance, promoters, private individuals – who participate in the initiative. Some estimates have been made on the fiscal incentives available for one technology, small-scale cogeneration.

Finally, there are further benefits for certain technologies, depending on the regulatory framework: feed-in tariffs for generation from renewable sources and energy performance certificates for actions by distributors aimed at reducing final energy consumption.

So far, in order to support the 'Covenant of Mayors' initiative, the Commission has made available a technical-financial assistance facility for local entities entitled ELENA, managed by the European Investment Bank in connection with the Intelligent Energy programme. Through ELENA alone nearly EUR 900 million were put into action in barely 10 months of 2010, with support from the EU of about EUR 8 million.

Also in the context of POI Energia, actions are being developed to support local administrations in the implementation of policies for improving their situation with regard to the use of energy and transport, in other words, for making the cities they govern "smarter".

Success factors: the energy efficiency activities, if correctly managed, could enable the transition towards the Smart City concept.

There is a need to assess the following factors and to provide administrations with appropriate choices:

- the involvement of the city's principal stakeholders;
- the choice of partners;
- the definition of an effective action plan (roadmap) for implementing projects;
- the obtaining of funds and project financing;
- the choice of management to drive the initiatives.

The commitment of the principal stakeholders in the community is essential for success and for the implementation of initiatives: industrial, financial, intermediaries for training and communications, local service companies (public sector) and residents. Agreement between these players must be built and maintained through an ongoing process of involvement.

5.2 Energy efficiency in data processing centres (DPC)

In terms of improving the efficiency of the European economy, one sector that merits particular attention is that of ICT (Information and Communication Technology), as was emphasised by the communication "Addressing the challenge of Energy efficiency through Information and Communication Technology" dating back to May 2008. At a European level (EU-25) it is estimated that in 2005 the total consumption of electricity in this sector amounted to about 214.5 TWh[46], representing therefore 8 % of the total consumption of electricity; the resulting CO_2 emissions reached 98.3 million tonnes CO_2 equivalent, equating to about 1.9 % of total emissions at a European level (EU-25). If one subtracts from the above consumption by ICT that of consumer electronics, the consumption is 118.6 TWh, equating to about 4.3 % of the total European electricity consumption. Within the sector, the consumption attributable to data

[46] European Commission DG INFSO, "Impacts of Information and Communication Technologies on Energy Efficiency", Final Report September 2008

centres represents about 25 % of the consumption by ICT (in 2005 equal to about 53.6 TWh).

The EU estimate for 2020 anticipates a growth in the ICT sector, that will be accompanied by a heavy increase in CO_2 emissions despite the development of ever more efficient technologies and the miniaturisation of devices demanded by the market. In the absence of specific initiatives (such as the limits on maximum consumption anticipated in future EuP directives) it is expected that electricity consumption by the ICT sector in 2020 will reach a level of 409.7 TWh (245.2 TWh excluding consumer electronics, amounting to 6.5 % of the total). Consumption by data centres is also expected to rise, reaching a level of about 130 TWh by 2020.

Table 5.1 – Electricity consumption by the ICT sector in Europe

	Europe	
	2005	**2020 (without EuP directive reductions)**
ICT sector electricity consumption (EU-25) [TWh]	214.5 (8 % of EU-25 electricity consumption)	409.7
ICT sector electricity consumption excluding consumer electronics (EU-25) [TWh]	118.6 (4.3 % of EU-25 electricity consumption)	245.1 (6.5 % of the total)
Data centre electricity consumption (EU-25) [TWh]	53.6 (c. 25 % of the sector total)	130.0 (c. 32 % of the sector total)

It is estimated that in Italy electricity consumption in the ICT sector (excluding consumer electronics) was about 13.3 TWh in 2005, with 6.2 TWh being attributable to data centres.

With regard to the forecast for the sector in Italy for 2020, it is estimated that, assuming that the EuP regulations on products for data processing will soon come into effect, it will be about 20 TWh (excluding consumer electronics), of which about 10 TWh will be attributable to data centres.

Table 5.2 – Electricity consumption by the ICT sector in Italy

	Italy	
	2005	**2020 (with reductions due to EuP directive)**
ICT sector electricity consumption [TWh]	24.7 (8 % of the total)	47.2
ICT sector electricity consumption excluding consumer electronics [TWh]	13.3 (4.3 % of the total)	20
Data centre electricity consumption (EU-25) [TWh]	6.2 (c. 25 % of sector total)	10

It can therefore be understood that energy consumption is currently a crucial factor for data centres: the increasing cost of energy on the one hand, and the need for ever higher levels of

performance on the other, result in many data centres today experiencing problems of power or space in trying to guarantee the levels of service demanded by their clients.

At the root of the problem are the unused desktop and server computers: until a few years ago in fact, the addition of a service or an application inevitably called for the installation of another server, with its related infrastructure and running costs; the result is that today the typical utilisation rate of a server is about 5-15 %, whereas for the entire remaining time it is idle, although still consuming the same amount of energy as when it is active: this occurs because the hardware is normally over-sized to cope with peaks of use due to the difficulty of making dynamic adjustments. The result is that the majority of IT centres are highly inefficient in carrying out the service assigned to them. Within this framework special attention should be given to the current trend of exceeding the actual configuration of the data centre by replacing dedicated physical machines with virtual servers.

In essence a virtual server is a physical server running software that, by emulating a certain number of machines, enables it to utilise their power in those areas where there is a greater demand from the users connected.

Concentrating the functions of the physical servers into a single machine results in a lowering of energy consumption due to both the direct effect of eliminating physical machines and the indirect effect of the drop in consumption for air conditioning of the premises where the DPC is located.

Comparing two scenarios as described below:

- BAU (Business as Usual) technology: the circumstances of the data centre configured with dedicated physical machines remains unchanged, retaining the same number of servers;
- BAT (Best Available Technology): the circumstances of the data centre after action for consolidation using virtualisation;

the result is that there is the potential for energy savings as a result of virtualisation (BAT technology) of 50-60 % in comparison with BAU; the reduction in consumption of a hypothetical reference scenario in 2005 would have enabled a saving of about 3.1 TWh while the estimate for 2020 suggests a saving of about 5 TWh.

These data from literature were fully confirmed in a pilot project carried out by MiSE in 2007 on a small network of users dedicated to a specific sector.

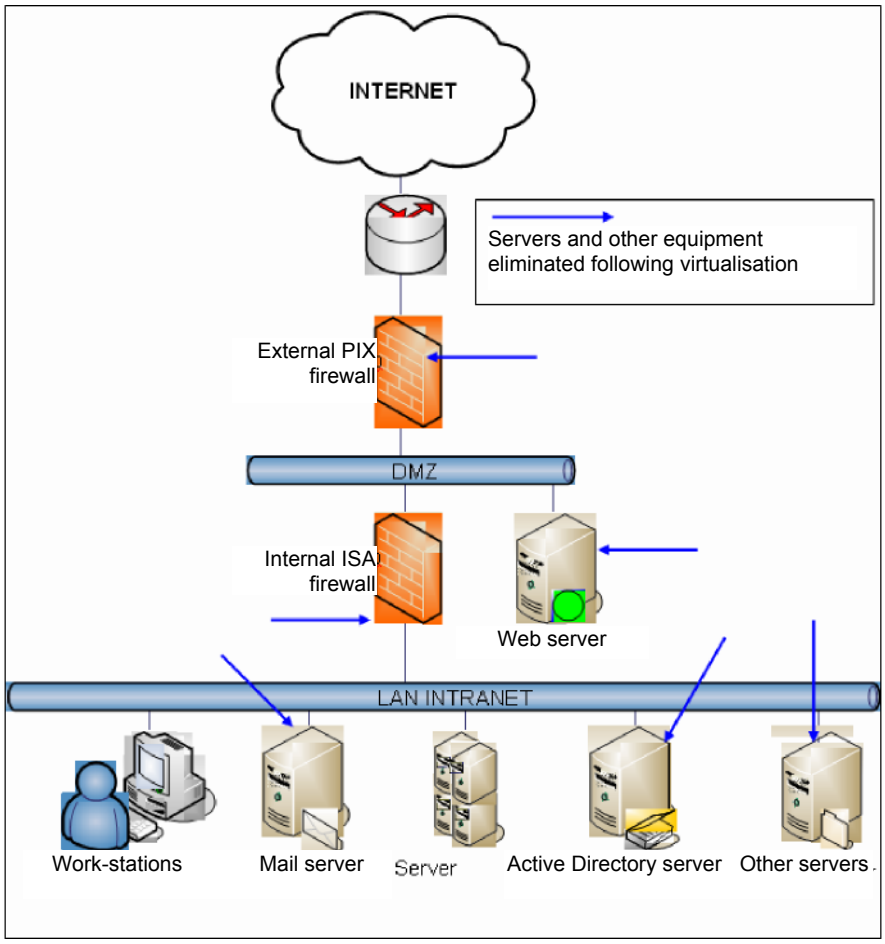


Figure 5.1 – Functional diagram showing an example of a virtual server

The Green Grid (an association of professionals and companies that operate in the Information Technology sector) in the 2007 white paper "Grid Metrics: Describing Data Center Power Efficiency" demonstrated the importance to the sector of establishing a parameter that enables operators to evaluate quickly the energy efficiency of their data centre and to compare it with best practice in order to make an informed decision on the need for actions to reduce consumption.

The document defines PUE and DCiE (1/PUE) as the two principal parameters currently used in the IT sector to check and assess the energy efficiency of a data centre.

The PUE index is initially calculated as the ratio between the peak power required by the equipment and the total required by the data centre. In the last recommendation published in May 2011 by Green Grid in collaboration with the major institutions in the sector, it was decided to assess PUE on the basis of the ratio between the total calculated demand for energy of the centre and the energy required by the IT equipment taken on an annual basis. As an initial approximation, in instances where it is not possible to obtain the energy consumptions, it is possible nevertheless to assess the ratio between the power ratings.

The parameters are defined as:

PUE = Total Facility Energy or Power/IT Equipment Energy or Power

DCiE = 1/PUE = (IT Equipment Energy or Power/Total Facility Energy or Power) x 100 % where

- **IT equipment energy or power** includes the consumption associated with all the IT equipment, such as processors, storage and network equipment, together with ancillary equipment such as switches, monitors and workstations / laptops used to monitor the data centre.
- **Total facility energy or power** includes the consumption linked to everything that supports the IT activity, such as: UPSs, generators, batteries and distribution leakages, air conditioners, fan coil units, cooling towers and lighting of the data centre's rooms.

The following table shows the reference levels for PUE and DCiE for classifying the energy efficiency of a data centre.

Table 5.3 – Reference levels for the PUE and the DCiE factors

PUE	DCiE	Level of Efficiency
3.0	33%	Very Inefficient
2.5	40%	Inefficient
2.0	50%	Average
1.5	67%	Efficient
1.2	83%	Very Efficient

A further contribution to the reduction of consumption in data processing centres can come from the installation of specific targeted cooling systems for the IT equipment, such as cooling units located inside the row of rack cabinets; furthermore, in the case of air cooling through raised floors and/or air conditioning units positioned at the sides of rooms, it is important to separate completely the flows of warm and cold air (warm and cold corridors). The cooling of the IT equipment is important and represents about 30 % of the total consumption of data centre premises.

5.3 Energy efficiency improvement in the transport sector

This paragraph considers further proposals for actions to improve energy efficiency in the transport sector; the proposed framework is not exhaustive inasmuch as margins for improvement undoubtedly also exist in other areas that are not dealt with here, such as the transport of goods by road and sea.

It should be emphasised that the evaluations reported are to provide a general indication of the energy savings achievable from the measures proposed; it will in fact be necessary to go into more detail and obtain certain data that are not presently available to arrive at a more accurate quantitative assessment.

The transport sector accounts for about 25 % of the country's total consumption and about 35 % of consumption for end-use; in 2009 the energy consumption attributable to the transport sector was about 43 MTOE (source BEN), down 2.7 % compared with the year before, confirming the falling trend that started in 2007 due to the financial crisis, which caused a reduction in consumption for both passenger transport and freight (5.2).

