Standby and Off-Mode Energy Losses In New Appliances Measured in Shops

Anibal T. de Almeida, Carlos Patrão, Paula Fonseca, Rui Araújo, Urbano Nunes, Claudio Rochas, Julija Bulgakova, Philippe Rivière, David da Silva, Ali Rahbar, et al.

SELINA

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INTELLIGENT ENERGY EUROPE

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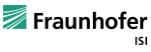
Project Partners

	*Aníbal T. de Almeida, Carlos Patrão, Paula Fonseca, Rui Araújo, Urbano Nunes*
	*Claudio Rochas, Julija Bulgakova*
	*Philippe Reviere, David da Silva*
	*Ali Rahbar, Troels Fjordbak*
	*Barbara Schlomann*
	*Iuliana Lazar, Camelia Burlacu*
	*Michaela Valentova*
	*Wim De Groote*
	*Bob Harrison, Nicola King*
	*Christian Elbe, Martin Lindinger*
	*George Markogiannakis, Argyro Giakoumi*
	*Andrea Roscetti*

Project Partners Description

ISR-UC is a research and technology transfer Institute, associated with the University of Coimbra. Its research interests include energy-efficient technologies, renewable energies, and energy planning. Recent work includes the coordination of several European projects on market transformation of electric motors and drives, integrated resource planning in the electricity sector, air conditioning, and large-scale use of biomass for combined heat and power production. ISR-UC has been involved in projects in developing countries to promote the penetration of energy efficient technologies (Brazil, Egypt, Pakistan, Philippines, and China). ISR-UC has carried out a large number of energy audits both in industry and in the residential and tertiary sectors, in collaboration with energy agencies, governmental agencies and the electric utility, to identify opportunities for efficiency improvement and energy reduction costs. ISR-UC has maintained a strong collaboration with the national utility, being responsible for the co-ordination of the first "Least Cost Planning" project carried out in Portugal. For the past four years, ISR-UC has been part of the consultant team that helps in the design of the DSM program for the national utility.

Ekodoma Limited group is an engineering consultancy practice with its permanent office in Riga, Latvia. Ekodoma operates in the Baltic countries since 1991, working towards energy efficiency, renewable energies, environment and economy. The team consists of several specialists and pool of experts working with energy and environment audits, business plans, expertise, methodologies and follow-up activities. It has undertaken a large number of successful local and international projects on energy efficiency and energy policy, including several of the European Commission. Ekodoma offers project development, project management, technical supervision of projects which involve energy measures, assessment of the social impact of energy efficiency and interfaces with neighbouring environmental fields. Ekodoma has an extensive network with different agencies, building cooperatives, municipalities, district heating and utilities companies providing professional consultancy and energy services for the implementation of energy efficient measures, renewable energy projects and energy management activities and investments.

ARMINES-Centre for Energy and Processes (CEP): The joint centre of Mines ParisTech (one of the leading French engineering schools and Armines, the research association) has developed skills in many fields that are useful for studying the transformation of matter and energy. Attention focuses on complex energy systems, particularly in transient conditions, and on controlling their emissions. This thematic diversity enables the Centre to carry out its training and research tasks, and the dissemination of the latest technological developments in all sectors of activity. Each of the Center's four sites conducts energy research in the following three main areas, industrial processes, buildings and networks and nanomaterials. Within the CEP, demand side management is addressed by the research team "Controlling energy demand and energy efficiency" directed by Professor Adnot, which has been collaborating to the SELINA project. The team develops physical models and knowledge to optimize the efficiency of energy systems with the main focus on building energy systems and energy networks.

IT Energy was set up by a group of engineers with broad-based experience from research and development work for Danish power supply utilities, public authorities, industries and international organizations such as IEA, UNIPEDE and EU. IT Energy operates the Danish bottom-up model for the domestic electricity consumption ELMODEL-domestic (30 major appliances, split into on and standby modes, different geographical and dwelling types etc.), i.e. the data collection, forecasting, reporting etc. as well as the model software itself, is updated by IT Energy. All major entities in Danish energy sector, including the Danish Energy Authority and the Danish Energy Saving Trust use results from the model, and contribute to the funding. Amongst other things, IT Energy offers services within analysis, design and development of IT solutions and database systems as well as development of data communication systems, handling data protocols between various systems.

Fraunhofer Institute for Systems and Innovation Research (Fraunhofer ISI) belongs to the Fraunhofer Society which undertakes applied research of direct utility to private and public enterprise and of wide benefit to society. The Fraunhofer Society maintains roughly 80 research units, including 57 Fraunhofer Institutes, at over 40 different locations throughout Germany. A staff of some 12,700, predominantly qualified scientists and engineers, works with an annual research budget of over one billion Euros mostly generated through contract research. Fraunhofer ISI was founded in 1972; it expands the technological spectrum of the Fraunhofer Society with its research and consultation projects at the intersection between technology, economy and society. Within Fraunhofer ISI the Competence Centre Energy Policy and Energy Systems analyzes technical, economic, ecological and social aspects of sustainable energy systems.

Romanian Energy Regulatory Authority - ANRE is a public independent body of national interest whose mission is to create and implement the appropriate regulatory system to ensure the proper functioning of the electricity, heat and gas markets, in terms of efficiency, competition, transparency and consumer protection. In discharging its competencies and tasks, ANRE works together with other central or local public administration bodies, electricity, heat and gas undertakings, with international organisations in the field, so that interests of all sector players may be harmonized and transparency of the regulatory process assured.

SEVEn, The Energy Efficiency Center, Prague, is a not-for-profit consultancy company that has been operating in the Czech Republic since 1990. SEVEn´s mission is to protect the environment and support economic development by encouraging more efficient use of energy. SEVEn focuses on business development and economic and efficient energy use consultancy services. SEVEn has been long active in the promotion of energy efficient appliances and their proper usage in the Czech Republic. The activities involve publications, expert studies, regular publishing in media, seminars, monitoring energy consumption in households and other. SEVEn also runs a database of the most energy efficient appliances on the market (as part of the Topten project) which has served as a basis for a national campaign under the gesture of the Ministry of the Environment. SEVEn coordinated the CEECAP project on implementing EU appliance policy in Central and Eastern Europe and will coordinate the ComeOnLabels project supporting proper implementation of the new labelling scheme.

E-Ster is an independent engineering and consultancy company, based in Belgium. E-Ster's mission is to support companies and organizations to make the transition to a sustainable energy system at the lowest possible cost. The core activities of E-Ster are: design assistance for Zero Energy Buildings, energy audits of existing infrastructure (large buildings and industrial sites), consultancy on electric appliances. Among E-Ster clients are companies such as DuPont de Nemours, AB InBev, Bayer and Levi Strauss, as well as several public authorities (European Commission).

INTERTEK, MILTON KEYNES, UK is a leading international provider of testing and certification services to a wide range of global and local industries and has a network of more than 1000 laboratories and offices with over 25,000 people in 110 countries around the world. Intertek is a FTSE 100 listed company which floated on the Stock Exchange in July 2002. Intertek Milton Keynes is one of Europe's leading consumer product research and testing facilities with an acknowledged expertise in performance testing of Wet, Cold and Cooking appliances, Consumer Electronics and ICT products. The laboratory was originally established by the UK Consumers' Association nearly 50 years ago and became part of the Intertek group of companies in April 2002. In the UK, Intertek Milton Keynes regularly undertakes energy label compliance and power consumption measurements for the UK Government as well as manufacturers and retailers.

Graz University of Technology is one of Austria's most venerable scientific institutions. It is divided into seven faculties that comprise 104 institutes. The quality of the education and training at Graz University of Technology is carried by the strength of its knowledge-oriented and applied research. Numerous competence centers, the Christian-Doppler laboratories, special research fields, research focuses, and large EU projects are only a few examples of the University's extremely active and successful research. The Institute of Electrical Power Systems is responsible for the teaching, research, development and scientific studies concerning technical aspects of electrical power systems and power supply systems. A main research area of IFEA is the utilization of electrical power and energy efficiency. The research on the Institute of Electrical Power Systems includes state-of-the-art scientific methods and advanced tools for measurement and calculation.

The **Centre for Renewable Energy Sources & Saving (CRES)** (founded in September 1987) is a public entity supervised by the Ministry of Environment, Energy & Climate Change, and has financial and administrative independence. CRES is active in the fields of Renewable Energy Sources (RES), Rational Use of Energy (RUE) and Energy Saving (ES). Its primary aim is to promote technological applications in the above-mentioned fields both at a national and international level. CRES acts as an advisor to the Greek State, and has established a highly visible profile of a strong and reliable national energy centre. CRES has a scientific staff of more than 120 highly qualified engineers and other scientists (among a total personnel of 160) and, over the years, has participated in more than 600 European and national projects. These include R&D projects, demonstration projects, development of energy information systems & models, assessment and analysis of energy policies, feasibility studies, technical and economic studies, market research, as well as training and promotional activities.

Politecnico di Milano (PoliMi) is a state university consisting of curricula in Engineering and Architecture (about 40000 students): within the Energy Department, the end use Efficiency Research Group (eERG), is dedicated to research, technology transfer and teaching about the efficient use of energy in buildings. In particular in the areas of: low energy buildings, passive cooling techniques - night ventilation, ground coupling, etc, efficient lighting and daylighting; technical and economic analysis of energy-using products; evaluation and certification of energy savings in the context of liberalised energy markets.

Executive Summary

This document provides an overview of the most important results of the Intelligent Energy Europe (IEE) Project *SELINA – Standby and Off-Mode Energy Losses In New Appliances Measured in Shops*.

Standby power is a general term commonly used to describe the low power modes in which many electrical and electronic products are, when not performing their main function.

For more than a decade, it has been recognized that the energy consumption in low power modes for electrical and electronic products is an important issue because it represent permanent loads (sometimes up to 24 hours per day) of a huge number of products. With the 1 W standby initiative of the International Energy Agency (IEA), several low power mode measurement campaigns have been led on a regular basis in a number of countries outside and inside Europe Union (EU). Based on these results and on the Energy-using Products Study Lot 6, the EU has prepared new regulation to limit the standby and off-mode power consumption of non-networked household electronic and electrical equipment, which is being applied since January 2010.

The IEE project SELINA carried out a large scale monitoring campaign in shops in order to characterise the low power modes of new appliances being sold in the EU market.

In order to ensure consistency of the collected data, a common measurement methodology was developed and the same high resolution measurement equipment was used by all partners. This document analyzes the results of more than 6000 different equipments measured in the 12 EU countries involved in the project. Standby and off-mode values by product categories were analysed and compared with data from other regions of the World. The measurements were also benchmarked against the new 2010/2013 EU standby and off mode regulation thresholds and the impact of the EU regulation is discussed.

It was found that 18.5% of the equipments, whose off-mode power was measured, do not respect the EU regulation threshold of 1 W. When the measurements are compared to the 2013 threshold of 0.5 W, this percentage raises up to 41.5%. Regarding standby mode input power, 31% of the measured products did not comply with EU regulation limit for the 2010 threshold. When the standby measured values are compared to the 2013 limit, the number of products over the EU regulation target increases to 66.4%.

When comparing the 2009 and 2010 measurements, only a slight decrease of the share of appliances exceeding the EU regulation limits was observed.

In parallel with the measurement campaign, an awareness study of the retailers was carried out. This survey helps to understand the customers' buying motivations and the influence of retailers' advice in their choices.

The results of the survey show that, despite of retailer's consciousness about the energy consumption and energy labels of the products, other types of sales arguments like the appliance price or functionalities are more frequently used to sell a product. This could be due to lack of visible information in shops related to the equipment energy consumption.

Furthermore, the results show that retailers try to adapt their advice to the customers' needs (price and product functionalities).

The retailers admitted that publishing more information regarding the energy consumption of products and some kind of cost saving calculator/reference would make the clients to opt for more efficient equipments.

Based on the survey results and on the analysis of different existing policies targeting electrical and electronic products in Europe, examples of policies to improve the low power modes situation of the EU market are reviewed.

The survey on measures enhancing the market transformation towards more energy-efficient electrical appliances showed a wide range of actions and policy tools in the SELINA partner countries. In national workshops, which mainly took place in the late summer/early autumn 2010, these measures were presented and discussed with all relevant national stakeholders.

In most countries, information campaigns (esp. brochures, leaflets, websites, and national labels) are the dominating measure type. In some countries, however, financial subsidies for very energy-efficient appliances, often paid by an energy utility and not by the government, play an important role, too (e.g. in the Czech Republic or Switzerland). In general, the impact of a financial programme is easier to quantify than the single impact of an information campaign, which often serves as an accompanying measure for regulations (labels, minimum efficiency standards) or fiscal and financial measures.

International cooperation with key institutions outside the EU, involved in similar efforts, such as the IEA Implementing Agreement 4E (Efficient Electrical End-use Equipment) with an Annex on Standby, the Energy Star/EPA in USA, the Australia Standby Initiative and the Swiss Federal Office of Energy, were used to promote synergies in the definition of common approaches to characterize the market and to define realistic and cost-effective performance targets which can be achieved in a short time frame.

Special care is required when promoting low standby consumption products (without consideration of other attributes) to ensure that there are no perverse effects such as the inadvertent promotion of products with low active mode efficiency and high energy consumption. It is desirable to follow a vertical approach to standby, where low power modes are combined with active modes to give total energy consumption. This approach is particularly preferable for products where the total energy consumption is significant. The definition of usage patterns under such a vertical approach is necessarily product specific and this could vary by region or country.

The new technologies offer many opportunities for energy savings potential but there are also some threats which need to be recognized and understood. There is a strong need to ensure that energy saving paradigms and strategies become a core consideration in future product designs.

It is recognized that equipments connected to networks are of growing importance. It is recommended that increased efforts to compile data and measurements, of networked

products, from a variety of sources in order to obtain better information on networked product characteristics, needs to be made.

An online database was created so that everyone can access the input power values, in the different equipment low power modes, of the more than 6000 equipments measured. A Standby Calculator Tool was also developed and can be accessed through the project website. It can be used to calculate the consumed energy, the annual cost and the equivalent CO2 emissions. In order to compare the results in an easy way, a diagram that shows the energy consumption of the different models is presented. Furthermore, the values for the most efficient device are also showed, in order to have an additional comparison.

One of the main objectives of this project was to identify effective market transformation policies initiatives targeted at all the key stakeholders involved in the manufacture, distribution, sales, purchasing and operation of appliances with standby and off-mode losses. As a result of the future policy actions that may appear after the end of the project, considering loads in networked mode, it is expected to achieve very large cost-effective savings of electricity (80 TWh projected by 2020) and carbon emissions (30 MTons of CO_2 by 2020).

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1 Introduction

The introduction of energy labels, together with MEPS – Minimum Energy Performance Standards, implemented with EU Directives during the last fifteen years, has produced a positive trend in the sales of more energy efficient appliances. However there has been a fast increase of electrical and electronic loads (entertainment, office equipment, communication/internet, white appliances with embedded electronics), coupled with the proliferation of gadgets which have electronic controls, and which are typically connected to the AC supply all the time.

The relevance of the standby and off-mode energy consumption is illustrated by the fact that the IEA estimates that, even with a continuation of all existing appliance policy measures, the electricity consumption for ICT and consumer electronics will grow by almost 800% from 1990 to 2030. Next figure shows an overview of IEA projections for ICT and CE electricity consumption up to 2030.

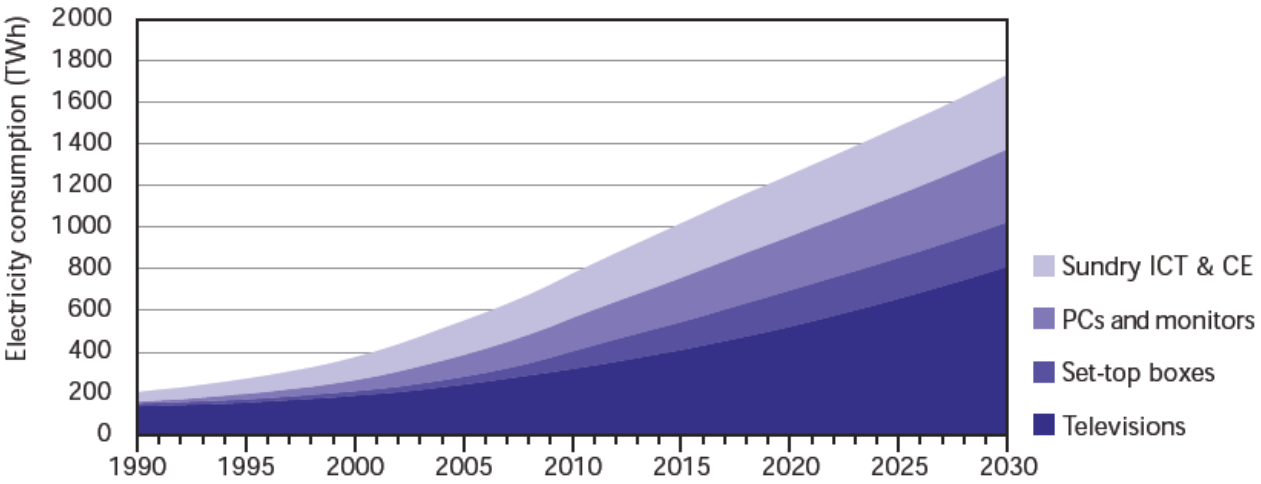


Figure 1 – Projected IEA electricity consumption for ICT and CE equipment, 1990-2030 (Gadgets and Gigawatts, 2009)

According to the IEA, by 2030, 15% of the total appliances electricity consumption in Europe could be due to standby functions. This represents the largest area of potential energy savings because efforts to introduce measures to reduce the standby and off-mode energy consumption have only started in the last 10 years. In the future, power demand will be influenced by technical improvements in the equipment introduced by manufacturers, as well as by Minimum Energy Performance Standards, such as the one recently set by the European Commission (e.g. Commission Regulation (EC) No 1275/2008 of 17 December 2008, implementing Directive 2005/32/EC of the European Parliament and of the Council with regard to ecodesign requirements for standby and off-mode electric power consumption of electrical and electronic household equipment).

