ITALIAN REPUBLIC

Ministry of Economic Development

ITALIAN ENERGY EFFICIENCY ACTION PLAN 2007

(Directive 2006/32/EC on energy end-use efficiency and energy services)

July 2007

Foreword

This Energy Efficiency Action Plan describes the measures the Italian Government intends to pursue with a view to achieving the targets for improving energy efficiency and energy services.

Directive 2006/32/EC concerning energy end-use efficiency and energy services requires each Member State to prepare a national energy efficiency action plan. The Commission has stressed the importance of this first report, inasmuch as it lays down the *ex-ante* measures to be undertaken for achieving the Directive's energy saving target of 9% by the ninth year of the Directive's application (2016), relative to the mean annual energy consumption over the five years before the implementation of the Directive, to be achieved by energy services and other energy efficiency improvement measures.

The Plan takes into account the measures already adopted under Law No 296 of 27 December 2006 (the 2007 Finance Act) and other measures implemented in 2006-2007 (energy efficiency standards in the construction industry, promotion of high-efficiency cogeneration etc.). Other measures are currently being considered in the industrial, residential and transport sectors pursuant to the European Directives on energy labelling, on the promotion of cogeneration, on the ecocompatible design of products and on energy end-use efficiency. It is also worth noting the technological innovation effort for energy efficiency set in motion under the Industry 2015 Programme for the development of competitiveness.

The current situation is in a state of change and not yet stabilised, but the series of proposed measures and the 9.6% saving target set for 2016 seem reasonably achievable if the measures already adopted (requalification of buildings, transport, biofuels, domestic electrical appliances, lighting, industrial motors) are maintained for at least some years and the other measures now being considered or transposed are coherently implemented. Greater efficiency might be achieved by more incisive measures in the urban and non-urban mobility sector that are proposed by the Plan but have yet to be quantified.

As regards the operativeness of the measures already initiated by the Government, the desirability of extending their duration or making them structural will be closely monitored during implementation, with a view to assessing their effectiveness and scope, for the purposes of implementing this Action Plan and, above all, the decisions adopted by the European Council on 9 March 2007. The 2008-2011 Economic and Financial Programming Document recently approved by the Government provides for pursuing and extending fiscal measures for encouraging energy efficiency of buildings and energy use equipment. The draft Law No 691 currently being discussed in Parliament also provides for specific authority for the Government to boost energy saving and renewable energy sources.

The preparation of the National Energy Efficiency Action Plan involved a process of consultation with the main organisations that have interests and expertise in the sector, specifically with a view to allowing a broad consensus on the priorities and targets to be achieved. The proposed measures affect the main technologies available for implementing energy efficiency programmes, with assessment of the savings actually achievable in the light of the current regulatory framework and possible changes in it.

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Introduction

In recent years the environmental, economic and energy supply security problems associated with the continuing growth in energy demand and the rising cost of oil have resulted in Italy, as elsewhere, in renewed interest in the ability of demand management and control policies to produce appreciable results in terms of reducing consumption fairly quickly at limited cost.

Consumption analysis shows that Italy recorded in 2005 a limited increase in total energy demand and in energy intensity. Primary consumption per energy source shows a further reduction in consumption of petroleum products, although they still account for the largest proportion of energy demand.
The corresponding growth in the use of natural gas nevertheless confirms an ongoing substitution process dating back to the mid-1990s. Coal also dropped in 2005, reversing its upward trend of previous years. After a long period of substantial stability, the amount of electricity imported was down in 2005 on 2004.
The 1% decline in the contribution of renewables was due to seasonal factors owing to the predominance of hydropower. The figures for 2002 to 2005 show a continuing rise in total energy consumption at a higher rate in 2002-2003 with a slowdown in 2004-2005, while GDP over the same period remained almost static, with a slight fall in 2005.
Italy has a high structural dependency on energy from foreign sources, currently just under 86%, with upward trend in the short term. Lacking traditional energy sources, the country's sole endogenous resources are renewables and possible energy efficiency gains. Its high energy dependency also impacts on the country's energy procurement cost.

For Italy as a whole, effective and far-reaching action on the energy end-use efficiency may create a synergy between the need to reduce energy dependency, increase security of supply and reduce greenhouse gas emissions, with effects on the competitiveness and technical innovation of the production system and the creation of new employment.

National initiatives for promoting energy efficiency

- Enhancing the level of information among both end users and operators and the level of training of operators
- Promoting the creation of new operators (e.g. ESCos[1]), effective funding mechanisms (e.g. third party funding) and the involvement of the financial system and banks.
- Carrying out demonstration projects per type of use and form of action, and innovative projects such as the "energy district" approach.
- Creating conditions for reconciling the market and the role of operators whose business involves selling energy with the operator whose business involves selling energy efficiency.

Until the end of the 1990s, Italy recorded final energy intensity values below the average of EU countries and has only recently come close to the average. Certain north European countries (Denmark, Germany, Sweden, Finland, Britain) have substantially reduced their energy intensity. In contrast, others, e.g. Spain and Portugal, starting from below-average energy intensity levels, show rising trends.

[1] Energy Services Companies

Comparison with the European situation shows Italy steadily losing the benefit it previously derived from a favourable energy intensity position, and failing in recent years to keep up with the bulk of European countries which, despite greater economic growth, have appreciably reduced their energy intensity (Fig. a).

Belgium

Denmark

France

Germany

Italy

Spain

Sweden

EU average

Britain

Fig. a – Final energy intensity of the GDP of certain EU countries (toe/1000 €)
Source: processing of EU data – ODISSEE project

Analysis by sector shows, relative to the energy intensity growth of the residential sector, which is obviously affected by the climatic component, a declining growth trend in the industrial and transport sectors (Fig. b).

Industry (intensity with respect to added value in industry)

Transport (intensity with respect to GDP*)

Tertiary and residential (intensity with respect to GDP*)

Fig. b – Sectoral energy intensities in Italy (percentage variations relative to 1990)
Source: processing of MSE data

We have an energy and production system that is failing to modernise and innovate and we are at the same time backward in implementing energy efficiency measures. The energy efficiency decrees provided for by two legislative decrees of 1999 and 2000 only produced their first effects in 2005 and other European Directives have been transposed late (energy efficiency of buildings and biofuels) or have yet to be transposed (Energy End-Use Efficiency Directive).

These facts are supported not only by the national data on the energy intensity of Italy as a whole but also by studies at European level such as the ODYSSEE project, which uses a methodology based on the assessment of energy efficiency indices.

Composite energy efficiency indices are constructed from unitary consumption indicators broken down by end use, type of system or equipment, transport modalities etc. and weighted for their impact on the sector's final consumption. The indices are calculated at the level of each segment of industry (relating energy consumption to the production indices per segment), transport modalities for the transport sector and use function for the residential. The elementary indices are pooled in the sectoral indices and thereafter weighted in the general index by the relating final consumptions.

The ODEX energy efficiency index[2] is an indicator for assessing the aggregate energy efficiency trend (whole economy, industry), eliminating the influence of structural changes and other factors unrelated to energy efficiency, so it provides different information from that on energy intensity.

All sectors

Industry

Transport

Residential

The graphs plot the national energy efficiency indices against the averages for the 15-country European Union over the period 1990-2004.

[2] This indicator, along with others, is incorporated in the ODYSSEE (*Energy Efficiency Indicators in Europe*) project. ODYSSEE is a joint project between ADEME, the European Commission's EIE programme and the national energy and environment bodies of the 15 EU countries plus Norway. The purpose of the project is to set up a database containing detailed data on the 15 countries' energy consumption, broken down by end users and subsectors, energy efficiency indicators and indicators relating to CO_2. ENEA is the Italian body participating in the project.

Assessment of the energy efficiency situation in the main sectors of the national economy

Whole economy

In the period 1990-2004, the energy efficiency index improved by only 3.9% as against the EU's[3] 10.1%. This was due to industry's negative result for the whole period not being sufficiently offset by good performance in the transport and residential sectors. The annual improvement was about 0.1-0.3%.

Industry

The industrial sector showed a consistent efficiency index trend in the period 1990-2004, with different trends between subsectors. The efficiency increase in such sectors as chemicals, ferrous metallurgy and construction materials was not sufficient to offset the negative results in the mechanical engineering, agrifood and textile sectors, in which there was a consistent decline in efficiency throughout the period, albeit with some improvement towards the end.

Transport

The energy efficiency of the transport sector in the period 1990-2004 improved by 4.0% as against the EU's 7.2%. This was mainly due to increasing efficiency of motor vehicles (7.1%). Other forms of transport, e.g. shipping and rail, had major energy efficiency improvements but represent only a small proportion of the sector. These good results were offset by a loss of road freight efficiency, particularly in 2004.

Residential

This was the sector with the best energy efficiency improvement in the period 1990-2004, recording 8.9% as against the EU's 12.9%. The beginning of the 1990s saw a faster improvement in energy efficiency, which slowed in the later years. New measures were adopted in favour of technologies resulting in efficient end-use of energy (compact fluorescent lamps, high-efficiency domestic electrical appliances, thermal insulation for buildings etc.). The increase in energy efficiency of electrical appliances in the last 5 years was 5.0% as against 8.3% in the period 1990-2004.

The energy efficiency improvement is mainly accounted for by better utilisation of energy by technologies resulting in greater efficiency and in savings due to changes in end user behaviour.
The technologies and action areas identified above are consolidated at national level: the point is to make end users of energy utilities appreciate that the latter do not represent an inevitable and unchangeable form of consumption but an element which it is possible and necessary to improve.
Improving energy efficiency in these terms in the tertiary sector clearly involves two kinds of problem, viz. funding and the management of measures.
It is important to institute the practice of energy audit to make it possible to have a clear picture of the situation and thereby identify the pockets of greatest inefficiency, with the consequent possibility of structuring a widespread action plan leading to the defining of priorities as a function of the fundamental parameter of payback time.

[3] A reduction in the index denotes energy efficiency improvement.

This will be the only way of making end users realise which and how many measures can be taken, some of them involving limited investment that pays off quickly, others with a longer return time but a more incisive and substantial impact in energy saving terms.
It is necessary, however, for the energy audit to be related to a specific action and management proposal capable of really achieving the intended energy saving. Applying the best technology, which often involves extra cost, requires proper cost/benefit analysis; nevertheless, end users need not only technologies, which are tools, but also “services” capable of optimising their energy requirements, thus embracing a management efficiency approach that rewards the energy savings achieved.
This is the role which, as the European Community acknowledges in its recent Energy Efficiency Plan, might be undertaken by ESCos making it possible, by means of their energy services contracts, to achieve their energy efficiency objectives such as optimisation of energy flows, lower procurement costs and reduction in pollutant emissions.
As indicated by the Electricity and Gas Authority (AEEG), the direct benefit in terms of energy expenditure avoided is accompanied by further benefits, both private (better level of service) and systematic (less pollution, development of products and energy services).
It is precisely to facilitate the funding of energy efficiency measures that the EU declares the need to identify and eliminate from national legislations the legal obstacles and the barriers to competition that hold back the use of i) companies offering energy efficiency solutions, ii) guaranteed and shared savings, iii) outside funding and iv) energy performance contracts.
Energy services companies are still at a developing stage and need a policy of support to encourage the spread among end users of their Energy Performance Contracts (EPCs), which pay back, in whole or in part, on the basis of the savings achieved.
This approach might therefore, if accompanied by expansion of rotating funds devoted to energy efficiency, be a positive answer to the often rather limited resources of the public and private tertiary sector, particularly SMEs.
Perception of measures that are feasible is not always sufficient to lead end users to choose to make the investments needed for achieving energy saving: there is often a predominance, in the public and private sectors alike, of a culture of measures and decisions fragmented over time that do not give priority to what would be desirable, i.e. an integrated approach in the management of buildings and infrastructures in their various components (installations, building automation, integrated control systems, air conditioning, lighting etc.).
In this context a fundamental part falls to fiscal inducements which, as a means of internalising external costs, represent an essential tool for promoting in Italy, as elsewhere, energy efficiency in end uses.
The importance of a deliberate fiscal policy of support for various possible forms of energy saving shows up clearly in the chapters on the various technologies and represents a cornerstone of the efficiency implementation strategies identified here, in its ability to render innovative solutions competitive, e.g. performance contracts accelerating the payback of investments and making it possible to reduce the length of contracts.
An important factor in this virtuous circle is the involvement of the banking sector, which needs encouraging to provide firms with the kind of credit lines that have too often been promised but never actually made available.
It is also possible and necessary for an essential pressure in favour of energy efficiency to be applied to such major energy consumers as the Public Administrations, which need to adopt virtuous behaviour that would make them both “models” of responsibility in the energy and environment field and also a “prime market” for new technologies.

It is therefore now possible to argue that the national energy efficiency action system is underway, heading in the right direction and among the most innovative in Europe. Italy is one of the first countries to have started, by decrees on energy efficiency, the system of “white

certificates". It has also to be realised that action on energy efficiency presents objective difficulties, being characterised by a high degree of fragmentation in both demand for efficiency and the supply of measures. On the demand side, users are spread geographically and small (e.g. a building or even an individual user such as a family) with only a small saving achievable per measure (e.g. replacement of a boiler by a more efficient one), with different types of users (e.g. families, hotels, small-scale industry). The fragmentation on the supply side comprises the multitude of technologies and energy saving techniques available, the size of the operators (e.g. ESCos) and the type of technological offering (in some cases international firms, in others SMEs and local firms).

It is in any case necessary to strengthen the regulatory system, monitor and verify results, give the market strategic certainties with medium to long term prospects and eliminate existing barriers and obstacles. To this end, a programme of measures has been sent in motion involving the following forms of action:

- developing effective implementation and management of the transposition of the European Directives on energy labelling (table A below);
- implementing European Directive 2004/8/EC on the promotion of cogeneration, European Directive 2005/32/EC on the ecocompatible design of products that consume energy, and European Directive 2006/32/EC on energy end-use efficiency;
- implementing Legislative Decree 311/06 on the energy efficiency of buildings and improving Legislative Decree 128/05 on the promotion of biofuels and the Decrees on energy efficiency by adjustment of energy saving obligations;
- implementing the guidelines contained in draft Law 691 (currently being formalised) on measures for liberalisation of the energy market, for rationalisation of procurement, for energy saving and immediate measures for the energy sector (Article 2 "Authorising the government to boost energy saving and renewable energy sources") and rules for implementing the Kyoto protocol by the development of renewable energy sources, energy system innovation and mobility.