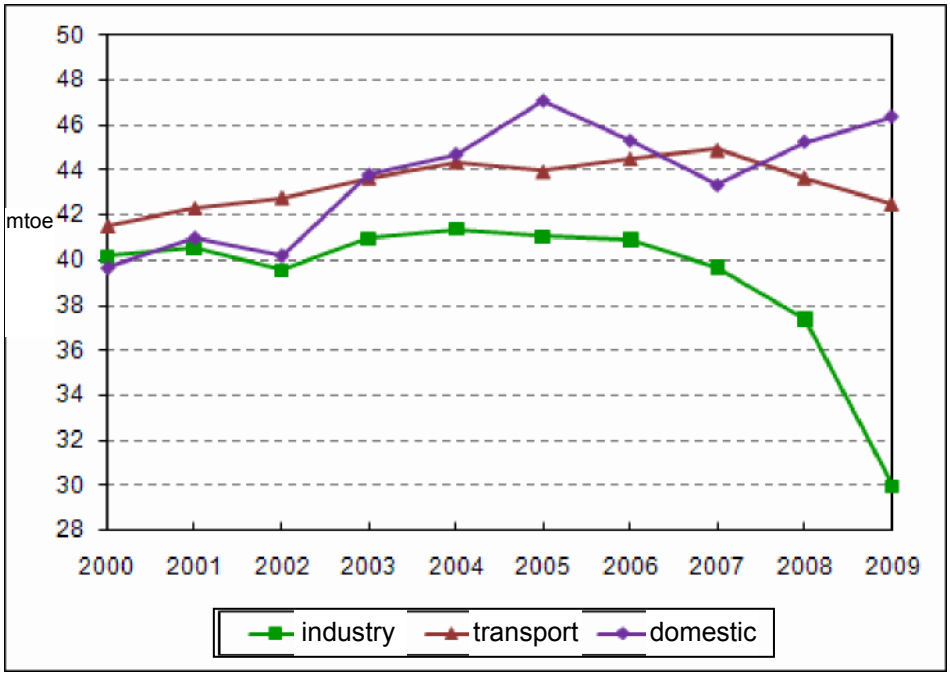


Figure 5.2 – Energy consumption by sector of the economy: industry, transport, domestic
Source: ENEA processing of BEN data

Transport is also an energy-consuming sector that is totally dependent on petroleum products (about 95 % of the total), but even in this context positive signs are beginning to be seen with an increasing use of fuels from alternative energy sources (5.3).

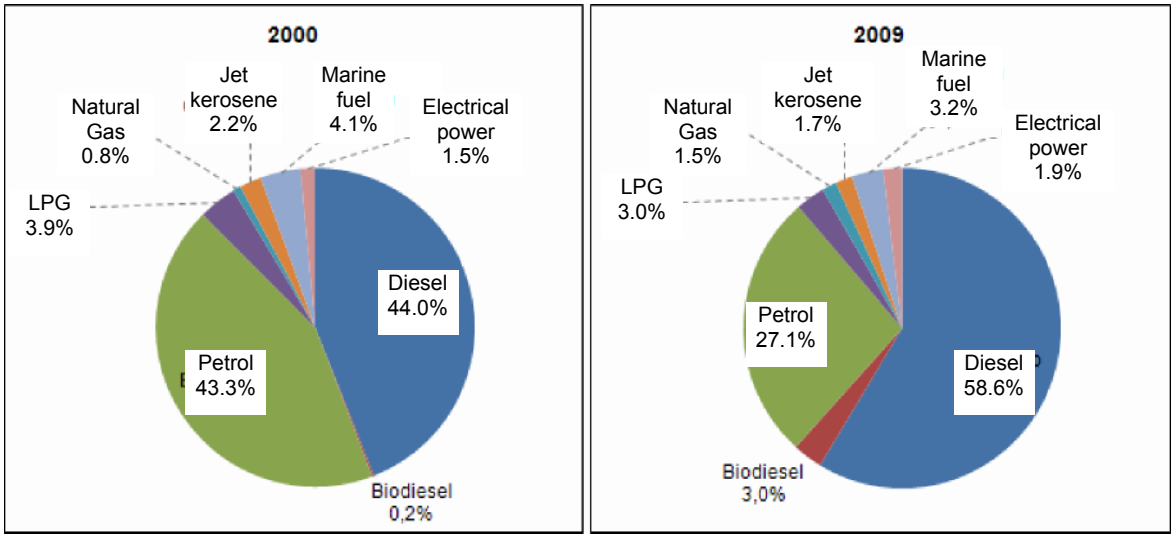


Figure 5.3 – Make-up of consumption by transport by type of fuel
Source: ENEA processing of ISPRA, BEN, TERNA and FS data

In fact, analysing the trend over time of consumption of the various sources of energy, a strong increase can be observed (about 60 %) in biofuels from 2008 to 2009 which, nevertheless, still only cover a minimal part of the energy consumed by transport.

Petrol and diesel continue to be the most heavily used fuels in the sector with diesel becoming increasingly predominant over petrol. The consumption of natural gas has increased steadily over the years, due to the policy pursued by the government of promoting the purchase of environmentally friendly vehicles and to a greater awareness by consumers of the financial and environmental considerations.

Road transport, which in 2009 had a 93 % share of the total consumption, calculated to include the amount relating to the energy production phase, has a major effect on the trend in overall consumption (see figure 5.4).

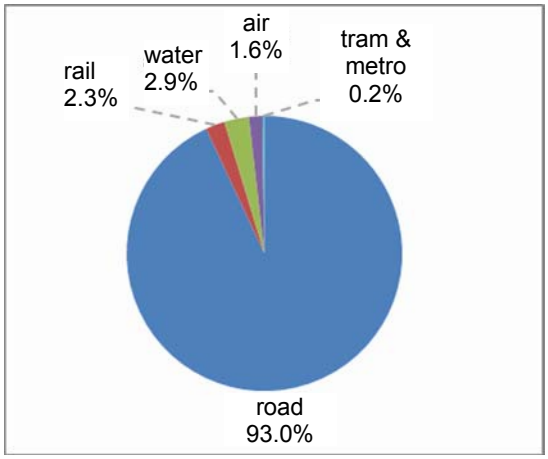


Figure 5.4 – Make up of well to wheel consumption by transport by type
Source: ENEA processing of ISPRA, BEN, TERNA and FS data

In 2009 consumption fell by 3.5 % compared with 2007, this reduction applying to all modes of transport: air transport experienced the largest fall in consumption (down 21.3 % compared to 2007), followed by marine transport (about 13 %) and rail (9 %). Consumption by road transport recorded a reduction of only 3 %. These reductions are attributable primarily to the reduced volume of traffic affecting all modes of transport for both passenger and freight as a result of the financial crisis in progress at the time.

About 2/3 (some 26 MTOE p.a.) of consumption by the sector was linked to passenger transport and the remainder (about 15 MTOE) to freight transport.

5.3.1 Promotion of vehicles using alternative forms of propulsion (electricity and biofuels)

The use of low consumption vehicles makes it possible to obtain results, in terms also of added value of the investments made, that increase in significance the greater the distances covered by the vehicles involved.

As a result, without taking anything away from the promotion of electric vehicles for personal transport, particularly for environmental reasons, mass transport (trams, buses and trolley buses) seems to be the favoured field on which to focus activity, together with initiatives involving fleets of service vehicles and those for freight and passengers, which also cover much higher mileages than private cars.

For these sectors a noteworthy contribution to energy savings could be obtained through the

hybridisation of internal combustion engines and through the more widespread use of plug-in electric vehicles (totally electrically powered or in combination with combustion engines), which enable a significant reduction in "well to wheel" energy consumption, as well as through the use of bio-methane produced from urban waste and residual biomass, which in some areas (Emilia-Romagna, Veneto, Campania) could also make a significant contribution to the reduction in consumption of petroleum products.

The high costs of these types of vehicles call for solutions that, without burdening state finances, encourage their more widespread use, for example, tax rebates and the introduction of White Certificates that could be issued to car rental companies, taxi firms, operators of car-sharing services and operators of fleets of light commercial vehicles. Furthermore, in built-up areas, concessions should be granted for the movement of these vehicles, especially those used for the delivery of goods, while restricting instead, the movement of traditional vehicles.

The annual sales of vehicles for the above-mentioned uses, although certainly lower than those of private cars, are nevertheless worth considering: more than 500 000 vehicles are registered every year (about 4 000 cars for use as taxis, about 300 000 cars for car rental, and about 200 000 light commercial vehicles).

Hybrid vehicles are a valid alternative to conventional vehicles for car rental with or without a driver, while electric vehicles fully meet the requirements for mobility in an urban environment, both for the delivery of goods and for car-sharing services. In fact, in both instances the models of electric vehicles already on the market are capable of providing the range needed to satisfy the average daily mileages of such services. Furthermore, there would be economies of scale for the installation of battery recharging stations in public and company car parks, that could be encouraged through suitable incentives, particularly if the electrical power were to be produced from renewable sources.

The hybrid versions of vehicles currently on the market offer a reduction in consumption per kilometre, compared with conventional vehicles having the same performance, that can range from 20-40 % (e.g. Honda Civic and Toyota Auris respectively).

Pure electric vehicles have even lower consumptions during use than hybrid vehicles: in fact electric traction has an efficiency 3-4 times better than that of the internal combustion engine. To get an idea of the average consumptions, a Piaggio Porter consumes about 700 Wh/km, whereas the electric version consumes 220 Wh/km (source ENEA).

The energy advantage during use is enough, by and large, to compensate for the lower performance during the production and distribution of the electrical power, compared with that during the refining and distribution of liquid and gas fuels. During the last decade, due to the improved efficiency of the national electricity system, if one considers the entire "well to wheel" cycle, the comparison is even more highly positive in favour of electric over internal combustion engined vehicles, with an energy saving of from 30-40 %.

Even better "well to wheel" results can be obtained if one looks at transport by surface and underground railway, tram and trolleybus, which are not penalised by the weight of batteries or their leakage during charging and use. In fact, comparing for example, a trolleybus and an 18 metre articulated bus (data from ATAC), based on a consumption of 0.83 litres of diesel per kilometre for the IC engined bus and of 2.2 kWh/km for the trolleybus, and assuming the same transformation/distribution performance as in the preceding case, the electric vehicle consumes 53% less, again in terms of primary energy.

However, due to the lower cost of the vehicles and the infrastructure the conventional bus still remains the most widespread solution for local public transport (LPT). Among the biofuels, bio-methane is the one that gives the greatest mileage per cultivated hectare, and moreover it can be produced from agricultural and domestic waste thus, in the most efficient way, extending the

use of renewable energy sources (RES) in transport to biomass. Then, considering the environmental benefits from the use of methane in transport compared with diesel, the ideal use of bio-methane is for LPT fleets, where its origin can be certified. The lower yield from the generation of electrical power in small-scale power plants, typical of plants using biogas, is finally getting close to the final yield of bio-fuels in their two alternative forms: production of electrical power and electrification of transport or the direct use of the fuels on vehicles.

Local public transport: BRT (Bus Rapid Transit)[47]

Talking of local public transport, a transport system that is very efficient is the so-called Bus Rapid Transit, a development of traditional bus routes that involves priority lanes, sophisticated bus stops similar to underground railway stations, priority at intersections, etc. In this way a transporting capacity of up to 40 000 passengers per hour can be achieved, at speeds up to 50 % faster than those of standard buses. The high frequency of the service makes it possible to use vehicles of all sizes, and propulsion may be of any type, conventional (using liquid and gas fuels, traditional and from RES, such as bio-methane and hydro-methane) hybrid, electric with on-board charger (or maybe rapid charging at bus stops) or with an overhead line. The electrification of BRT lines is the ideal solution, and moreover does not encounter aesthetic-type obstacles that are generally encountered in old town centres, bearing in mind that the transporting capacity, similar to that of trams and light railways, makes BRTs very well-suited to routes linking the outskirts to the centre.

Combining the opportunities offered by these high-usage transport systems, which therefore require the use of correspondingly high power, with the use of electricity from renewable sources or bio-methane, offers a solution with high added value for an investment with an energy and environmental focus.

Railway transport: dual mode self-propelled trains

This solution is ideal for operation on mixed routes (part electrified and part not), as can be seen from the calculation of the potential savings of energy and atmospheric emissions.

In fact, of the more than 53½ million train kilometres travelled per annum using diesel traction on the FS network, about 24 million – equating to 45 % - is on mixed stretches. For 30 % of the time these trains are running under overhead lines.