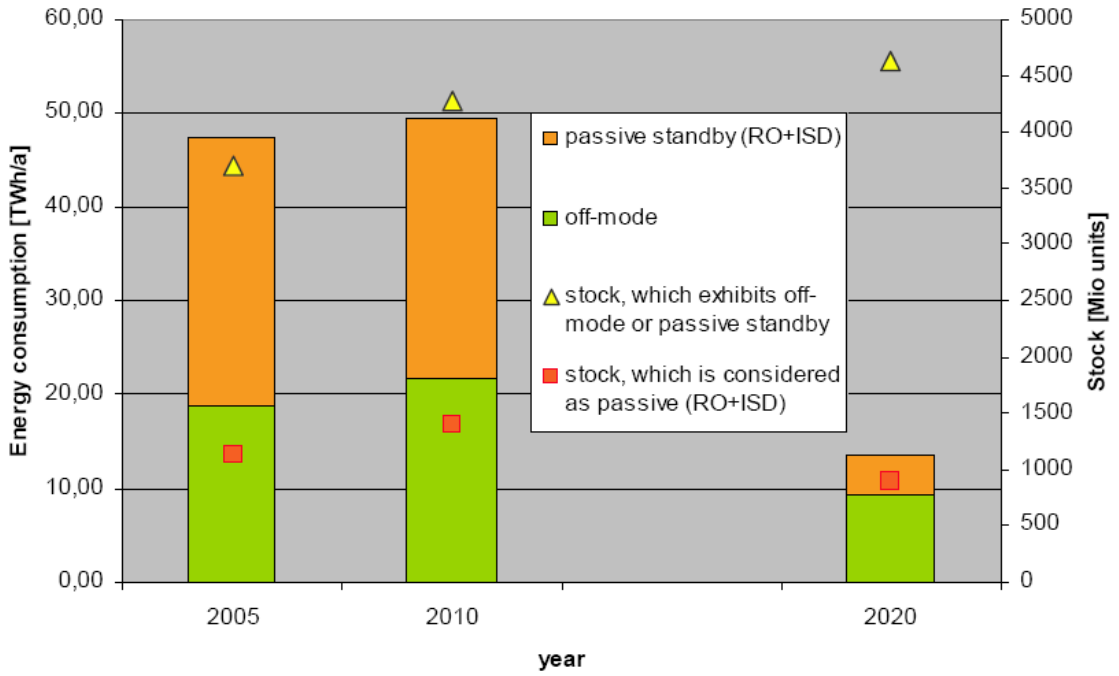


Figure 2 – Development of stock and electricity consumption of standby/off mode, excluding networked equipment and assuming a 0.5W/1.0W power consumption level in 2020 (RO: reactivation only; ISD: information or status display) (DG TREN, Impact Assessment, 18/12/2008)

According to the DG TREN Impact Assessment report, the electricity consumption of electrical and electronic equipment in standby and off-mode is expected to be 13.6 TWh by 2020, due to the new requirements of the regulation. Excluding networked equipment, the expected reduction is of about 35 TWh compared to the Business as Usual (BAU) scenario that can be seen in the figure above. This represents about 4.5 billion Euros in electricity costs savings supposing the prices of the year 2005[1] (DG TREN, Impact Assessment, 18/12/2008).

Although significant improvements in energy efficiency have been achieved in appliances technologies, during the period of 2004 to 2007 the end-use electricity consumption had an increase of 2.11% in residential sector and 10.45% in the tertiary sector. In the tertiary sector it is a significant increase when compared with the growth rate for the period of 2001 to 2004, when an increase of 6.96% was registered (Bertoldi, et al., 2009).

Some of the reasons for such increase in the residential and tertiary sector electricity consumption are associated with a higher degree of basic comfort and level of service and amenities (particularly in the new EU member countries), as well as with the widespread utilization of relatively new types of loads whose penetration and use has experienced a very significant growth in recent years.

Office equipment (PCs, monitors, fax machines, photocopiers, printers, internet equipment, etc.) are the fastest growing users of electricity in the tertiary sector. It is expected that this

[1] Average electricity price in 2005 in EU-25: 13.6 Cent/kWh

electricity consumption doubles by 2020 (EL-TERTIARY, 2008). The EL-TERTIARY European Project estimated that the office equipment electricity consumption represents around 5.3% of the tertiary sector in France, 6% in Italy, 14% in Germany and 7.5% in The Netherlands (EL-TERTIARY, 2008). Based on a recent published estimation, in 2007, more than 48 million desktop computers and 59 million laptops were installed in non-residential applications (Bertoldi, et al., 2009).

Based on statistics data, the total standby electricity consumption of home appliances in EU-27 in 2007 amounted to around 43TWh, which is 5.4% of total residential electricity consumption (Bertoldi, et al., 2009). According to another recent study, based on measurements in 1300 homes across the EU, the average standby electricity consumption is about 305 kWh per household per year, which is about 11% of the total annual electricity consumption per household (REMODECE, November 2008).

In Germany, the share of standby is estimated to be about 6.8% or 9.4 TWh (Fraunhofer IZM / Fraunhofer ISI, 2009). Substantial technical and behavioural saving options exist to reduce standby consumption. For Germany, electricity savings of 4.6 TWh are estimated until 2020, if all saving options with regard to standby were applied. This means a halving of current standby consumption in the residential sector. On the part of manufacturers, the technical solutions for reducing standby consumption, which are mostly cost-effective, are often not applied due to possible additional costs for the manufacturer, and also because it is not a market access requirement [(Bertoldi, et al., 2009), (EuP Lot6, October 2007)].

In a recently completed Intelligence Energy Europe (IEE) Project, REMODECE (Residential Monitoring to Decrease Energy Use and Carbon Emissions in Europe - http://remodece.isr.uc.pt), the electricity use of appliances in houses has been monitored in detail (with separate metering of lighting and individual appliances) in some 1300 homes across the EU. The average measured standby power was about 40W and electricity consumption is 305 kWh per household per year, which is about 11% of the total annual electricity consumption per household. The standby electricity consumption, for all participating countries of REMODECE project, amounts in total to about 40 TWh (REMODECE, November 2008). For the tertiary sector the annual electricity consumption for the standby of office appliances in EU-27 countries is estimated to be 9.43 TWh (Bertoldi, et al., 2009).

In 2005, the G8 leaders agreed to promote the application of the International Energy Agency's (IEA) 1-Watt initiative which aims to reduce standby requirements for all new appliances to below 1 Watt by 2010, which was a positive step in the right direction.

It is generally accepted that the demand for information and communication services and technologies will sharply increase. The future power demand will be more influenced by the technical improvements introduced in the equipments by manufacturers, as well as by voluntary agreements and programmes (such as the Code of conduct for Digital TV Services, Code of Conduct on Energy Consumption of Broadband Communication Equipment, Code of Conduct on Efficiency of External Power Supplies and IEA Standby Power Initiative). Electrical and electronic equipment with standby and off-mode losses is a fast growing load (e.g. entertainment, information and communication technologies -ICT, set top boxes-STB). In the near future, all domestic equipment (including white goods) is likely in the near future to be

controlled by electronic equipment, and will have the capability to communicate with other equipment. This situation will potentially lead to an increase in the standby and off-mode electricity consumption, if appropriate policies are not implemented.

The SELINA project

The name SELINA stands for *Standby and Off-Mode Energy Losses In New Appliances Measured in Shops*. The SELINA project was directed to characterize the EU market in terms of standby and off-mode consumption in new electrical and electronic household and office equipment, being sold in shops, following a specific measuring methodology developed within the project. A large scale monitoring of new equipment was conducted in order to characterize low power modes ("lopomos"), of the equipment being sold in a large geographically diverse sample of 12 EU Countries. More than 6.000 pieces of equipment were measured, in the period 2009-2010, before and after the entering in force of the European Regulation EC 1275/2008 regarding standby and off-mode power consumption. The groups of products that were covered include:

- Entertainment equipment (Set Top Box, TVs screens of all sizes and technologies, DVD players and recorders, Video Projectors, Hi-Fi, Home Cinema systems, game consoles, all external Power supplies and Chargers associated with portable entertainment equipment);
- Information and Communication Technologies - ICT (Desktop and Notebook Computers, Monitors, Printers, Fax machines, wired and wireless Routers, cordless Telephones, Answering Machines, all External Power Supplies and Chargers associated with portable ICT equipment.);
- Large appliances (Washing Machines, Dishwashers, Tumble Dryers, Chillers, Air Conditioning devices, etc.);
- Miscellaneous (Electronic Controllers for central heating/cooling and solar systems, home Alarm Systems Garage Door Openers, Occupancy Sensors / Automatic Light Switches etc).

Another aim of the SELINA project was to propose a representative "basket of products" for which standby and off-mode power levels could be measured and tracked in any country around the world. This basket was measured by interested parties to compare trends in standby and off-mode power within that country and across countries.

International cooperation with institutions outside the EU, involved in similar efforts [IEA Implementing Agreement 4E (Efficient Electrical End-use Equipment) with an Annex on Standby, Energy Star/EPA in USA, Australia Standby Initiative, Swiss Federal Office of Energy] were used to promote synergies in the definition of common approaches to characterize the market and to define realistic and cost-effective performance targets which can be achieved in a short time frame.

The purpose of these standby and off-mode measurements on a common set of products was to characterize equipment consumption and to allow national and international comparison of these like equipments across different countries and regions. Such measurements allow to increase the awareness of stakeholders of the magnitude of standby and off-mode power and to provide a focal point to highlight possible differences across regions between similar equipments. Such measurements also help to demonstrate the effectiveness of the policy mix used in individual countries and promote products that meet the standby power challenge.

The SELINA project produced a user friendly brochure with 8 pages (in each partner national language), with guidelines on equipment selection and operation. This brochure emphasizes not only energy and financial benefits, but also the reduction of the carbon emissions and the contribution to the EU climate change targets. It provides key stakeholders (retailers, energy agencies; consumer associations as well as consumers) with estimates of energy requirements and operating costs for electrical appliances, allowing consumers to make more informed electrical equipment buying decisions.

One of the main objectives of SELINA Project was to identify effective market transformation policies initiatives targeted at all the key stakeholders involved in the manufacture, distribution, sales, purchasing and operation of appliances with standby and off-mode losses. As a result of the future policy actions that may appear after the end of the project, and considering loads in networked mode, it is expected to achieve a huge cost-effective savings of electricity (80TWh projected by 2020) and carbon emissions (30MTons of CO_2 by 2020).

In the long term, project activities will aim to:

1. Increase the penetration of energy efficient equipment in the residential and tertiary sectors;
2. Increase consumers awareness leading to an improvement of their behaviour in the selection and operation of the electricity consuming equipment;
3. Reduce standby and off-mode electricity consumption (the economic potential is about 80 TWh/year by 2020);
4. Reduce the carbon emissions (the savings potential is over 30 million tons of CO2 by 2020), thus contributing to meeting the EU climate commitment and helping to mitigate climate change;
5. Increase and accelerate the availability of higher energy performance equipment in the market.

2 Measurement methodology

A common measurement methodology was developed and the same equipment (ADpower – WATTMAN HPM-100A) was used by all partners in all countries. This way it was possible to collect comparable values between countries.

This section does not intend to be an exhaustive explanation of the methodology used. The understanding of the methodology requires the reading of the specific document developed. This document can be accessed at project website: www.selina-project.eu

2.1 Measurement procedure

In order to store the data from the monitoring campaigns, an Excel data sheet was created. This excel data sheet was based on the Australian Excel data sheet with a few simplifications. Indeed the Australian datasheet does not only cover standby and off-mode information, but it also includes energy consumption in other modes for energy labeling and MEPS according to Australian Standards.

A significant improvement was made regarding the acquisition and data storing mode. IT-Energy/Intertek/ARMINES developed a "macro" allowing the communication between the wattmeter and the excel data sheet. This enabled to minimize the errors due to data manipulation and a lot of time was saved for the measurement campaign. The measurement procedure is illustrated hereafter.

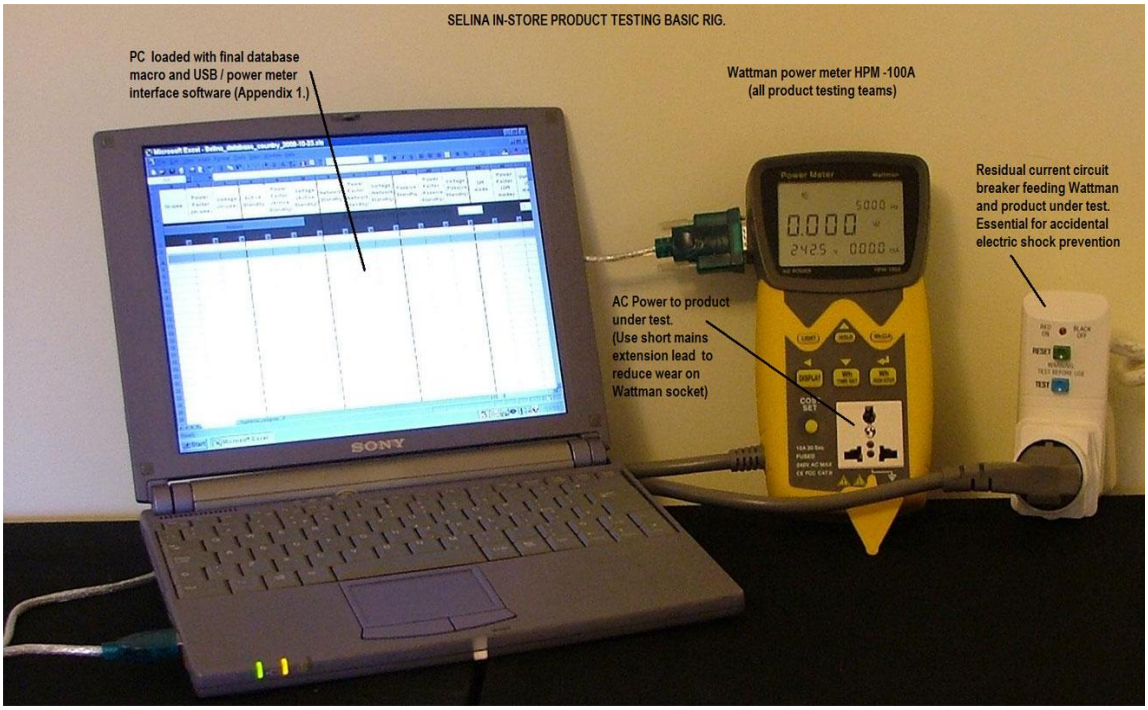


Figure 3 – Illustration of the measurement process.

The measurement equipment (Wattman) is connected to the mains and connected to the computer; it can communicate with the excel data sheet through a macro. Then the product is plugged into the Wattman and the measurement can be started. The measurement can last between 1 to 10 minutes depending on the stability of the power consumption (the measurement time period is chosen by the user) and the average values are then recorded automatically into the excel file: voltage, power factor and active power.

2.2 Target products

First of all, how could a certain product type be defined (e.g. TV), to be sensitive for market trend and at the same time general enough to cover differences between countries? When focusing only on basic functions, it could be general and easily found in any EU members' market, but it could be far from the market trend. On the other hand, when considering on all high-tech products in markets, it could reflect most market trend, but the cost of implementing policies based on its complexity would be too high to afford. Therefore, it was necessary to prepare a product type providing both qualities, being ordinary in markets and responsive to market in the steps of measurement. The second issue was naming rules: if specific naming rules were not created, not only records of measurement results across countries but also the ones with time gap could be inconsistent, ensuing extra effort to make different terms compatible. These appear to be minor problems but if done in the beginning steps, they are greatly helpful in the long term of an international project.

Base+Adders

For the purpose of meeting two qualities of product type (being general and responsive for market), it was used the "Base+Adders" model (Nordman, et al., 2006), and its form and naming rules are as follows: **[Base(Main body), Adder/Adder/.....]**

> **Base:** As a basic function or most significant function to be recognized or distinguished in a market/store. It could be replaced by "Adder" responding to market trend.
>
> **Adders:** extra functions or characteristics being listed by '/' and selected among technical parameters in terms of the effect over the standby consumption.