Table A – Measures transposing Community legislation on energy labelling

Equipment	**Community enactment**	**Transposition in Italy**
Domestic appliances in general	Directive 92/75/EEC	Presidential Decree No 107 of 9 March 1998 enacting rules for implementing Directive 92/75/EEC concerning information on the energy consumption of domestic appliances, published in G.U. *[Official Gazette of the Italian Republic]* No 89 of 17 April 1998.
Electric ovens for household use	Directive 2002/40/EC	MAP *[Ministry of Productive Activities]* Decree of 2 January 2003 implementing Commission Directive 2002/40/EC of 8 May 2002 stating the arrangements for applying Council Directive 92/75/EEC on labelling the energy consumption of electric ovens for household use, G.U. No 23 of 29.1.2003.
Air conditioners for household use	Directive 2002/31/EC	MAP *[Ministry of Productive Activities]* Decree of 2 January 2003 implementing Commission Directive 2002/31/EC of 22 March 2002 stating the arrangements for applying Council Directive 92/75/EEC on labelling the energy consumption of air conditioners for household use, G.U. No 23 of 29 January 2003.
Household dishwashers	Directive 1997/17/EC	MICA *[Ministry of Industry, Trade and Agriculture]* Decree of 10 November 1999 on arrangements for applying energy labelling to dishwashers for household use under Community Directives 92/75/EC and 97/17/EC, G.U. No 269 of 16 November 1999.
Lamps for household use	Directive 98/11/EC	Decree of 10 July 2001 transposing Commission Directive 98/11/EC of 27 January 1998 stating the arrangements for applying Council Directive 92/75/EEC as regards labelling the energy efficiency of lamps for household use, G.U. No 184 9 August 2001.
Clothes washing and drying machines	Directive 96/60/EC	MICA Decree of 7 October 1998 on the arrangements for applying energy labelling to washing machines, clothes drying machines and washing and drying machines for household use, G.U. No 248 of 23
Clothes dryers	Directive 95/13/EC	

Household washing machines	Directive 95/12/EC	October 1998.
Domestic electric refrigerators, domestic electric freezers and combinations thereof	Directive 94/2/EC	MICA Decree of 2 April 1998 on rules for implementing Commission Directive 94/2/EC of 21 January 1994 stating arrangements for applying Council Directive 92/75/EEC of 22 September 1992 on labelling the energy consumption of domestic electric refrigerators, domestic electric freezers and combinations thereof, G.U. general series No 248 of 23 October 1998.
Domestic electric refrigerators, domestic electric freezers and combinations thereof	Directive 2003/66/EC (amending Directive 94/2/EC)	MAP Decree of 21 September 2005 implementing Commission Directive 2003/66/EC of 3 July 2003 amending Directive 94/2/EC stating the arrangements for applying Council Directive 92/75/EEC on labelling the energy consumption of domestic electric refrigerators, domestic electric freezers and combinations thereof, G.U. No 229 of 1 October 2005.

Instruments enacted for energy use efficiency improvement and energy services

To drive forward the energy efficiency action programme, a number of instruments have already been enacted, including the 2007 Finance Act, the defining of energy efficiency standards for the construction industry, the promotion of high-efficiency cogeneration, the Industry 2015 energy efficiency project and various training and information campaigns directed at end users of every kind (including the residential, tertiary and industrial sectors).
Law No 296 of 27 December 2006 (the 2007 Finance Act) "*Provisions for the formation of the State's annual and multi-year budget*" published in the Ordinary Supplement to Official Gazette No 299 of 27/12/06 provides in sections 344 to 365 attractive incentives for energy saving that deserve close attention from citizens, traders and entrepreneurs. The modest investments involved in improving the energy efficiency of our homes and workplaces are likely to be suitably compensated not only by the lower costs we face in the future and the knowledge that we have helped to protect the environment, but also by the tax deductions we shall be eligible for, which in some cases cover more than half of the costs we shall have to bear. The table below sets out the main energy efficiency measures provided for by the Finance Act.
The beneficiaries comprise all taxpayers, individuals, professionals, companies and firms that bear the cost of measures on existing buildings or parts of them or on existing property units of any land register category, including rural units, owned or occupied.

Where the measures are carried out under financial leasing contracts, the tax deduction accrues to the user and is determined on the basis of the costs borne by the leasing company.

			Measure	Incentive	Other conditions
Residential sector	**Existing buildings**	**344**	Energy reclassification of existing buildings to achieve an annual primary energy requirement limit value for winter conditioning at least 20% lower than the values set out in Annex C (1) Table 1 of Legislative Decree No 192 of 19 August 2005.	Gross tax deduction equal to 55% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €100,000.	- Measure to be carried out by 31 December 2007; - Verification of appropriateness of the measure by an authorised technician; - Energy certification of the

Residential sector	**New buildings**	**345**	Measures on existing buildings or parts of them or property units with regard to vertical and horizontal opaque structures (roofing and flooring) and windows, including their frames.	Gross tax deduction equal to 55% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €60,000, subject to meeting the thermal transmittance (U) requirements expressed in W/m^2K of Table A appended to the Finance Act.	
		346	Installing solar panels to produce hot water for domestic and industrial purposes and to meet hot water requirements of swimming pools, sports structures, residential and care homes, scholastic institutions and universities.	Gross tax deduction equal to 55% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €60,000.	
		347	Replacement of winter conditioning installations by installations provided with condensing boilers and simultaneous updating of the distribution system.	Gross tax deduction equal to 55% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €30,000.	
		350	Municipal building regulations making the issue of a construction licence subject to installing photovoltaic solar panels for producing not less than 0.2 kW per housing unit.		
		351	New buildings or building complexes to achieve an annual primary energy requirement limit value per useful square metre at least 50% lower than the values set out in Annex C (1) Table 1 of Legislative Decree No 192 of 19 August 2005, and the energy requirement for lighting and summer conditioning.	Contribution equal to 55% of the extra costs of achieving this energy requirement limit value, including the higher design costs.	Total volume of building/complex exceeding 10,000 cubic metres Works commencing by 31 December 2007 Works completed within three years thereafter
		352	Setting up of €45 million Fund for financing very high efficiency buildings.		
	Electrical equipment	**353**	Replacement of refrigerators, freezers and combinations thereof by similar appliances of energy class not inferior to A+	Gross tax deduction equal to 20% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €200 per appliance, in a single instalment.	Operation to be carried out by 31 December 2007

			Measure	Incentive	Other conditions
Tertiary sector	**Lighting**	**354**	- Replacement of indoor luminaires by others with high energy efficiency of 60% or more; - Replacement of indoor incandescent lamps by class A fluorescent lamps provided that they are housed in luminaires of high optical efficiency, 60% or more; - Replacement of outdoor luminaires provided with mercury vapour lamps by luminaires with high optical efficiency, 80% or more, provided with high or low pressure sodium vapour lamps or metal iodide lamps; - Actuation or addition of luminous flux regulators indoors or outdoors.	Deduction from corporate income of 36% of the costs borne	Operations to be carried out in the two tax periods after the period running at 31 December 2006

			Measure	Incentive	Other conditions
Industrial sector	**Electric motors**	**358**	Acquiring and installing high-efficiency motors of electric power between 5 and 90 kW. Replacing existing motors by high-efficiency motors of electric power between 5 and 90 kW.	Gross tax deduction equal to 20% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €1500 per motor, in a single instalment.	Operation to be carried out by 31 December 2007
	Inverters	**359**	Acquiring and installing speed variators (inverters) on installations with electric power between 7.5 and 90 kW	Gross tax deduction equal to 20% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €1500 per motor, in a single instalment.	Operation to be carried out by 31 December 2007

Industrial sector		**352**	
	Energy efficiency and supply cost reduction for corporate purposes	**362**	Setting up a Fund to be used for covering measures for corporate energy efficiency and energy supply cost reduction. Fund financed, within the limit of €100 million per annum, by the greater tax yield from VAT on the prices of motor and other fuels of petroleum origin relating to increases in the cost of crude oil relative to the reference value provided for in the Economic and Financial Planning Document (DPEF) for the years 2007-2011. Initial Fund appropriation of €50 million per annum for the period 2007-2009.
	Competitiveness and development	**841**	Setting up Competitiveness and Development Fund for measures to support industrial innovation, with budgets comprising 1) residual resources of the Fund instituted by Article 60 (3) of Law 289/2002 and of the Fund referred to in Article 52 of Law 448/1998, both repealed, 2) € 300 million for 2007 and €360 million for each of the years 2008 and 2009, 3) resources allocated by the CIPE (Interministerial Committee for Economic Programming) within the scope of the apportionment of the Fund for Underutilised Areas for measures to be carried out in those areas. Fund devoted to ensuring the continuity of measures required under regulatory provisions in force and to financing industrial innovation projects identified within the scope of the technological areas of energy efficiency, sustainable mobility, new living technologies, new technologies for *made in Italy* and innovative technologies for cultural assets and activities.
	Greenhouse gas emission reduction	**1110-1115**	Setting up a rotating Fund for the financing of measures intended for the implementation of the Kyoto Protocol and provided for by CIPE resolution 123 of 19 December 2002 and subsequent amendments and additions. The following measures have priority financing of €200 million per annum for the period 2007-2009: - high-efficiency diffuse micro-cogeneration; - small-scale installations run on renewable energy sources; - replacement of industrial electric motors of power exceeding 45 kW by high-efficiency motors; - increasing energy end-use efficiency in the residential and tertiary sectors; - elimination of nitrogen protoxide emissions from industrial processes; - R&D pilot projects on new technologies and new energy sources with low or zero emissions.
	Sustainable development	**1124-1125**	Setting up a Sustainable Development Fund to finance environmental sustainability projects in economic/production sectors or geographical areas, environmental information and education and inter-nation projects for sustainable environmental cooperation. Fund resources of €25 million per annum for the years 2007-2009. Priority measures to be financed by ministerial decree.

			Measure	Incentive	Other conditions
Transport sector	Motor vehicles	224-214	Incentives in favour of energy efficiency and the environmental sustainability of vehicles.	Various contributions in capital account	
	Biofuels and energy families	367	Review of national indicative targets for releasing to the market biofuels and other renewable motor fuels	a) by 31 December 2005: 1.0%; b) by 31 December 2008: 2.5%; c) by 31 December 2010: 5.75%;	The biofuels incentivised are biodiesel, bioethanol and its derivatives, ETBE and biohydrogen
		368	Raising the minimum proportion of biofuels and other renewable motor fuels to be released to the market	From 1% (2007) to 2% (from 2008 onwards)	
		371	Within the scope of a national programme running from 1 January 2007 to 31 December 2010, reduction of excise duty on biodiesel intended for mixing with gasoil in road haulage	20% reduction with respect to that applied to gasoil used as motor fuel.	Annual quota limit of 250,000 tonnes
		372	Reduction of excise duty on bioethanol derived from agricultural products Reduction of excise duty on ETBE derived from agricultural products	€289.22 per 1000 litres €298.92 per 1000 litres	

Another important instrument instituted by the Italian Government is the Industria 2015 Project, which stabilises the strategic lines for the future development and competitiveness of the Italian production system on the basis of:

- an industry concept extended to new production arrangements that integrate manufacture, advanced services and new technologies;
- analysis of the future economic/production scenarios that await Italy in the medium to long term (2015).

The Government's strategy sees enterprise networks, innovative finance and, above all, Industrial Innovation Projects as the new instruments for maintaining the strategic repositioning of the Italian industrial system within the scope of the globalised and highly competitive world economy.
This is a strategy that aims at identifying the fundamental drivers of change in a perspective of innovation and at orienting economic policy choices accordingly. Implementing the strategy relies on being able to orientate the production system towards approaches compatible with changes in competition scenarios.
This capacity for orientation involves not only identifying productive technological areas and specific industrial innovative objectives but also mobilising around those objectives the central

and local administrations, the business world, universities, research bodies and the financial system.
In this perspective, the document summarising the project indicates that there are fundamentally "two legs" for boosting the Italian production system in the future:

- generalised and partly automatic support mechanisms for research, corporate cost reduction, investment promotion, size growth of enterprises and geographical balance.
- tailor-made incentive systems for particular strategic objectives to be achieved by identifying technological/production areas with high development impact (e.g. energy efficiency, sustainable mobility, life sciences, etc.).

The objective of the first Industrial Innovation Project launched by the Government is to boost the competitiveness of the industrial system by improving Italy's energy efficiency by:

- saving energy in production processes and end uses;
- utilising renewable energy sources, thereby improving the country's energy security *inter alia* in a perspective of environmental sustainability.

Energy efficiency is to be achieved by encouraging the inception and implanting of an *ecoindustry* by financing initiatives intended to bring about:

- industrial investment in the renewable energies sector (e.g. solar collectors to produce hot water in houses, small electric power stations with cogeneration running on biomass, solar photovoltaics and wind power by the production of aerogenerators, technologies for the production, storage and use of hydrogen, high-temperature solar, biofuels);
- investment to reclassify existing industrial segments in the direction of new low environmental impact products capable of saving energy (e.g. bricks with high thermal insulation, A+ refrigerators, glazing that reduces thermal emissions);
- industrial investment to innovate production processes in such a way as to reduce the energy intensity of manufacturing (e.g. motors with inverters, techniques for reuse of waste heat within production processes).

To this end, businesses, research bodies, universities and private financial entities are called upon to participate in particular industrial innovation projects in promising technology areas, and all national and local public administrations are involved in projects and can provide central contributions structured:

  - either conventionally (via the new Competitiveness Fund);
  - or in support of new instruments (the new Business Finance Fund);
  - or by regulatory standardisation and any other useful measures.

In particular, the Regions will on the basis of their productive abilities and skills be able to participate and make their contribution to projects of national significance.
The mainstay of the projects is the unprecedented relationship between the Minister of Economic Development, the Minister of Universities and Research and the Minister of Innovation in Public Administration. This relationship will be involved at every key point along the road to the implementation of each project and will involve, on the financial side, close coordination between the applied research funds managed by the Ministry of Universities and the development funds managed by the Ministry of Economic Development. These funds will operate jointly for the implementation of the projects.

Finally, a fundamental part in achieving the objective of improving energy end-use efficiency will be played by strong, incisive and widespread training and information activity. To this end, the Ministry of Economic Development, partly in collaboration with the Ministry of the Environment and Territorial and Marine Protection, issued the Ministerial Decree of 20 July 2004 and signed a number of agreements with specialist agencies with a view to starting integrated training programmes and information campaigns.
That Decree (extended to the whole of 2007) promotes, and provides financing instruments for, the conducting of information and awareness campaigns in support of energy end-use efficiency conducted by distributors. The campaigns have to be aimed at creating awareness of the intended measures and operations under the same Decree by the dissemination of both qualitative and quantitative (economic) information on the benefits relating to energy saving in end uses; accordingly they have to refer to concrete examples of energy saving measures; they may not refer to products, appliances and components of any specific provenance, and they must make it clear that they are being conducted in response to government enactments on the basis of resources derived from electricity tariffs.

The agreements made include that signed with ReNAEL (the National Network of Local Agencies) and APAT (the Agency for Environment Protection and for Technical Services) with regard to activities pertaining to the information, communication and education campaign in support of renewable energy sources and energy end-use efficiency under Article 15 of Legislative Decree No 387 of 29 December 2003 and Article 1 (119) (a) of Law No 239 of 23 August 2004.
Activities are along three lines that may be summarised as follows:

- television advertising spots to be made available to the agreement partner with a view to transmission on the national broadcasting networks;
- contact with citizens and manufacturers and associations in the various Regions by letters to families, internet sites, seminars and conferences;
- widespread provision of various kinds of documentation on the technical and environmental characteristics of installations run on renewable energy sources and how to improve their end-use efficiency in different sectors.

Another agreement has been signed between the Ministry of Economic Development and ENEA for information and promotion activities in the energy efficiency and saving field under the Ministerial Decree of 18 December 2006, with two objectives:

- to disseminate correct and timely information on the opportunities for access to incentives for energy saving measures, particularly those relating to the pertinent provisions of the 2007 Finance Act;

- to help to create a more knowledgeable energy/environment culture with particular regard to training and promotion in energy saving and energy efficiency; these initiatives target middle and high schools and involve the preparation of durable kits differentiated by type of school and structured to enable students in their turn to act as “trainers” for their families; the initiatives aimed at the university world are with a view to specific training, partly in the form of advanced training courses to help to create a more knowledgeable culture on energy problems and their economic, environmental and energy security repercussions, *inter alia* with a view to more knowledgeable formation of positions on the siting of energy infrastructures.

These initiatives will cover a number of regions: Abruzzo, Molise, Campania, Apulia, Basilicata, Calabria, Sicily, Sardinia.