The use of dual mode passenger trains could result in an energy saving of about EUR 5 million per annum, if the stretches equipped with overhead lines were covered with electric traction rather than diesel as happens today, and this without even considering the additional benefits of hybrid traction (dual mode with on-board electric charging). Similarly, a reduction of emissions in the order of 3 % per annum could be expected, equating to more than 8 000 tonnes of CO_2.

The acquisition cost of the dual mode version is about 12 % more than the traditional diesel version. In terms of LCC instead, the cost is almost linear, with the dual mode version being slightly more economical due to the savings obtained in the running costs.

[47] The vehicle could be one with an IC engine running on bio-methane (if there is a production/purification/refilling site that supplies a company compression/filling station) or a trolley-bus, a rapid recharge electric bus, or a bimodal diesel-electric bus.

5.3.2 Financing of rapid mass transport lines (underground railways) in metropolitan areas

Urban movement by means of public transport offers clear advantages in terms of energy efficiency compared with the use of private vehicles, as can be seen in the following graph obtained by integrating data relating to the consumption of travel by road processed by ISPRA and data on the load factors of other types of vehicle[48].

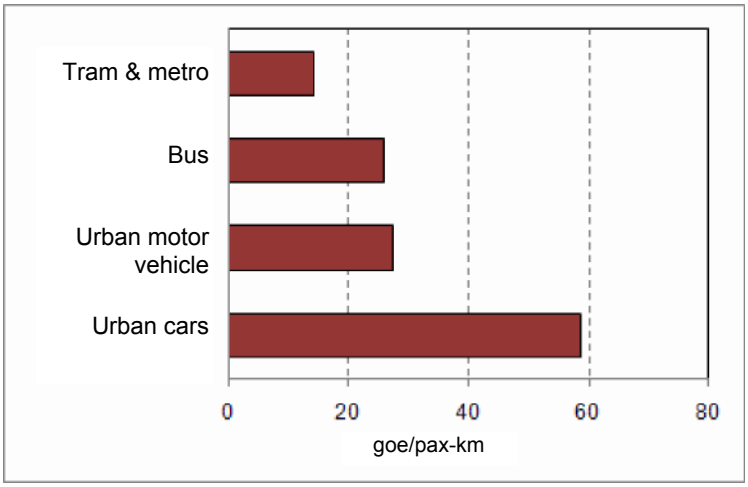


Figure 5.5 – Energy intensity of urban passenger transport by mode of transport
Source: Processing of ISPRA and CNIt data

Transport using underground metropolitan railways is particularly advantageous, because as well as enjoying a higher traction efficiency, they are characteristically "large-scale" and hence, if their transportation potential is exploited to the full, their consumption is spread over a greater effective load. In addition to the matter of energy, these systems offer benefits in terms of atmospheric emissions (local pollutants and greenhouse gases), of safety and congestion. Finally, metropolitan lines and surface railway lines that carry out a similar service are the backbone of a good public transport system in a metropolitan environment, without which the functionality of the service loses a part of its efficiency.

That notwithstanding, in Italy the railway system is inferior to those in the most advanced European countries in terms of the organisation of urban mobility.

To date there are only six Italian cities that have a metropolitan system with networks totalling a little less than 150 km, the bulk of the networks being in Milan (75 km) and Rome (37 km) followed by Naples (19 km[49]) and Turin (9.5 km); Genoa and Catania each have just a single line with lengths of 5 and 4 km respectively.

Law 211/1992 established that the state will contribute to the creation of rapid mass transit networks and activities were subsequently laid down for the Strategic Works Plan of Law 433/2001 ('legge obiettivo' or target law). The two laws are not the only ones aimed at the development of railway infrastructure for local mobility, others needing to be added to them, renewing the planning agreements between public bodies and private entities (RFI – Italian Railways – for example), the Under-utilised Areas Fund, European funds and so on.

[48] The average urban bus loading was extrapolated from data on urban LPT contained in the Conto Nazionale dei Trasporti, the *National Transport Report*, published each year by the relevant ministry, while an average was assumed of 1.3 passengers/car and 1.1 per motor-cycle.
[49] In Naples the urban railway, called the "Arcobaleno", that came into service between 2005 and 2009, having a length of about 13 km, carries out a metropolitan-type service; an additional 1.8 km of Line 1, on the Dante-Università stretch, came into service in March 2011.

The first fruitage of this financial effort can already be seen in the development of infrastructures for tramways and metropolitan railways in our cities as shown by the data contained in the following table.

Table 5.4 – Evolution of the development of infrastructures for tramways and metropolitan railways

	2000	2001	2002	2003	2004	2005	2006	2007	2008
Km metro	121	126	126	127	127	131	142	145	147
Km tram	398	382	383	469	476	455	468	457	466

Source: Conto Nazionale Infrastrutture e Trasporti, years 2008-2009

The following table summarises the costs, the financing already in place and the network kilometres anticipated from the works relating to rapid mass transit that will be completed by 2016 and 2020. The metropolitan railway network will be increased by 116 km by 2016 and by a further 92 km by 2020, while tramways will have an additional 91 km by 2016 and 128 km by 2020.

Table 5.5 – Financing and costs of mass public transport works to be completed by 2016

Type of work	Cost of works € millions	Financing € millions	Length of network	Number of stations
Metropolitan railways	9 254	5 315	116	132
Tramways	1 561	1 207	91	146
Trolley bus	452	295	32	148
Regional railway	738	738	23	14
TOTALS	**12 005**	**7 556**	**261**	**440**

Table 5.6 – Financing and costs of mass public transport works to be completed in the period 2016-2020

Type of work	Cost of works € millions	Financing € millions	Length of network	Number of stations
Metropolitan railways	9 221	3 972	92	89
Tramways	1 365	603	36	67
TOTALS	**10 586**	**4 575**	**128**	**156**

Overall the works provided will cost 22.6 billion euros (see the following table), about 53 % of the funding of which has already been covered. The majority of the funds are intended for works in metropolitan areas and more specifically for the building of metropolitan railways (18.5 billion euros that equates to 81 % of the total costs).

Table 5.7 – Financing and costs of mass public transport works to be completed by 2020

	2007-2020
Total cost of works (billions)	22.6
Public and private financing (billions)	12.1
Costs yet to be funded (billions)	10.5

Of particular significance are the works within the country's three largest metropolitan areas, Rome, Milan and Naples; for these three cities alone there are plans to build metropolitan railways and tramways with a total cost of over 15.6 billion euros and extending more than 150 km in total, 130 of which are just for new metropolitan railway lines, more than doubling the existing system.

As a rough guide, an analysis has been carried out to check the effect on energy savings if all the metropolitan lines planned for the three cities in question are completed, without entering into the question of the state of progress of the works and the approval procedures for the projects.

Since the results of the feasibility studies of the individual projects are not available, in order to estimate the potential for the mass transport services to gain traffic following the commissioning of the new metropolitan lines, the data published by ISTAT on urban mobility for the period 2000-2009 were analysed. These series of historical data for each provincial capital include the number of journeys per capita made by local public transport services as well as the development of the networks of the various types of service (bus, tram, trolley bus, metropolitan railway) and the offering of the same types of service expressed in seat-km per annum; the number of paid parking spaces and those provided for 'park and ride' services, where travellers can switch from private to public transport, was also provided.

Although the historical series is somewhat limited, it has been confirmed that, taken together, in the three metropolitan areas analysed in their totality, there is a good correlation between the modal share of Local Public Transport and the capacity provided by the metropolitan railway lines, as can be seen in the following graph.

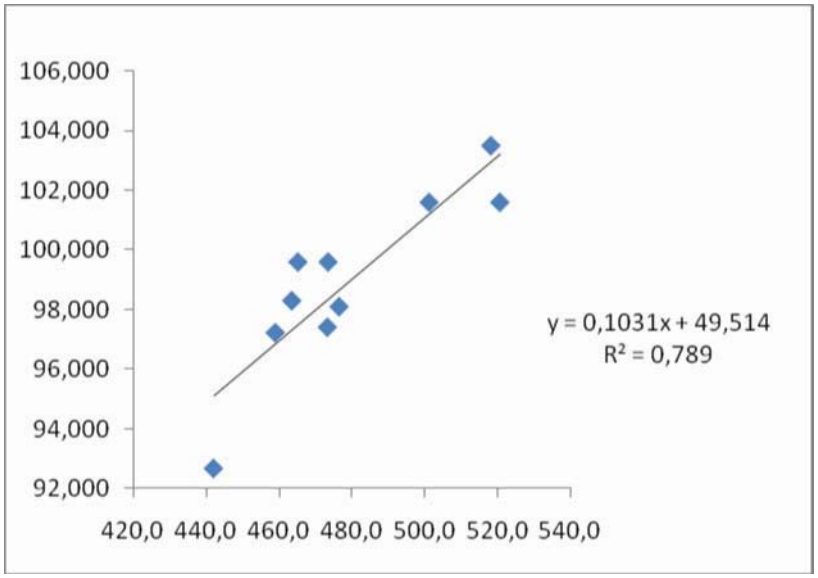


Figure 5.6 – Correlation between per capita demand on LPT and km of metro lines (Rome, Milan and Naples)

For a further refinement of the analysis a study was made of the trend in the demand for public transport in relation to a wider set of variables, including the price of fuel, in which metropolitan railways always proved to be the preferred choice, demonstrating that the presence of a well connected and well functioning metro network is capable of acting as an engine for the entire

public transport service system within metropolitan areas.

Using multiple regression between per capita demand and the most important variables of the public transport offering (km of metropolitan lines, average frequency of underground services, km of routes on surface services, average frequency of surface services), an estimate was made of the per capita demand on public transport on the assumption that all the new works for underground lines planned for the three cities, Rome, Milan and Naples, are completed within the anticipated timescales.

In the three cities taken together, the 40 km of new underground track planned by 2016 would lead to an increase of over 50 % in the per capita demand for public transport while, due to the addition of a further 100 km of track, by 2020 demand would be three times the present level; it can be seen that these macroscopic effects can be attributed to financial and construction measures that are beyond the normal, the actual feasibility of which are to be confirmed as part of another exercise.

In the calculation it was assumed that there would be a growth in the population and in the characteristics of the public transport offering other than the underground network. The positive effect resulting from the upgrading of the public transport service linked to a reduction in disposable family income and the rise in price of fuels is deemed already to be included within the model under consideration.

In the light of the results relating to the growth in demand, an energy saving is estimated due to the transfer of travel from private to public transport of about 0.2 MTOE in 2016 and 0.8 MTOE by 2020. The savings linked to decongestion of the various metropolitan networks, as shown in the following table, must be added to these figures.

Table 5.8 – Energy reduction resulting from the metropolitan railway construction work in Rome, Milan and Naples

	2016	**2020**
Reduction through modal shift	0.20	0.8
Reduction through decongestion (MTOE)	0.03	0.2
Totals	**0.23**	**1.0**

It can therefore be concluded that the completion of the works analysed, which still required the provision of public financing, will have a positive effect in terms of reducing energy consumption, notwithstanding the fact that they were conceived primarily to improve accessibility and urban mobility rather than for energy or environmental reasons.

It goes without saying that merely upgrading the infrastructure is not enough to guarantee the success of the actions considered, but it must be accompanied by the planning of a quality service (in terms of frequency, punctuality and passenger information) and by steps to integrate the public and private transport networks (with particular regard to ‘park and ride’ facilities) and the public road and rail networks. The upgrading can be made even more effective through policies to discourage private travel (where the public service is sufficiently effective) by restricting and levying charges for movements of private vehicles and, as demonstrated in the example of the Campania Region, through policies of tariff integration.

