



The Efficiency Revolution.

The technical and economical potential of energy efficiency in the final uses of electricity in Italy by the year 2020 and the benefits of its wide implementation.

A Report for **GREENPEACE**

Executive Summary

The Report has been prepared for Greenpeace by eERG, end-use Efficiency Research Group (www.eerg.it), Faculty of Engineering, Department of Energy Studies, Politecnico di Milano

The study estimates the potential energy savings in electricity end-uses by measures to be applied between 2007 and 2020. The benefits, in terms of reduction of the energy bill and of environmental impact, would extend beyond 2040.

Three different saving potentials have been evaluated:

- a) The Technical Saving Potential which represents the possible saving due to the general introduction of the most efficient technologies within the current available, without limiting the application to strictly cost-effective solutions.
- b) The Saving Potential that could be achieved, within the next 14 years, consists of the fraction of technical potential which is achievable through a series of programmes and policies aimed at removing barriers to the diffusion of technologies
- c) The Cost-Effective Saving Potential represents the savings produced by the overall introduction of more efficient technologies than are currently available, which will cost less to purchase and operate, resulting in a lower cost of ownership.

Electrical end-uses in Italy have been analyzed in the industrial, domestic, tertiary sectors and in railroad transport. The selection of end-uses being considered in the calculation of potential savings is based upon the importance of the end use, in terms of percentage, and availability of enough data to determine the saving potential as well as the cost of the saved energy.

Promoting and disseminating efficient technologies from today to 2020 would allow approximate savings of 100 TWh/year on electrical energy consumption.

Group of measures (already available on the market) have been identified to improve energy efficiency in different end-uses: from lighting systems to industrial engines, from household appliances to refrigeration in the service sector.

Due to the lack of aggregate analysis available, the potential energy savings connected to the improvement of building envelopes, diffusion of passive cooling technologies, and improving efficiency of active cooling systems haven't been included in this study.

The technical potential, in the considered sectors and end-uses, is around 140 TWh/year and is displayed in the following tables, distinguishing between measures whose costs have been evaluated, and measures whose costs could not be evaluated within this study.

Table 1: Technical saving Potential within 2020 which has been evaluated from a cost perspective

Sector	Total	Residential	Commercial Tertiary	Public Tertiary	Industrial
End-use	[TWh/year]	[TWh/year]	[TWh/year]	[TWh/year]	[TWh/year]
Lighting	45.4	4.5	20.7	4.7	15.5
Electric motors	39.4	1.1	10.7	1.0	26.6
Household appliances	7.5	7.5	0.0	0.0	0.0
Others	10.7	0.0	5.9	1.6	3.2
Total	103.0	13.1	37.2	7.3	45.3

Table 2: Technical electric energy saving Potential within 2020 which hasn't been evaluated from a cost perspective

Electric energy saving measures	Potential [TWh/year]
Reducing Stand-by consumption	25
Increasing efficiency of trains and trams	3
Producing hot sanitary water with thermal solar	4
Washing machines and dishwashers with external hot water supply	3
Measures on the building envelope, passive cooling and efficient air conditioning systems	n.d.
Total	35

Between 2007 and 2020 a mix of programs and policy measures (incentives to the end users, extension and improvement of labels and minimal efficiency standards, voluntary agreements with producers, etc...) can be adopted in order to achieve the major part of this Technical Potential.

The potential saving that could be obtained – a quota of the Technical Potential – with such a series of measures is around 100 TWh/year by 2020, equating to more than 20% of the consumptions estimated in that year (in the "Business as Usual" scenario).

Obtaining this savings would maintain the electrical consumption almost unchanged at the current levels from today till 2020, rather than having a 2% average increase in energy consumption every year in the BaU scenario.

The application of cost-effective measures would produce an economic saving of 65 billions (in Euro 2007), net of investments.

The diffusion among 2007 and 2020 of the only measures already cost-effective today, would result in a cumulated economic benefit (net of investments) of 65 billions of Euro (in real terms 2007), and in an amount of energy savings growing year by year up to 83 TWh/year in 2020. Both technological costs and costs of the programs are considered in the investment costs.