1 Overview table

Energy efficiency improvement measures	Annual energy saving expected in 2010 [GWh/year]	Annual energy saving expected in 2016 [GWh/year]
Residential Sector:		
1) Thermal insulation of opaque surfaces of pre-1980 residential buildings	1) 3489	1) 12800
2) Replacement of single glazing by double glazing	2) 233	2) 930
3) Replacement of incandescent lamps (GLS) by fluorescent (CFL)	3) 1600	3) 4800
4) Replacement of dishwashers by class A appliances	4) 305	4) 1060
5) Replacement of refrigerators and freezers by class A+ and A++ appliances	5) 1210	5) 3860
6) Replacement of clothes washing machines by superlative class A appliances	6) 31	6) 410
7) Replacement by efficient electric water heaters	7) 700	7) 2200
8) Use of efficient air conditioners	8) 180	8) 540
9) Use of efficient heating installations	9) 8150	9) 26750
10) Balanced flues and wood-fired boilers	10) 1100	10) 3480
Total Residential Sector	**16,998**	**56,830**
Tertiary Sector:		
1) Use of efficient heating installations	1) 5470	1) 16600
2) Incentives for using efficient air conditioners	2) 835	2) 2510
3) Efficient lamps and control systems	3) 1400	3) 4300
4) Efficient lamps and luminous flux regulating systems (public lighting)	4) 425	4) 1290
Total Tertiary Sector	**8,130**	**24,700**
Industrial Sector:		
1) Efficient lamps and control systems	1) 700	1) 2200
2) Replacement of 1-90 kW electric motors by class Eff2 to Eff1[4]	2) 1100	2) 3400
3) Installing inverters on 0.75-90 kWh[5] electric motors	3) 2100	3) 6400
4) High-efficiency cogeneration	4) 2093	4) 6280
5) Use of mechanical vapour compression	5) 1047	5) 3257
Total Industrial Sector	**7,040**	**21,537**
Transport Sector:		
1) Introduction of 140 g of CO_2/km emissions limit (average for vehicles sold)	1) 3490	1) 23260
Total Transport Sector	**3490**	**23,260**
Total expected energy saving (national target)	**35,658 (3%)**	**126,327 (9.6%)**

[4] The saving indicated in this measure and that relating to inverters refers to the data of the tertiary and industrial sectors.
[5] For details see section 3.3.3.

2 National indicative target

2.1 Calculating the national target

	Year 2001				Year 2002				Year 2003			
	Fossil	**Renewables**	**Electricity**	**Total**	**Fossil**	**Renewables**	**Electricity**	**Total**	**Fossil**	**Renewables**	**Electricity**	**Total**
	GWh				GWh				GWh			
Final national energy consumption	**1180445**	**19771**	**277957**	**1478173**	**1163000**	**17445**	**282609**	**1463054**	**1221150**	**22097**	**291913**	**1535160**
Exemption: energy consumption in activities covered by Emission Trading Directive	-159366.5	0.0	-43270.7	-202637.3	-152149.3	0.0	-43072.6	-195221.9	-162927.2	0.0	-43108.3	-206035.5
Final national energy consumption within ESD target	**1021078.5**	**19771.0**	**234686.3**	**1275535.7**	**1010850.7**	**17445.0**	**239536.4**	**1267832.1**	**1058222.8**	**22097.0**	**248804.7**	**1329124.5**
Of which: residential	241904	15119	61639	318662	236089	11630	62802	310521	255860	12793	66291	334944
Tertiary	93040	0	65128	158168	86062	0	68617	154679	96529	0	73269	169798
Industry (ESD target)	172088.5	2326.0	95126.3	269540.7	168838.7	3489.0	94161.4	266489.1	175505.8	4652.0	95288.7	275446.5
Transport	482645	1163	8141	491949	488460	1163	9304	498927	498927	2326	9304	510557
Agriculture	31401	1163	4652	37216	31401	1163	4652	37216	31401	2326	4652	38379

	Year 2004				Year 2005			
	Fossil	**Renewables**	**Electricity**	**Total**	**Fossil**	**Renewables**	**Electricity**	**Total**
	GWh				GWh			
Final national energy consumption	**1236269**	**23260**	**295402**	**1554931**	**1253714**	**20934**	**301217**	**1575865**
Exemption: energy consumption in activities covered by Emission Trading Directive	-167653.8	0.0	-43372.2	-211026.0	-167068.1	0.0	-43889.6	-210957.7
Final national energy consumption within ESD target	**1068615.2**	**23260.0**	**252029.8**	**1343905.0**	**1086645.9**	**20934.0**	**257327.4**	**1364907.3**
Of which: residential	260512	15119	66291	341922	281446	12793	66291	360530
Tertiary	96529	0	75595	172124	102344	0	80247	182591
Industry (ESD target)	175431.2	3489.0	96187.8	275108.0	170201.9	3489.0	94507.4	268198.3
Transport	504742	2326	9304	516372	500090	2326	10467	512883
Agriculture	31401	2326	4652	38379	32564	2326	5815	40705

Average of last 5 years	**1,316,261**
9% energy saving target in 2016	**118,464**
Energy saving target in 2016 (9% or more)	126,327 (9.6%)
2010 intermediate target adopted	35,658 (3%)

2.2 Specific aspects of national target calculation

Directive 2006/32/EC lays down “the indicative targets, the mechanisms, the incentives and the institutional, financial and legal framework that are needed for eliminating the existing barriers and imperfections on the market that hinder efficient energy end use”. In particular, it states that Member States will adopt and try to achieve an overall indicative national energy saving target of 9% by the ninth year of application, to be achieved by means of energy services and other energy efficiency improvement measures. The Directive prescribes the following procedure for calculating the target of each Member State:

Determining the annual mean consumption

Member States annual mean consumption is represented by the average amount of energy distributed or sold to final customers during the last five years, not adapted to degree-days or structural or production changes.
The unit of measure in which the data are expressed is GWh on the basis of 1 GWh = 86 toe.

National target

The national indicative energy saving target:

a) comprises 9% of the above annual mean consumption;
b) is measured after the ninth year of applying the Directive
c) is the result of cumulative annual energy savings achieved over the whole period of nine years of applying this Directive;
d) is to be achieved by means of energy services and other energy efficiency improvement measures.

National energy saving relative to the national indicative energy saving objective is measured from 1 January 2008 onwards.

3 Presentation and assessment of programmes and measures for energy efficiency improvement and energy services in the various economic sectors

3.1 Energy efficiency improvement measures in the residential sector

The residential sector's energy consumption in 2005 was about 16% higher than in 2000 at nearly 31 Mtoe. Looking at the various different energy sources, the increase was mainly due to rises in natural gas and electricity consumption of 29% and 10% respectively, as against a continuing decline in the consumption of other hydrocarbons relative to the year 2000 to the extent of 87% for coal, 37% for fuel oil and 16% for gasoil.
In use function terms, the sector's energy demand in 2005 was accounted for nearly 70% by heating, 15% by obligatory electrical uses, 10% by hot water production and the remaining 5% by kitchen use.
Such is the context of the proposed action plan based on a number of measures (set out schematically in the tables) which may be summarised as follows:

- raising and extending in time the energy efficiency targets for electricity and gas distributors (white certificates);
- incentives to replace energy-hungry systems and appliances, with stringent time limits for putting them on the market;
- investment programmes to improve the efficiency of public lighting;
- stabilising the prevailing tax concessions (e.g. high-efficiency electric motors, replacement of refrigerators, efficiency in lighting and the construction industry, provided for by the 2007 Finance Act).

The most significant instrument adopted for energy efficiency promotion is the system of so-called White Certificates aimed at incentivising energy saving in a cost-effective manner and conforming to the liberalisation of the internal electricity and gas market brought about by Community Directives.
Under this system, electricity and gas distributors that served more than 100,000 final customers in 2001 are bound to achieve *annual energy saving targets* by carrying out projects and appropriate measures. This obligation may be honoured either by conducting operations directly or by resorting to related service companies or by purchasing the corresponding White Certificates on the market. These certificates, each of which represents the achievement of primary energy savings of one tonne of oil equivalent (toe), are issued annually by the Electric Market Manager to each distributor after verification of results achieved. They may also be issued to companies operating in the energy services sector (of which more later) for projects carried out autonomously by them.

White Certificates or Energy Efficiency Certificates are therefore simply negotiable documents witnessing that measures have been carried out. This arrangement, combining a coercive type of approach (imposing quantitative targets) with a market approach (negotiable certificates) reduces the overall costs associated with achieving the predetermined targets. The possible of exchanging Energy Efficiency Certificates enables distributors who would incur relatively high marginal costs on energy saving by direct carrying out of projects to acquire energy efficiency certificates from those with relatively lower marginal costs who may find it desirable to sell their certificates on the market.

The expected savings at the end of the first five years of application (2005-2009) comprise 2.9 Mtoe of energy, broken down as in the following table:

Mtoe	2005	2006	2007	2008	2009
Electricity	0.10	0.20	0.30	0.80	1.60
Gas	0.10	0.20	0.40	0.70	1.30
Total					**2.90**

Specific individual targets for each operator are determined annually by AEEG (Electricity and Gas Authority) resolution on the basis of the ratio between the energy distributed by each distributor to final customers connected to their network as self-certified by them and the total amount of energy distributed over the whole national territory, both calculated in the year preceding the latest ended. Not less than 50% of the targets thus set has to be achieved by a corresponding reduction in electricity or gas consumption respectively, by measures and operations typically of the kinds defined in the Decree.
Fulfilment of obligation is verified by the submission of the energy efficiency certificates held by distributors to AEEG, which withdraws and marks off those submitted by the distributor until the appointed target is reached. The energy consumption reductions achieved annually by each distributor within the scope of a particular project count towards achieving the same distributor's overall target for a period of five years.
For certain types of measures, however, the number of years for which they generate certificates differs. Thermal insulation operations on buildings, control of inward radiation via glazed surfaces during the summer months, and applications of bioclimate architecture, passive solar and passive heating techniques count towards the achievement of the distribution undertaking's overall targets for a period of eight years. This is one of the parameters available to the legislator for varying the effectiveness of incentives in order to modulate the mechanism's ability to encourage the spread of certain types of measures.

Where distributors do not succeed in amassing certificates equivalent to at least 50% of what is incumbent upon them in the relevant year or fail to rectify any defaults over the two years thereafter, AEEG will impose appropriate administrative sanctions, which must be proportional to and in any case greater than the amount of the investments needed for rectifying the defaults. In cases, however, where the distributor submits certificates not equivalent to the appointed target but nevertheless equivalent to or greater than the ratio between the value of all the certificates issued, expressed in Mtoe, and the value of the annual national obligation, both referred to the preceding year, the missing proportion may be made up in the two years thereafter without incurring sanctions.
Analysis of the results to date shows that the majority of the operations carried out are on the efficiency of lighting (27% of the total), whether public or private (fluorescent lamps are part of residential electrical usage, representing 33% of the total), followed by cogeneration and district heating systems and other residential sector heating technologies.

3.1.1 Overview table of energy efficiency improvement measures in the residential sector

The measures proposed in the residential sector take their cue from prevailing European and national legislation, starting with framework Directive 92/75/EEC, which states the criteria for indicating domestic appliances' consumption of energy and other resources by labelling that involves standard forms of declaration. Labelling has been implemented for refrigerators, freezers, washing machines, dryers, dishwashers, ovens, water heaters, lighting sources and air conditioners.
In addition to the specific measures undertaken by each sector (energy efficiency requirements and energy labelling), the energy saving picture also includes the so-called EUP (energy using

products) framework Directive 2005/32/EC that will lead to the development of Community specifications for the ecocompatible design of products that consume energy. It provides for the compilation of specifications to which products that consume energy have to conform if they are to be released to the market and/or put into service.
The following are the sectors ("lots") currently under examination: boilers, water heaters, PCs, photocopiers, faxes, scanners, televisions, standby and off-mode loss, battery chargers, office lighting, street lighting, air conditioners and ventilation, electric motors, commercial refrigeration, domestic refrigeration, domestic dishwashers and washing machines.
Another key reference is surely Directive 2006/32/EC of 5/04/06 concerning energy end-use efficiency and energy services with a view to improving energy end-use efficiency, controlling energy demand and promoting the production of renewable energy.
That Directive is intended to provide indicative targets, mechanisms, incentives and the institutional, financial and legal framework that are necessary for eliminating the existing barriers and imperfections on the market that hinder efficient energy end-use; it also aims at creating the conditions for the development and promotion of an energy services market and the supply of other energy efficiency improvement measures to end users.
The following table shows the measures and corresponding energy savings identified for the residential sector [GWh].

No.	Title of measure	Intended user	Duration	Annual saving in GWh expected at 2016
1	Thermal insulation of opaque surfaces of pre-1980 residential buildings	Owners/tenants	01/01/2008 to 31/12/2016	12800
2	Replacement of single glazing by double glazing	Owners/tenants	01/01/2008 to 31/12/2016	930
3	Replacement of incandescent lamps (GLS) by fluorescent (CFL)	Owners/tenants	01/01/2008 to 31/12/2016	4800
4	Replacement of dishwashers by class A appliances	Owners/tenants	01/01/2008 to 31/12/2016	1060
5	Replacement of refrigerators and freezers by class A+ and A++ appliances	Owners/tenants	01/01/2008 to 31/12/2016	3860
6	Replacement of clothes washing machines by superlative class A appliances	Owners/tenants	01/01/2008 to 31/12/2016	410
7	Replacement by efficient electric water heaters	Owners/tenants	01/01/2008 to 31/12/2016	2200 (*)
8	Incentives for using efficient air conditioners	Owners/tenants	01/01/2008 to 31/12/2016	540 (*)
9	Incentives for using efficient heating installations	Owners/tenants, ESCos	01/01/2008 to 31/12/2016	26750
10	Balanced flues and wood-fired boilers	Owners/tenants	01/01/2008 to 31/12/2016	3480

(*) also includes measures in the tertiary sector

3.1.2 Description of energy efficiency improvement measures

Insulation of transparent walls of buildings

Expected annual saving at end of 2010: 0.02 Mtoe/year	
Expected annual saving at end of 2016: 0.08 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Replacement of single glazing by double glazing as per table 5 of the approved procedures for quantification of permissible measures under the Ministerial Decrees of 20.7.2004.
Efficiency improvement measure (policy action)	White Certificates Information programmes Tax reliefs and incentives for thermal insulation of buildings
Assumptions for assessment of energy efficiency measures (bottom up)	
2007 situation and market trend	**Heating service demand: 16 Mtoe/year** 20.3 million heated apartments 0.79 toe/year/apartment **44.4 million m^2** of windows with single glazing
Business as Usual scenario 2016	**Heating service demand: 17.5 Mtoe/year** 22.3 million heated apartments 0.79 toe/year/apartment
EAAP scenario 2016	In the period 2008-2016: replacement of **8.5 million m^2** of single glazing by double glazing **(*)** **Heating service demand: 17.4 Mtoe/year** *22.3 million heated apartments* *0.78 toe/year/apartment*
Unit saving	**0.010 toe/year/m^2** *of thermally insulated transparent surface*

(*) Window of opportunity represented by the assumption of annual replacement for 1/30 of surface area, implemented in 63.5% of cases.

Insulation of opaque walls of buildings

Expected annual saving at end of 2010: 0.3 Mtoe/year	
Expected annual saving at end of 2016: 1.1 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Application of insulating material to outside walls and roofs of existing buildings, as per table 6 of the approved procedures for quantification of permissible measures under the Ministerial Decrees of 20.7.2004.
Efficiency improvement measure (policy action)	- White Certificates - Information programmes - Tax reliefs and incentives for thermal insulation of buildings
Assumptions for assessment of energy efficiency measures (bottom up)	
2007 situation and market trend	**Heating service demand: 16 Mtoe/year** *20.3 million heated apartments* *0.79 toe/year/apartment* **15.5 million apartments** built before the rules about the thermal insulation of buildings came into force, with a total conductive area of sidewalls and roofs of **1956 million m^2** (126 m^2/apartment)
Business as Usual scenario 2016	**Heating service demand: 17.5 Mtoe/year** 22.3 million heated apartments 0.79 toe/year/apartment
EAAP scenario 2016	In the period 2008-2016: thermal insulation of outside walls and roofs amounting to a surface area of 378 million m^2 **(*)** **Heating service demand: 16.6 Mtoe/year** *22.3 million heated apartments* *0.75 toe/year/apartment*
Unit saving	**0.003 toe/year/m^2** *of thermally insulated opaque surface*

(*) Window of opportunity represented by the assumption of a maintenance operation on the outside walls every 30 years, i.e. on 517,000 apartments per annum, 65% of them being thermally insulated.