Works considered in the analyses

Table 5.9 – Metropolitan railway lines to be built in the period 2011-2016

City	Length of track km	Number of stations
Milan	14.7	21
Naples	16.5	15
Rome	8.8	7
Totals	**40.0**	**43**

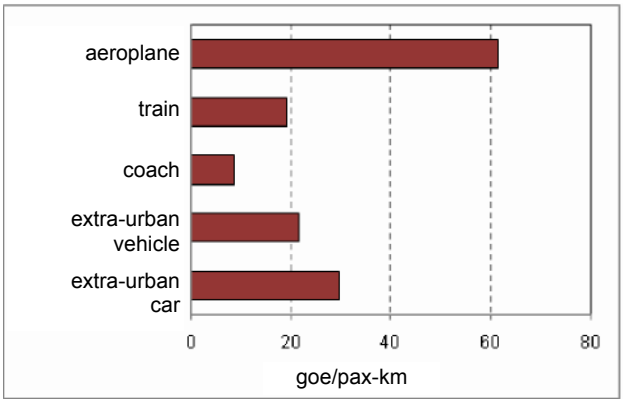
Table 5.10 – Metropolitan railway lines to be built in the period 2016-2020

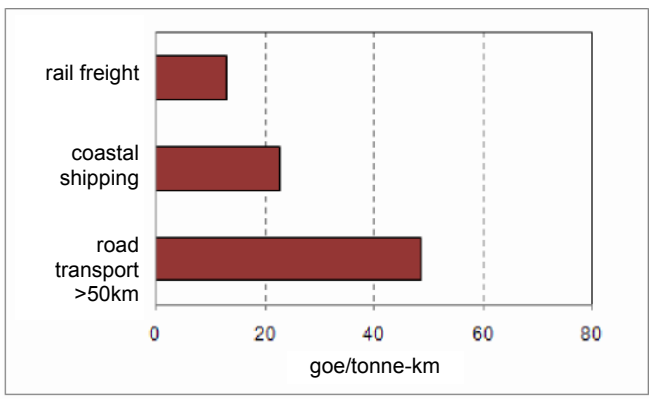
City	Length of track km	Number of stations
Milan	46	37
Rome	45.9	52
Totals	**91.90**	**89**

5.3.3 Promotion of rail transport

A characteristic of rail transport is its high-efficiency, in the case both of passengers and of freight, as demonstrated in the graphics below created by combining energy consumption and traffic data relating to the year 2007.

Source: Processing of ISPRA and CNIT data





A – Non-urban passenger transport energy intensity by mode of transport

B – Non-urban freight transport energy intensity by mode of transport

Figure 5.7 – Passenger and freight transport energy intensity

The benefits of rail transportation are not limited just to energy savings, but include other aspects such as atmospheric pollution, the greenhouse effect, congestion and safety.

The EU, in its policy documents for the transport sector promotes the use of railways; in particular in the latest White Book, "Roadmap to a Single Transport Area"[50] it states:

- that it wishes to triple the length of the high-speed rail network across Europe by 2030 using it, not just for long distance travel, but also for medium distances;
- that within the same timeframe, it wishes a 30% share of freight transportation over distances above 300 km to take place on the whole on rail or water; in support of this argument it emphasises that in many instances it is necessary to make freight transportation by rail more attractive than it is at present through a better quality of service, as however is already happening in some Member States.

In fact the Italian state has already made a huge financial commitment to the construction of the high-speed rail network that is now at a high level of completion; the HSR lines make rail transport competitive compared to road and air travel, not just because of the lower impact on energy and the environment, but also in terms of performance. Furthermore, the construction of the new HSR network has freed up capacity on the old network which can therefore more easily handle types of demand other than the fast connections between large urban centres, such as regional transport and freight.

However, set against the investment made, there was unfortunately a reduction in the demand satisfied by the railways from 2001 to 2008[51], as can be seen from the graph below.

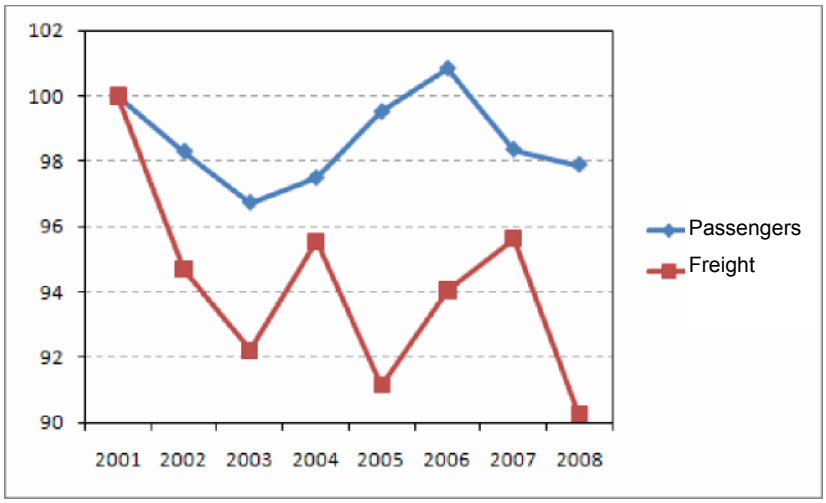


Figure 5.8 – Trend in passenger and freight traffic (base year 2001) on the railways (Source: Processing of CNIT data)

Even more significant than the absolute values are the trends of the modal shares which, although averaging the overall trend in demand, are also clearly declining (following table) in a

[50] COM(2011) 144 final of 28 March 2011
[51] The last year for which railway traffic data are available.

countertrend to both the Community objectives and internal expectations.

Table 5.11 – Modal share of total medium-long distance transport of rail transport from 2001 to 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Freight	11.4 %	10.4 %	9.6 %	9.1 %	9.5 %	9.1 %	9.4 %	9.3 %	8.9 %	6.8 %
Passengers	9.8 %	9.6 %	9.3 %	9.2 %	9.0 %	8.9 %	8.7 %	8.4 %	8.6 %	8.4 %

Source: ENEA processing of CNIT and ISPRA data

Pausing for a moment and considering the case of passengers, it can be seen that, surprisingly, it is precisely the medium-long distance segment, where the presence of the high-speed services should be having an effect, that is driving the negative trend, with a decrease of 13.5 % in the period under consideration, whereas regional transport has seen an increase of 13.9 percentage points. It should be pointed out that according to the analysis of the State Railways (FS), the unsubsidised services, consisting primarily of the HSR links, are holding up well against the negative effects of both the competition from air travel and the rise in the cost of living; evidently however, the success of the HSR services is not enough to make up for the losses from the remaining medium-long distance traffic. Yet according to the FS forecasts contained in the Industrial Plan 2007-2011, the completion of the HSR network should have led to an increase in long distance passenger traffic of 14 % in five years[52].

An examination of the data contained in the following graph, however, indicates that right from 2007 the FS group had opted for a policy of an overall reduction in the medium-long distance services offered, a fact revealed by the substantial increase in the fares charged (due also to higher operating costs for the improvement of the quality of the service offered with the HSR). It is worth emphasising that in the period from 2001 – 2008 air travel increased its passenger kilometres by about 43 %, due also their low cost pricing policy.

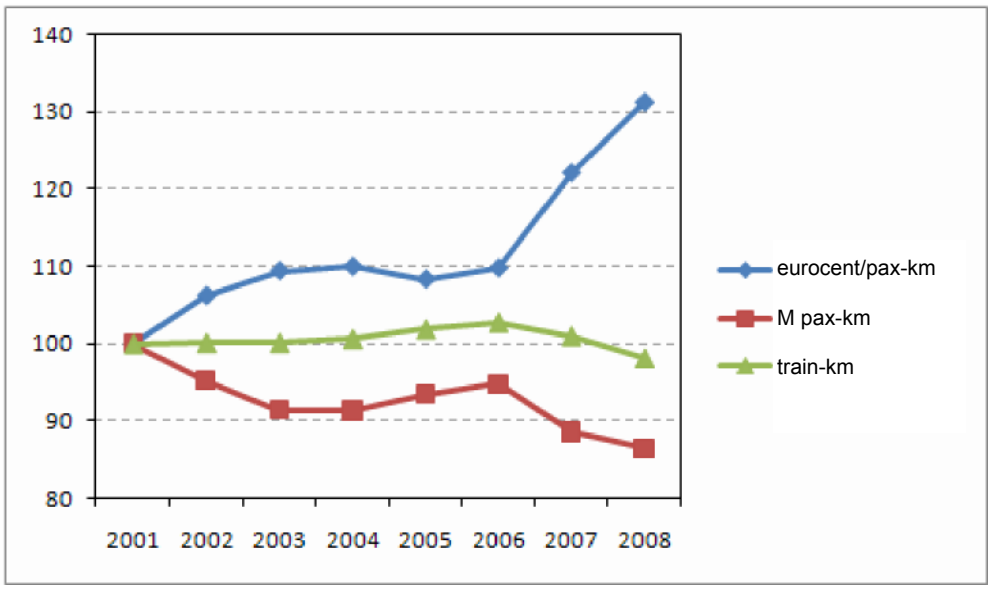


Figure 5.9 – Trend in fares, demand and offering on medium-long distance FS trains
(Source: processing of CNIT data)

As has been emphasised many times by the senior management of FS, the new policies on service offerings have, in fact, made it possible for the group to balance its books, a

[52] Together with an increase of 34 % for regional transportation and 19% for freight transport.

requirement of the business regime of the liberalised market introduced from 2000. Evidently though, the legitimate demands of the railway's accounts are not compatible with the efforts to steer the market towards this mode of transport which must be supported by cost balancing measures that reward the lower impact on energy and the environment.

Also in the above-mentioned Community White Book, the need is highlighted to restructure transport fares which must reflect the make up of infrastructure costs and external effects. This can be achieved through a revision of the excise duty on fuels, which must take account of the energy and carbon content, and the application of tolls that also cover the costs of congestion, local pollution, noise and safety. Furthermore there is a need to introduce measures to steer the market towards the lowering of CO_2 emissions.

From a very approximate estimate carried out in 2008 for the Ministry of Infrastructure and Transport, based on the hypothesis of an increase of traffic of the existing FS Industrial Plan 2007-2011, a reduction in energy consumption of about 1 MTOE p.a. should have been possible. In reality, the potential of the Italian railway infrastructure is even greater and could be exploited more fully through appropriate regulatory, fiscal and financial support policies as well as through better usage of organisational, human and financial resources by the railway companies on less profitable segments of the market.

APPENDIX A – PRELIMINARY ANALYSIS FOR THE PROVISION OF NEW STANDARDISED TECHNICAL DATA SHEETS FOR THE AWARDING OF WHITE CERTIFICATES

The recent Legislative Decree 28/2011 in transposition of Directive 28/2009 on the promotion of the use of energy from renewable sources, pursuant to Legislative Decree 115/08, calls for the preparation of at least 15 standardised schedules for categorising savings in respect of the White Certificates mechanism, with particular regard to the following matters:

- the wider use of vehicles running on electricity, natural gas and LPG;
- actions in the IT sector with particular regard to the use of remote – even virtual – servers/services;
- efficient lighting with particular regard to public lighting using LED technology and to the services sector;
- measures to improve efficiency in the industrial plant engineering sector;
- measures to improve the efficiency of the water distribution industry;
- energy savings in telecommunications systems and the use of telecommunications technology for energy savings purposes;
- the recovery of energy;
- high-efficiency appliances for the residential, services and industrial sectors, such as refrigeration units, air handling units, heat pumps and domestic appliances bearing energy labels.

To this end ENEA has prepared technical data sheets relating to the following energy efficiency measures:

1. the installation of chillers in industrial environments;
2. the installation of high-efficiency UPS systems;
3. the recovery of heat in industrial environments;
4. the installation of automation and control systems in buildings (domotic systems) in connection with the application of the UNI EN 15232 standard;
5. thermodynamic recovery of steam through mechanical steam recompression;
6. the installation of equipment fuelled by biomass for domestic use;
7. energy efficiency measures for greenhouse agriculture (efficient greenhouses).

1. Technical data sheet for the installation of chillers in an industrial environment

The types of chillers considered are: vapour compression cycle and absorption cycle.

An estimate of the savings achievable for chillers can be made from an analysis of the potential improvements associated with the individual components. Nevertheless these analyses run the risk of overestimating the energy saving potential of chillers, hence it was decided that the performance of chillers will be assessed in their entirety. In the document “Refrigerating and freezing equipment Executive summary” (it may be appropriate to provide information on the origin of the document) from 2010, estimates of the potential savings are reported under different hypotheses:

a. 15 %, estimate based on the individual components;

b. 65 %, estimate based on current and future technology;
c. 30 %, estimate based on information from stakeholders.

Assuming a chiller-related energy consumption in 2020 of about 12.88 TWh (2 408 560 TOE), the following respective savings in TOE are obtained:

a. 15 %, 361 284 TOE;
b. 65 %, 1 565 564 TOE;
c. 30 %, 722 568 TOE.

Bearing in mind the fact that the WC mechanism provides for five-year certificates for energy savings achieved through the installation of the equipment in question, there are also proposals to introduce a requirement to provide guarantees and assistance for the equipment (aimed at ensuring efficient operation) having the same duration as that of the incentive.