Example: TV incorporating two functions of satellite receiver and LCD

> → TV, LCD / satellite receiver

A list of products was extracted from the existing relevant standby studies. 269 different products were identified in these previous standby related studies. They were classified with an adapted taxonomy with 4 main levels: entertainment, ICT, appliances and miscellaneous and two adders.

From the existing standby studies in Europe and abroad, a shortened list of products thought to have high impact on the total standby energy consumption was created.

Regarding market data, when no study was identified, Prodcom data was used. The stock of products was computed simply from the product of life time and sales in a reference year. Low power mode unitary power was identified from past studies. With the EuP standby regulation entering into force, it was likely that a large part of these products unitary standby power values would decrease to meet maximum legal requirements.

This also means that other products that were not firstly included in the basket of products could become more relevant to be measured than products that reveled to be less efficient in the previous years. It was then necessary to open the measurements to new products, presently not covered in the EuP standby regulation. To achieve these goals would require some flexibility in the choice of the appliances measured, but keeping in mind the order of magnitude of the sales or stock data of products measured, in order not to spend too many measurements with low volume products.

The present methodology was created in order to help finding existing products in shops for each country where SELINA's measurements took place. For a chosen product, a web search was done to determine the 2 or 3 most common stores, normally almost all products are available in common electrical stores. Next a simple search on each store website was done to determine the number of available models[2]. If a low number of models were observed in these stores, a research for specialized stores should be made.

It is important to know the most important brands for each product/country because it gives a clue of what equipments should be priority and to define the differences between countries in terms of brand/models commercialized.

Then the store with the larger number of products corresponds to the maximum number of available models to measure.

[2] *The most important brands and the number of models are normally indicated on the website.*

The figure bellow shows a scheme of this methodology:

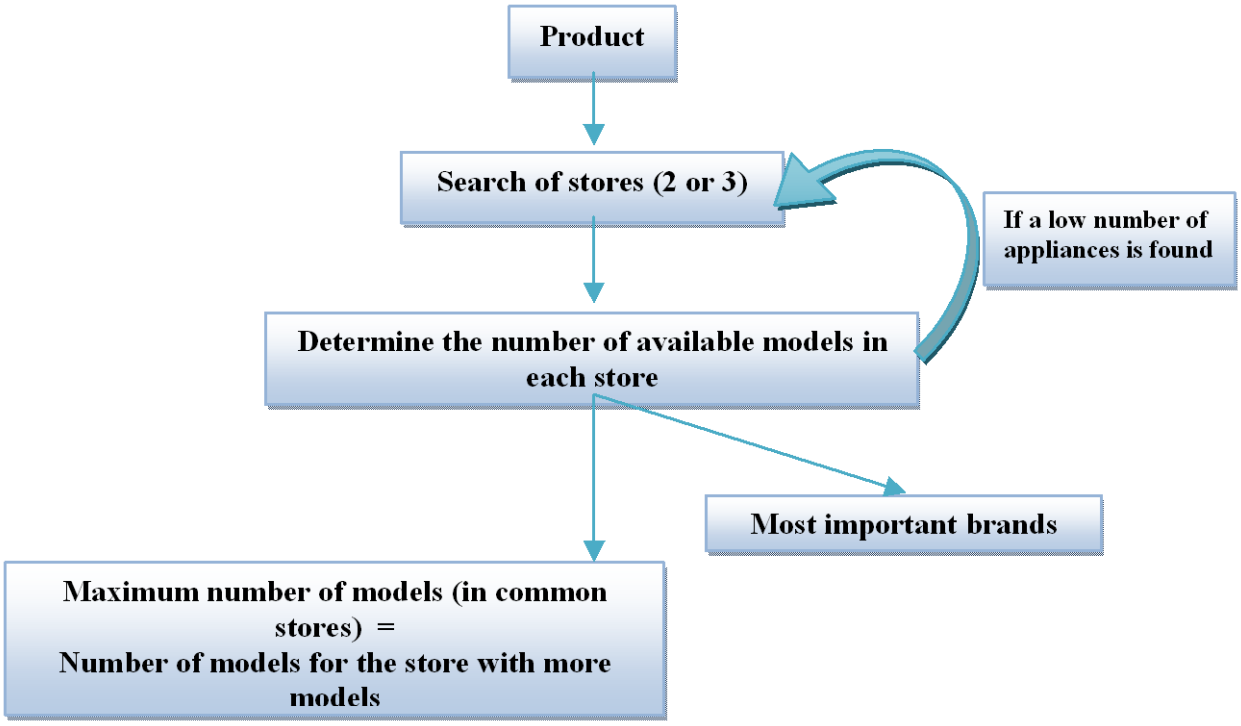


Figure 4 – Methodology for product to measure.

2.3 How to override the problem of repeated measurements?

To overlap the problems of repeated measurements the following three steps were followed:

1. In a first approach each partner went to the store and righted down all the available models for measurement;
2. Secondly the recovered models were introduced in the online database. If one or more of the introduced models was already available in the database, a note appeared showing the list of models which couldn't be measured;
3. The measurements were done for the "available" models.

At a certain time, during the measurement campaigns, the teams were not able to follow these 3 steps and some double measurements were made. These double values were used to calculate the error of the measurements.

2.4 Equipment power mode definition

The terms in this study regarding low power modes are in agreement with the EuP Preparatory study DGENER LOT 6, and with the APP (Asian Pacific Partnership on Clean Development and Climate) study. The minimum recording requirements for each product are, Power (W), Power Factor and Voltage (V), as defined in the EC 1275/2008 regulation. The different mode definitions are as follows:

Off-mode

In this mode the appliance does not offer any functions and burdens no load, despite its connection to a power source. Depending on whether power consumption is 0 watt or not, it could be conceptually divided into two modes:

1) 0 Watt off-mode,

2) Off-mode with losses.

To have an off mode, the product must have a power switch located on the product.

Off mode is when a product or appliance is connected to a power source but does not produce any sound or picture, transmit or receive information or is waiting to be switched “on” by the consumer.

If the product has a remote control, it cannot be woken by the remote control from off mode – it can only be activated via the power switch on the product.

No display should be active in off mode. While the product may be operating some internal functions in off mode (e.g. memory functions, EMC filters) these are not obvious to the user.

Passive standby mode

In this mode the appliance is put into low power mode by a certain means like switch or remote control, providing one of the following additional functions, not a main function, and it is identical to that of DGENER EuP Lot 6.

- Reactivation function provided by soft or hard switch, remote control, internal sensor or timer,
- Continuity functions:
    - Information or status displays including clocks
    - Information storage (volatile memory)
    - Sensor-based safety functions
- Product incorporating internal timer which enables the automatic reactivation after a certain time delay usually provides function of delay start, function to be carefully considered.

Networked standby mode

In this mode the appliance provides one of the following additional functions, not a main function, and it is identical to DGENER EuP Lot 6 networked standby mode definition:

- Reactivation via network command
- Network integrity communication

Active standby mode (Transition to standby)

Active Low (active standby) is when the appliance is on but not performing its main function. For example, the DVD may be on but is not playing or recording. This mode is usually only present in devices:

(a) where there is a mechanical function which is not active (e.g. DVD drive or motor) but where power circuits are on, or
(b) where a device has a battery and the device is charging or
(c) where a device is in a quiescent power state (audio amplifier with no audio signal) or
(d) the device is downloading data (STB or TV updating Electronic Program Guide or software)

In-Use

In this mode the appliance provides one or more of its main functions. During the measurement campaign, it was asked to all partners to measure as many modes as possible in order to achieve the maximum information about products power consumption.

If the study mainly focused on *passive standby* and *off-mode*, a few measurements were attempted of n*etwork standby* and also *in-use* modes for some products. Network standby was found very difficult to measure.

2.5 Standby definitions and the EU regulation 1275/2008

Since there is a difference between the EU Regulation and the SELINA's definition for standby (Table 1) and to maintain a low power mode definition coherent with other studies (for matter of comparison), a column of the excel datasheet was used to identify which of the two EU Regulation standby definitions was measured.

Table 1 – Differences between SELINA's and EU Regulation low power modes definitions.

<table>
<tr><td rowspan="2">EU Regulation 1275/2008</td><td rowspan="2">Active mode</td><td colspan="2">Standby</td><td rowspan="2">Off-mode</td></tr>
<tr><td>Reactivation</td><td>Information or status display</td></tr>
<tr><td>SELINA</td><td>In-Use</td><td colspan="2">Passive standby mode

Delay start</td><td>Off-mode
(with losses)</td></tr>
</table>

It was important to correctly identify these two EU standby modes because different standby consumption limits are set by the EU regulation 1275/2008 (Table 2) for each one of the low power modes.

Table 2 – Off-mode and standby limits set by the EU regulation 1275/2008.

	2010 limit	**2013 limit**
Off-mode (W)	*1*	*0.5*
Standby – Reactivation only (W)	*1*	*0.5*
Standby – information or status display (W)	*2*	*1*

Regarding Off-mode power consumption the definitions are the same, both for SELINA and EU Regulation 1275/2008.

2.6 Basket of products

In this section, it is described the steps to identify and choose the appliances to measure.

A list of 269 products was identified, based on previous standby related studies [(EuP Lot6, October 2007), , (Meier, et al., 2007), (Energy Consult, June 2008)]. However this number was reduced to 139, because some appliances showed to be very difficult to find or to measure in a shop environment. This list is presented in Table 3.

Table 3 – List of measured products.

	Appliance	Domain	Class
1	Access control	Miscellaneous	Building&Infrastructure
2	Air cleaner	Appliances	HVAC
3	Air compressor	Miscellaneous	Building&Infrastructure
4	Air conditioning	Appliances	HVAC
5	Answering machine	ICT	Telephony
6	Automatic griddles	Appliances	Cooking-Heating
7	AV Receiver	Entertainment	Audio
8	Barbecue grill	Appliances	Cooking-Heating
9	Battery charger	Appliances	Power
10	Blender	Appliances	Cooking-Cutting
11	Breadmaker	Appliances	Cooking
12	Can opener	Appliances	Cooking-Heating
13	Cassette deck	Entertainment	Audio
14	CD player	Entertainment	Audio
15	Circular saw	Miscellaneous	Building&Infrastructure
16	Coffee grinder	Appliances	Cooking
17	Coffee maker	Appliances	Coffee maker
18	Computer - Laptop	ICT	Computer
19	Computer - Speakers	ICT	Computer
20	Computer - Monitor	ICT	Computer
21	Computer - Desktop	ICT	Computer
22	Computer/TV	Entertainment	Display
23	Cooktops	Appliances	Major Appliance
24	Copier	ICT	Imaging
25	Deep fryer, residential	Appliances	Cooking-Heating
26	Dehumidifier	Appliances	HVAC

27	Digital camera	Entertainment	Display
28	Digital photo frame	Entertainment	Display
29	Dishwasher	Appliances	Major Appliance
30	Drier	Appliances	Major Appliance
31	Drill	Miscellaneous	Building&Infrastructure
32	DVD, portable	Entertainment	Audio
33	DVD/BR, players	Entertainment	Audio
34	DVD/BR, recorders	Entertainment	Audio
35	DVD/VCR	Entertainment	Video
36	Egg boiler	Appliances	Cooking-Heating
37	Electric blanket	Appliances	HVAC
38	Electric chain saw	Miscellaneous	Building&Infrastructure
39	Electric knife	Appliances	Cooking-Cutting
40	Electric toothbrush	Appliances	Personal Care
41	Electric toys, mains connected	Miscellaneous	Toys
42	Electric water boiler	Appliances	Cooking-Heating
43	Electrical piano / other el. instruments	Entertainment	Audio
44	Electronic controllers for central heating/cooling	Miscellaneous	Building&Infrastructure
45	Electronic controllers for solar systems	Miscellaneous	Building&Infrastructure
46	Epilator	Appliances	Personal Care
47	EPS	Miscellaneous	EPS
48	Equalizer (audio)	Entertainment	Audio
49	External DVD/CD - Drive	ICT	Computer
50	External hard disk	ICT	Computer
51	Facsimile	ICT	Imaging
52	Fan	Appliances	HVAC
53	Fondue	Appliances	Cooking-Heating
54	Food dryer	Appliances	Cooking
55	Food processor	Appliances	Cooking-Cutting

56	Food slicer	Appliances	Cooking-Cutting
57	Freezer	Appliances	Major Appliance
58	Fruit press	Appliances	Cooking
59	Frying pan	Appliances	Cooking-Heating
60	Game console	ICT	Computer
61	Garage door openers	Miscellaneous	Building&Infrastructure
62	Grill	Appliances	Cooking-Heating
63	Hair clipper	Appliances	Personal Care
64	Hair curler	Appliances	Personal Care
65	Hair dryer	Appliances	Personal Care
66	Hair straighteneir	Appliances	Personal Care
67	Hand mixer	Appliances	Cooking-Cutting
68	Hand-held blender	Appliances	Cooking-Cutting
69	Handheld vacuum	Appliances	Cleaning
70	Hard disk recorder	Entertainment	Video
71	Headphones (wireless base station)	Entertainment	Audio
72	Heater - electric	Appliances	HVAC
73	Heater - gas	Appliances	HVAC
74	Home security system	Miscellaneous	Building&Inflastructure
75	Home theatre system	Entertainment	Audio
76	Hot air gun	Miscellaneous	Building&Infrastructure
77	Hot plate (kitchen)	Appliances	Cooking-Heating
78	Humidifier	Appliances	HVAC
79	Ice cream maker	Appliance	Cooking-Cutting
80	Iron	Appliances	Personal Care
81	Jigsaw	Miscellaneous	Building&Infrastructure
82	Juicer	Appliances	Cooking-Cutting
83	Kettle	Appliances	Cooking-Heating
84	Kneader	Appliance	Cooking-Cutting
85	Knife sharpener	Appliance	Cooking-Cutting

86	Lighting, lamp/transformers	Miscellaneous	Lighting
87	Massage device	Appliances	Personal Care
88	Microwave	Appliances	Cooking-Heating
89	Microwave, Oven	Appliances	Cooking-Heating
90	Mobile phone/Smart phone	ICT	Computer
91	Modems, routers (cable or wireless connection)	ICT	Network
92	Multi-function device	ICT	Imaging
93	Oven	Appliances	Cooking-Heating
94	Oven + cooktop	Appliances	cooking-heating
95	PDA	ICT	Computer
96	Phone, Cordless - Base station	ICT	Telephony
97	Phone, Cordless - Outpost	ICT	Telephony
98	Pop corn machine	Appliance	Cooking-Cutting
99	Printer, inkjet	ICT	Imaging
100	Printer, laser	ICT	Imaging
101	Projector	Entertainment	Display
102	Projector, projector slide	Entertainment	Display
103	Raclette	Appliances	Cooking-Heating
104	Radio	Entertainment	Audio
105	Rangehoods	Appliances	Major Appliance
106	Refrigerator	Appliances	Major Appliance
107	Rice cooker	Appliances	Cooking
108	Sander	Miscellaneous	Building&Infrastructure
109	Scanner	ICT	Imaging
110	Security camera	Miscellaneous	Building&Infrastructure
111	Sensor(light)	Miscellaneous	Building&Inflastructure
112	Set-Top box	Entertainment	Set-top-boxes
113	Sewing machine	Appliances	Personal Care
114	Shaver	Appliances	Personal Care

115	Shredder	Miscellaneous	Shredder
116	Speaker, powered	Entertainment	Audio
117	Stand mixer	Appliances	Cooking-Cutting
118	Steam cleaner	Appliances	Cleaning
119	Steam cooker	Appliances	Cooking-Heating
120	Steam iron station	Appliances	Cleaning
121	Stereo, integrated	Entertainment	Audio
122	Stereo, portable	Entertainment	Audio
123	Subwoofer	Entertainment	Audio
124	Toaster	Appliances	Cooking-Heating
125	Tuner	Appliances	Audio
126	Turn table	Entertainment	Audio
127	TV, LED	Entertainment	Display
128	TV, portable	Entertainment	Display
129	TV, CRT	Entertainment	Display
130	TV, LCD	Entertainment	Display
131	TV, PLASMA	Entertainment	Display
132	Vacuum cleaner	Appliances	Cleaning
133	Vacuum machine	Appliance	Cooking-Cutting
134	VCR	Entertainment	VCR/DVD
135	Videocassette rewinder	Entertainment	Video
136	Waffle maker	Appliances	Cooking
137	Washer / Dryer	Appliances	Major Appliance
138	Washing machine	Appliances	Major Appliance
139	WIRELESS AUDIO TRANSMITTER	Entertainment	Audio

From this reduced list, a basket of products of about 45 items was also defined (Table 4). The final basket of products was based upon EU regulation EC 1275/2008 and on the APP studies on standby, so that comparisons could be made with other countries (out of the EU). This is very useful in order to benchmark the EU situation regarding other countries around the world. This basket of 45 products was also used to assess the market transformation induced by the EU regulation EC 1275/2008 implementation.

Table 4 – Basket of Products.