Adoption of efficient (fluorescent) LAMPS

Expected annual saving at end of 2010: 1600 GWh/year	
Expected annual saving at end of 2016: 4800 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Replacement of incandescent lamps (GLS) by compact fluorescent lamps (CFL), as per table 1 of the approved procedures for quantification of permissible measures under the Ministerial Decrees of 20.7.2004. CFL lamp consumption: 20% of GLS lamps (with duty parity)
Efficiency improvement measure (policy action)	• White Certificates • Information/education programmes • Incentives for using fluorescent lamps • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Number of dwellings: **22.7 million** GLS 25, 40, 60, 75, 100 W lamp stock: **386 million** GLS lamp consumption: 5300 GWh/year (out of total lighting consumption of 9400 GWh/year)
Business as Usual scenario 2016	Number of dwellings: **24.1 million** No change of ratio between GLS lamp consumption and total annual consumption (6700 GWh out of 11900 GWh)
EAAP scenario 2016	Replacement of three GLS lamps per dwelling by three compact fluorescent lamps CFL lamps installed in period 2008-2016: **72.3 million** Sector's total annual consumption after proposed measure: 7100 GWh
Unit saving	**66 kWh/year per lamp replaced**

Adoption of efficient DISHWASHERS

Expected annual saving at end of 2010: 305 GWh/year	
Energy efficiency measure (technological action) (2010 target)	Adoption of class A dishwashers:
Efficiency improvement measure (policy action)	- Information programmes to promote systematic and exclusive purchase of class A washing machines - Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2008-2010: 4.0 million** 1.5 million stock increase 2.5 million replacements *Stock of appliances at end of 2007: 10.3 million* *Stock of appliances at end of 2010: 11.8 million* Energy consumption at end of 2007: 4122 GWh/year
Business as Usual Scenario 2010	Total consumption: 4537 GWh/year Mean unit consumption: 385.4 kWh/year/appliance
EAAP Scenario 2010	Total consumption: 4232 GWh/year Mean unit consumption: 359.5 kWh/year/appliance
Unit saving	**76 kWh/year** *per class A appliance sold in period 2008-2010*
Expected annual saving at end of 2016: 1059 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Adoption of higher than class A dishwashers: Reference consumption: 0.877 kWh/cycle Reference use: 262 cycles/year
Efficiency improvement measure (policy action)	- Agreements with domestic electrical appliance industry for development and marketing of dishwashers superior to class A from 2011 - Information programmes - Incentives for installing high-efficiency appliances - Incentives for early replacement of obsolete appliances
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2011-2016: 9.1 million** 3.1 million stock increase 6.0 million replacements *Stock of appliances at end of 2010: 11.8 million* *Stock of appliances at end of 2016: 14.9 million*
Business as Usual scenario 2016	Total consumption: 5163 GWh/year Mean unit consumption: 347.5 kWh/year/appliance
EAAP scenario 2016	Total consumption: 4104 GWh/year Mean unit consumption: 276.2 kWh/year/appliance
Unit saving	**83 kWh/year** *per higher than class A appliance sold in the period 2011-2016*

Adoption of efficient REFRIGERATORS AND FREEZERS

Expected annual saving at end of 2010: 1209 GWh/year	
Energy efficiency measure (technological action) (2010 target)	Adoption of efficient (class A+) refrigerators and freezers: Mean reference consumption per appliance:
Efficiency improvement measure (policy action)	• Information programmes • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2008-2010: 8.5 million** 7.0 million stock increase 1.5 million replacements *Stock of appliances at end of 2007: 34.46 million* Stock of appliances at end of 2010: 35.99 million Energy consumption at end of 2007: 13,071 GWh/year
Business as Usual Scenario 2010	Total consumption 2010: 13,571 GWh/year Mean consumption per appliance: 377.1 kWh/year/appliance
EAAP Scenario 2010	Total consumption 2010: 12,362 GWh/year Mean consumption per appliance: 343.5 kWh/year/appliance
Unit saving	**142 kWh/year** *per class A+ appliance sold in the period 2008-2010*
Expected annual saving at end of 2016: 3857 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Adoption of efficient (class A+) refrigerators and freezers: Mean reference consumption per appliance: 225.6 kWh/year
Efficiency improvement measure (policy action)	• Information programmes • Incentives for installing high-efficiency appliances • Incentives for early replacement of obsolete appliances • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2011-2016: 17.3 million** 14.8 million stock increase 2.5 million replacements *Stock of appliances at end of 2010: 35.99 million* *Stock of appliances at end of 2016: 38.5 million*
Business as Usual scenario 2016	Total consumption 2016: 14,554 GWh/year Mean consumption per appliance: 378.4 kWh/year/appliance
EAAP Scenario 2010	Total consumption 2016: 10,697 GWh/year Mean consumption per appliance: 277.8 kWh/year/appliance
Unit saving	**153 kWh/year** *per class A+ appliance sold in the period 2011-2016*

Adoption of efficient CLOTHES WASHING MACHINES

Expected annual saving at end of 2010: 31 GWh/year	
Energy efficiency measure (technological action) (2010 target)	Adoption of class A+ clothes washing machines(*): Reference consumption: 0.85 kWh/cycle Reference use: 266 cycles/year *(*) 5 kg; 0.17 kWh/kg/cycle*
Efficiency improvement measure (policy action)	- Information programmes to promote systematic and exclusive purchase of class A+ washing machines - Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2008-2010: 6.7 million** 0.9 million stock increase 5.8 million replacements *Stock of appliances at end of 2007: 23.0 million* *Stock of appliances at end of 2010: 23.9 million* Energy consumption at end of 2007: 6378 GWh/year
Business as Usual Scenario 2010	Total consumption: 6328 GWh/year Mean unit consumption: 265.2 kWh/year/appliance
EAAP Scenario 2010	Total consumption: 6297 GWh/year Mean unit consumption: 263.9 kWh/year/appliance
Unit saving	**5 kWh/year** *per class A+ appliance sold in the period 2008-2010*
Expected annual saving at end of 2016: 405 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Adoption of higher than class A+ clothes washing machines: Reference consumption: 0.68 kWh/cycle Reference use: 266 cycles/year
Efficiency improvement measure (policy action)	- Agreements with domestic electrical appliance industry for development and marketing of clothes washing machines superior to class A+ from 2011 - Information programmes - Incentives for installing high-efficiency appliances - Incentives for early replacement of obsolete appliances
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	**Estimated sales in years 2011-2016: 13.5 million** 1.3 million stock increase 12.2 million replacements *Stock of appliances at end of 2010: 23.9 million* *Stock of appliances at end of 2016: 25.1 million*
Business as Usual scenario 2016	Total consumption: 6030 GWh/year Mean unit consumption: 240.1 kWh/year/appliance
EAAP scenario 2016	Total consumption: 5625 GWh/year Mean unit consumption: 224.0 kWh/year/appliance
Unit saving	**28 kWh/year** *per higher than class A+ appliance sold in the period 2011-2016*

Adoption of efficient WATER HEATERS

Expected annual saving at end of 2010: 700 GWh/year	
Expected annual saving at end of 2016: 2200 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Adoption of efficient electric water heaters based on various technologies: - improved-efficiency water heater - solar water heater - heat-pump water heater
Efficiency improvement measure (policy action)	- Agreements with domestic electrical appliance industry for development and marketing of innovative products - Information programmes - Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
Market trend	Estimated sales in years 2008-2016: 10.6 million (standard appliances) 0.4 million stock increase 10.2 million replacements *Stock of appliances at end of 2007: 11.2 million* *Stock of appliances at end of 2016: 11.6 million (100% standard)*
Business as Usual scenario 2016	Total consumption: 17,400 GWh/year Mean unit consumption: 1500 kWh/year/appliance
EAAP scenario 2016	**Estimated sales of efficient appliances in the years 2008-2016: 7.1 million** • *improved-efficiency* *5.8 million* • *solar* *1.0 million* • *heat-pump* *0.25 million* Total consumption: 15,200 GWh/year Mean unit consumption: 1293 kWh/year/appliance
Unit saving	**136 kWh/year per improved-efficiency water heater** **1206 kWh/year per solar water heater** **754 kWh/year per heat-pump water heater** *per efficient appliance sold in the period 2008-2016*

Adoption of efficient HEATING systems

Expected annual saving at end of 2010: 0.7 Mtoe/year	
Expected annual saving at end of 2016: 2.3 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Heating by non-renewable energy sources: installing of efficient installations, with the following seasonal mean efficiency values (with respect to primary energy): Existing buildings: Mean seasonal efficiency of installation > = 0.85 New or completely restructured buildings: Seasonal mean efficiency of installation > = 0.90 This measure is achievable by the various technologies available on the market that provide the required performance (e.g. condensing boilers, heat-pump installations with compression or absorption technology, high-efficiency cogenerative installations, installations with integration of solar energy).
Efficiency improvement measure (policy action)	• Information programmes • Incentives for replacing inefficient boilers • Tighter constraints on the performance of heating installations in new or restructured buildings • Energy certification of buildings • White certificates for installations with seasonal mean efficiency > 1 • Promotion of heating energy services provided by ESCos in centralised installations
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Heating demand: 16 Mtoe/year covering 19.5 million apartments inhabited and heated Seasonal mean efficiency of installation: 0.68 Energy consumption: 22.7 Mtoe (1.16 toe/year/apartment)
Business as Usual scenario 2016	Heating demand: 17.70 Mtoe/year covering to 21.5 million apartments inhabited and heated (including 2 million new apartments) Seasonal mean efficiency of installation: 0.76 Energy consumption: 22.4 Mtoe (1.04 toe/year/apartment)

EAAP scenario 2016	Heating service demand: Same as BAU scenario Seasonal mean efficiency of installation: 0.86 Energy consumption: 20.1 Mtoe (*) (0.93 toe/year/apartment)
Unit saving	**0.25 toe/year/apartment**

(*) Measures covering 44% of apartments.

Adoption of efficient BALANCED FLUES and WOOD BURNING BOILERS

Expected annual saving at end of 2010: 0.1 Mtoe/year	
Expected annual saving at end of 2016: 0.3 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Installing balanced flues and wood burning boilers for household use (heating, sanitary water, kitchen) with the following seasonal mean efficiency values (with respect to primary energy): Classification of balanced flues and wood burning boilers as per CTI PM_12 of 23.03.2006): Class C – Efficiency of installation = 0.53 Class A – Efficiency of installation = 0.73
Efficiency improvement measure (policy action)	Incentives and tax reliefs for replacing inefficient boilers Tighter constraints on the performance of heating installations in new or restructured buildings Energy certification of buildings White certificates Promotion of heating energy services provided by ESCos in centralised installations Information programmes
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Consumption of renewable fuels in household sector: 12.79 TWht/year, equivalent to 1.1 Mtoe Heat demand in household sector covered by renewable fuels: 6.8 TWht/year (average class C installation) Unit heat demand per average apartment: 0.75 toe/year Assuming 780,000 apartments entirely heated by wood
Business as Usual scenario 2016	Unchanged situation
EAAP scenario 2016	**Heating service demand: unchanged** **Replacement of boilers and fireplaces of 780,000 apartments by class A appliances** Energy consumption: 9.31 TWht (0.8 Mtoe)
Unit saving	**4.45 MWht/year per apartment** **(0.38 toe/year/apartment)**

Adoption of efficient CONDITIONING systems

Expected annual saving at end of 2010: 180 GWh/year	
Expected annual saving at end of 2016: 540 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Installing conditioning systems and appliances with seasonal EER (energy efficiency ratio) of at least: Autonomous installation: 3.3 Centralised installation: 4.1 This measure is achievable by the various technologies available on the market that provide the required performance.
Efficiency improvement measure (policy action)	• Information programmes • Energy certification of conditioning installation • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC) • Promotion of cooling services provided by ESCos in centralised installations
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Cooling demand met at 2005: 10 TWhf/year corresponding to 500 million m^2 cooled (unit consumption 20 kWhf/m^2/year) Mean EER (individual installation): 2.39 Energy consumption: 4.2 TWh
Business as Usual scenario 2016	**Autonomous installation:** Cooling demand met: 23.1 TWhf/year (1155 million m^2 cooled) By installations with mean EER = 3.05 Energy consumption: 7.99 TWh/year **Centralised installation:** Cooling demand met: 0.2 TWhf/year (9.4 million m^2 cooled) By installations with mean EER of 3.6 Energy consumption: 0.05 TWh/year
EAAP scenario 2016	**Autonomous installation:** Cooling demand met: 22.9 TWhf/year (1145 million m^2 cooled) Total consumption: 7.21 TWh/year By systems with mean EER = 3.2 **Centralised installation:** Cooling demand met: 0.37 TWhf/year Total consumption: 0.1 TWh/year (18.7 million m^2 cooled) By systems with mean EER = 4.1

Unit saving	**Autonomous installation:** 90 kWh/year per kWf of efficient cooling power installed **Centralised installation:** 100 kWh/year per kWf of efficient cooling power installed

3.1.3 Assessment of energy efficiency improvement measures identified and others proposed in the residential sector

Energy certification of buildings
The compulsory energy certification introduced for new buildings (with only gradual application to existing buildings being restructured, depending on the type of operations carried out) has defined the criteria, conditions and procedures for improving the energy performance of buildings with a view to encouraging the development, upgrading and integration of renewable energy sources and energy diversification, to helping to achieve the national greenhouse gas emission limitation targets and to promoting the competitiveness of the most advanced segments by technological development.
The new rules govern in particular:

- the methodology for calculating the integrated energy performance of buildings;
- the application of minimum requirements for the energy performance of buildings;
- the general criteria for energy certification;
- periodic inspections of conditioning installations;
- the criteria for ensuring the qualification and independence of the surveyors entrusted with the energy certification and inspection of installations;
- the gathering of information and experience, the processing thereof and the studies needed for orientating the sector's energy policy;
- promotion of rational energy use, *inter alia* by informing and creating awareness among end users and by training and updating the sector's operators.

A leading role in relation to the desired expansion of the Energy Efficiency Certificates market will have to be played by ESCos; the particular feature of the involvement of ESCos is that the technical operations needed for achieving energy savings are carried out by investments borne by the companies themselves and not by customers. Energy efficiency improvement operations involving an ESCo therefore take place within the context of *Third Party Financing* in the form of a financial option correlated with the supply of energy service. This formula commits ESCos to finding the financial means for carrying out the agreed operation, which are subsequently recovered conditionally pro rata to the future savings that the ESCos undertake to guarantee. The involvement of ESCos may thus play a crucial part in the achievement of energy efficiency targets, particularly in relation to technologies that are more expensive to install and to run (mini and micro-cogeneration) in such a fragmented market as the residential sector; monitoring and promoting such activities involves the definition of supporting instruments and guarantee funds.

Domestic appliances
From 1990 to 2004, the Italian domestic appliance industry's turnover rose from about 4469 to 9371 million Euro (current) accompanied by a growth in the national market, in terms of apparent consumption[6], from 2205 to 4113 million Euro (current). In general the internal demand breaks down into refrigeration 20% (refrigerators, freezers and conditioners), washing 30.1% (washing machines, dishwashers, dryers), cooking 15.2% (cookers, ovens, hotplates etc.), heating 14.2% (hot water, boilers, heaters etc.) and small appliances 20.4%.
The production of large white goods in 2004 comprised 6.6 million refrigerators, 2.1 million freezers, 8.9 million washing machines and washer-dryers and 3.0 million dishwashers as

[6] The Italian domestic appliance industry in 2005, National Association of Household and Professional Appliance Industries

against apparent consumption[7] of 2.5 million refrigerators, 630,000 freezers, 1.8 million washing machines and washer-dryers and 880,000 dishwashers. In value terms the national market in the main white goods in 2004 comprised washing machines €592 million, dishwashers €122 million, refrigerators €495 million and freezers €107 million[8].