As far as the algorithm for calculating the achievable savings is concerned, reference is made to an average EER market value (baseline), distinguishing the types using air and water condensation for vapour compression chillers, whereas for absorption chillers reference is made to a vapour compression machine that represents the baseline for this type of refrigerating group.

2. Technical data sheet for the installation of high-efficiency UPS systems

An uninterruptible power supply (UPS) operates continuously for 24 hours per day and the power involved can be very high, for which reason an increase in efficiency, even of just a few points, could deliver significant benefits. Nevertheless, energy efficiency in UPS systems is still a parameter that is not taken into sufficient consideration at the time of purchase, mainly because companies rarely prepare a purchase specification that takes into consideration the LCCA (life cycle cost analysis), a technique that would make it possible to compare the additional cost of the efficient technologies with the savings accrued over the life cycle of the equipment being considered.

The introduction into the White Certificates mechanism of a reward for these devices could encourage the selection of more efficient UPSs.

The savings achievable can be assessed by defining a minimum level of efficiency (baseline) and then, for the purposes of the incentive, calculating the percentage points above the reference value. The choice of the minimum efficiency varies by type of UPS (static or dynamic) and power band, given that at higher levels of power the efficiency of static UPSs improves. The performance of static UPSs should be assessed in accordance with the CEI EN 62030-3:2002 standard and dynamic UPSs in accordance with CEI EN 88528-11:2005.

The following table indicates the average annual savings obtainable assuming that the installed base grows at a constant average rate, has an average power rating of 55kVA, and a $\Delta\eta$ of two percentage points above the baseline.

Average annual saving achievable by 2020	P [kVA]	No of UPSs	average installed annually	Average power [kVA]	$\Delta\eta$ [%]	Saving [GVAh p.a.]	Saving [GWh p.a.] (cosφ=0,8)	Saving [TOE p.a.]
2008-2012	11 - 100	19 231	4 808	55	2	46	37	6 931
2012-2016	11 - 100	18 793	4 698	55	2	45	36	6 773
2016-2020	11 - 100	12 142	3 036	55	2	29	23	4 376
Total saving by 2020 [TOE]								72 317

3. Technical data sheet on heat recovery in an industrial environment

During the years 2005 – 2009 many of the process technologies for improving energy efficiency were evaluated for the purpose of awarding White Certificates, through the submission of consumption-based projects. In addition to the process technologies, there was a high number of projects related to heat recovery, i.e. the recovery of the heat still present in fluids to be discharged and that traditionally was not used.

The purpose of this technical data sheet is to provide a method for calculating energy savings that is simple and flexible enough to be used in a variety of potential heat recovery situations.

Heat recovery does not relate to a single technology, since it is not linked to a specific plant or device; rather it is a procedure within the structure of a manufacturing process determined by the need to optimise flows of energy.

During the past decade, the needs resulting from the recurring energy crisis have prompted a deeper study of the elements of a conceptual nature for addressing the issue of energy recovery: how to decide on the optimal set-up of the heat exchangers between the various components of an industrial plant, how to define the criteria for differentiating between processes that produce a pay-back and those that are of no value, etc.

This proposed technical data sheet has been put together in such a way as to be applicable to two different types of procedure:

a) the installation of plate and tubular heat exchangers, in counter-currents or parallel flows, for heating or cooling, using liquids or gases;
b) the provision of a chemical washing system for periodic maintenance that returns the heat exchanger to its original condition.

With regard to the installation of heat exchangers, the following calculation algorithm is proposed.

The recovered heat is multiplied by 1.1 to take account of the production efficiency. In the case of recovery from coolants for pre-cooling fluids used in air conditioning and/or refrigeration, the energy recovered is converted into electrical energy by applying a COP=3 and then into primary energy by dividing by a power plant efficiency of 860/1870. Hence the primary energy recovery will be equal to 0.725. The same coefficient is used in the case of absorption devices, with a correction value of COP=1.38.

If it is then necessary to add one or more pumps or fans to cope with higher losses of pressure in the exchanger recovery unit, account should also be taken of the electricity consumed annually by these auxiliary devices measured in kWh.

With regard to cleaning systems, however, WCs are only awarded for the chemical washing of heat exchangers. Mechanical washing carried out using brushes or brush sticks is not considered, nor is cleaning using air jets or rinsing with water, since they are deemed to be current practices.

In this instance, in order to obtain WCs, the energy saving calculation is made by comparing the same operating conditions before and after.

4 Technical data sheet for assessing savings obtainable through the application of the UNI EN 15232 standard in buildings (domotics)

Currently the use of building automation and control systems in Italy is very limited. The proper

and automated running of heating, air conditioning and lighting systems could lead to a significant saving of energy and greater personal comfort, both in residential and service settings.

The recent UNI EN 15232 standard estimates the savings achievable through the application of automation systems in new or existing buildings, both residential and non-residential, dividing them into classes of efficiency in heating, cooling, lighting, ventilation and air conditioning applications. The standard referred to identifies four classes of energy efficiency in building automation systems: class D “Non Energy-efficient”, class C considered to be the reference standard, class B “Advanced” and class A, the most efficient “High Energy Performance”.

The installation of domotic systems can be carried out in both new buildings and in those being refurbished; in both instances proper planning will make it possible to achieve the ideal integration into the structure and hence the maximum benefits.

Given the consumption of residential heating systems in 2007 of about 18 MTOE, savings can be estimated based on the application of this standard in this sector. Considering all dwellings in UNI EN 15232 class D, without automation, achievement of the class C rating alone would result in a 9 % reduction in consumption whereas with a class B rating it would be as much as 20 %.

It has been estimated that the maximum savings achievable in a residential context through the application of domotic systems to heating or cooling systems is 4 675 kTOE. In the services sector estimates of this type are more difficult, but undoubtedly there would be significant reductions in consumption, in view of the fact that the generally higher baseline is offset by a higher number of initiatives for installing building automation.

One of the barriers to the wider implementation of these systems is the higher initial cost. Their introduction into the WC mechanism would encourage the spread of more efficient systems by producers of the technology, seeing that the average cost of an entry-level system for a dwelling is about EUR 3 000 (class C) – which could rise to EUR 15 000 for advanced systems – and hence being granted a WC would be considered too low a reward to encourage individual installations.

5. Technical data sheet for devices for the thermodynamic recovery of steam through mechanical recompression

The mechanical recompression of steam or mechanical vapour recompression, hereafter MVR, is a process with a high level of energy efficiency that consists of using a mechanical compressor to increase the pressure and hence the temperature of steam produced by boiling. The steam, thus enhanced by its increased temperature, is used in processes in place of steam produced by a boiler, with significant savings of fuel. This technology does not involve the use of new steam produced by a boiler, other than any needed to start the process or any needed for replenishment, and it eliminates the need for cooling and hence the use of auxiliary condensers and their associated costs.

However, MVR requires the use of electrical energy offsetting a greater reduction of thermal energy with a final saving of primary energy.

The specific consumption (electricity) of the MVR is in the order of 10-30 kWh/t of water produced, which in terms of primary energy equates to 78-235 kJ/kg as against 850 kJ/kg (heat plus electricity) from a trigeneration plant.

To assess the savings obtainable with MVR it is necessary to start from the quantity of water to evaporate in order to concentrate the solutions in the most promising sectors for the application of the technology. The following table shows the values of the technical application potential of

the mechanical recompression of steam in the industrial sector in 2009.

	Water to evaporate	Actual consumption		MVR electrical consumption	Primary energy saving
		Heat	Electricity		
	Mm^3 p.a.	TJ p.a.	GWh p.a.	GWh p.a.	TOE
Food industry	12.786	13 048	83.84	162.44	282 960
Concentration of food industry waste	1.782	2 096	7.34	31.44	42 968
Concentration of domestic and industrial mud	1.483	2 436	27.09	21.22	36 539
Concentration of industrial liquid waste	4.664	7 876	92.22	73.36	113 708
Totals	20.71	25 454.87	210.49	288.46	476 175

Source: RSE

The energy saving achievable with this technology is equal to the difference between the total primary energy necessary to evaporate the solution in the initial situation (baseline), including the energy consumed by the auxiliary plant, and the electrical energy, expressed in terms of primary energy, used by the steam compressor in the post situation.

6. Technical data sheet for the installation of equipment fuelled by biomass for domestic use

The consumption of biomass for energy uses, in particular heating, is well-established in our country, even though there is still ample room for improvement. The estimated potential in the Italian government's position paper of 2007 was 1.9 MTOE for heating/cooling and about 6 TWh for the electricity sector, equating to a little more than 1 MTOE. According to ITABIA the data in the position paper are underestimated, not taking account of independently produced and consumed biomass outside of the commercial arena, particularly in the domestic sector. Using and processing data from other sources it estimated that the primary energy for heating purposes was about 4 MTOE, instead of 1.9 MTOE.

On the matter of the equipment for conversion to domestic use, there is no official database or a precise number of the equipment installed; the estimates available are based on the quantity of raw material consumed (in its turn not completely traceable for the reasons given below), on statistical telephone surveys and through questionnaires completed by a sample population, or on the sales of stoves and hearths (with the collaboration of certain sector associations).

The producers, with their network of installers and resellers, could in fact constitute (or be supported by) ESCOs that, by agreement with the final users, could apply for certificates. If for example one assumes the annual market in pellet stoves to be 100 000 units, and given that the incentive is available for five years, there is the potential for figures in the region of eight or nine million euros per annum for 5 years. Assuming 25 TOE and full recognition of the saving, assuming the replacement of a consumption of 1 200 Nm^3 of natural gas per annum per boiler, the minimum quantity for making an application would equate to the installation of 25-30 biomass boilers or stoves, with a value of about EUR 2 000-2 300. It can be seen therefore that the figures become interesting on the production side and such as would justify the creation of a function dedicated to relations with clients. It has been pointed out that with that fund it would be possible, for example, to offer customers a free maintenance service in exchange for the right to obtain certificates for their installations, promote sales, provide customers with a

certificate of compliance of their installations that would permit them to obtain the 55% tax allowances, train the installers, carry out educational programmes, and so on.

With regard to the method for calculating savings, it was decided to include 100% of this additional action in cases where equipment using fossil fuels is replaced, while the percentage could be on a sliding scale for the replacement of equipment fuelled from renewable sources.

7. Proposed technical data sheets for energy efficiency in greenhouse agriculture (efficient greenhouses)

To counter energy costs on the one hand and the need to reduce CO_2 emissions on the other, greenhouse agricultural businesses can now no longer delay either the introduction of environmentally friendly energy technology or the adoption of agricultural practices, systems and production processes capable of maximising the energy efficiency of the agricultural cycle on the one hand and favouring the use of locally available renewable energy for managing micro-climates on the other.

The following table reports the schedule of energy-efficient greenhouse measures.

Energy efficiency for greenhouse agriculture	
Systems and devices to increase energy efficiency	**Benefits to the company, agriculture and the micro-climate**
Greater insulation of the greenhouse	Reduction of surface area losing heat
Use of 'thermal blanket' systems	Reduction in the volume of greenhouse to heat
Strategies for controlling and planning temperatures and relative humidity	Heating of the air correlated to the intensity of external light
Systems and techniques for passive accumulation of solar heat	Maximisation of solar heating
Transparent/filtering covers for regulating the transparency of	Increase in visible radiation (PAR) and reduction in infrared radiation (NIR)
Covers that increase the diffusion of direct sunlight	Increase in visible radiation for plants
Increasing the heat dispersing area of windows	Greater natural ventilation for cooling
Cogeneration systems	Use of local energy resources (biomass)
Low-energy bulbs or Light Emitting Diode (LED) lighting	Improvement of vegetable productivity and increase in the life cycle of light bulbs
Biomass boilers, geothermal heat pumps, photovoltaic systems	Energy innovation, reduction in emissions of CO_2

APPENDIX B – ANNOUNCEMENTS OF FUNDING PROVIDED BY THE REGIONS FOR THE IMPROVEMENT OF ENERGY EFFICIENCY

With the goal of increasing the consumption of energy from renewable sources and of improving energy efficiency and the saving of energy, the Regions have prepared many announcements in relation to financing, a brief picture of which is provided below from which can be seen a significant investment of financial resources.