Basket of Products	
Air conditioning	Mobile Phone/Smart Phone
AV Receiver	Modems, Routers (cable or wireless connection)
CD Player	Multi-function device
Coffee maker	Oven
Computer - Laptop	Phone, Cordless - Base station
Computer - Monitor	Phone, Cordless - Outpost
Computer - Desktop	Printer, inkjet
Cooktops	Printer, laser
Copier	Projector
Digital photo frame	Radio
Dishwasher	Rangehoods
DVD/BR, players	Set-Top box
DVD/BR, recorders	Computer - Speakers
Electric toothbrush	Stereo, integrated
EPS	Stereo, portable
Facsimile	Subwoofer
Hair dryer	Toaster
Heater - Electric	TV, LED
Heater - Gas	TV, CRT
Home security system	TV, LCD

Home theatre system	TV, PLASMA
Lighting, lamp/transformers	Washing machine
Microwave	

To organize the different appliances and allow an analysis by appliance classes, 17 classes were defined, which are shown hereafter. The table below gives some appliances examples for each class.

Table 5 – Products Class.

Class	Examples
Audio	Stereo integrated, radio…
Building&Infrastructure	Sensor (light), home security system…
Cleaning	Steam iron station, handheld vacuum cleaner…
Computer	Laptop, desktop computer…
Cooking	Microwave, oven…
Display	TV…
EPS	EPS…
HVAC	Electric heater, air conditioners…
Imaging	Copiers, laser printer…
Lighting	Lighting, lamp/transformers…
Major appliance	Washing machine, dryer…
Network	Modems, routers…
Personal care	Shaver, hair dryer…
Power	Battery charger…
Set-top-boxes	Set-top-boxes…
Telephony	Phone, Cordless - Base station, Answering machine…
VCR/DVD	DVD player, VCR…

3 Measurement results

About 6318 of the 6000 targeted appliances (Figure 5) were measured. However 324 measurements corresponded to double measurements.

The first measurements were not made using the developed methodology. Therefore, because the Excel macro improved the measurement precision, those first measurements were replaced by the extra measurements carried out whenever possible.

The next figure represents the measurements by country.

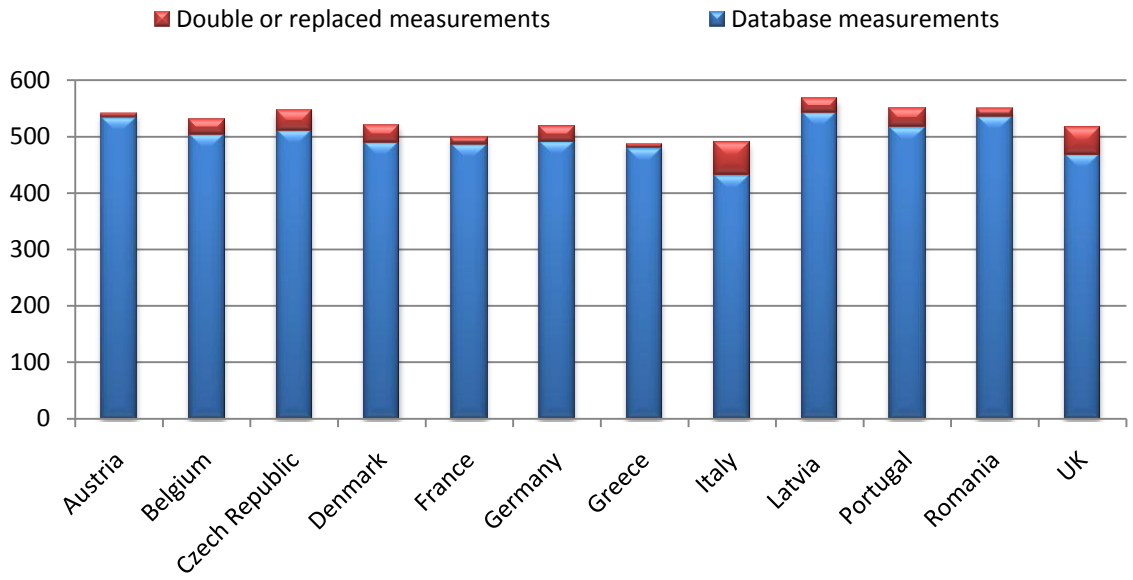
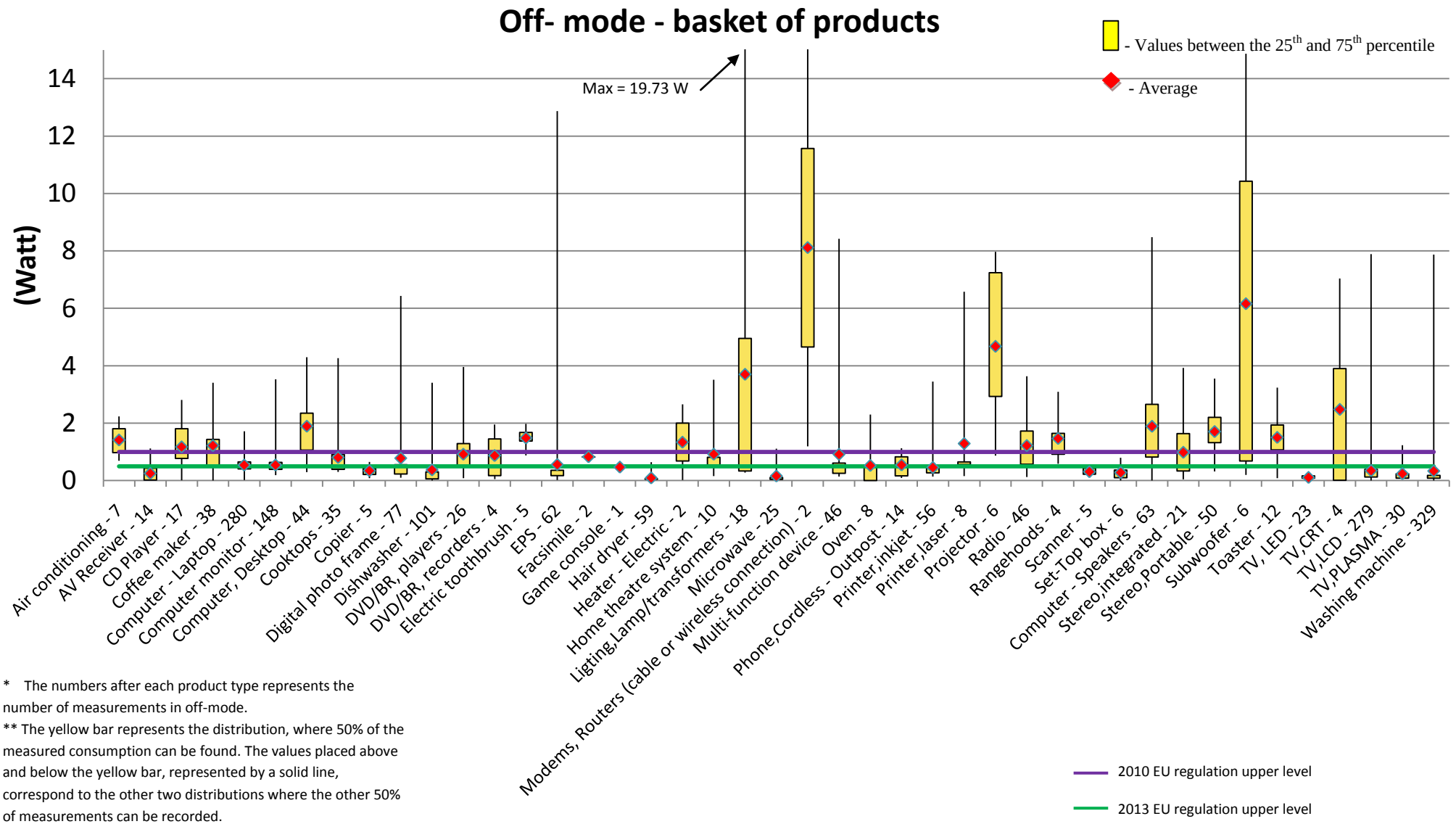


Figure 5 – Measurements distribution by country.

It can be seen that almost all countries reached or surpass the fixed target (500 products by country).

The SELINA database, corresponding to the measurements without doubles (repeated equipment models measured) is available online on the SELINA Project website (www.selina-project.eu).

The measured power of appliances in off-mode (with losses) is represented in Figure 6. The measured power of appliances in standby is represented in Figure 7.



* The numbers after each product type represents the number of measurements in off-mode.

** The yellow bar represents the distribution, where 50% of the measured consumption can be found. The values placed above and below the yellow bar, represented by a solid line, correspond to the other two distributions where the other 50% of measurements can be recorded.

Figure 6 – Off-mode input power for the basket of products.

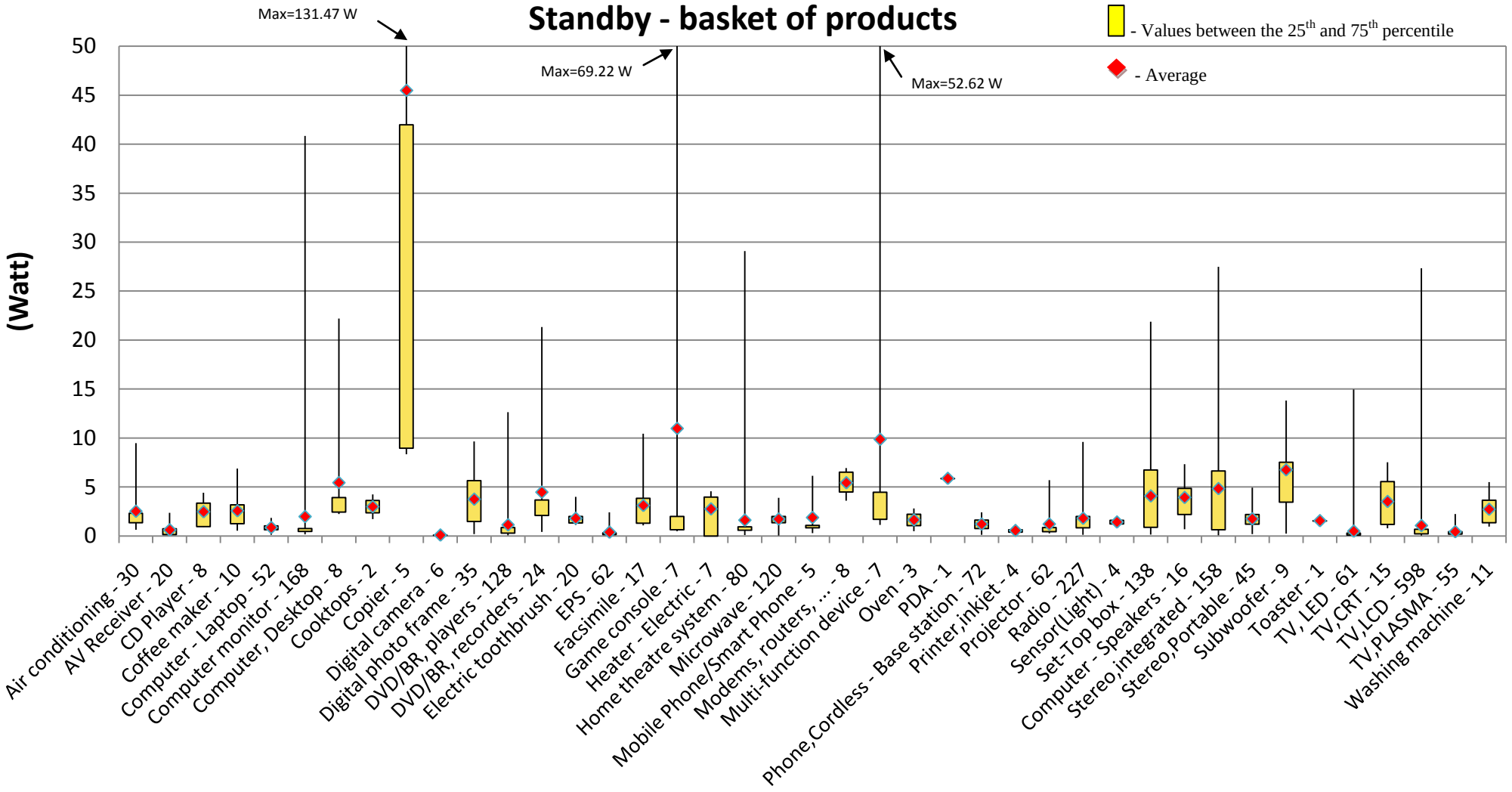


Figure 7 – Standby input power for basket of products.

* The numbers after each product type represents the number of measurements in standby.

** The yellow bar represents the distribution, where 50% of the measured consumption can be found. The values placed above and below the yellow bar, represented by a solid line, correspond to the other two distributions where the other 50% of measurements can be recorded.

*** No EU regulation thresholds is presented in this figure because they depend on each products characteristics (presence of display/clock or not)

The reason why there is a small number of measurements for example for copiers, home security systems, modems, and others is because some products were very difficult to find in shops or to get the necessary conditions to measure them. The reasons behind this are: either that there are only a few number of models being sold or exposed (sometimes only the product box is exposed – or for modems, there is no off mode and it is difficult to simulate passive mode) or that they are hard-wired.

There are some products that appear in the Figure 6 and are not listed in the Figure 7 and vice-versa because these two modes of operation are not always available at the same time on the same product.

In off-mode, lighting-lamp/transformer registered the highest input power with 19.73W. Regarding the standby power, the highest input power registered was a copier with 131.47W.

Copiers, game consoles, multi function devices and computer monitors are the products with the highest standby measured input power. However these high values represent a low percentage of the total measurements. It should be noted that these high values can be due to equipment damage, production defect or products with special features.

The values for off-mode input power are in general low and almost always near the EU regulation limits. In the case of the standby mode, the input power values are higher, as expected, but only slightly above the EU regulation (1 W and 2 W for 2010 limits – depending if the equipment has only a reactivation function or a display/information).

In the next figure, the input power in off-mode and standby of the equipments measured, in the scope of SELINA project, is compared with the regulation limits, showing the percentage of products over the EU regulation threshold is shown in Figure 8.

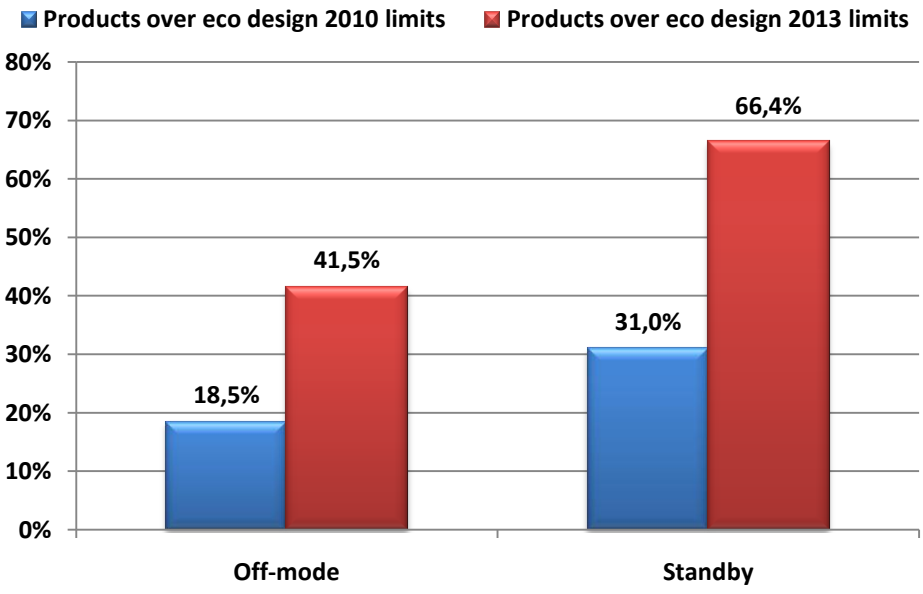


Figure 8 – Compatibility of the appliances input power with the EC 1275/2008 regulation threshold.

The previous figure shows that 18.5% of the measured products presented power values higher than the 2010 EC 1275/2008 regulation threshold in off-mode. For standby this value reaches 31%. When a comparison is made with the 2013 EC 1275/2008 regulation threshold these values are doubled.

Because the measurement campaign started in 2009 and ended in June 2010, with the EC regulation entering into force in January 2010, it was expected to identify a significant difference between the values measured before and the ones measured after the entry into force of the regulation. However, the 2010 measurement results tend to show that the number of products over the EU regulation threshold did not vary significantly (Table 6).

Table 6 – Difference between 2010 and 2009 measurements related to measurements out of EU regulation limits.

	Off-Mode	Standby
Difference between 2010 and 2009 Products over eco design 2010 limits	2.6%	-1.7%
Difference between 2010 and 2009 Products over eco design 2013 limits	-1.7%	2.1%

This suggests that manufacturers of most products already adopted their production to the DGENER Lot 6 EuP study on standby, which started in 2006. The low difference between 2009 and 2010 measures could also be due to remaining product stocks.

Anyway it appears that future market surveillance will be helpful to verify and to clean the market as intended by the European Regulation.

3.1 Results by class

The next figures show the off-mode and standby power input by product class.