Refrigerators and freezers

The energy efficiency of refrigerators and freezers produced in the EU improved appreciably from 1992 to 2004, with the percentage of class A models rising from 1.8 to 52.6% and the introduction of appliances in the new energy efficiency classes A+ (6.1%) and A++ (0.25%) defined in Directive 2003/66/EC, which updated the energy labelling scheme that had covered these appliances since 1994. In 2004, more than 20 million appliances were produced in Europe[9].

The European average Energy Efficiency Index[10] of the models sold in Europe from the first introduction of energy labelling to 2004 fell by an average of 39.4% from 100.2 in 1992 to 60.8 in 2004. With an annual consumption of 450 kWh, the average appliance on sale at the beginning of the 1990s consumed 32.0% more energy than the corresponding model on sale in 2004 (306 kWh/year).

The efficiency of the models sold in Italy may be assessed on the data published by ENEA from the early 1990s about the consumption and main functional characteristics of the various models available at retail outlets. In 2004, 47.2% of refrigerator models were class A and 3.2% class A+ (Fig. 3.1a). Class A freezers were 3.6% in 1993 and 22.7% in 2004, class A+ 17.6% in 2004 (Fig. 3.1b). The average consumption of refrigerators and freezers fell from about 500 kWh/year in 1993 to 390 kWh/year in 2002, a drop of 22%.

Models (%)

Fig. 3.1 – Energy efficiency of refrigerators (a) and freezers (b) sold in Italy in 1993 and 2004 (source: ENEA processing of its own and GfK data)

Washing machines

Although steps to improve the energy efficiency of washing machines were only implemented at the end of 1998, the average efficiency of the models sold in Italy (Fig. 3.2) improved significantly over the 11 years: class A appliances comprise nearly 63% and class A+ 12.4%. The 1994 data are also shown by way of comparison, although energy labelling was then not yet in force.

[7] The apparent market calculated as production – exports + imports includes producers' and distributors' stocks and therefore differs from the actual consumption of families.

[8] *L'Osservatorio Findomestic, 2005*

[9] European Committee of Manufacturers of Domestic Appliance, CECED.

[10] The Energy Efficiency Index is the ratio between the energy consumption of the particular appliance (measured in standardised conditions) and the energy consumption of the average appliance in the reference year for the same product category.

Models (%)

Fig. 3.2 – Energy efficiency of washing machines sold in Italy in 1994 and 2004

Europe recorded in the period 1994-2004 a 36% reduction in the average specific consumption of models produced, from 0.300 to 0.192 kWh/kg. Over the same period the reduction in the specific consumption of models sold in Italy was 26%, from 0.281 to 0.208 kWh/kg.
A 2000 survey at Community level showed the need to shift attention from the possible technological improvement of appliances to external factors relating to the day-to-day use of washing machines by end users, such as washing temperature, clothing load and detergent proportioning with a view to increasing the efficiency of washing and enabling further reductions in energy and water consumption.

Dishwashers
European dishwasher production in 2004 was about 8 million units[11], largely concentrated in the segment of appliances for 12 covers (table settings) which accounted for about 80% of the total. In the 1993-2004 period the percentage of class A appliances produced in the EU rose from 0.3 to 82.0%.
Data for Italy are only available up to 2002, when class A appliances accounted for 50.6% of sales (Fig. 3.3).

Models (%)

Fig. 3.3 – Energy efficiency of dishwashers sold in Italy in 1993 and 2002

Although steps to improve the energy efficiency of this product came into force at the end of the 1990s with the energy savings scheme, the energy saving over the period 1994-2004 was about 35%.

[11] CECED

High-efficiency boilers

A high-efficiency boiler is one in which nearly all (more than 90%) of the energy contained in the fuel is transferred to the heat transfer fluid; efficiency is quantified by the combustion yield, i.e. the percentage of energy arising from combustion that is transferred to the heat transfer fluid (e.g. with an 85% boiler, 15% of the energy contained in the fuel is lost). In other words, the greater the efficiency of the boiler, the greater the fuel saving, resulting in both energy and economic savings.
The efficiency of traditional boilers averages about 85-86%: in less cold weather, when not all the available power is utilised, efficiency declines significantly because of combustion not taking place in optimum conditions, and fuel consumption increases accordingly.
The types of high-efficiency boilers now on the market comprise premixing boilers and condensing boilers. Installing a high-efficiency boiler involves a larger initial investment but this can be amortised by the greater saving in the medium-long term.
The present Italian scenario involves about 60 producers of thermal installations and appliances and components intended for environmental temperature comfort, with over 12,000 employees and turnover of more than €2000 million. The reference values for the Italian residential market (the biggest market) are 14 million autonomous boilers and 5.5 million dwellings served by centralised installations.
Up to the year 2000, an average of 1.2 million boilers were installed per annum, 17.7% being new installations (the majority traditional) and 83.3% replacements.
From 2001 onwards, although there has been an increase in the demand for appliances capable of high performance in terms of energy saving and low pollutant emissions, the sector generally has shown a slight but constant decline in sales (<1 million, with only 6.8% high-efficiency) attributable not so much to foreign competition as to a loss of confidence that has inhibited investment and delayed work on existing installations with a view to regaining efficiency and improving safety (aspects to which less importance is attached in the present world political situation).
Over the last three years, the replacement of heat generators has been virtually constant at about 1 million.
The year 2005 saw the replacement of about a million boilers, 800,000 of them below 35.0 kW, with production turnover estimated at about €2800 million.
Condensing boilers comprise about 4.5% of turnover, including installing, of €135.0 million.
The market and the spread of condensing boilers are likely to increase. Legislative Decree No 192/05, the revision of it now undergoing approval, and the regulatory measures indicated above are encouraging the installing of boilers with higher efficiencies.
In a context where information technology is becoming a strategic factor for changing the whole economic system, particularly in relation to globalisation and fiercer competition, all operators need to appropriate and utilise technologies with a view to “creating value” for end users, i.e. increasing the perceived value of goods and services, which means optimising processes by reducing costs. The new paradigm will be increasingly to meet customers’ specific demands. Not supplying products, but finding solutions.

3.2 Energy efficiency improvement measures in the tertiary sector

The tertiary sector covers service activities comprising both non-commercial ones offered by the public sector and commercial ones such as business, catering, credit and insurance, communications etc. Final consumption of energy in the tertiary sector in 2005 amounted to 15.7 Mtoe, representing about 34% of the residential sector's total demand and about 11% of total end uses.

2005 saw a tertiary sector energy demand increase of 6.1% on the previous year, a higher rise than in the residential sector (+5.2%), despite stagnating sectoral added value. The great disparity between the development of energy demand and added value resulted in an appreciable increase in the sector's energy intensity, from 19.3 toe/€ million in 2004 to 20.4 in 2005, an increase of about 6%.

The structure of tertiary sector final consumption in 2005 highlights the part played by electricity and natural gas, which together covered more than 90% of the energy demand. The recent dynamic performance of these two sources is evidence of the slow but constant growth of electricity and a more erratic trend in natural gas demand.

This unsteady trend seems partly due to weather conditions and the spreading use of natural gas for the heating and conditioning of large local units (e.g. commercial centres and hospitals), but also the gas price trend.

Natural gas continues to be the main energy source, covering 46.8% of the sector's total energy consumption, followed by electricity at 43.9%. Despite a lower proportion of consumption than that of gas, electricity consumption more than doubled in the period 1990-2005 (rising nearly 7.0% per annum) as against a nearly 70% increase in natural gas (5% per annum).

Consumption of petroleum products remained virtually constant between 2004 and 2005, with a subsequent drop from 9.8 to 9.2%. LPG is the only source that showed a positive trend (+6.1%), while gasoil and fuel oil continued the previous years' downward trend.

Electricity consumption in 2005 was 5.3% up on the previous year. All parts of the tertiary sector showed increasing electricity consumption except the credit and insurance sector.

The energy consumption breakdown has remained virtually unchanged (Table 3.1): commercial services account for 75.4% of total consumption, the business sector alone 29.1%, followed by hotels, restaurants and bars at 15.4%. Business is the only sector showing a constant increase in the level of consumption.

	1998	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Commerce	13,797	14,749	15,632	16,359	17,520	18,992	20,141	21,471
Hotels, restaurants, bars	8,133	8,516	8,944	9,312	9,745	10,431	10,674	11,388
Credit and insurance	2,340	2,410	2,411	2,440	2,463	2,572	2,587	2,520
Communications	2,571	2,849	3,115	3,337	3,278	3,583	3,671	3,681
Other commercial services	10,067	10,719	11,259	12,206	13,279	14,329	14,938	16,585
Total commercial services	37,088	39,243	41,361	43,654	46,284	49,906	52,011	55,644
Public administration	3,234	3,364	3,453	3,500	3,604	3,898	3,971	4,040
Public lighting	5,184	5,374	5,471	5,561	5,700	5,791	5,918	6,104
Other non-commercial services	5,566	5,918	6,310	6,521	7,244	7,832	8,056	8,088
Total non-commercial services	13,984	14,656	15,234	15,582	16,547	17,520	17,944	18,231
Total	51,072	53,898	56,595	59,235	62,831	67,426	69,955	73,875

Table 3.1 – Electricity consumption by sector (GWh). Source: TERNA

Following Legislative Decree No 79 of 16 March 1999, the proportion of electricity purchased on the free market rose from 2.7% of total consumption in 2000 to 31.2% in 2005. This was due to the increase in the number of eligible customers[12] that find it economically advantageous to resort to the free market on which the price of electricity comprises to only a small extent a managed tariff (transmission activity), while the remainder is determined by market prices and bilateral contracts.

The increase in the number of eligible customers, with their eligibility threshold set by the Electricity and Gas Authority (AEEG) at 100 MWh in 2003, is also a symptom of the increasing size of local units in the tertiary sector.

Electrical intensity in 2005 maintained the rising trend of previous years, at +4.7% in 2005 as against a mean annual increase of 3.6% between 2000 and 2004. The electrical intensity also underwent a substantial increase (+45.8%), albeit smaller than that of consumption per work unit and only partly paralleled by the increase in the sector's added value (+26.5%).

[12] In the electricity market, an eligible customer is one able to make supply contracts with any energy producer or distributor.

3.2.1 Overview table of energy efficiency improvement measures in the tertiary sector

With regard to technology, there are various areas open to greater efficiency to achieve energy consumption savings in the tertiary sector.
The reference parameters for quantifying the targets are indicated by the European Union:

- Directive 32/2006/EC on end uses and energy services: a national end-use energy saving target for EU Member States of 9% in nine years over the period 2008-2016 (1% per annum)[13];
- Energy efficiency action plan[14]: 20% reduction of EU energy consumption by 2020;
- Energy efficiency action plan[15]: 30% maximum potential saving for commercial buildings (tertiary sector).

The action areas of greatest impact in the sector are:
- efficient heating
- conditioning (as regards the portion not assimilated to the residential sector)
- lighting and public lighting

No.	Title of measure	Intended user	Duration	Annual saving in GWh expected at 2016
1	Use of efficient heating installations	Owners, ESCos	01/01/2008 to 31/12/2016	16600
2	Incentives for using efficient conditioners	Owners, ESCos	01/01/2008 to 31/12/2016	2500
3	Efficient lamps and control systems	Owners, ESCos	01/01/2008 to 31/12/2016	4300
4	Efficient lamps and luminous flux regulating systems (public lighting)	Public administrations/ESCos	01/01/2008 to 31/12/2016	1290

[13] Directive 2006/32/EC of the European Parliament and the Council on energy end-use efficiency and energy services, repealing Council Directive 93/76/EC. Target to be achieved by ninth year of application (Article 4).
[14] Energy efficiency action plan: realising the potential (October 2006)
[15] Idem.

3.2.2 Description of energy efficiency improvement measures in the tertiary sector

Adoption of efficient HEATING systems

Expected annual saving at end of 2010: 0.47 Mtoe/year	
Expected annual saving at end of 2016: 1.43 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Heating by non-renewable energy sources: installing of efficient installations, with the following seasonal mean efficiency values (with respect to primary energy): Existing buildings: Mean seasonal efficiency of installation > = 0.85 New or completely restructured buildings: Seasonal mean efficiency of installation > = 0.90 This measure is achievable by the various technologies available on the market that provide the required performance (e.g. condensing boilers, heat-pump installations with compression or absorption technology, high-efficiency cogenerative installations, installations with integration of solar energy).
Efficiency improvement measure (policy action)	• Information programmes • Incentives for replacing inefficient boilers • Tighter constraints on the performance of heating installations in new or restructured buildings • Energy certification of buildings • White certificates for installations with seasonal mean efficiency greater than a predetermined value • Promotion of heating energy services provided by ESCos in centralised installations
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Heating demand met at 2005: 5.95 Mtoe/year Seasonal mean efficiency of installation: 0.71 Energy consumption: 8.42 Mtoe
Business as Usual scenario 2016	Heating demand met at 2016: 7.62 Mtoe/year Seasonal mean efficiency of installation: 0.81 Energy consumption: 9.46 Mtoe
EAAP scenario 2016	Heating service demand met at 2016: same as BAU scenario Seasonal mean efficiency of installation: 0.95 Energy consumption: 7.62 Mtoe
Unit saving	350 kWh/year per kW of useful thermal power installed

Adoption of efficient CONDITIONING systems

Expected annual saving at end of 2010: 835 GWh/year	
Expected annual saving at end of 2016: 2510 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Installing conditioning systems and appliances with seasonal EER (energy efficiency ratio) of at least: Autonomous installation: 3.3 Centralised installation: 4.1 This measure is achievable by the various technologies available on the market that provide the required performance (e.g. condensing boilers, heat-pump installations with compression or absorption technology, high-efficiency cogenerative installations, installations with integration of solar energy).
Efficiency improvement measure (policy action)	• Information programmes • Incentives to replace obsolete devices • Promotion of cooling services provided by ESCos in centralised installations
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Cooling demand met at 2005: 41.87 TWhf/year By installations with seasonal mean EER =2.9 Energy consumption: 14.5 TWh
EAAP scenario 2016	Cooling demand met: same as BAU scenario By installations with seasonal mean EER = 3.55 Energy consumption: 19.1 TWh/year
Unit saving	**Autonomous installation:** 90 kWh/year per kWf of efficient cooling power installed **Centralised installation:** 100 kWh/year per kWf of efficient cooling power installed

Efficiency of LIGHTING in the tertiary sector

Expected annual saving at end of 2010: 1400 GWh/year	
Expected annual saving at end of 2016: 4300 GWh/year	
Energy efficiency measure (technological action) (2016 target)	1. Replacement of halophosphate type T12 and T8 linear fluorescent lamp systems operating with electromagnetic feeders by type T5 linear fluorescent lamp systems operating with electronic feeder (achievable saving at least 35%). 2. Introduction of control systems with presence sensors and flux regulation with addition of natural light (achievable saving 40% of what the consumption would be without the control system)
Efficiency improvement measure (policy action)	• White Certificates • Energy certification of lighting installation • Economic incentives (VAT reduction, tax discounts) for modernisation of lighting installation • Incentives for running of public lighting service by ESCos • New and renewed installations must conform to minimum energy efficiency values according to their compliance with the parameters of standard UNI EN 12464-1 and EN 15193 • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Energy consumption for lighting in the tertiary sector in 2005 amounts to 21.9 TWh. It is assumed that 75% of this is attributable to non-efficient fluorescent lamp systems without control systems. • Mean power per light point of present systems: (2xT8+VVG): 90 W • Annual operating hours: 2250 • Number of light points: 82 million
Business as Usual scenario 2016	*No changes to existing light points.*
EAAP scenario 2016	• Replacement of T5 lamps and electronic feeder at 60% of existing light points • Addition of control system with presence sensors and flux regulation with addition of natural light at 20% of light points
Unit saving	• Replacement of T5 lamps and electronic feeder: **annual saving per light point: 70 kWh/year** • Control system with presence sensors and flux regulation with addition of natural light: **further annual saving per light point: 52 kWh/year**