	ANNOUNCEMENTS
AUTONOMOUS PROVINCE OF BOLZANO	27/12/2007 and 14/10/2008: Invitations to present project proposals for promoting the environmental sustainability of economic development policies totalling 23.7 million euros.
REGION OF CALABRIA	13/08/2008 – Announcement directed to local entities for the modernisation of public lighting by means of a low consumption system. Funding: 26 million euros from ROP 2000-2006, and ROP ERDF Calabria 2007/2013, Axis II - Energy 26/03/2010 – Announcement promoting initiatives in the field of energy saving in public lighting, with funding of 11.5 million euros from ROP ERDF 2007-2013.
EMILIA ROMAGNA	16/07/2008 – Announcement for the environmental and energy related upgrading of the regional manufacturing system, in particular SMB, through activities to promote energy saving, renewable sources, systems for combined energy production and reductions in the emission of greenhouse gases, with funding of 15 million euros from ROP ERDF 2007-2013 20/10/2008 – Announcement for the creation of ecologically equipped areas nationally, on the basis of energy from renewable sources, district heating and cooling of buildings, high performance cogeneration, trigeneration and quadrigeneration plants, high performance lighting systems and plant telemonitoring and telemanagement systems. Financing of 53 million euros from ROP ERDF 2007-2013 and from the agreement signed by the Region and the provinces of Campania on 13 December 2006. 27/01/2011 – Announcement for the removal of asbestos from buildings, the insulation of buildings and the installation and commissioning of photovoltaic systems, with financing of 9 million euros from ROP ERDF 2007-2013.

REGION OF FRIULI	30/12/2009 – Announcement for the exploitation of geothermal resources by means of ground source heat pumps, for ambient heating, the production of domestic hot water and technical uses. Funding of 3.08 million euros from ROP ERDF 2007-2013. 15/04/2010 – Announcement for actions aimed at the exploitation of renewable energy sources, in particular biomass, through the construction of cogeneration or trigeneration heat producing plants for public or private users, and district heating and cooling. Funding of 10.3 million euros from ROP ERDF 2007-2013. 28/05/2010 – Two announcements for the exploitation of geothermal resources, for ambient heating, domestic hot water production and technical uses including the creation and commissioning of district heating networks. Funding of 3.08 million euros from ROP ERDF 2007-2013. 16/06/2010 – Announcement for actions aimed at the promotion of energy saving, renewable sources of energy, cogeneration and the replacement of hydro-carbons with other fuels. Funding of 8 million euros from ROP ERDF 2007-2013. The financing is granted in the form of non-refundable assistance. The maximum extent of incentives paid under the “de minimis” regime is 80% of the allowable costs.
REGION OF LAZIO	28/02/2009 – Announcement directed to businesses in the ceramics sector for energy efficiency actions and the use of renewable energy sources, energy audits and certifications, and cogeneration with funding of 2 million euros from ROP ERDF 2007-2013. 14/05/2009 – Announcement for upgrading the efficiency of the public lighting system and the replacement of traditional traffic lights with LED systems, with funding of 12.5 million euros (from ROP ERDF 2007-2013), of which 2.5 million euros is for energy audits and 10 million for energy efficiency improvement works. 06/06/2009 – Announcement for the promotion of energy efficiency and the production of energy from renewable sources, with funding of 10 million euros from ROP ERDF 2007-2013. In particular the actions for which incentives are offered relate to: saving energy and optimising the use of energy starting with an audit (works relating to the building envelope, purchase of high-efficiency plant, goods and instruments; gas absorption heat pumps; centralised or condensing boilers; high-efficiency cogeneration and trigeneration plants; energy efficiency monitoring systems; plants for the direct use of geothermal heat by means of heat pumps; kilns and other specific production plant; solar heating systems; and district heating networks for the distribution of thermal energy). 13/06/2009 – Announcement in relation to the efficiency and environmental sustainability of the regional paper-making industry, with funding of 2 million euros from ROP ERDF.

	21/01/2010 – Announcement of projects for innovation in integrated access and environmental sustainability, in relation to energy audit and certification activities, integrated energy efficiency solutions, cogeneration and the production of energy from renewable sources. Funding of 4 million euros from ROP ERDF.
REGION OF LIGURIA	04/02/2009 – Announcement for the support of investments in the production of energy from renewable sources and the carrying out of works to improve energy efficiency through, *inter alia*, the installation of photovoltaic systems, biomass cogeneration plants and wind power installations. Funding of 10 million euros. 08/07/2009 and 28/10/2009 – Two announcements directed to public bodies for the production of energy from renewable sources and energy efficiency, with total funding of 9 million euros from ROP ERDF 2007-2013.
REGION OF LOMBARDY	21/07/2008 – Announcement directed to local entities in relation to actions for improving the energy efficiency of existing or new public lighting installations, with funding of 10 million euros from ROP ERDF 2007-2013. 13/07/2009 – Announcement for carrying out industrial research and experimental development projects in the field of energy efficiency, directed to SMB and public and private research bodies, for energy efficiency works in buildings, in industrial processes, in the field of machinery and electric motors (high energy efficiency), and in advanced lighting technology. Funding of 15 million euros from ROP ERDF 2007-2013. 16/08/2010 – Announcement of incentives for carrying out energy check-ups at SMB in Lombardy in the context of the Trend Project (Technology and Innovation for Widespread Energy Saving and Efficiency). Funding of 2.5 million euros from ROP ERDF 2007-2013 resources. 16/09/2010 – Announcement for the installation of systems for ambient heating and cooling in public buildings through the use of heat pumps for winter heating and summer cooling and/or the production of domestic hot water. Funding of 5 million euros from ROP ERDF 2007-2013.

THE MARCHE REGION	15/07/2008 – Announcement for promoting the efficient use of energy by public entities, by means of cogeneration and trigeneration plants, and district heating networks. Funding of 7 million euros from ROP ERDF 2007-2013 resources. 30/07/2008 – Announcement for support of investments in energy saving and the production of energy from renewable sources in a production environment, also the introduction of new technological processes including cogeneration. Funding of 1.5 million euros from ROP ERDF 2007-2013 resources. 07/11/2008 – Selection announcement directed to public entities for works for energy efficiency and the use of renewable energy sources for public lighting, with funding of 2.5 million euros from ROP ERDF 2007-2013 resources. 07/11/2008 – Announcement directed to public entities of incentives for low-energy geothermal plants, with funding of 1 million euros from ROP ERDF 2007-2013 resources. 10/03/2009 – Announcement of incentives for energy saving and the use of energy from renewable sources (solar heating and photovoltaic) by SMB in the commercial sector, with funding of 0.76 million euros from ROP ERDF 2007-2013 resources. 26/03/2009 – Announcement of investments aimed at energy saving and the use of renewable sources of energy, for SMB in the cultural field, through energy audit/analysis activities, the insulation of building envelopes, bio-climatic buildings, natural ventilation systems for the summer, the replacement of heating plants, heat pumps (for use also for summer cooling), the use of renewable energy sources (solar photovoltaic and heating), the use of more efficient equipment for the combustion of fuels from non-renewable sources, the adoption of automatic stand-by and switch-off systems for appliances, the rephasing of electricity lines, the replacement of electric motors and lighting systems and the certification of energy efficiency improvements. Funding of 0.76 million euros from ROP ERDF 2007-2013 resources. 07/04/2009 – Announcement for investments in energy saving and the use of renewable sources of energy by SMB in the tourism sector, through actions to improve the efficiency of heating and cooling systems, the production of domestic hot water and lighting, the upgrading of plant, also through the adoption of instruments to measure, monitor and manage energy, the adoption of plants to produce energy from renewable sources (solar heating and photovoltaic, and wind power). Funding of 0.53 million euros from ROP ERDF 2007-2013 resources. 06/07/2010 – Setting up of an engineering financing fund for granting guarantees on investments by businesses in renewable energy and energy saving, with funding of 8 million euros from the Community's ROP ERDF 2007-2013 resources.
REGION OF MOLISE	22/09/2009 – Announcement of incentives for investments in energy saving, with funding of 9 million euros from ROP ERDF 2007-2013 resources.
REGION OF PIEDMONT	22/04/2008 - Two announcements of incentives for measures aimed at rationalizing energy consumption and the use of renewable sources of energy in manufacturing plants, the setting up of new plants and new production lines for systems and components to take advantage of renewable energy and energy carriers, energy efficiency and product innovation in the field of technology for energy, with funding of 90 million euros from ROP ERDF 2007-2013 resources.

	09/10/2008 – Announcement of incentives for the solar production of electrical power on rubbish dumps that are no longer used or are in a post-operative phase, directed to local entities and businesses, with funding of 10 million euros from ROP ERDF 2007-2013 resources. 17/11/2008 – Announcement for actions to rationalise energy consumption and to produce/use energy from renewable sources in the building stock of public institutions and offices used for hospital and health purposes, specifically: energy upgrading of the hospital of Alba-Bra (8 million euros) energy upgrading of Palazzo Nuovo (5 million euros) photovoltaic system on Palaolimpico (0.8 million euros) 07/04/2009 – Announcement of incentives, through grants related to assets, for investments in the rationalisation of energy consumption in the non-residential building stock for public use, of national public entities, totalling 15 million euros, funded from ROP ERDF 2007-2013. 27/11/2009 – Regulations for the co-financing of energy upgrading works on public buildings of the city of Turin, with resources of 11.4 million euros from ROP ERDF 2007-2013. 08/03/2010 – Announcement of incentives for setting up production lines for systems and components in the field of energy efficiency and the exploiting of renewable energy sources, directed to SMB and their consortia, totalling 20 million euros from ROP ERDF 2007-2013. 30/08/2010 – Announcement of incentives for works aimed at rationalising energy consumption and the use of renewable energy sources in manufacturing sites, with resources of 20 million euros from ROP ERDF 2007-2013.
REGION OF SARDINIA	06/04/2009 - Announcement of co-financing of initiatives in the field of energy saving in public lighting and the containment of light pollution, directed to local bodies, with resources of 20 million euros from ROP ERDF 2007-2013. 16/12/2009 – Announcement for carrying out the functional reorganisation of mini hydro-electric power plants and for energy efficiency improvement works on the integrated regional water system through the production of electrical power from renewable sources, with resources of 29 million euros from ROP ERDF 2007-2013. 14/04/2011 - The Sardinia CO2.0 project for the promotion of short, medium and long-term integrated actions for reducing CO_2 emissions within the region, through the involvement of local communities. Within the context of this project, on 13 June 2011 the Covenant of Mayors was signed, involving the island's 377 municipalities in the Sardinia CO2.0 project. Funding of 25 million euros from ROP ERDF 2007-2013. 19/05/2011 – Directive implementing the Sardinia CO2.0 project, particularly through investments in renewable energy sources (biomass, solar heating, photovoltaic and wind power systems), in energy saving and in high-efficiency cogeneration plants. Funding of 12 million euros from ROP ERDF 2007-2013. 26/05/2011 – GPP announcement directed to local entities, for the promotion of sustainable and efficient use of environmental resources, the improvement of instruments for environmental sustainability and the adoption of green procurement procedures in the manufacturing sector, in the domestic sector and in public administration. Funding of 1.3 million euros from ROP ERDF 2007-2013.

REGION OF SICILY	05/03/2010 – Announcement of the granting of concessions to local entities and other public bodies for the production of energy from renewable sources (solar, wind, biomass, hydro-electric and geothermal), the increasing of energy efficiency (also cogeneration) and the reduction of climate-changing emissions. Funding of 60 million euros from ROP ERDF 2007-2013. 28/05/2010 – Public notice of the granting of concessionary financing, through the signing of regional programme contracts for the development of industrial activity, relating to actions to set up manufacturing facilities in the region in the field of renewable energy sources including innovative pilot projects (solar heating, solar photovoltaic, biomass, low temperature geothermal, sustainable mobility, eco-efficiency, biofuels and hydro-electricity) directed to SMB. Funding of 120 million euros from ROP ERDF 2007-2013.
REGION OF TUSCANY	10/11/2008 – Start of activities for the promotion of energy saving and renewable energy sources, totalling 189.6 million euros from ROP ERDF 2007-2013. 14/11/2008 – Announcement of the support of joint research projects between groups of companies and research bodies on issues related to the environment, transport, logistics, info-mobility and energy, with funding of 9.13 million euros from ROP ERDF 2007-2013. 22/06/2009 – Announcement implementing the actions on renewable sources of energy, energy savings, cogeneration and district heating, directed to businesses and public entities, with funding of 29.24 million euros from ROP ERDF 2007-2013.
AUTONOMOUS PROVINCE OF TRENTO	11/08/2009 – Announcement for the promotion of applied research projects relating to renewable sources (new components, technologies and solutions for the production of thermal energy and electricity from renewable sources such as hydro-electric, solar, wind, geothermal, biomass and hydrogen) and to sustainable building, pertaining to the energy and environment technology district. Funding of 3 million euros from ROP ERDF 2007-2013 resources. 04/08/2009 – Announcement of contributions to companies and public entities for investments in the fields of energy efficiency and renewable energy, in particular for activities relating to measures for energy saving, high-efficiency cogeneration and the promotion of energy production from renewable sources. Funding of 2.5 million euros from ROP ERDF 2007-2013 resources. 22/07/2008 – Announcement of the promotion of research projects pertaining to the energy and environment technology district, in particular applied research projects relating to renewable energy sources (hydro-electric, solar, wind, geothermal, biomass and hydrogen), sustainable building and energy saving. Funding of 15 million euros from ROP ERDF 2007-2013. 21/09/2007 – Announcement of the construction and/or refurbishment of public buildings in compliance with nationally and internationally recognised low-energy consumption and low environmental impact standards, in particular for residential building works for spreading the culture of sustainability and energy saving and works on non-residential buildings (public buildings, schools, social services and production units) in accordance with criteria of compatibility. Funding of 9 million euros from ROP ERDF 2007-2013 resources.