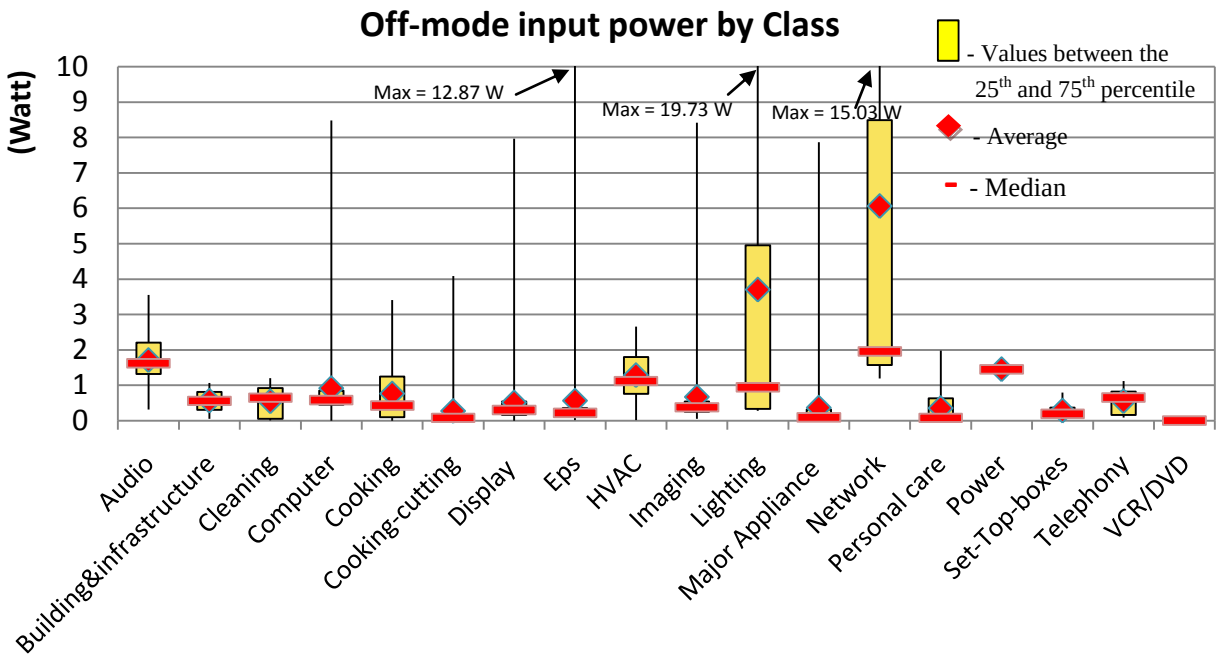


Figure 9 – Off-Mode input power by products class.

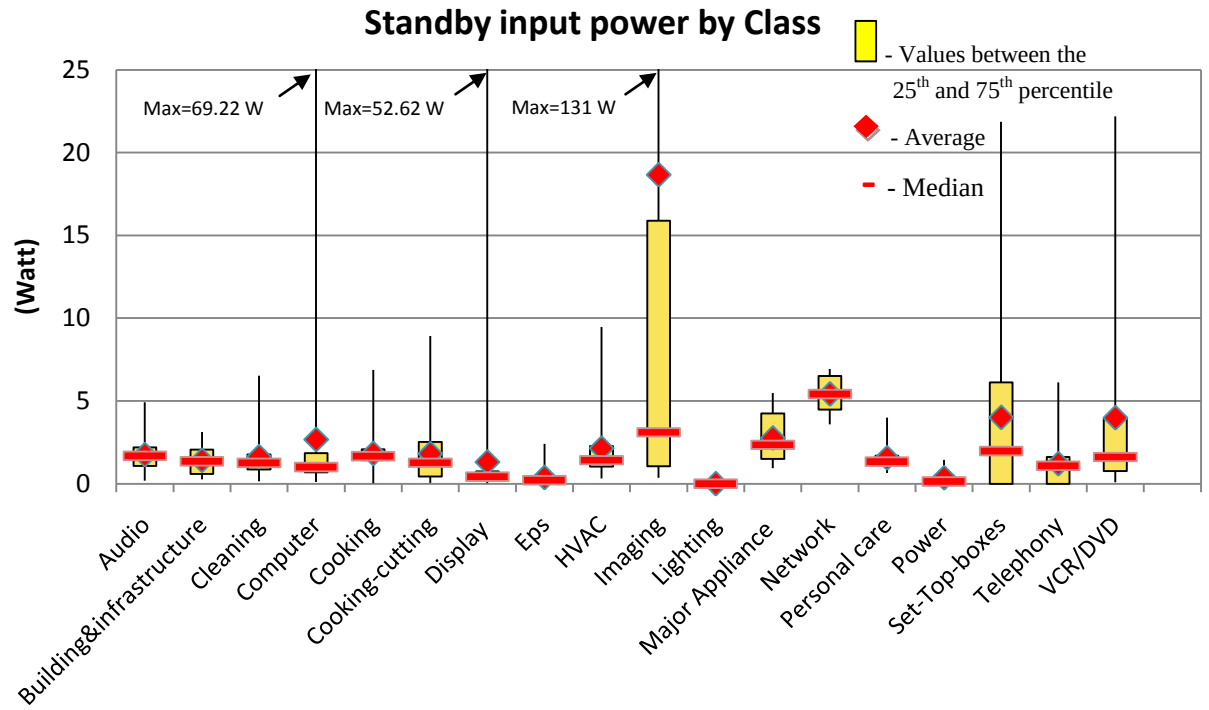


Figure 10 – Standby input power by products class.

In Figure 9, five classes, Audio, HVAC, Lighting, Network and Power (low number of measurements for this class) have values above the EU regulation limits for 2010. On the other hand all the other classes seem to comply with the EU regulation limits.

The standby results show high input power values especially for Network, set-top-boxes and VCR/DVD. The average value for the imaging class was highly influenced by some appliances with very high values. So if the median is taken into account, the standby input power remains relatively low.

Other classes seem to have in general low input power values, closer to the EU regulation thresholds (2 W if display/clock is presented and 1 W if only reactivation function is presented).

3.2 Result comparation with other international studies

One of the SELINA project goals was to identify the low power mode input power in Europe as compared to abroad countries.

In this section, the obtained average values are compared with the data of the APP measurement campaign, more specifically, with the measurements carried out in Australia, Korea and in the United States of America. The comparison is drawn for the “Core basket of products” and for the “Secondary basket of products” of the APP.

However, in order to compare data for the same years, the analysis was limited to the APP data of 2007, 2008, 2009 and 2010.

Additionally, the analysis could not cover all products because not all products from the two referred baskets of products were available, or one of the two baskets had low number of appliances measured to be considered (less than 10 measurements).

The following table gives the list of appliances used to make the comparison between values measured by the two international studies (SELINA and APP).

Table 7 – List of appliances used for comparison from the two basket of products of APP study.

Basket of Core Products	*Basket of Secondary Products*
Major appliances	
Washing machine	Dryer
Microwave	Dishwasher
	Washer/Dryer
	Air conditioner
Home entertainment Products	
TV, CRT	Projector
TV, LCD	DVD, recorder
TV, Plasma	Hard disk recorder
Portable stereo	DVD/VCR
Integrated stereo	VCR
DVD player	AV Receiver
	Subwoofer
Office Equipment	
Computer monitor	Computer desktop
Printer laser	Computer speakers
Printer inkjet	
MFD (multi function device)	
Other Equipment	
EPS	Electric heater (Portable)

3.2.1 Off-Mode comparison

The Figure 11 and Figure 12 show the off-mode values comparison for different studies.

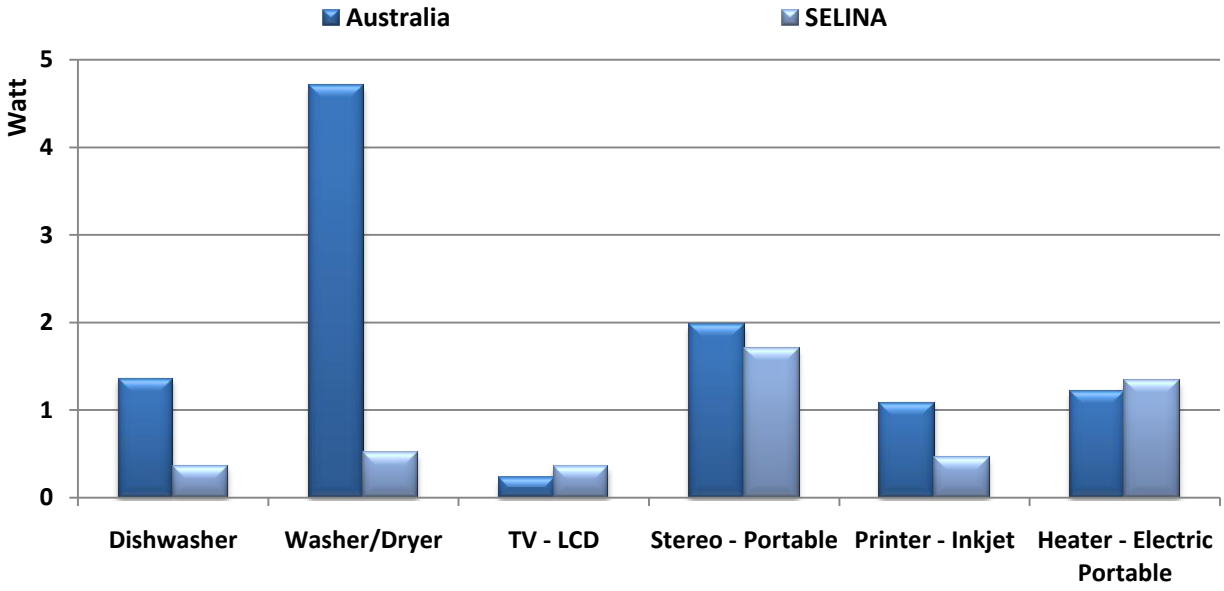


Figure 11 – Off-Mode comparison with APP data.

The previous figure shows that the measurements in off-mode are in some way equivalent for almost all products with the exception of Washer/Dryer and Dishwasher.

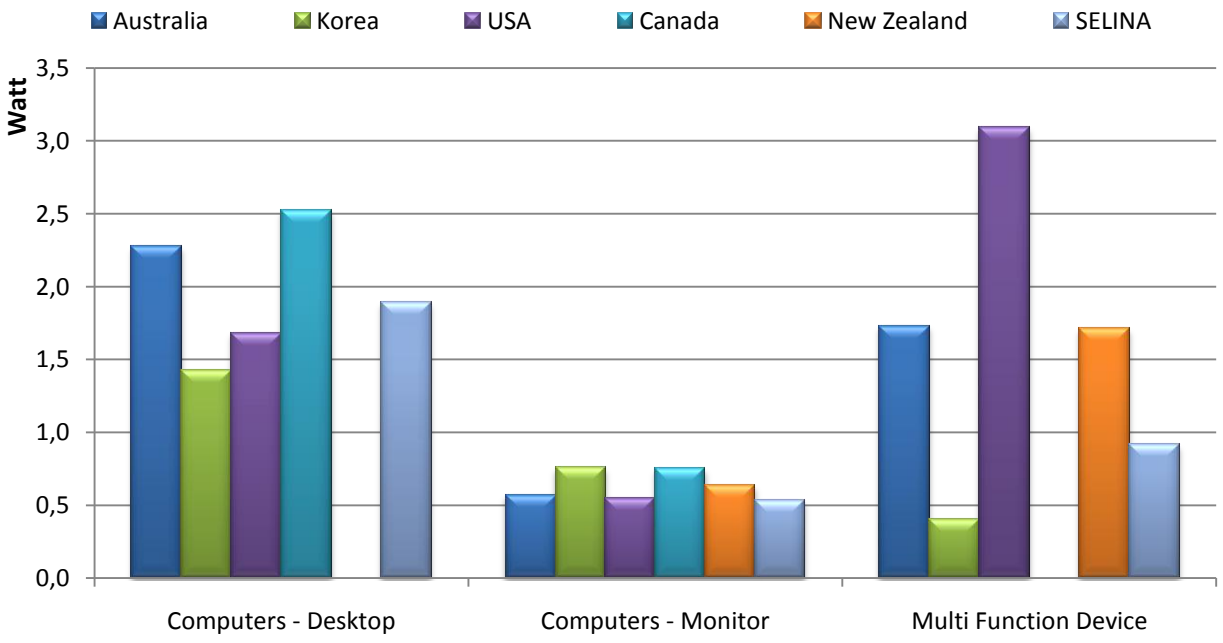


Figure 12 – Off-Mode comparison between SELINA and APP different countries.

In this previous figure, SELINA values have off-mode values with the same range as other countries.

3.2.1 Standby comparison

In the next figures, the measured standby consumption values for 15 different appliance types are presented for the SELINA project and compared to the APP data.

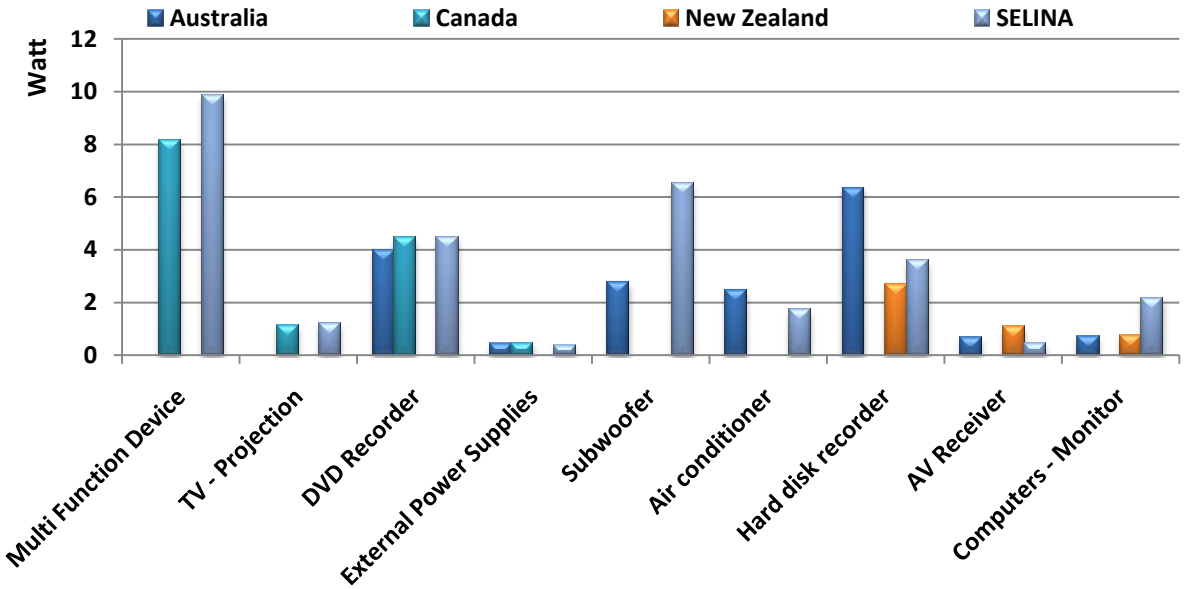
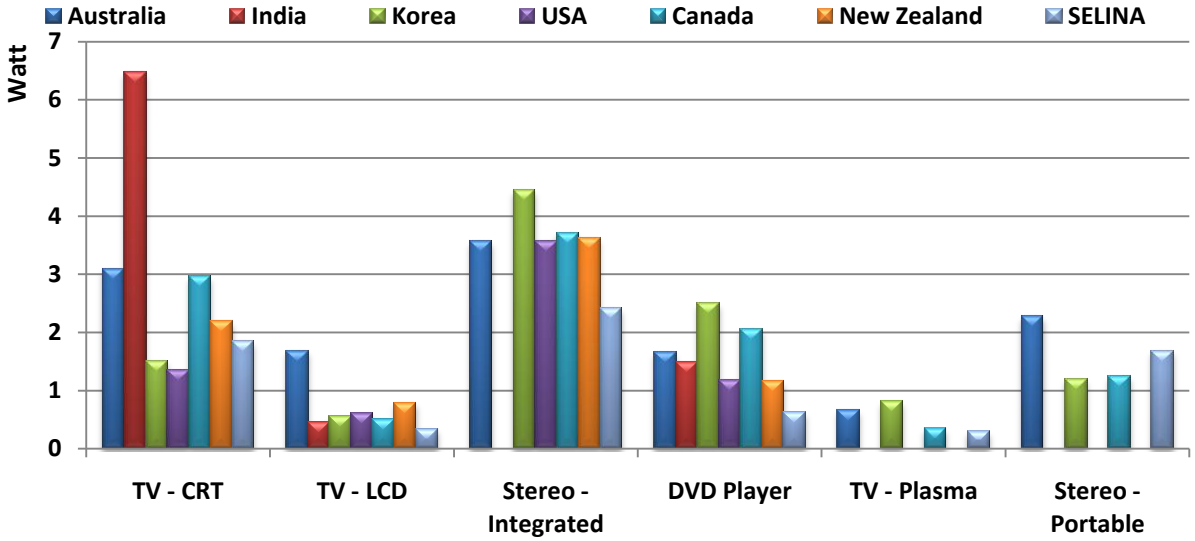


Figure 13 – Standby comparison between studies (1).

The figure above indicates that only subwoofer and computer monitor standby input power was substantially greater than the values obtained for other countries.