Efficiency of light sources in PUBLIC LIGHTING

Expected annual saving at end of 2010: 350 GWh/year	
Expected annual saving at end of 2016: 1060 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Replacement of mercury vapour lamps by new-technology lamps (metallic halogenides/high-pressure sodium)
Efficiency improvement measure (policy action)	• White Certificates • Information/education programmes • Taxing of mercury vapour lamps • Incentives for running of public lighting service by ESCos
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	80, 125, 250 and 400 W mercury vapour lamps stock: 5760 million Their consumption: 2.86 TWh/year (out of 6.10 TWh/year total public lighting consumption) Average consumption of mercury vapour lamps: 498 kWh/year
Business as Usual scenario 2016	Same number of mercury vapour lamps as now installed
EAAP scenario 2016	Complete replacement of mercury vapour lamps installed at 2005. Total consumption of lamps replaced as a result of proposed measure: 1809 GWh/year
Unit saving	Average saving per mercury vapour lamp replaced: 314 KWh/year

Luminous flux regulators in PUBLIC LIGHTING

Expected annual saving at end of 2010: 75 GWh/year	
Expected annual saving at end of 2016: 230 GWh/year	
Energy efficiency measure (technological action) (2016 target)	Installing automatic ignition, extinction and luminous intensity regulation systems in public lighting installations, as per table 17 of the approved procedures for quantification of permissible measures under the Ministerial Decrees of 20.7.2004.
Efficiency improvement measure (policy action)	• White Certificates • Information/education programmes • Incentives for running of public lighting service by ESCos
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Stock of regulatable lamps: 5.76 million Their consumption: 1.81 TWh/year (after replacement by efficient lamps) Average consumption per regulatable lamp: 314 kWh/year
Business as Usual scenario 2016	No change in number of regulated lamps
EAAP scenario 2016	Installing new luminous intensity regulators on 3.5 million lamps, average power 100 W. Total consumption of lamps replaced as a result of proposed measure: 1580 GWh/year
Unit saving	Average saving per 100 W regulated lamp: **66 KWh/year**

3.2.3 Assessment of energy efficiency improvement measures identified and others proposed in the tertiary sector

In some areas, the figures stated for the residential and industrial sectors are regarded as covering also the tertiary sector, as it has not been possible to segregate the data. The areas concerned are domestic electrical appliances, motors/inverters and high-efficiency cogeneration, which are dealt with in sections 3.1.3 and 3.3.3.

A relevant portion of the tertiary sector that needs further examination is professional hospitality and collective catering, currently accounting for 24 GWh/year. A policy aimed at product efficiency might achieve savings of 30% at 2016. The industry indicates the need to implement energy labelling so that the 30% figure is measurable and consequently achievable.

	STATE OF THE ART 2004		
	Units sold	Units in use	Consumption of units in use, MWh/year
TOTAL GAS	**32,061.0**	**379,600.0**	**10,956.0**
Cooking	**32,061.0**	**379,600.0**	**10,956.0**
TOTAL ELECTRIC	**470,732.0**	**6,265,000.0**	**13,147.8**
Washing	**21,207.0**	**535,000.0**	**2,301.1**
Cooking	**182,331.0**	**2,540,000.0**	**4,283.1**
Refrigeration	**267,194.0**	**3,190,000.0**	**6,533.6**
T O T A L	**502,793.0**	**6,644,600.0**	**24,073.8**

3.3 Energy efficiency improvement measures in the non-ET industrial sector

In 2005, the energy consumption of the industrial sector, accounting for 28% of final consumption, was slightly down on the previous year (-0.8%).
The breakdown of sources used confirms the steady growth of electricity consumption, with the decade's first contraction in natural gas consumption (-2.1%) back in absolute terms to the levels of two years before (2003) after a historic peak in 2004.
Consumption of solid fuels continued the modest recovery trend that began in 2003 and exactly mirrored in reverse the slow decline in petroleum products. In 2005 this sector alone accounted for about 46% of electricity consumption, nearly 96% of solid fuel consumption, nearly 11% of petroleum product consumption and slightly below 38% of natural gas final consumption (40% down on the previous year). Apart from gas, the two previous years had shown very similar values.

Overall consumption trends per source
The industrial sector's energy demand in 2005 contracted by about 0.8% on the previous year, from 41.4 Mtoe in 2004 to 40.8 in 2005 ***[TAKING "2003" TO BE A TYPING SLIP]***, net of renewable energy sources (whose impact was in any case marginal). Petroleum products dropped from 7.6 to 7.5 Mtoe (-1.6%), 18.4% of the sector's final energy consumption.
Electricity consumption continues stable since 2000, although the marginal increase recorded in 2005 was sufficient to mark a historic peak (11.9 Mtoe), and accounts close to 30% of the sector's energy consumption.
Natural gas is the sector's leading energy source (41.6%) despite a 2% drop compared with the previous year. Sectoral demand for solid fuels remains at the 2003 level of 4.4 Mtoe, 11% of the sector's total energy consumption. The sector's overall energy demand showed a decrease, most of it in gas and petroleum products, as against substantial stability in electricity and an increase in solid fuels.
2005 thus seems to mark a clear reversal of the trend of the 1995-2004 period in which final demand growth was led first by electricity and subsequently by natural gas, which recorded an increase of nearly 18%, as against a clear steady reduction in solid fuels. It is thought that a decisive factor in this development was soaring oil prices (and hence also gas prices) that had a substantial effect with regard to replacement by solid fuels. The overall growth rate of petroleum products over the period 1995-2004 was in line with the end use trend, but with major oscillations at various phases of the economic cycle.

Electricity

Natural gas

Petroleum products

Solid fuels and derivatives

Final energy consumption

Fig. 3.4 – Industry's final energy consumption by source (base 2000 = 100). Source: Processing of MSE data

Up to 2000, the increase in end uses followed the trend of the industrial production index and the added value index. From 2001 onwards, production contracted and added value stagnated, while energy consumption continued to increase; the result was increasing energy intensity in 2002, 2003 and 2005. Consumption per employee seems to influence the productivity trend (the added value per employee): both figures rose in 2003 and 2004 but dropped last year.

Energy intensity in industry

The outsourcing process over the last 15 years caused a reduction in overall final energy intensities owing to the low energy intensity of tertiary sector activities.

No less important is the structural change in the industrial sector with the increasing impact of less energy-hungry productive activities (e.g. the growing importance of fine chemicals and pharmaceuticals in the chemical segment as against basic chemical production). The energy intensity of the industrial sector as a whole in 2005 was 0.9% up on the previous year. This was due to the decrease in the sector's added value (-1.7%) being larger than that in energy consumption (-0.8%), reversing the trend of the previous year, when energy intensity fell by 0.5% (+1.6% added value offsetting the 1.0% consumption increase). This tends to support the recently emerging uncertainty about the "durability" of the link between GDP and industrial activity, pointing towards an actual "structural break". The competition with developing countries is thought likely to cause faster changes than in the past in the Italian industrial system.

The industrial sectors recorded in the period 2003-2005 declining energy intensity growth rates and even, from 2004 onwards, some downturns, particularly in chemicals (-5.3%), agrifood (-1.5%), mechanical engineering (-1.6%), construction materials and paper (-0.9%) and other manufacturing industries (-3.9%).

The chemical sector's energy intensity continues to decline, with a contraction of 0.6% in 2005 due to the reduction in energy consumption (-1.6%) being larger than the contraction in added value (-1%).

Likewise in 2005, the energy intensity of the petrochemical industry halted its rising trend, with a slight decline of 0.6%. The substantial increase in energy consumption over recent years (+11% from 2002-2004) was replaced by a sharp reduction of 5.3%, with added value down by 4.7%.

The agrifood industry's energy intensity fell sharply in 2005 from 184.8 to 178.3 toe/M€ (-3.5%) owing to a sharp contraction in energy consumption (-3.1%) backed by an albeit slight increase in added value (0.4%).

The construction materials, glass and ceramics industry showed energy intensity down by 3.1% owing to a 0.04% increase in energy consumption and a substantial 4.8% increase in added value. In contrast, the textile industry, after a sharp energy intensity contraction (-4.6%) in 2004 due to a sharp reduction in energy consumption (-9.1%) with respect to the negative change in

added value (-4.7%), recorded a 5.4% increase in 2005. This trend reversal is reflected in the added value contraction (-9.7%) being this time greater than the decrease in energy consumption (-4.8%). The negative economic performance trend already prevailing for several years is due substantially to the sector's so-called "Made in Italy" crisis arising from growing competition by Asian countries, mainly affecting small firms.
In the mechanical engineering industry, there was an energy intensity upturn of 1% compared with a 2.6% decline in 2004. This was reflected in an 0.2% energy consumption decrease backed by a 1.3% added value drop. Energy intensity in metallurgy reversed its previous growth trend by declining 1.1%, partly due to a 2.5 increase in energy consumption that offset the increase in added value (+1.3%).

Analysis of technologies and their consumption
The technologies in the industrial sector that contribute most to electricity consumption are electric motors, lighting and other technologies used in production processes such as furnaces and electrochemical transformations.
It is thought, however, that the consumption of natural gas or other fuels used in production cycles and auxiliary services associated with them pertains to complex technological systems and is difficult to attribute to the efficiency of a particular technology. Accordingly, the savings achievable by using high-efficiency cogenerative systems or process heat recovery within thermal installations may be significant but difficult to assess in general analyses that take no account of the particular features of the production process. This makes energy audits essential for assessing possible measures in the industrial sector on the basis of which to assess the potential energy savings achievable by implementing them. The information deriving from the energy audit would serve to assess the State's incentive for implementing measures according to the achievable saving. This would lead to financing and promoting energy saving measures even in the more complex industrial contexts where energy saving may involve a number of measures and possibly heat recovery systems closely tied to the production process and the specific characteristics of the plant. Energy audits would have to be carried out by a third party not involved in the sale of technology and would have to be incentivised. The incentives to implement measures would have to be calibrated in each particular case on the basis of the cost of the investment identified by the audit and the prospective savings.
The use of petroleum products is declining and is also concentrated in certain production processes. The impact of the consumption of solid fuels pertains to only two industrial segments and in some cases to individual plants situated in Italy where it is difficult to suggest ways of improving their production.
In this context, high-efficiency cogeneration is also a technology on which to base measures for achieving the required objectives.

3.3.1 Overview table of energy efficiency improvement measures in industry

The technologies that most account for electricity consumption in the industrial sector are electric motors, lighting and other technologies; in particular, it is found that electric motors account for about 84%, lighting 2%[16] and other electrical technologies 14%.
Most of the measures for greater efficiency in very energy-hungry production processes, particularly in industrial areas not covered by the emission trading scheme (aluminium, chemicals, hides/leather/footwear, food, mechanical engineering) were implemented prior to 1995, what remains is maintenance and technological control operations that cannot be expected to yield striking results.
On this basis, energy efficiency measures have been proposed in the following areas:

No.	Title of measure	Intended user	Duration	Annual saving in GWh expected at 2016
1	Efficient lamps and control systems	User firms, ESCos	01/01/2008 to 31/12/2016	2200
2	Replacement of 190-kW asynchronous motors by Eff2 to Eff1	User firms, ESCos	01/01/2008 to 31/12/2016	3400
3	Inverters for 190-kW asynchronous motors by Eff2 to Eff1	User firms, ESCos	01/01/2008 to 31/12/2016	6400
4	High-efficiency cogeneration	User firms, ESCos	01/01/2008 to 31/12/2016	6280
5	Using mechanical vapour compression	User firms, ESCos	01/01/2008 to 31/12/2016	3257

[16] Figure from ASSIL (National Association of Lighting Producers), CESI figure 8%.

3.3.2 Description of energy efficiency improvement measures

Efficient LIGHTING in industry

Expected annual saving at end of 2010: 700 GWh/year	
Expected annual saving at end of 2016: 2200 GWh/year	
Energy efficiency measure (technological action) (2016 target)	1. Replacement of halophosphate type T12 and T8 linear fluorescent lamp systems operating with electromagnetic feeders by type T5 linear fluorescent lamp systems operating with electronic feeder (achievable saving at least 35%). 2. Introduction of control systems with presence sensors and flux regulation with addition of natural light (achievable saving 40% of what the consumption would be without the control system)
Efficiency improvement measure (policy action)	• White Certificates • Energy certification of lighting installation • Economic incentives (VAT reduction, tax discounts) for modernisation of lighting installation • Incentives for running of public lighting service by ESCos • New and renewed installations must conform to minimum energy efficiency values according to their compliance with the parameters of standard UNI EN 12464-1 and EN 15193 • Adoption of minimum efficiency standards ("Ecodesign" Directive 2005/32/EC)
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Energy consumption for lighting in the tertiary sector in 2005 amounts to 13 TWh. It is assumed that 75% of this consumption is attributable to non-efficient fluorescent lamp systems without control systems. Mean power per light point of present systems: (2xT8+VVG): 90 W • Annual operating hours: 3000 • Number of light points: 36 million
Business as Usual scenario 2016	No changes to existing light points.
EAAP scenario 2016	• Replacement of T5 lamps and electronic feeder at 50% of existing light points • Addition of control system with presence sensors and flux regulation with addition of natural light at 20% of light points
Unit saving	• *Replacement of T5 lamps and electronic feeder:* ***annual saving per light point: 95 kWh/year*** • *Control system with presence sensors and flux regulation with addition of natural light:* ***further annual saving per light point: 70 kWh/year***

Promotion of high-efficiency ELECTRIC MOTORS

Expected annual saving at end of 2010: 1100 GWh/year(*)	
Expected annual saving at end of 2016: 3400 GWh/year(*)	
Energy efficiency measure (technological action) (2016 target)	Replacement of 1-90 kW asynchronous motors by class Eff2 to class Eff1
Efficiency improvement measure (policy action)	• White Certificates • Information programmes • Incentives for installing high-efficiency units • Tax release for replacement of obsolete units
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Number of motors at 2005: 11.9 million (class Eff3) Power installed at 2005: 82 GW Consumption at 2005: 119 TWh/year
Business as Usual scenario 2016	• All the motors replaced and the increases are in class Eff2 • No replacement of motors that are rewound (they remain Eff3) Slightly more than 50% of motors are class Eff2, the rest remain in class Eff3, with total consumption 135.9 TWh
EAAP scenario 2016	• 50% of motors replaced by revamping or increases are class Eff1 instead of Eff2 • 50% of motors to be rewound are replaced by Eff1 motors About 26% of motors are class Eff2, about 42% Eff1, the rest remain class Eff3, with total consumption 132.5 TWh
Unit saving	Installing Eff1 motors: **annual saving per power unit installed: 56 kWh/kW/year** (equivalent to 56 fewer hours per annum relative to average 1500 h/year)

(*) Including savings in the tertiary and agricultural sectors.