The average cost to save a kWh using these technologies is less than 5.4 €cent/kWh. In our calculation we assumed a cost of generation between 5 and 6 €cent/kWh on the wholesale market.

The estimates contained in many EU documents (e.g. the Energy Efficiency Action plan) on the existence of a cost-effective energy saving potential, of roughly 20% of energy used, are confirmed by this research on end-uses in Italy.

The related reduction of CO₂ emissions, of about 50 million tons/year at 2020 would not imply a cost, but a net economical benefit for society.

In this research we didn't consider other economic benefits such as the avoidance of permission costs to fulfill the emission caps under the Emission Trading System.

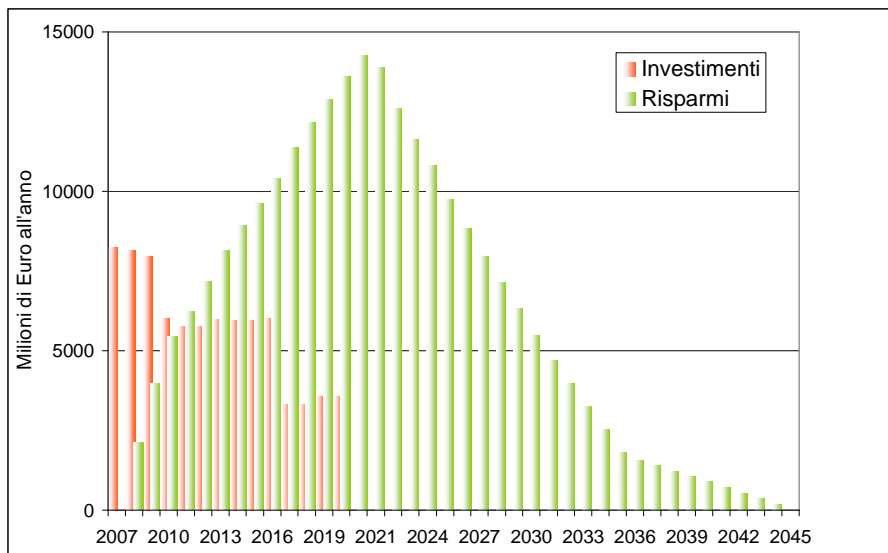


Figure 1: Investments and Economic Savings (Million Euros per year) connected to the deployment of the Economic Saving Potential

Remarkable results with cautious hypothesis

These results are based on conservative hypothesis. The end uses of electricity considered here are not exhaustive, but reflect those applications for which more data and information are available; to evaluate increments in efficiency for the selected end-uses, only the solutions technically available in 2006 are considered and costs are calculated on 2006 prices, without considering a possible future decrease in costs due to diffusion of these technologies. Finally the electricity production cost is assumed to decrease in real terms.

Where more can be saved

The most important sectors to obtain the total cost-effective saving of 83 TWh/year by 2020 are industry (47%) and commercial tertiary (33%), followed by public administration (7%) and residential housing (13%). Lighting and electrical motors represent about 2/3 of the total savings across all sectors.

Remove barriers and systemize measures

The report identifies the main barriers that are hindering the more efficient technologies from becoming a reference for the market. Removing these barriers of information, technical knowledge and culture, lack of access to funding and split incentives, is a key point for every energy efficiency policy. To achieve this goal a series of measures, actions, initiatives and laws based on an international experience, are suggested.

Further positive effects on national economy

The set up of policies to promote energy efficiency on a wide-scale has further economic advantages; such as the reduction of Italian dependence from energy imports . In particular:

when a technology spreads from a niche to a mass acceptance, and is produced and distributed on a wide scale, its costs are reduced due to scale economies; this is a benefit

for every user, not only for the program participants, and it has benefits to the national economy;

several international studies conclude that investing on energy efficiency can produce new work places (or preserve others from disappearing); the research carried on by Wade, J. (2000), analyzes in detail the effectiveness and the extension of a series of programs activated in different countries and proposes a probable range between 8 and 14 person-year for every million Euro invested. If we suppose a similar result, the adoption in Italy between 2007 and 2020 of the economically proposed Potential savings, which would imply an investment of 80 billions of Euro, could produce about 60 000 new jobs for the duration of the programme (14 years).