Note: SELINA's DVD player measurements also include Blu-ray players

Figure 14 – Standby comparison between studies (2).

Measurements values showed in the previous figure indicate, once more, similar input power values for the six countries used for comparison and the SELINA data.

3.3 Measurement accuracy

During the SELINA measurement campaigns, at a certain time period, it was not possible for some partners to follow the three steps of the methodology to avoid double measurements.

This was in general due to late shop appointments and cooperation difficulties. This created double measurements and the data had to be filtered before being added to the database.

However these double measures of the same appliances offer the possibility to evaluate the measurement accuracy, since the same model was tested in different countries by different partners.

Another feature that the double measurements allowed to evaluate was the precision of the developed "macro" for communication between the excel data sheet and the measurement equipment. From a total of 324 double measurements, 80 corresponded to measurements made without and with the new macro, i.e. one measurement was made without the macro and the other one using the macro. Other 231 measurements corresponded to measurements made for the same appliance with the macro. 13 double measurements were also recorded without the excel macro.

Table 8 – Measurements precision and macro accuracy improvement.

Measurement Error*	*Both measurements with Macro*	*Both measurements without macro*	*Measurements with and without Macro*
Average	11.4%	19.9%	18.9%
Min	0.0%	0.0%	0.0%
Max	100.0%	100.0%	100.0%
Median	3.3%	9.2%	7.5%
Standard deviation	19.4%	28.4%	24.7%
Number of measurements	218	13	80

* Error = |Difference between measurement| / (Maximum value)

The results show that an average error of 19% can occur between measurements with and without the macro. This error decreases to half, when both measurements use the excel macro. An error of the same magnitude is achieved when both measurements were done without the macro. The standard deviation indicates that the error can sometimes be twice as large as the average error.

As the macro improved the measurement precision, measurements in the database without the macro were replaced by those with macro when a double was available.

The measurement procedure with the macro could certainly be completed in order to limit the human involvement in the measurement. But this would require an important engineering work by type of appliance and category, in order to further automate the acquisition by automatic signal treatment.

4 Retailers awareness campaign results

During the implementation of the SELINA project, a large period of time was spent in shops carrying out measurements on equipments. This was an opportunity also to gather other types of information. Two other sources of information were exploited: the customers and retailers role in the decision to purchase more energy efficient appliances. These sources represent vital information, to be able to understand the customers' motivations to choose more energy efficient appliances and the influence of retailers' advice concerning the energy features of the equipment.

The main objective was to answer to the following questions:

- Do retailers have enough information or are they trained enough to correctly advice customers on how to buy energy efficient appliances?
- Are retailers making specific efforts to sell energy efficient appliances?
- Which are the major features that motivate a client to choose a specific appliance? Is energy consumption or is it the functionalities?

To answer these questions, it was decided to perform retailers' interviews, in which each retailer (salesman) had to answer a pre-defined questionnaire. It was also proposed to do customers' interviews, but shop managers/owners did not allow it, because it would interfere with shop sales environment.

Each project partner needed to contribute with a minimum of 25 questionnaires in order to complete the retailer's survey awareness campaign. The analyzed questionnaires per country are shown in the next figure.

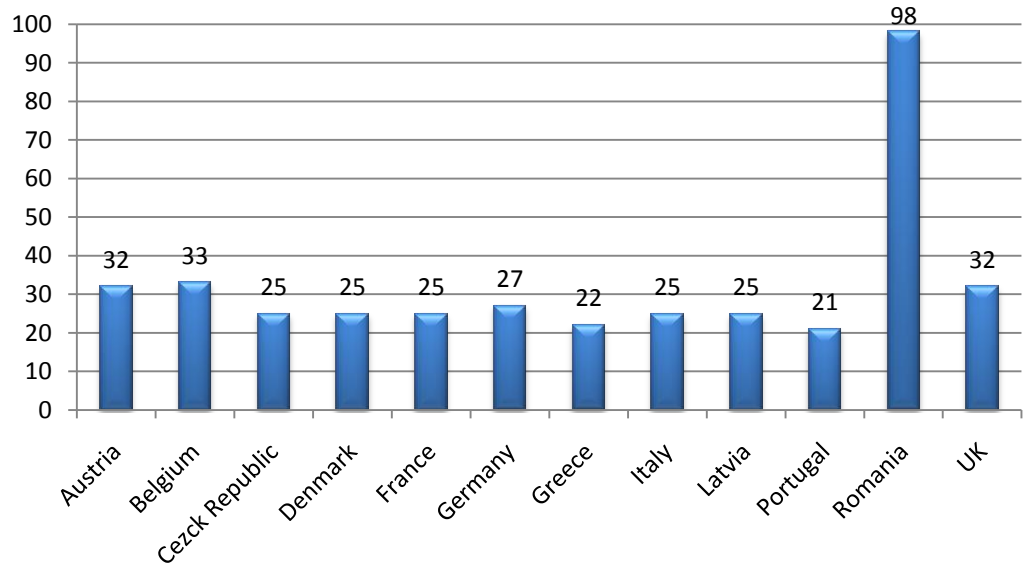


Figure 15 – Number of delivered questionnaires by country.

4.1 Questionnaire

The questionnaire was consisted of four major sections:

i. Retailer advice regarding energy efficiency

The objective of the first section objective was to evaluate which type of advice retailer's use and what is the place left for advice regarding the energy consumption of the appliances at the time of sale.

ii. Customer decision

This part of the questionnaire aimed at understanding about the retailer's feedback regarding customer needs and motivations. This section will provide the points which should be improved so that customers start buying more efficient equipments.

iii. Energy information and labels

The retailer's opinion about the available information on products in the shops could help to define new approaches in terms of the information that should be provided to customers. Consequently, the third part of the questionnaire aimed at quantifying the information available on the products about energy consumption and the role of the energy labels in the sales.

iv. Standby & Off-mode

The last part of the questionnaire focused in retailers' knowledge about off-mode and standby energy consumption characteristics.

The questionnaire used in the SELINA project can be found at the project website: ww.selina-project.eu

4.2 Aggregated questionnaire answers

In the next subtopics the main results of the analysis made to all the acquired questionnaires is presented. The results presented below are aggregated results for all countries.

4.2.1 Retailer advice regarding energy efficiency

1) When advising a client, which points do you use more often in order to sell a product (scale 0- never ;10-always)

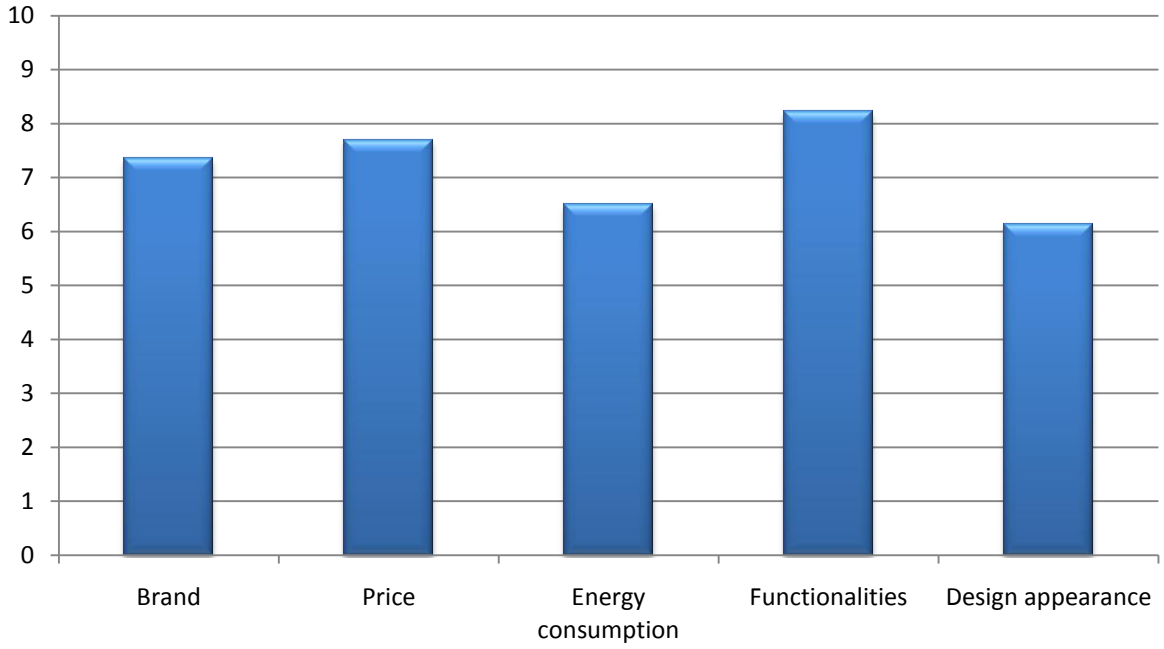


Figure 16 – Arguments used by retailers to sell appliances

2) Rating of the importance weight of each energy advice during a sales advice (scale 0- nothing; 10- very important)

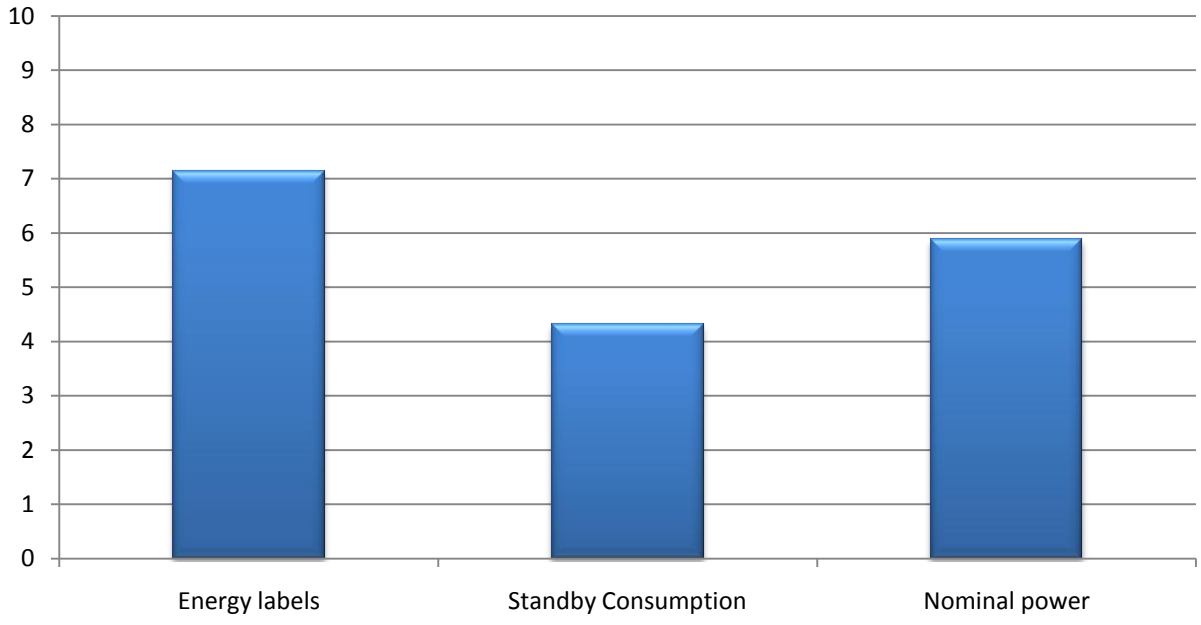


Figure 17 – Weight of different pieces of energy advice during sales advice.

3) **When advising a client, do you try to give emphasis to energy savings and environment protection that the client could benefit from the energy efficient equipments?**

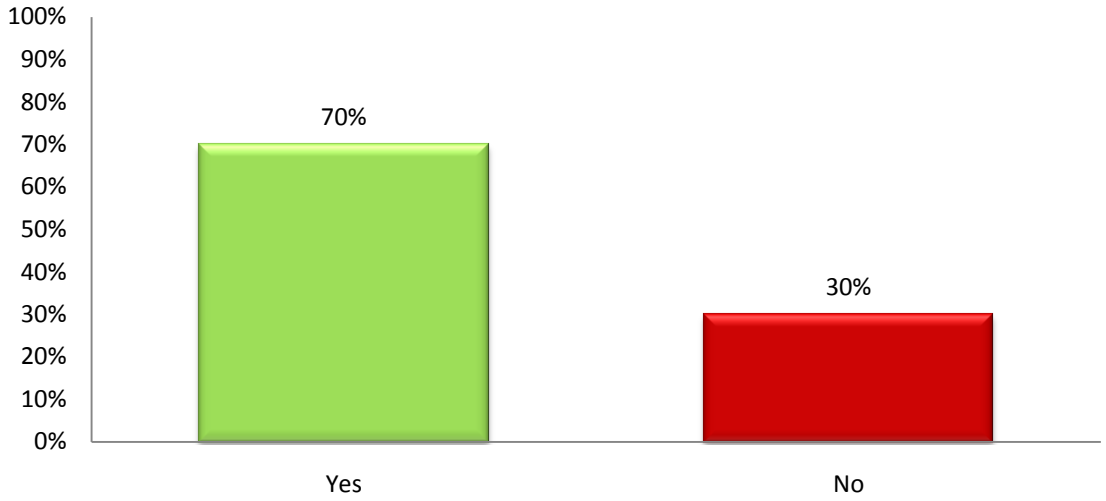


Figure 18 – Weight of the emphasis to energy savings and environment protection.

When selling a product, on average, 70% of the interviewed retailers underlines the possible benefits that client may gain from energy efficient appliances.

The answers from retailers reveal that most of the time, arguments used by retailers are the product functionalities and price (see questions nº5). Nevertheless other features like brand and appliance design have also an important weight. Energy advice appears at the bottom of the argument list. Regarding energy advice, the feature that has the more important influence on the sales are the energy labels, followed by the product nominal power.

4.2.2 Customer decision

4) **Do you think that Energy Labels or other additional information change the client decision? [Please rate from 1 (does not interfere at all) to 10 (definitely interferes)]**

- The average answer was: 7.0

5) Based on your experience, what role do the following features play in the buying decision of the client? (scale 0-nothing; 10- very important)

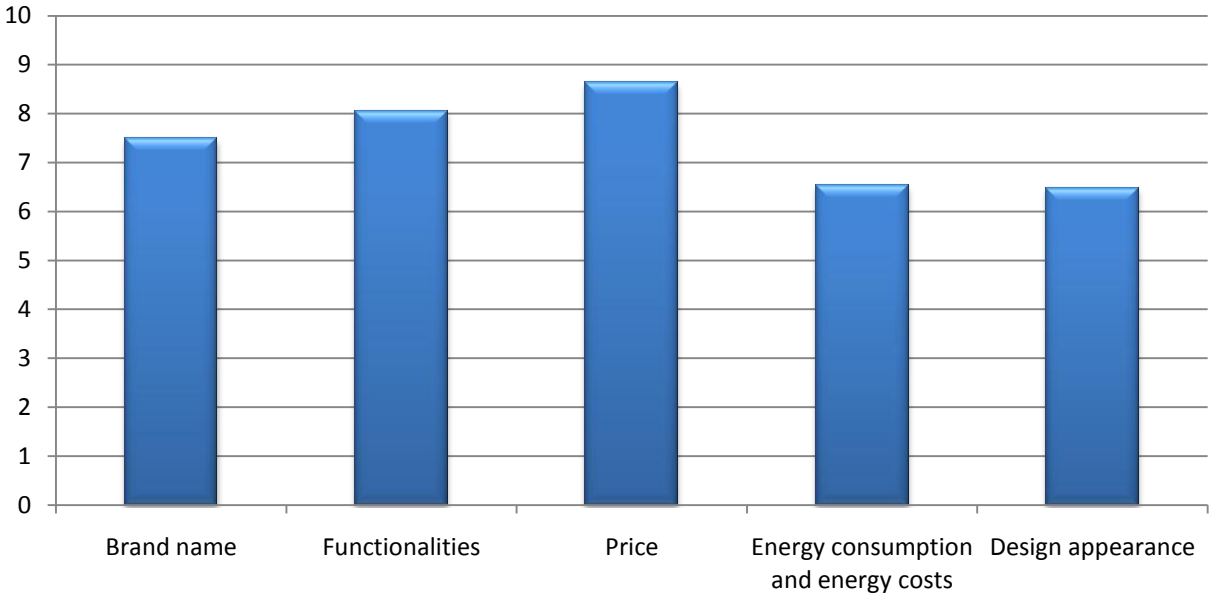


Figure 19 – Role of different features in the client decision.