Application of INVERTERS to three-phase a.c. electric motors

Expected annual saving at end of 2010: 2100 GWh/year(*)	
Expected annual saving at end of 2016: 6400 GWh/year(*)	
Energy efficiency measure (technological action) (2016 target)	Installing inverters on 0.75 to 90 kW electric motors installed in industry and the tertiary sector
Efficiency improvement measure (policy action)	• White Certificates • Information programmes • Incentives for installing high-efficiency appliances
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Assuming 5 million motors for which inverter operation is desirable, total annual consumption 57.4 TWh. An average motor suitable for inverter operation is regarded as having the following characteristics: • Power 7 kW • 1400 operating hours per annum equivalent • mean annual consumption: 10 MWh/year Applying an inverter to such a motor is assumed to save 22% of total consumption (2.2 MWh/year)
Business as Usual scenario 2016	No installing of inverters on motors suitable for inverter operation. Annual consumption 57.4 TWh
EAAP scenario 2016	Installing inverters in 50% of eligible cases; annual consumption 51.0 TWh/year
Unit saving	Installing an inverter leads to annual saving per power unit installed of 330 kWh/kW/year

(*) Including savings in the tertiary and agricultural sectors.

Adoption of high-efficiency cogeneration

Expected annual saving at end of 2010: 0.18 Mtoe/year	
Expected annual saving at end of 2016: 0.54 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	Production by high-efficiency cogeneration of electricity and heat used in industrial processes. Characteristics of high-efficiency cogenerative system: • First-principle efficiency: 80% • Electricity/heat ratio: 0.66
Efficiency improvement measure (policy action)	• Information programmes • Incentives for high-efficiency cogeneration in industrial contexts
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Useful heat cogenerated: 4.6 Mtoe
Business as Usual scenario 2016	As at 2005
EAAP scenario 2016	Further production by cogeneration: • 1 Mtoe/year of electricity • 1.5 Mtoe/year of thermal energy
Unit saving	0.36 Mtoe/year per Mtoe of useful heat (coproduct)

Use of mechanical vapour compression

Expected annual saving at end of 2010: 0.09 Mtoe/year	
Expected annual saving at end of 2016: 0.28 Mtoe/year	
Energy efficiency measure (technological action) (2016 target)	New installing of mechanical vapour compression (MVC) evaporators or retrofit of existing evaporators, for the concentration of liquid solutions. Evaporative capacity of reference evaporator: 5-10 t/h
Efficiency improvement measure (policy action)	• Information programmes • Development of components industry (compressors) • Incentives for MVC in industrial contexts
Assumptions for assessment of energy efficiency measures (bottom up)	
2005 situation and market trend	Food industry evaporation requirement 15 Mt/year of water entirely met by multi-effect thermal evaporators
Business as Usual scenario 2016	Use of three-effect thermal evaporators, specific consumption 21.7 $x10^{-3}$ toe/t of water evaporated(*)
EAAP scenario 2016	Use of MVC thermal evaporators, specific consumption 3.3 $x10^{-3}$ toe/t of water evaporated(**)
Unit saving	$18.4x10^{-3}$ toe/t of water evaporated

(*) Equivalent to vapour consumption of 350 kg/t of water evaporated, with a requirement of 2.6 MJ/t of vapour produced

(**) Equivalent to consumption of 15 kWh/t of water evaporated and 0.22 x 10^{-3} toe/kWh

3.3.3 Assessment of energy efficiency improvement measures identified and others proposed in the sector

Electric motors and inverters
CEMEP (European Committee of Manufacturers of Electrical Machine and Power Electronics) and the European Commission have defined efficiency classes for electric motors (2 and 4 poles with powers of 1.1 to 90 kW). Motors have thus been divided on the basis of their rated power into the three efficiency classes of Eff.1, Eff.2 and Eff.3 (in descending order of efficiency). High-efficiency motors provide the same performance at lower energy consumption than standard motors in return for a limited initial extra cost.

The electricity consumption of motors in Italy has a huge impact[17]:

- industrial sector
  - consumption 132,396 GWh (85% of total electric motor consumption)
  - installed power 80,805 MW (20% of total power installed in electric motors)
  - 14,365 million units (24.9% of total electric motors installed)
- tertiary sector
  - consumption 18,937 GWh (12.2% of total electric motor consumption)
  - installed power 20,227 MW (20% of total power installed in electric motors)
  - 4,781 million units (24.9% of total electric motors installed)

Inverters represent a control device for electric motors. They are capable of optimising the latter's energy consumption on the basis of actual duty needs. At present, unfortunately, the use of these components in Italy is extremely limited as compared with other European nations, so their contribution to reducing consumption is extremely small.

The present number of inverters may be estimated on the basis of the SAVE studies entitled "VSDs for electric motor systems" and "Improving the penetration of EEM and drives" and projecting them to the Italian electric motor population. This leads to an installed power of 4504 MW with a total number of 655 units, and further processing of the SAVE model leads to calculating the potential inverter market (in thousands of units) that might be installed on Italy's present electric motors with a view to optimising consumption at a power of 2940 MW representing 162 units.

The projections set out in the tables are based on "Business as Usual", with no provision of incentives in the years ahead for the use of Eff.1 motors and inverters, using linear interpolation from the figures for 1996, 2000, 2005 and 2010.

The measure provides for installing Eff1 electric motors (rated 0.75 to 90 kW) to replace the present installed stock regarded as Eff3 and on the basis of using only Eff1s in new installations from 2005 to 2014.

The 0.75 kW motor rating has an impact on the total achievable saving even if no 0.75 motors with Eff1 markings are available on the market. There is available, however, a high-efficiency

[17] Source: Confindustria data

0.75 kW motor with efficiency values extrapolable from those relating to the other ratings covered by the CEMEP agreement. What is involved as regards inverters is installing 50% of all of those technologically and economically justified on the 2005 electric motor population. The incentive policy required is the possibility of recovering 20% of the purchase and installation cost of the inverters and Eff1 motors of 0.75 to 90 kW.

High-efficiency cogeneration

The saving achievable by high-efficiency cogeneration was estimated by assessing the potential for further spread to cope with a larger amount of heat equivalent to 1.5 Mtoe (as against the present 4.2 Mtoe).
It was also assumed that this saving scenario might be achieved by a proposed boosting of Energy Efficiency Certificates. Under Legislative Decree 20/07 transposing European Directive 2004/8/EC, this technology is due to be incentivised by the market mechanism of Energy Efficiency Certificates (EEVs). To this end it is supposed that modifications may be made to the mechanism to render EEVs more open to industrial entities that invest in this sector and to achieve greater stability of prices tied to EEVs.
There is at present little use of the EEV mechanism for achieving energy saving objectives in the industrial sector, partly because of the very high cost of investments as compared with that of other less complex technologies, because it is impossible for firms to have direct access to obtaining and managing certificates and, above all, because of the extreme volatility of the cost of EEVs on the stock market, which prevents any certainty about a return on the investment.

Mechanical vapour compression
Mechanical vapour compression (MVC) is an efficient technique for concentrating and distilling liquid solutions. It involves the use of compression to increase the temperature of vapour, which can thus be used as a heating fluid in the process from which it arises, in which it is caused to condense. This makes it possible, at a relatively modest cost in terms of electricity to drive the compressor (or the blower/fan), to recover the latent condensation heat, which is generally equal to the heat required for evaporation. The heat recovered from the vapour produced enables a great reduction (to one-fifth or less) of energy consumption as compared with the traditional solution based on multi-effect thermal evaporators. MVC can be used in systems provided with any kind of evaporator, although it is best suited to falling-film evaporators operating with small temperature jumps.
MVC is widely applied in the agrifood sector, where it is used successfully for concentrating milk, milk serum, fruit and vegetable juices (apples, beetroot, tomatoes etc.), maize steep water, sugary liquids etc.
There are also substantial installations in the pharmaceutical industry (small systems producing pure water) and the chemical industry (various concentration processes) as well as others for the treatment of wastewater in various industries (paper, textile, oil mills, metal processing) and discharge percolates.

3.4 Energy efficiency improvement measures in the transport sector

The economic significance of the transport sector is reflected in its contribution to GDP, in a proportion of about 10%. The area that best defines the sector (manufacture, trading and repair of vehicles, transport services) is that of service activities, more particularly road freight services, which alone make up more than 24% of the total.

This sector involves more than 2.4 million standard work units (employed and self-employed), i.e. 10% of the whole national economy. The cost of transport (purchase and operating cost of vehicles and use of transport services) is a major item in family finance, second only to housing. The cost of transport, which in 2005 was over €100,000 million, represents 14% of family expenditure and has increased by nearly 36% since 1990. In addition, the sector's consumer prices index for the country as a whole rose 30.8% over the period 1995-2005, with very high growth rates between 1999 and 2000 and in the last two years, along with repeated rises in energy raw materials, well above the trend of the general index. There is also the relentless rise in the vehicle insurance index, which in 2005 reached the record level of 230.7 (1995 = 100), having risen by 130% in ten years.
Public expenditure in this sector rose from €32,414 million in 2001 to €45,803 million in 2005, amounting respectively to 6.2% and 7.4% of total public administration outgoings. The bulk of this (77%) is spent on fixed installations and roads. The increases are certainly due to the substantial growth in the expenditure of local authorities and sector firms. The rising trend in traffic volumes underwent a slowdown in 2005 in both freight and passengers, with a particular drop in road traffic, amounting to 4% in freight and 1% in private passenger road use.

Italy is the country with the world's highest concentration of motor vehicles relative to population, with a 2004 ratio of 1.69 persons per car. The next highest European countries are Iceland (1.73), Germany (1.83), Switzerland (1.93) and Britain, which is at the European average of 1.98 persons per car. Fig. 3.5 illustrates the great predominance of mobility by road, which in 2005 accounted for about 93% of transport in Italy.

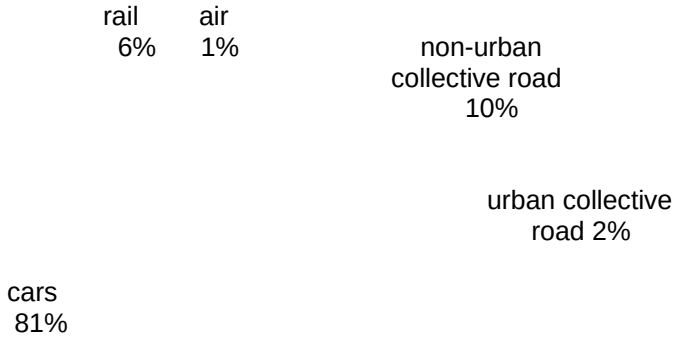

Fig. 3.5 – Passenger mobility structure by means of transport (%). Year 2005.
Source: Ministry of Infrastructure and Transport

As regards infrastructure, Italy has more than 179,000 km of major roads comprising motorways (6,500), ANAS state highways (22,000) and regional and provincial highways (151,000); there are also 312,000 km of non-urban municipal roads and 400,000 km of urban, about 20,000 km of railways, 156 ports and 98 airports. This system carries more than 48 million vehicles, with cars running about 13,000 km per annum and internal freight more than 240,000 million t*km/year.

There is a growing discrepancy between demand and supply of mobility by road, with only very limited growth of the road network (roads 5.6% and motorways only 0.97%) to cope with the growing number of vehicles (+16.5% in the period 1997-2004) and a still greater increase in motorway traffic (+25.1% in vehicle-km).
The period from 1990, in a context of substantially stable population, has seen an appreciable increase in passenger mobility that has led to growing energy consumption and greenhouse gas emissions. This is largely due to private transport, particularly cars, since the use of bus and rail services has remained substantially stable, while the large increase in mobility by air covers only a very limited proportion of total passenger transport.
As we have seen, transport by road far outstrips other modes and the modal structure has remained almost unchanged since 1990. The traffic generated by private cars also maintains an almost constant proportion of 80%. Over the last ten years, overall mobility has increased by 15%, well above the 7% increase in rail use.
In terms of passenger-km, personal mobility demand is Europe's highest, 29% above the European average. In particular, Italy is the country with the highest per capita distance travelled by motor vehicles, 15,400 km per annum (31% above the European average, 60% above the German). Not only in Italy but also in the other European countries, personal mobility is based mainly on private vehicles, which cover about 82% of the demand.

On the freight side, the total amount of internal traffic further than 50 km declined by 3.3% in 2005 compared with 2004. Here again there is an absolute predominance of road transport, which for the last 15 years has accounted for between 73 and 77% of total freight traffic. In 2005, road transport represented about 75% of all freight traffic.

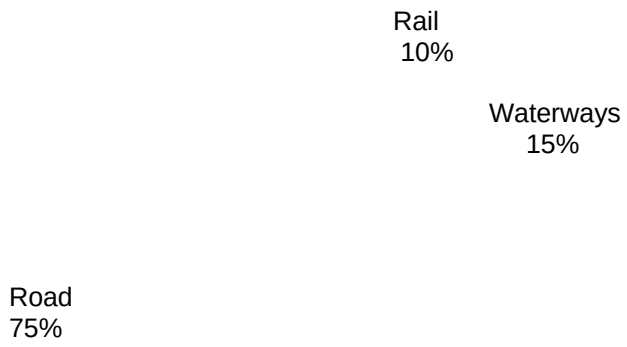

Fig. 3.17 – Freight mobility percentages by mode of transport, Italy 2005.
Source: Ministry of Infrastructure and Transport

Over the last decade, freight transport has grown by 36% compared with 1990, the great bulk of it by road: 82% of the increase in freight mobility between 1990 and 2005 was by road. This makes the transport sector one of the most critical points in terms of environmental impact and a central factor in the prevention of climate change, not only because it absorbs a substantial proportion of the total energy consumed but also because the trend in the demand for transport and the associated energy consumption seems to be sharply upwards.

We summarise below some of the critical elements that emerge from an analysis of the characteristics of the national transport system:

- heavy imbalance in favour of road transport, due to sustained growth in mobility demand (from 1990 to date, passengers-km up 33% and tonnes-km up 14%) and a general increase in family incomes, life styles and habits, wider spread of homes and production establishments, outsourcing processes and new modes of organising production;
- congestion, particularly in metropolitan areas and their hinterland, in which 22 million people (38.3% of the population) are concentrated and about 90% of daily travel takes place (source: ISFORT);
- ever-increasing energy consumption, with final uses up from 1990 to 2004 by 10.6 Mtoe (+31%);
- worrying increases in atmospheric pollutants and greenhouse gas emissions because the greater efficiency of the vehicle fleet due to its renewal has not been sufficient to offset the growth of the fleet, the greater distances travelled and the increase in the average cylinder capacity of cars (suffice to consider the fact that in 2002 cars with a cylinder capacity of less than 1200 cc accounted for 39% of the fleet and that only three years later this figure had dropped to 33%);
- low levels of accessibility to urban public transport services, due to insufficient quality (measurable by falling demand, down by 9.6% in the last 20 years) and an under-provision of transport infrastructure, the density of which is only 6.6 metres per hectare.

On the energy requirement front, the transport sector in Italy recorded an increase of about 31% from 1990 to 2005. Total end uses grew by more than 10 Mtoe.
The transport sector is almost entirely dependent on oil, which accounts for 97% of its energy consumption. In 2004, more than 95% of the annual energy increase recorded was due to petroleum products (+0.7 Mtoe), followed by natural gas and, well behind, electricity; the contribution of renewable energy sources was insignificant (0.243 Mtoe).

Analysing the sector's energy data by mode of transport shows that the most sustained growth has been on the road.
The total energy consumption of road transport has been on an upward trend for a long time, rising from 1990 to date in percentage terms by 28.7% and in absolute terms by 8.8 Mtoe. However, 2005 showed a surprising drop in the energy consumption of the road system by 1.47% compared with the previous year, in contrast to the situation of growth in the air and largely unaffected by the current general situation.
What we have is not merely a consumption trend in absolute terms, due mainly to changing economic conditions, but also an apparent immobility of specific consumption with respect to traffic variables, often tending in the opposite direction to other countries at a similar stage of development and the general picture of the transport system in Italy.
Greater transport efficiency depends substantially on the two factors of growing energy efficiency of means of transport and profound reorganisation of transport modes. The first of these is directly affected by improvements in traction technologies, but the second is determined by demand for mobility, network and service development policies and mobility control modalities. There is a need for measures for judicious combining of improvement elements on both fronts, i.e. not only pursuing further reduction in unit consumptions and the diversification of traction fuels but also achieving rationalisation of mobility by limitation of distances travelled, boosting alternative modes of transport to roads and optimum use of infrastructures.