REGION OF UMBRIA	30/05/2007 – Announcement of support for businesses for investments in renewable energy sources, the protection and restoration of the environment, in particular for actions aimed at the reduction of atmospheric, water and sound pollution, the reduction of refuse and the recycling of material, the rational use of energy, the promotion of renewable sources of energy and cogeneration. Funding of 6 million euros from ROP ERDF 2007-2013 resources. 15/04/2009 – Announcement of incentives directed to businesses, for supporting the introduction of measures and investments aimed at energy efficiency, in particular for actions for energy saving, including energy audits of manufacturing sites. Funding of 17.4 million euros from ROP ERDF 2007-2013 resources.
REGION OF VALLE D'AOSTA	04/11/2008 – Announcement of incentives for innovation projects proposed by businesses in collaboration with research bodies for projects relating to the promotion of renewable energy sources and energy saving. Funding of 1.4 million euros from ROP ERDF 2007-2013 resources. 05/06/2009 – Awarding to the company Telcha S.r.l. of a grant related to assets for a project for the construction of a cogeneration plant in conjunction with a district heating network in the city of Aosta. The funding awarded was 5.67 million euros from ROP ERDF 2007-2013 resources.
NOP Research	18/01/2010 – Published by the Ministry of Instruction, Universities and Research, an invitation to present industrial research and experimental development projects, and projects for the training of researchers and/or research technicians. Beneficiaries: companies, research centres, consortia, consortium companies, science and technology parks with manufacturing facilities or registered offices in the Convergence Regions. Activities qualifying for the grant: the promotion of renewable energy sources, energy efficiency, advanced transport and logistics. Funding of 465 million euros from ROP ERDF 2007-2013 resources. 14/10/2009 – Issued by the Ministry of Economic Development, an announcement with the objective of promoting the competitive repositioning of the manufacturing system and promoting the specific skills of the areas of the Convergence Objective. Activities qualifying for the grant: experimental development programmes and industrial research activities for innovation in products and/or processes in the fields of energy production from renewable sources, energy efficiency of buildings, nanotechnologies and ICT. Beneficiaries: companies operating in the following sectors: a) industrial; b) agro-industrial; c) trades; d) industrial research centres. Funding of 100 million euros from ROP ERDF 2007-2013 resources, also in the form of partnerships.

APPENDIX C – DEFINITION OF MINIMUM CRITERIA FOR "GREEN PUBLIC PROCUREMENT"

The "minimum environmental criteria", specified in the *National Action Plan on Green Public Procurement* (NAP GPP) have in part already been adopted by a decree of the Ministry of the Environment, in collaboration with the Ministry of Economic Development and the Ministry of Finance and in part are in the process of being defined and will be adopted in the coming months, as indicated below. In accordance with the NAP GPP, only contracts that incorporate the minimum environmental criteria may be defined as "green".

The minimum environmental criteria include a series of requirements, among them being:

- energy efficiency requirements, where pertinent (e.g. for electrical and electronic office equipment, for restaurants – schools, staff restaurants, public offices – street lighting equipment, building work and construction materials);
- technical requirements specific to the category of goods associated with the use of energy (for example external doors and windows);
- instructions to be provided to PA personnel to promote operations with reduced energy consumption;
- contractual clauses aimed at implementing sustainable systems of mobility for personnel employed on public assignments and at identifying actions to rationalise movements of public administration personnel, encouraging the adoption of sustainable mobility;
- CO_2 emissions limits for the purchase, rental and leasing of vehicles for the transportation of persons and goods (categories M1 and N1).

Furthermore, the environmental criteria tend to favour the procurement of services rather than the procurement of goods, with the purpose of orienting public administration towards integrated forms of contracts that, including both the operation of plant and the supply of products and carrying out of work, enable rationalisation of activities and hence the saving of energy and the reduction of environmental impact and of costs.

Since the criteria refer to the lifecycle of products and services, they favour the least energy-intensive production methods and hence the products with a lower energy content (for example, in the case of restaurant services and the supply of foodstuffs, organic products).

These provisions will make results achievable, in terms of the reduction of environmental impact and particularly of the containment of energy consumption, increasingly so, as procurement practices in line with the technical prescriptions of the NAP GPP become more widespread.

The minimum environmental criteria adopted and in the process of definition

To date minimum environmental criteria have been adopted by means of the Decree of the

Ministry of the Environment for:

- "reams of paper", falling within the category of "stationery (paper and consumable materials)" – Ministerial Decree No. 111/09, published in the Official Gazette No 261 of 9 November 2009;
- "soil improvers", falling within the category of "urban and land services (management of public green areas, urban design)" - Ministerial Decree No. 111/09, published in the Official Gazette No 261 of 9 November 2009;
- "textile products", "textile products and footwear" - Ministerial Decree No. 21/11, published in the Official Gazette No 64 of 19 March 2011;
- "office furnishings", falling within the category of "furnishings for offices, school equipment, equipment for filing rooms and reading rooms)" - Ministerial Decree No. 21/11, published in the Official Gazette No 64 of 19 March 2011;
- "apparatus for public lighting", falling within the category of "energy services (lighting, heating and cooling of offices, public lighting and illuminated signs)" - Ministerial Decree No. 21/11, published in the Official Gazette No 64 of 19 March 2011:
    - High-intensity discharge lamps and LED systems
    - Luminaires
    - Lighting systems
- electric and electronic office equipment, falling within the category of "electronics (electric and electronic office equipment and related consumables, telecommunications equipment)" - Ministerial Decree No. 21/11, published in the Official Gazette No 64 of 19 March 2011:
    - desktop personal computers
    - laptop personal computers
    - printers
    - multi-function devices
    - photocopiers.

In relation to the promotion of energy efficiency in end-use, the minimum environmental criteria relating to **electrical and electronic office equipment** specify among the basic requirements a level of energy efficiency equal to the current version of Energy Star and the awarding of technical bonus points for devices that are even less energy-demanding. Furthermore, they provide operating instructions to make users aware of how to use the equipment in a way that minimises energy consumption.

The minimum environmental criteria relating to **public lighting apparatus** set out basic requirements for the luminous efficacy of lamps and LED systems, the efficiency of the ballast, and factors for maintaining the luminous flux. Some of these factors anticipate the measures

that will become mandatory pursuant to Regulation (EC) No 245/2009[53] and Regulation (EU) No 347/2010.

- Among the products and services for which minimum environmental criteria are in the course of being defined, those that can make the most significant contribution to energy efficiency improvement in end-use are:

- "external doors and windows", falling within the category of "building (construction and refurbishment of buildings with particular attention to construction materials, construction and maintenance of roads", soon to be adopted. Among the basic criteria there will minimum levels of air transmittance and permeability;

- "cars, light commercial vehicles, buses and heavy commercial vehicles for purchase, rental or leasing", falling within the category of "transport (transport vehicles and services, systems of sustainable mobility)", at an advanced stage of definition. Among the basic criteria will be the favouring of lower energy and environmental running costs and limits on CO_2 emissions, restricted to cars and light commercial vehicles;

- "lighting and FM services for buildings", falling within the category of "energy services (illumination, heating and cooling of buildings, public lighting and illuminated signs)", at an advanced stage of definition. Among the criteria will be the installation of automated systems for the management of plant and recording of the associated consumption, energy analyses and audits of plant and buildings and the planning of energy upgrading works;

- "heating/cooling services for buildings", falling within the category of "energy services (illumination, heating and cooling of buildings, public lighting and illuminated signs)", at an advanced stage of definition. Requirements similar to those for lighting and FM services are planned and in addition requirements relating to the capturing of on-site data. For both services the objective of the criteria is to enable administration to acquire sufficient knowledge about the plants and buildings to be able to carry out subsequent renovation works.

- "public restaurant services" for which an advanced stage of definition has been reached on the voluntary agreements for the energy labelling of appliances for cold storage, refrigerators and freezers ECE (etichettatura certificazione energetica *energy certification labelling*), washing and cooking.

Finally, there are plans to set up a working group to define the minimum environmental criteria for the construction and refurbishment of buildings and for construction materials, for which the matter of energy efficiency is of significant importance.

[53] Commission regulation on "*implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for fluorescent lamps without integrated ballast, for high-intensity discharge lamps, and for ballasts and luminaires able to operate such lamps*"

APPENDIX D – DISTRICT HEATING NETWORKS

The national district heating networks landscape has witnessed[54] a major expansion in northern Italy, with almost the entire volume heated in this way (about 227 million m^3, equating to 97% of the total) concentrated in just five regions: Lombardy, Piedmont, Emilia Romagna, Veneto and Trentino Alto Adige.

The mix of primary energy sources used in urban district heating is dominated by natural gas (74.3 %), followed by coal (3.5 %), biomass (5.2 %), fuel oil (3 %), USW incineration (7.9 %), geothermal heat (0.8 %) and recovery from industrial processes (0.2 %).

Natural gas is still the principal source, even though in recent years there has been an increase in the use of energy recovery from USW waste to energy. Use of other renewable sources is still marginal.

Thermal energy produced through cogeneration represents 52.3 % of the total energy fed into the network; integrated energy produced by simple boilers represents 29.3 %, while about 18.3 % comes from renewable sources. Overall 70.6 % of the thermal energy fed into the Italian district heating network is produced through low environmental impact technologies.

The quantity of emissions avoided is around 600 $kgCO_2/100m^3$ for the networks fed by dedicated cogeneration systems and about 50 $CO_2/100m^3$ for networks fed solely by heat-only gas-fired boilers.

On the basis of a study carried out as part of the Ricerca di Sistema[55] project, the Italian Urban Heating Association (AIRU), anticipated that by 2020 the volume heated by district heating would have increased to something in the order of 1 000Mm^3 with a consequent saving of primary energy of 1.8 MTOE p.a. and a reduction of 8 MtCO2 p.a. in emissions.

The incentives offered for district heating consist of a tax credit, currently only granted for plants fuelled by biomass or geothermal heat in areas with a harsh climate, that was made permanent by the 2009 Finance Act[56]. In cases where the district heating network is fed by a cogeneration plant, a reduction in the excise duty on natural gas is provided for.

Article 1, paragraph 71 of Law No 239/2004[57] introduced the direct issuing of green certificates for electrical power produced by cogeneration combined with district heating, restricted to the amount of thermal energy actually used for district heating. This provision was subsequently abrogated by Article 1, paragraph 1120 of the 2007 Finance Act, without prejudice to those rights acquired.

District heating also benefits from the White Certificate incentive scheme. Energy savings from

[54] ENEA, AIRU, Energy Study, POLIMI, “District heating and integrated energy systems”, 2008.

[55] GAME project, SVALTER sub-project, RSE S.p.A. (formerly CESI).

[56] Law No 203 of 22 December 2008, Article 2, paragraph 12.

[57] Law No 239 of 23 August 2004 containing regulations on “The restructuring of the energy sector, as well as delegation to the government of the reorganising of current dispositions on the matter of energy”, in Official Gazette No 215 of 13 September 2004.

district heating systems can be evaluated using the analytical method using AEEG's schedule No 22.

In the first year of operation of the certificate mechanism almost 20 % of savings were obtained from totally new systems or the extension of district heating networks, but this percentage fell significantly during the course of the second year.