6) In your opinion which points could be improved in order to help the client to choose an energy saving equipment? (scale 1- no impact, 10 – very high impact)

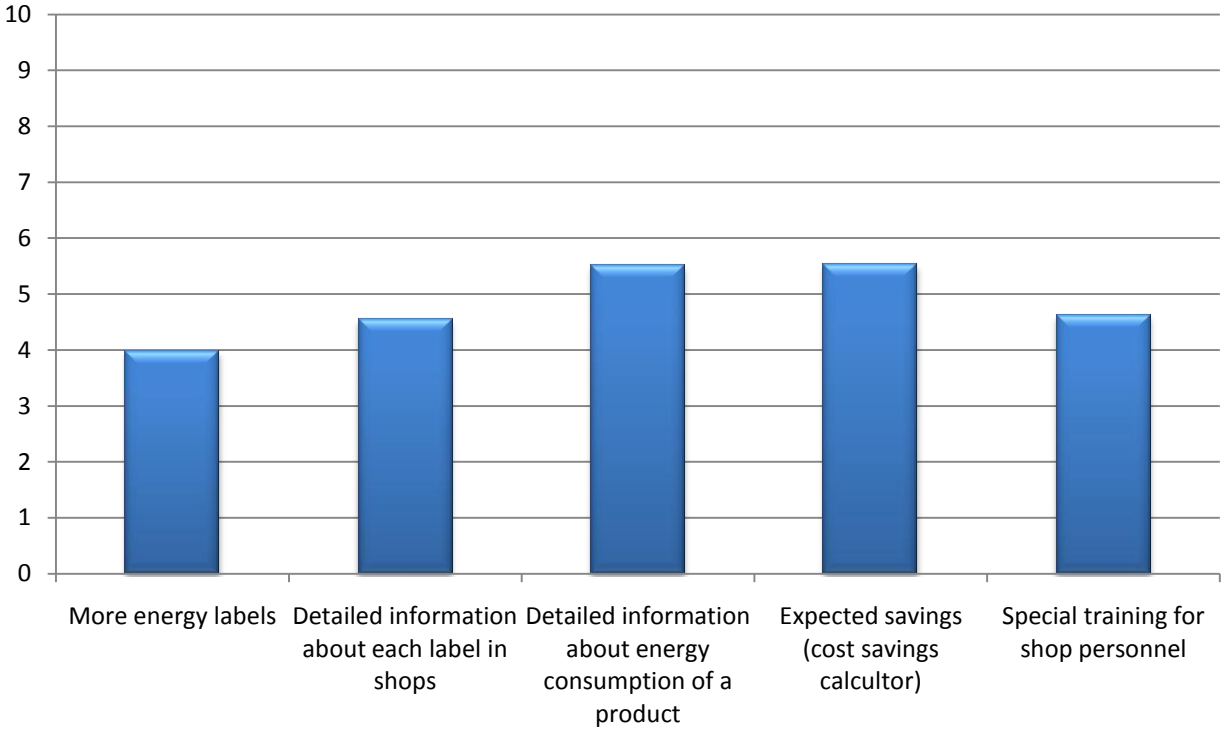


Figure 20 - Points that could be improved to help clients to choose energy efficient equipments.

The answers reveal that, in the retailer's opinion, more energy labels or energy consumption information could lead customers to buy more energy efficient equipments. However, the top priority of the client's is the price and the functionalities of the products, showing that the advices given by the salesmen are very important to drive customers to take the right energy wise option.

According to the retailers' opinion, more information about the energy consumption of the products and the expected economic savings that the client could gain from efficient equipment would help the clients to choose more efficient appliances. However, this is an opinion shared by only about half of the salesmen.

4.2.3 Energy information and Labels

7) In your opinion do you think that there is enough information in your store about energy consumption of appliances?

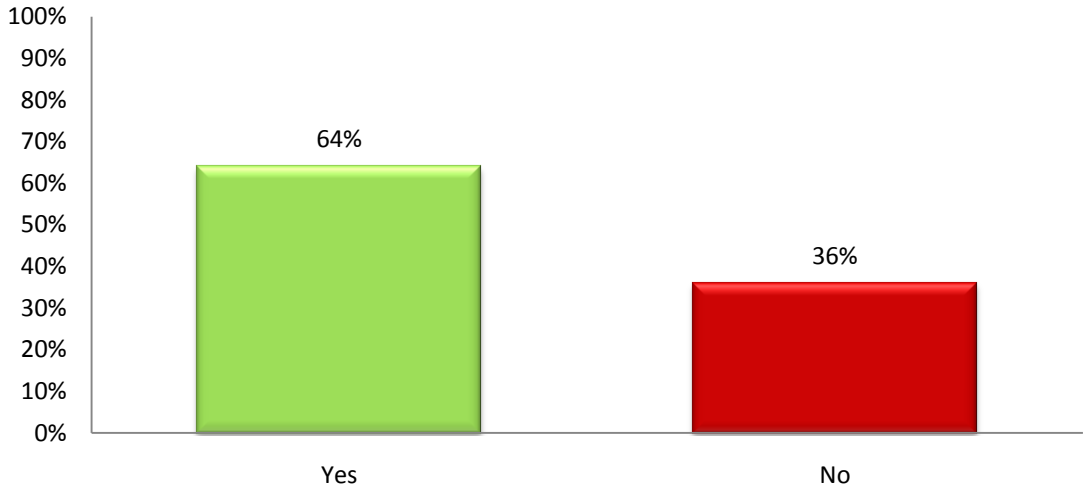


Figure 21 – Is there enough information in stores related to energy consumption of appliances?

8) Is it easy to explain Energy Labels to the Client?

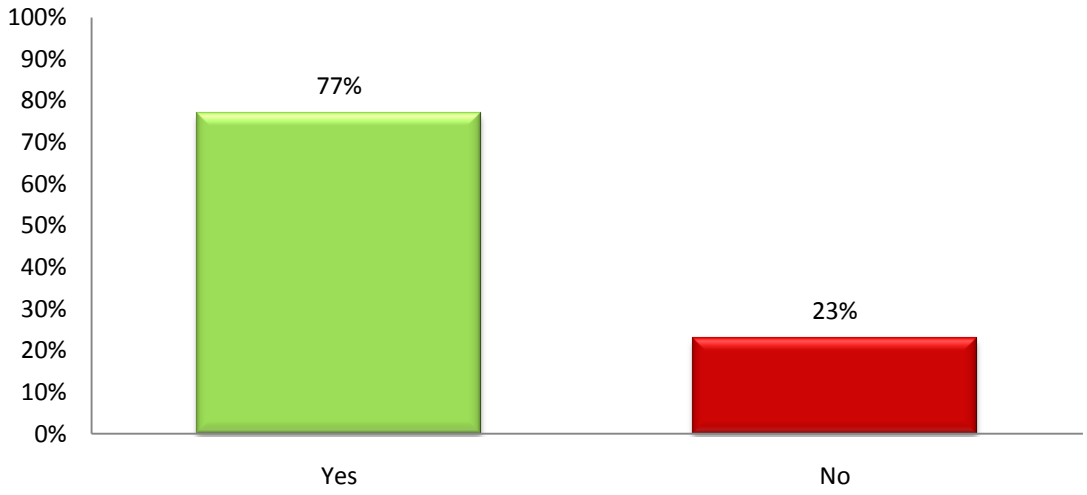


Figure 22 – Is it easy to explain Energy Labels to the Client?

9) Do Energy Labels or other additional information about energy efficiency helps to sell more efficient equipments?

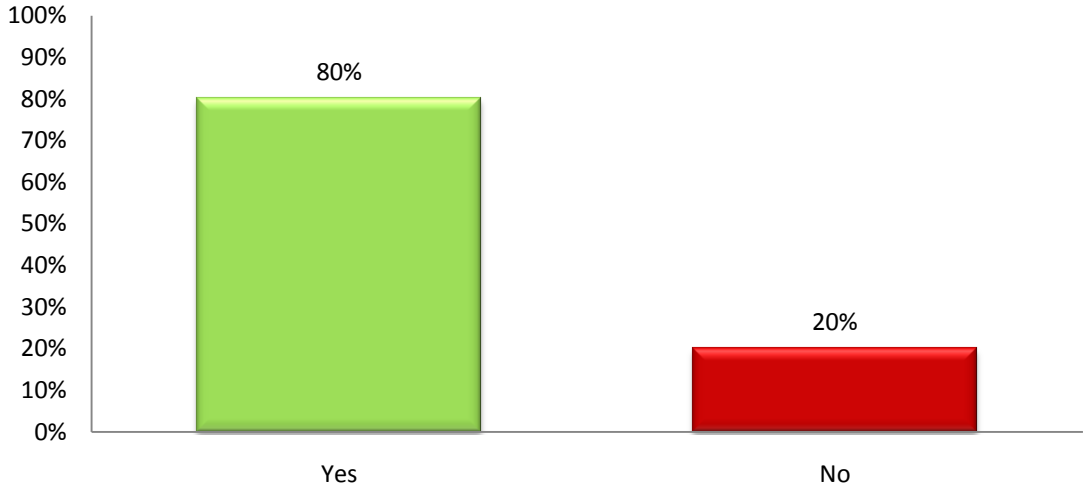


Figure 23 – Does Energy Labels or other information about energy efficiency helps to sell?

Most of the answers point out that there is enough information in shops about energy consumption of appliances. Energy Labels are considered to be easy to explain and they help retailers to sell more efficient equipments.

4.2.4 Standby & Off-Mode

10) Are you aware that some products could consume energy in off-mode (e.g.: TV turned off by the power switch button)?

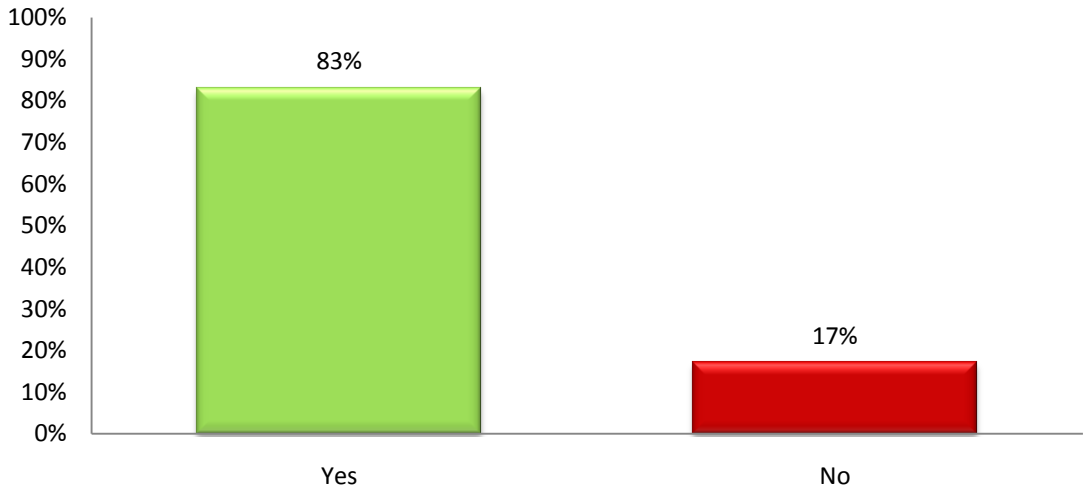


Figure 24 – Percentage of answers on question 10.

11) Are you aware of any policy or study regarding standby and/or off mode consumption?

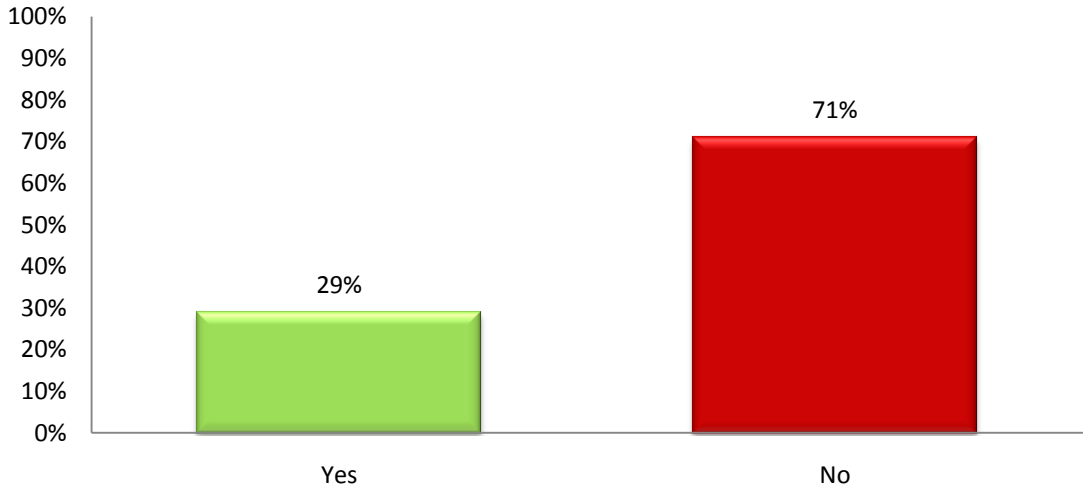


Figure 25 – Percentage of answers on question 11.

12) In your opinion could the Standby consumption be decreased?

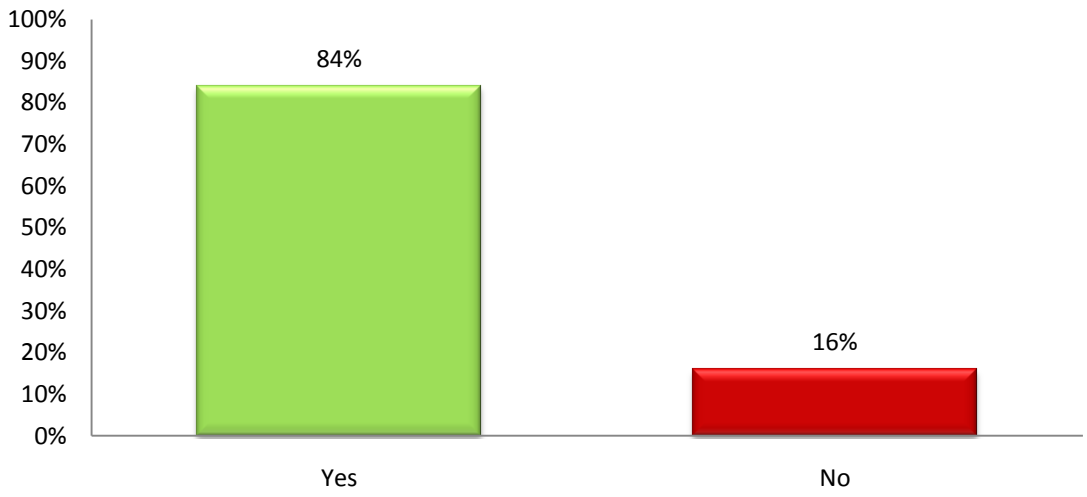


Figure 26 – Percentage of answers on question 12.

If your answered is "Yes", please indicate how:

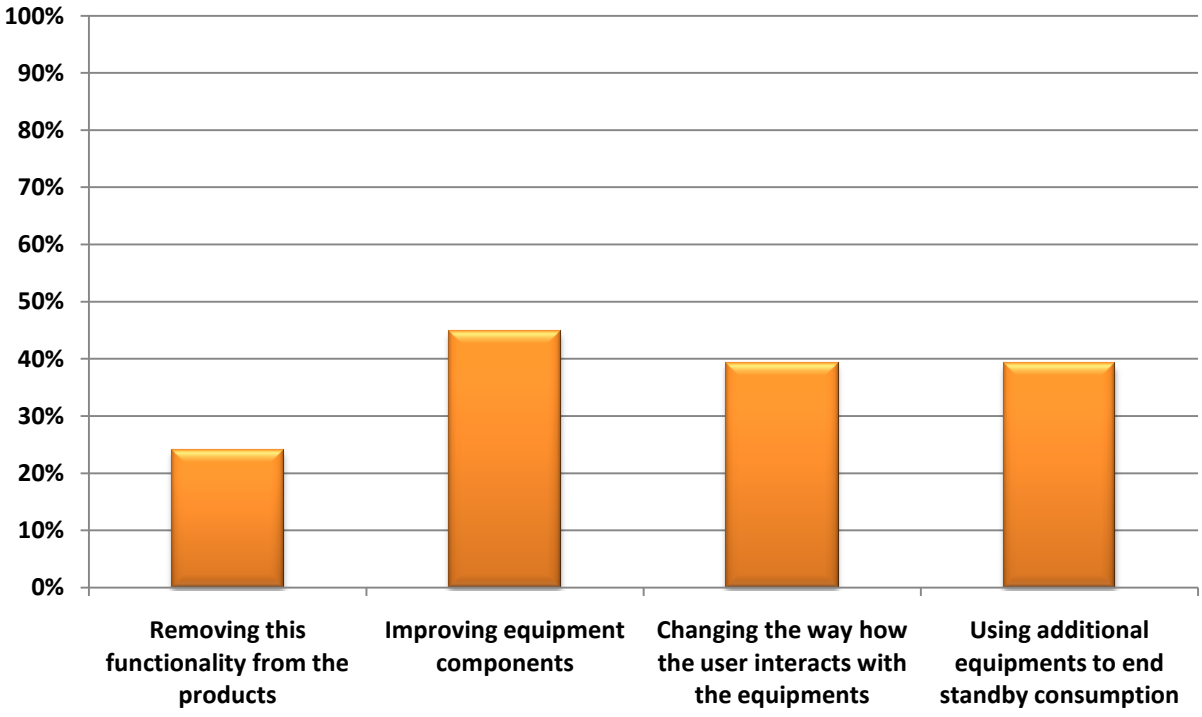


Figure 27 – Solutions to reduce standby consumption.

In general, good knowledge was shown by retailers concerning low power modes. 29% of the interviewed retailers already knew about some kind of policy/study related to low power modes.