Trend scenario
Transport demand growth is expected up to 2010, with changes in the modal pattern in favour of transport by rail and water, owing to new infrastructures. The vehicle fleet on the road, currently about 31.7 million, should reach about 32 million in 2010 and remain stable to 2020.

With reference to the trend scenario (BAU) accommodating the effects of the measures provided for by the national greenhouse gas reduction plan approved in 2002, energy consumption relating to transport is likely to rise from about 45 Mtoe at present to more than 51 Mtoe in 2014 and about 55 Mtoe in 2020.

3.4.1 Overview table of energy efficiency improvement measures

With regard to proposed measures in the transport sector, it should be noted that the European motor industry was the first sector to sign a voluntary agreement with the European Commission that lead to an average 13% reduction in CO2 emissions of newly registered vehicles in the period 1995-2004.
Proposals for limiting energy consumption due to transport have therefore to refer to the relevant Community policies recently reviewed by the "Draft Commission communication to the Council and to the European Parliament for the reduction of CO2 emissions of cars and light commercial vehicles".
A measure therefore proposed for adoption from 2009 is the compulsory reduction of emissions from new vehicles to 140 gCO2/km (engine improvements):

No.	Title of measure	Intended user	Duration	Expected annual saving at 2016
1	Introduction of 140 g/km consumption limit (average for vehicles sold)	Producers	01/01/2009 to 31/10/2016	23260 GWh

Descriptive notes on the measure

- BAU scenario: energy consumption at 2015 without specific measures
- Efficient scenario: introduction of 140 g/km limit for new vehicles (average value) from 2009
- Scenario at 2010: 3489 GWh
- Fleet renewal rate: 15 years (6-7% replacement per annum)
- Transport sector annual growth rate: 1.6%

3.4.2 Description of energy efficiency improvement measures

The following table provides a non-exhaustive summary of other possible measures being discussed for achieving energy consumption reductions in the road transport sector.

	CO_2 abatement cost[18]	Energy saving[19],[20] in Italy at 2014		Remarks
	€/tCO_2	MtCO_2	Mtoe (end uses)	
Technological measures relating to vehicles				
Efficient conditioners	50	0.2	0.06	
Low rolling resistance tyres	49	0.5	0.13	Low rolling resistance tyres
Tyre pressure monitoring systems	-45	0.6	0.16	Average cost about € 120 per vehicle
Low viscosity lubricants	113	0.6	0.16	
Efficient vehicles for heavy transport		0.9	0.23	Assuming 10% penetration
Motor biofuels				
Biofuel	-28 +268	0.6	0	Replacement of a further 1% of energy beyond the levels reached. Biofuel cost ranging from €10 to 21 per GJ
Measures directed at demand and behaviour				
Eco-driving	-49	1.2	0.32	Costs include training and GSI devices
Taxation	-103	1.3	0.35	
Motor vehicle advertising code				
Some infrastructure measures				
Dynamic control of traffic signals	180	0.4	0.10	
Road surface		0.7	0.18	Assuming 50% road surface with 40% rolling resistance reduction
Parking management		1.5	0.42	
Telematics for transport		3.9	1.1	Comprises various applications[21]
Other measures				
Car sharing		0.6	0.17	Assuming 4.5 million km
Car pooling		0.3	0.07	Assuming 2% penetration

In the heavy transport sector it is recognised that fuel consumption is one of the most important aspects of containing hauliers' operating costs. It is therefore for the market itself to encourage the development and spread of vehicles and solutions for minimising energy consumption and hence CO2 emissions. Accordingly, heavy vehicle manufacturers are deeply committed to finding innovative solutions for meeting market requirements for increasingly efficient vehicles. The most specific actions areas considered are as follows:

[18] Abatement costs are assessed per company, taking into account the cost of technical solutions and the cost of fuel saved (both exclusive of taxes). The cost of fuel derived from petroleum is assessed on the basis of €50 per barrel.

[19] Energy saving assessments are based on analyses conducted at European level and referred to the Italian situation. Studies conducted are in some cases reviewed on the basis of ACEA and CRF considerations.

[20] The savings are not cumulative.

[21] Intelligent traffic signals, organisation of car sharing, platooning, management of freight transport, dynamic navigation, etc.

- *Vehicle technologies* for increased efficiency*:* the most effective measure is increasing the maximum size of vehicles, thereby making it possible to reduce energy consumption per tonne-km. Current European rules already provide (at national level) for a so-called "modular concept" transport system whereby two or more trailers are combined to reach a length of 25.25 m, with articulated elements in various combinations. However, this solution entails problems of manoeuvrability and safety of vehicles as well as compatibility with much existing road infrastructure. Accordingly, solutions are being examined for a modest increase in semitrailer length (1.5 m) to increase load capacity by about 10% without affecting vehicle manoeuvrability and safety. There is also consideration of other technological improvements with regard to aerodynamics (providing wheels with miniskirts, ducting between tractor and semitrailer to limit turbulence), rolling resistance (enlarged single wheels instead of twin wheels) and engine efficiency (two-effect turbo etc.). Combining these solutions with larger sizes might achieve CO2 reductions of the order of 25% per t/km.
- *Telematics for logistics* with a view to better use of transport systems and smoother traffic. Innovative traffic management systems represent a fundamental contribution to sustainable mobility. Modern location and communication systems involving exchange of information between vehicles (V2V) and between vehicle and infrastructure (V2I) open up new horizons with potential benefits that are as yet largely unexplored.

According to the ACEA agreements, the Italian market should see by 2008 the advent of cars run on petrol consuming 5.8 litres per 100 km and cars run on gasoil consuming 5.25 litres per 100 km, and the same figures may be presumed to apply to two-thirds of renewed vehicles accounting for 16.6% of the whole fleet; the weighted average of these figures produces an average consumption for 16.6% of vehicles at 2010 of 5.6 litres per 100 km. The estimated saving is 2.9%.
A single point of saving on transport, i.e. 0.43 Mtoe, is equivalent to avoiding about 1.2 Mt of CO2, so the environmental value of one point of saving on transport is equivalent to removing 0.25% of the national energy system's total CO2 emissions.
Another widely discussed aspect is the intention to reduce road freight transport by applying a fiscal lever designed to encourage freight and passengers to transfer from road to rail or sea and to favour less polluting vehicles. To this end, the Infrastructure Ministry has adopted a number of measures: the first, based on Article 34 (3) of Law 166/2002, provides State financial assistance to help shipowners to bear the investment cost of developing short-distance maritime transport and is also intended to encourage an increasing amount of vehicle transport by sea, within the context of appropriate action to relieve congestion on the national road network.
The second measure, based on Decree-Law 209/2002, converted to Law 265/2002, promotes the shipment of trucks by sea by means of a sort of "ecological insurance ticket" for road hauliers. This measure provides for the development of logistic chains and the boosting of inter-mode facilities with particular reference to "Motorways of the Sea", appropriating for the purpose a 15-year commitment limit of €20 million. Regarding this latter project, analysis of the feasible options led to preparing the draft of the Presidential Decree for implementing Law 265/2002, which specifically provides incentives for road hauliers in the form of a benefit commensurate to the differential between the external costs of road transport and external costs of maritime transport.
The third measure is intended to appropriate about €2000 million for a re-examination aimed specifically at benefiting existing inter-modal activities on the logistic platforms of ports with a view to optimising arrangements for continuity between the road and rail networks and the provision of transport by sea.

3.4.3 Assessment of energy efficiency improvement measures identified and others proposed in the transport sector

Anti-traffic and anti-pollution policies

With regard to urban transport, municipalities with more than 30,000 inhabitants are obliged to prepare an Urban Traffic Plan for improving traffic conditions and containing critical aspects of them with a view to respect for the environment and saving of energy.

The Ministry of Transport reports that 77.6% of municipalities that are capitals of provinces have adopted this planning instrument under the new Road Code. Forms of traffic control recorded include nearly all municipal administrations resorting to Limited Traffic Zones. Another aspect is the control of parking by the use of administrative and economic instruments, mainly tariff measures aimed at containing prolonged stays in designated parking areas. Parking tariff measures are not merely a first signal towards internalisation of external costs in urban contexts (congestion, pollution) but also a way of discouraging private car use in favour of public transport, which is currently characterised by an ever downward trend in its market share.

Likewise in urban situations, many municipalities have introduced telematic technologies to control private traffic, including measures that mainly involve traffic signal plans based on traffic flow analysis, a satellite control system for the public transport fleet, an automatic system controlling access to Limited Traffic Zones, automatic pricing and monitoring of the availability of parking spaces, signboard information to users on local public transport journey times. ISTAT statistics show that at least 50% of municipalities that are capitals of provinces in north-western, north-eastern and southern Italy have adopted telematic traffic control technologies.

We should also note the policies implemented for encouraging cycling and pedestrian mobility by instituting cycle tracks and pedestrian areas. The municipality with the largest amount of cycle tracks is Padua with 101.2 km per 100 km2 of municipal territory, followed by Turin (65.5 km) and Modena (60.0 km).

Community policies in the transport sector are based on sectoral proposals aimed at lowering present levels of pollution, not only pollution whose impact is showing up worldwide (greenhouse effect) but also pollution impacting more limited geographical areas, with negative effects on the health and more generally the quality of life of the populations most exposed to it.

In particular, with regard to the transport sector, a great deal of attention has been paid to the role of cars and the containment of energy consumption, which has led to a motor industry commitment to achieve lower average specific CO2 emissions from new cars than present-day ones. An example is the ACEA (Association of European Motor Vehicle Manufacturers) agreements on CO2 emissions of cars and the negotiations with Japanese and Korean car producers (JAMA and KAMA); these voluntary agreements provide for a maximum CO2 emission limit of 140 g/km in 2009 and 120 g/km at 2020.

The main results achieved in the period 1995-2001 are the reduction of average specific CO2 emissions from vehicles sold on the EU market: ACEA about 2.5%, JAMA about 2.2% and KAMA about 2.6%. The efficiency improvements in diesel cars have been appreciably greater than those in petrol vehicles. The commitments undertaken do provide, however, for the associations to achieve increasing CO2 reduction rates over time.

With regard to energy efficiency in transport, the 2007 Finance Act fully incorporates the rules on motor biofuels, as regards both incentives and compulsory release to the market. In particular, from 1 January 2007 to 31 December 2010 biodiesel intended for mixing with gasoil for motor vehicles would no longer be totally exempt but would bear excise duty amounting to 35% of that applied to gasoil within the limit of an annual quota of 306,000 tonnes (previously 220,000).

It also reviews the obligations for release to the market, which had been introduced by Law 81/06 (1% from 1 July, percentage to be increased by one point each year up to 2010) but had

hitherto not been implemented. The 2007 Finance Act states a biofuel release obligation of 2.5% from 2008. On the realignment of excise duties, the duty on LPG for road transport would drop to €227.77 per 1000 kg (-€57), with an increase of €0.30 per litre on gasoil duty (this increase does not apply to the road transport sector).

A series of measures are also provided a contribution of a € 80 for anyone deciding to scrap a Euro 0 and Euro 1 vehicle. Refraining from subsequent replacement of the vehicle will be rewarded by full reimbursement of the whole year's local public transport season ticket within the scope of the municipality of residence and domicile. Anyone deciding to purchase new vehicles registered as Euro 4 or Euro 5 which emit not more than 140 grams of CO2 per km will receive a contribution of €800 and two years of exemption from payment of motor vehicle taxes (three years where the vehicle concerned is less than 1300 cc). With regard to trucks, anyone demolishing vehicles registered as Euro 0 or Euro 1 and replacing them by new vehicles with less environmental impact receives a contribution of €2000 per vehicle up to 3.5 tonnes registered as Euro 4 or Euro 5. An engine run on methane gas or LPG, electricity or hydrogen attracts an contribution of €1500, increasable by a further €500. Finally, the purchaser of a new moped in category Euro 3 with simultaneous replacement of a Euro 0 that goes for demolition is exempt from payment of motor vehicle taxes for five years and receives a contribution of €80 per motorcycle.

Also as regards two-wheelers, the Environment Ministry provides the following incentives under air quality improvement policies for the demolition of a Euro 0 moped or any built up to 2001:

- for purchasing a bicycle, 30% of list price up to maximum €250;
- for a motorcycle or quadricycle with electric traction, 30% of list price up to maximum €1000;
- for an electric moped or assisted pedal bicycle, 30% of list price up to maximum €700;
- for a Euro 2 four-stroke or any low-consumption moped (2.3 litres per 100 km), 15% of list price up to maximum €300;
- for a Euro 2 two-stroke moped, 8% of list price up to maximum €150.

In addition, the Environment Ministry will allocate the following within the main initiatives for air quality and sustainable mobility policies:

- €90 million per annum for three years to the National Sustainable Mobility Fund for the financing of projects that encourage, for example, the use of public transport, low environmental impact vehicles, the creation of interchange parking facilities, the spread and use of low environmental impact motor fuels, cycling mobility and low environmental impact freight transport;
- €10 million to financing a programme agreement for promoting car sharing in Italy. This is intended to promote experiments, particularly in the large urban centres, with direct involvement of local administrations.

3.5 Measures in the public sector

The Ministry of Economic Development in conjunction with the Ministry of the Environment and Territory Protection enacted a Decree on 22 December 2006, published in Official Gazette No 2 of 3/1/2007, "Approving of the programme of measures and action on public energy uses under Article 13 of the Decree of the Minister of Productive Activities in conjunction with the Minister of the Environment and Protection of Territory and Sea of 20 July 2004". The Decree, which refers also to Legislative Decree No 192 of 19 August 2005 on energy efficiency in the building

industry, provides for energy diagnoses and the working design of consequent measures and defines the apportionment of resources between Regions and Autonomous Provinces.

The resources allocated to these activities are about €8.5 million, apportioned between Regions and Autonomous Provinces. The agencies awarded them that will carry out the operations arising from the energy diagnoses and design work may apply for the issue of energy efficiency certificates (white certificates) to a value equal to the energy consumption reduction achieved. The following types of energy users are eligible for energy diagnoses and the working design of measures:

a) state schools;
b) water supply systems;
c) public lighting;
d) public buildings or buildings for public use;
e) buildings for residential use;
f) hospitals, clinics, care homes.

The choice of energy users on which to carry out energy consumption reducing measures and operations is up to Regions and Autonomous Provinces on the following criteria:

a) representativeness of energy uses;
b) environmental and energy value of measures;
c) extent of consumption and possible savings;
d) replicability and visibility of measures
e) immediacy of measures.

Regions and Autonomous Provinces have 180 days from the effective date of the Decree to let the Ministry of Economic Development, the Ministry of the Environment, the Electricity and Gas Authority and the Electricity Sector Equalisation Fund have a list of fundable measures, with their locations and characteristics, and any co-funding. The design work is covered by the provisions of Legislative Decree 163/2006 (Public Contracts Code). The monitoring and dissemination of the results of the programme are entrusted to ENEA. To date, lists of measures have been sent by the Regions of Basilicata, Campania, Friuli Venezia Giulia, Lazio, Liguria, Lombardy, Molise, Apulia, Tuscany, Sicily, Veneto and the Autonomous Provinces of Trento and Bolzano.
It is at present not possible to make a reliable assessment of the potential saving achievable. The following table sets out the main data from a first examination of the programmed measures, covering the energy audit and the design for reclassification of the various types of building:

	Number of measures	**K€**
Schools	63	894
Water supply system	4	120
Public building	44	1610
Public hospitals and the like	45	1960
Residential use buildings	18	355
Public lighting	6	150
Total	**180**	**5089**