A further measure recently introduced to promote the wider spread of district heating networks can be found in Legislative Decree No 311/2006. In fact the decree, amending Legislative Decree No 192/2005, provided that in the case of newly constructed public and private buildings, or refurbishments of the same, it is mandatory to carry out works on both the building envelope and on building plant to enable connection to district heating networks. This disposition is applicable, however, only if there is a stretch of a network within 1 km or if projects have already been approved through suitable planning instruments.

Finally, Legislative Decree No 28 of 3 March 2011, within the context of the upgrading of energy-efficient transport infrastructure, defined additional measures in Article 22 in support of district heating and district cooling networks, among them the creation of a guarantee fund, financed by a levy applied to the consumption of methane gas, to be used in conjunction with the provisions of the regional plans.

APPENDIX E – CREATION OF A NATIONAL FUND FOR ENERGY EFFICIENCY – ECO PRESTITO

It is estimated that across the country there are more than 2 500 000 buildings in a precarious state of repair, that need to be either renovated or demolished and rebuilt; they are buildings and building complexes that have now come to the end of their useful lives and are therefore ready for “substantial renovation work”.

During the past few years there has been a strong shift in culture compared to the past, when the renovation of buildings was approached from a predominantly architectural point of view and works, in the main, were limited to individual actions on individual structures. Today the effort to implement policies of sustainable development and energy efficiency enhancement through improvements to the energy-environment quality system, and the need to stimulate the building sector, is forcing a broader view to be taken of works in the residential building sector along with a search for effective ways to resolve all the problems – environmental, urban, financial, social and employment – that characterise these contexts.

In order to ensure the efficiency of the “building-plant” system in its totality an innovative planning method must be defined, that is capable of marrying the technological with the operational-management and socio-economic aspects and with a guaranteed quality of work.

The application of new procedures and the use of qualified professionals/workforce and contracts that guarantee results, provide assurances to the end-user and guarantee the quality of the work, are factors that help achieve high levels of performance in terms of energy and the environment, and stimulate a market in serious difficulty.

The performance objectives must be appropriate to the scope of the work, based on principles of compatibility and balancing of the actions and processes and aimed at the maximising of resources and the improvement of the country.

To encourage this measure, consideration is being given to the setting up of a fund to support actions capable of enabling pre-established levels of high energy efficiency to be achieved.

The ECO PRESTITO fund will be a revolving type fund and will provide support particularly to public and private bodies and/or ESCOs through loans at favourable rates, loans linked to performance indices, or other guarantee instruments for sharing risk. These loans will be granted in relation to the types of works and their cost.

The fund could operate in conjunction with traditional channels of financing (e.g. bank loans) to facilitate access to credit.

In cases where the work involves the demolition and reconstruction of a building it may be that a volume-based bonus may be granted up to a maximum of 30% of the volume demolished.

APPENDIX F – NOTIFICATIONS PURSUANT TO ARTICLE 10, PARAGRAPH 2, ARTICLE 14, PARAGRAPH 4 AND ARTICLE 15 PARAGRAPH 4 OF DIRECTIVE 2010/31/EC

List of measures and instruments as per Article 10 paragraph 2 of Directive 2010/31/EC

Article 10, paragraph 2 of Directive 2010/31/EC requires that Member States prepare a list of existing and, if appropriate, proposed measures and instruments including those of a financial nature, other than those required by the Directive itself, which promote the objectives of the Directive.

The list that follows reports the most significant elements in support of Directives EPBD 1 and 2.

1. Financial instruments

A. Tax allowances for energy saving works on the existing building stock (the 55% package).

The tax allowances for energy saving works were introduced by the 2007 Finance Act which was valid until 31 December 2007. The 2008 Finance Act extended the scope of the permitted works and the mechanism through to 31 December 2010. The 2011 Stability Law (Law No 220 of 31 December 2010) provided for a new extension of the incentives for works carried out by 31 December 2011.

The instrument was found to be particularly effective in promoting the energy efficiency upgrading of existing buildings and has supported the entrepreneurial activities of the national industrial and trades sectors that produce highly energy-efficient materials, equipment and products, during a period of serious economic difficulty, generating the creation of more than 42 000 jobs.

At present an extension of the measure is under consideration, possibly restructured and integrated with other incentive schemes, that guarantees an appropriate time frame for planning the necessary investments by businesses in the sectors.

The measures and the results obtained are fully documented in paragraph 3.1.2. Additional information follows.

The concession consists of a deduction against the gross taxable income on the annual tax return of 55% of the costs incurred by the tax-payer, up to a maximum deduction that varies depending on the type of work involved. The allowable costs include the costs of purchasing equipment, components and materials as well as those for carrying out installations and for executing the works.

The experience of recent years - monitored by ENEA on behalf of MiSE – has produced very positive results; the following estimates relate to just the period from 2007-2010:

- the total number of works carried out was about 1 000 000;
- the overall investment exceeded 11 billion euros;
- the total value of the tax allowances was about 6 billion euros, to be spread over the period 2008-2015.

Against these costs ENEA estimated a lasting energy saving of about 6 500 GWh p.a., and it is worth stating that this impact should be replicable for some decades.

The table below reports the details of the maximum deductible expenses, the estimate of the number of works carried out by 31 December 2010 and the average annual energy saving expected for each type of work eligible for deduction against tax by the Ministerial Decree of 7 April 2008 and subsequent modifications and supplements.

Type of work	**Current maximum allowable deductible expense (€)**	**Estimated (*) number of works carried out by 31.12.2010**	**Average annual saving of energy by type of work (MWh p.a.)**
Insulation of walls, floors and roofing	60 000	50 000	12
Replacement of windows	60 000	470 000	2.5
Replacement of heating plant with condensing boilers, heat pumps or geothermal plants	30 000	300 000	10
Installation of solar heating panels	60 000	160 000	7
Comprehensive works carried out on buildings	100 000	20 000	20

(*) The data relating to the year 2010 are estimates, since the applications sent to ENEA can be modified up to 30 September 2011 (Inland Revenue Circular No 21/E of 23 April 2010)

B. White Certificates

By means of the Ministerial Decrees of 20 July 2004 *New specification of the quantitative targets for increasing energy efficiency in the end-use of energy, pursuant to Article 9, paragraph 1 of Legislative Decree No 79 of 16 March 1999 and subsequent modifications and supplements* energy efficiency goals have been set for suppliers of thermal energy and gas with the awarding of energy efficiency certificates or White Certificates, certifying the reduction of primary energy consumption resulting from energy efficiency measures and actions, including those on buildings.

The measures and the results obtained are documented in paragraph 3.1.5.

C. Legislative Decree No 40 of 25 March 2010 "incentives decree" and Ministerial Decree of 26 March 2010

With Legislative Decree 40/2010 and the Ministerial Decree of 26 March 2010, incentives were introduced to support employment and companies and to increase the wide-spread adoption of energy efficiency. Among other things the provisions set out incentives for purchasing new high-efficiency homes, distinguishing the contributions for Class B buildings from those for Class A buildings. At present the budgeted sum has been fully used.

The fund of 20 million euros was used to promote the purchase of 2 450 Class B homes and 1 154 of Class A.

D. Legislative Decree No 28 of 3 March 2011: "thermal feed-in tariff"

Articles 27 and 28 of Legislative Decree 28/2011 introduce a support arrangement for the production of thermal energy from renewable sources and for energy efficiency by means of the following incentives:

a) concessions on natural gas tariffs for small-scale works carried out on existing buildings after 31 December 2011;
b) expanding and strengthening the White Certificates system for all works other than those included in letter a).

The aforementioned incentives will be brought into effect by a decree issued within six months of the date when Legislative Decree 28/2011 comes into force (29 September 2011).

2. Other instruments

A. Simplification, rationalisation and updating of administrative and regulatory procedures.

Within the context of the simplification, rationalisation and updating of the administrative and regulatory procedures, the Commission's attention is drawn to the following:

- since the entry into effect of Legislative Decree No 192 (Attachment I, DPR 59/09 Article 4, paragraphs 4 and 7) the minimum requirements have become mandatory in all instances of refurbishment of buildings or plant, without limit to the size or the value of the works, hence going well beyond Directives EPBD 1 and 2. By way of example, compliance with these requirements affects:

  - repairs to the water-proofing of roofs;
  - the replacement of individual windows;
  - the replacement of heat generators of any size, with the obligation to carry out an energy audit (and hence certification) in the case of buildings with installed power > 100 kW;
  - repairing of external plastering;
  - other.

  It is stressed that in the case of renovations these requirements are even more stringent than the corresponding parameters for the minimum performance requirements for new buildings.

- Article 16, paragraph 2 of Legislative Decree 192/05 provides for the streamlining of procedures for condominiums for the carrying out of energy upgrading works for buildings, when the works called for have been defined following an energy audit and/or certification.

- Article 11, paragraphs 1, 2 and 3 of Legislative Decree 115/08 provides for volume bonuses and extends the minimum distances in order to encourage the construction and refurbishment of more efficient building envelopes as well as a streamlining of the authorisation procedures to encourage the use of renewable energy sources in those same buildings.

- Article 5 of the Ministerial Decree of 26 June 2009 institutes a comparison and coordinating body involving the State, the regions, the autonomous provinces and local entities, with the following objectives:

- monitoring of the application of the regulation on energy performance certification of buildings aimed at ensuring the most effective means of communicating information between the buyer and the seller of a building and the most widespread adoption and uniformity of procedures nationwide;
- the comparison and exchange of experiences in support of the preparation of programmes to renovate the nation's building stock (Article 9(c)(3a) of legislative Decree 192/05);
- the formulation of proposals for the creation of a regional and national IT system that will facilitate the gathering of data on energy certification and monitoring of the energy efficiency of buildings;
- the formulation of proposals for updating current regulatory dispositions;
- the formulation of proposals for the development of coordinated initiatives to provide information to the public encouraging the exchange of instruments and the optimising of available resources;
- the evaluation of market costs and conditions for gaining access to the service for certifying the energy performance of buildings, in consultation with national professional bodies;
- the formulation of proposals pertaining to the development of certifications and the voluntary marking of energy-environmental quality;
- the proposals aimed at ensuring the widest publicity of the conditions for carrying out certification services;
- promoting the process to bring regional instruments for the energy performance certification of buildings into line with national guidelines.

- Article 3 of DPR 59/09, for the calculation of the energy performance of buildings, made mandatory the standards of the UN I/TS 11300 series, defined in the context of the CEN standards prepared in support of Directive 2002/91/EC.

- Article 7 of DPR 59/09 already lays down that, to comply with current regulations, including those pertaining to certification, the energy performance of buildings must be determined with the use of commercial software that has passed the verification procedure prepared for the purpose by the Italian Thermo-technical Committee (CTI). Software is admissible if it has a margin of error in the energy performance index values of less than 5% compared with the corresponding parameters determined by the application of the national reference instrument provided by the CTI.

- With the recent Legislative Decree 28/2011 (RES) Article 13 modifies the rules for energy certification laid down in Article 6 of Legislative Decree 192/05. Among them, in anticipation of the forthcoming transposition of Directive 2010/31/EC, it is pointed out that from 1 January 2012 in notices for the sale of buildings it will be obligatory to state the energy performance index value.

Notification pursuant to Article 14, paragraph 4 of Directive 2010/31/EC

Italy carries out the inspection of heating plants in compliance with paragraph 1 of Article 14 of Directive 2010/31/EC and hence is not subject to the obligation to present a report pursuant to Article 14, paragraph 4 of Directive 2010/31/EC.

Notification pursuant to Article 15, paragraph 4 of Directive 2010/31/EC

Italy intends to carry out the inspection of heating plants in compliance with paragraph 1 of Article 15 of Directive 2010/31/EC and hence is not subject to the obligation to present a report pursuant to Article 14, paragraph 4 of Directive 2010/31/EC.

On this issue the Commission is hereby informed that, because of delays due to the definition of specific technical regulations, our country has an ongoing regulation programme that governs the inspection of summer air conditioning plants and is integrating it with the corresponding inspections for heating systems. It is anticipated that the procedure for this provision will be concluded between November 2011 and January 2012.

It should be remembered that the inspections of heating systems have been present in Italian legislation since 1976 (Law 373/76), were updated in 1993 (DPR 412/93) and further revised with the transposition of Directive 2002/91/EC (Legislative Decree 192/05 and DPR 59/09).