According to retailers' opinion, standby can be decreased by improving equipments components. 84% of retailers answered also that standby can be decreased by other means like changing the way how the user operates the equipment or by installing additional equipment to prevent standby consumption.

4.3 Different countries answer analysis

Because of cultural/sociological differences between countries, it was decided to carry out an analysis of the retailer's awareness campaign showing each participating country result:

1) **When advising a client, which points do you use more often in order to sell a product (scale 0- never ;10-always)**

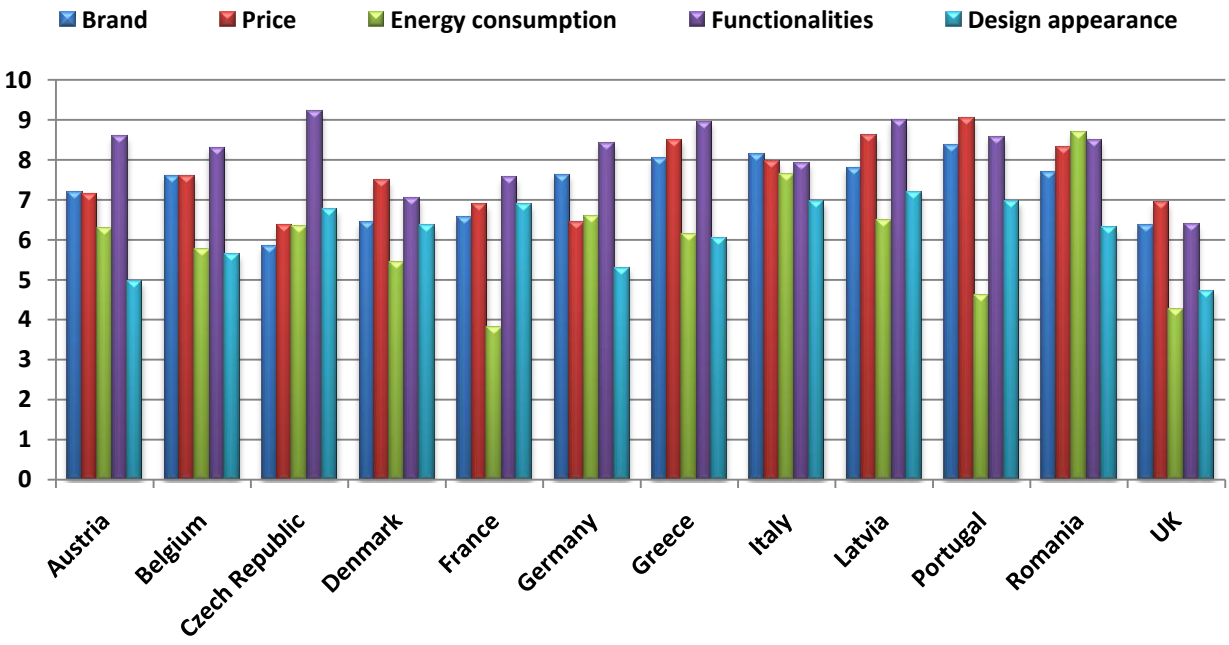


Figure 28 – Frequency of arguments used by retailer in order to sell a product.

The previous figure shows that the different point's weights vary between countries. However the same trend is found for every country. One argument which presents a significant difference between countries is the energy consumption advice. For Portugal, France and UK it can be seen that this point appears at the bottom of the list of the retailers' advice priorities.

2) Rating of the importance weight of each energy advice during a sales advice (scale 0- nothing; 10- very important)

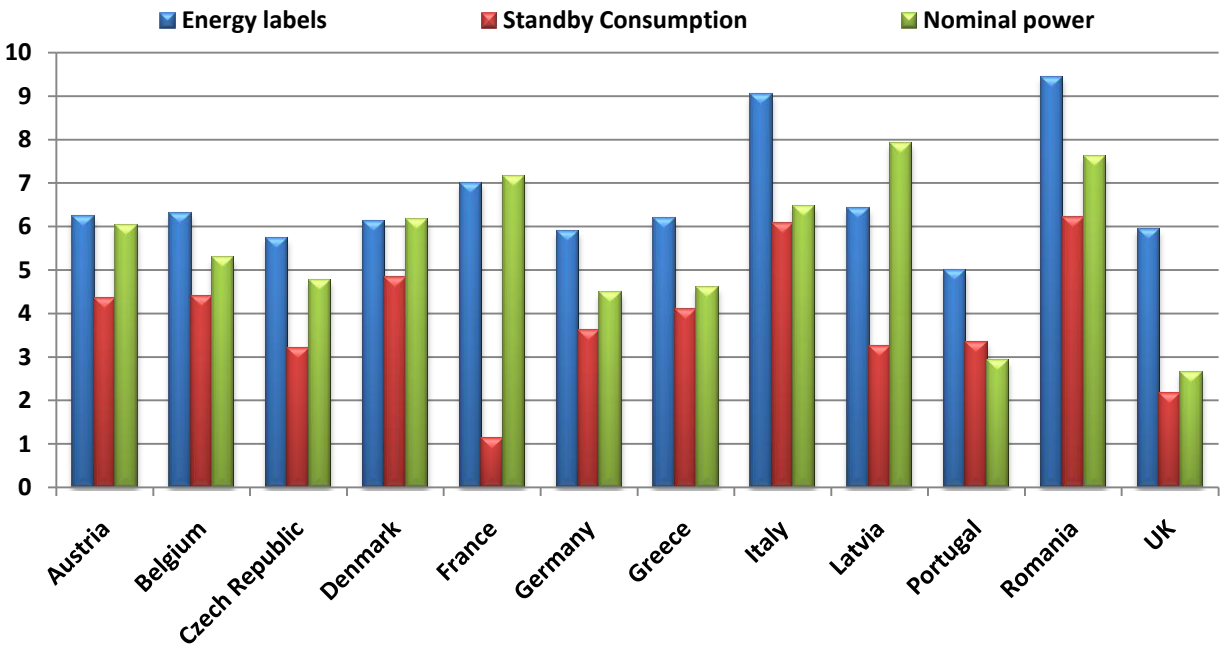


Figure 29 – Influence of each energy advice during a sale.

In general energy labels represent the major energy advice given by retailers. For some countries the product nominal power also remains as one of the major points during an advice. Standby consumption is less important in all countries, which for the decision regarding one single product seems rather logical.

3) When advising a client, do you try to give emphasis to energy savings and environment protection that the client could benefit from the energy efficient equipments?

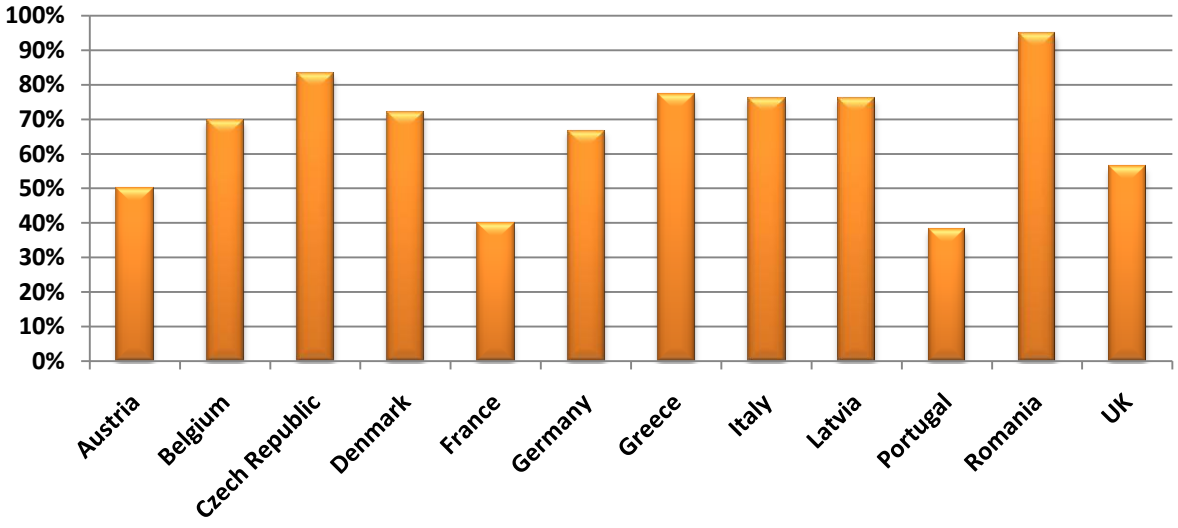


Figure 30 – Difference between countries about the focus on energy savings during a sales advice.

Large differences can be obtained when different countries are compared. Retailers in general try to give emphasis to energy savings and environmental protection that the clients can benefit from efficient equipment. Even so countries like Austria, France and Portugal have low values, indicating that retailers are not doing enough to promote energy efficient equipments.

4) **Do you think that Energy Labels or other additional information change the client decision? [Please rate from 1 (does not interfere at all) to 10 (definitely interferes)]**

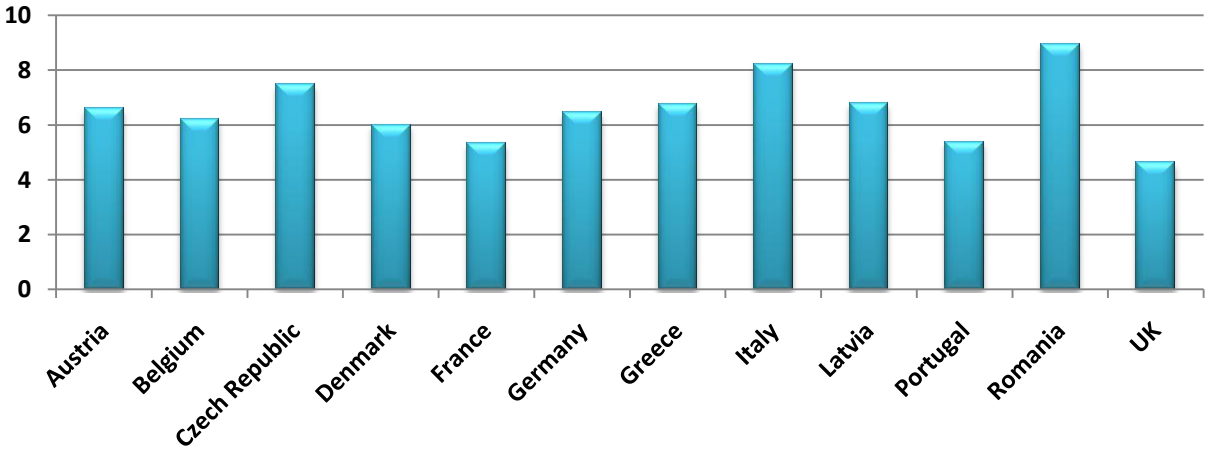


Figure 31 – Energy labels and other energy additional information influence in the client decision.

The results show that across all countries retailers agree that additional information would help to change client's decision regarding energy efficient products.

5) **Based on your experience, what role do the following features play in the buying decision of the client? (scale 0-nothing; 10- very important)**

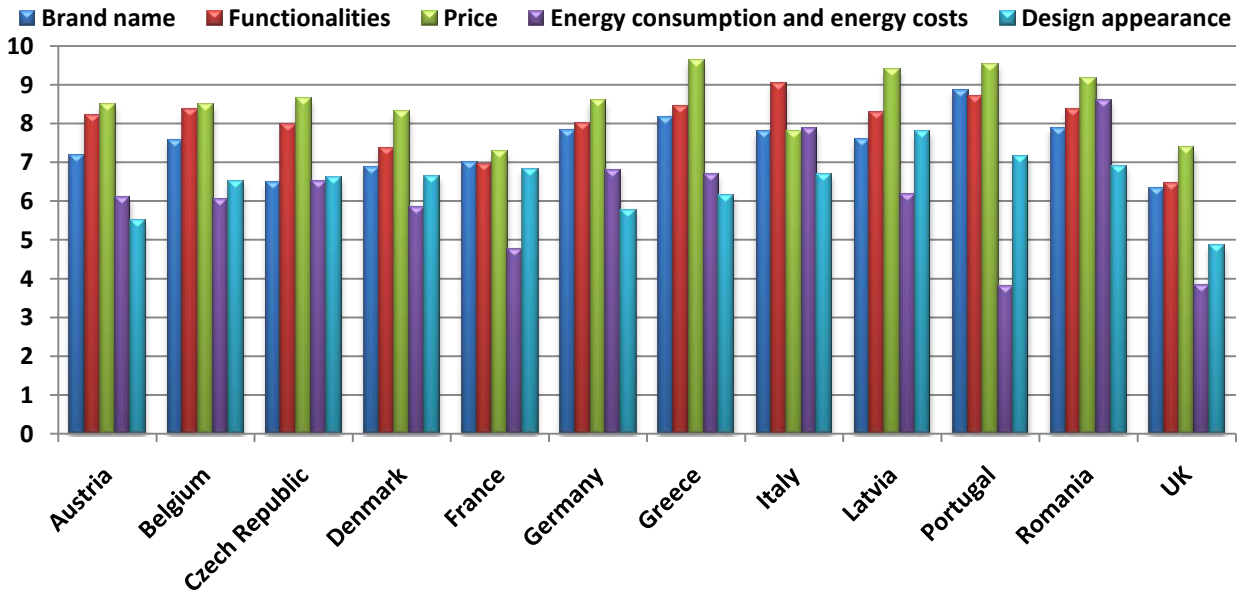


Figure 32 – Role of different features in client decision.

The questionnaires results show that the same trend is observed for all countries. The price remains the major feature in the client's decision.

6) In your opinion which points could be improved in order to help the client to choose an energy saving equipment?

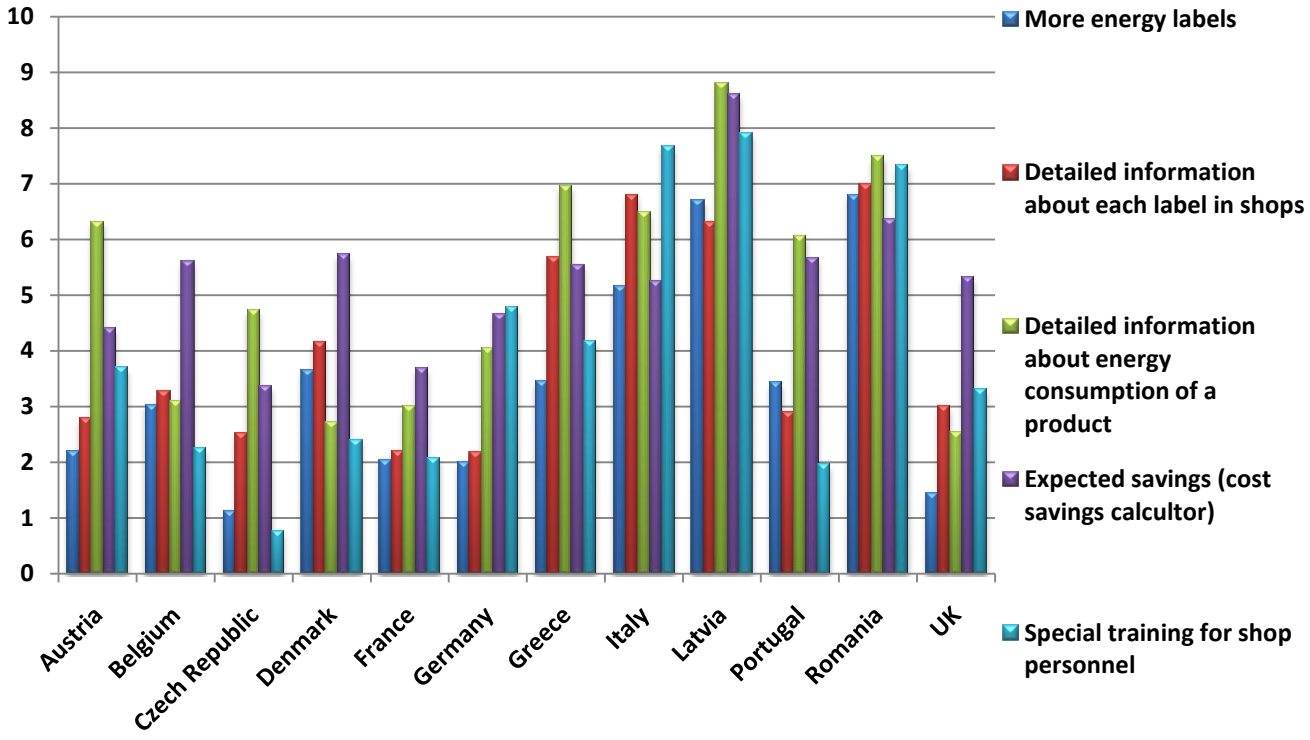


Figure 33 – In shop points improvements related to energy efficiency.

The previous figure shows that retailer's opinions vary widely across the EU-countries. The general trend is that improved information on the expected savings that clients can benefit from efficient equipments and detailed information about products energy consumption can lead clients to choose these appliances. However the results for some countries show that special shop personnel training could help retailers to use better arguments, helping them to sale more energy efficient equipment.

7) In your opinion do you think that there is enough information in your store about energy consumption of appliances?

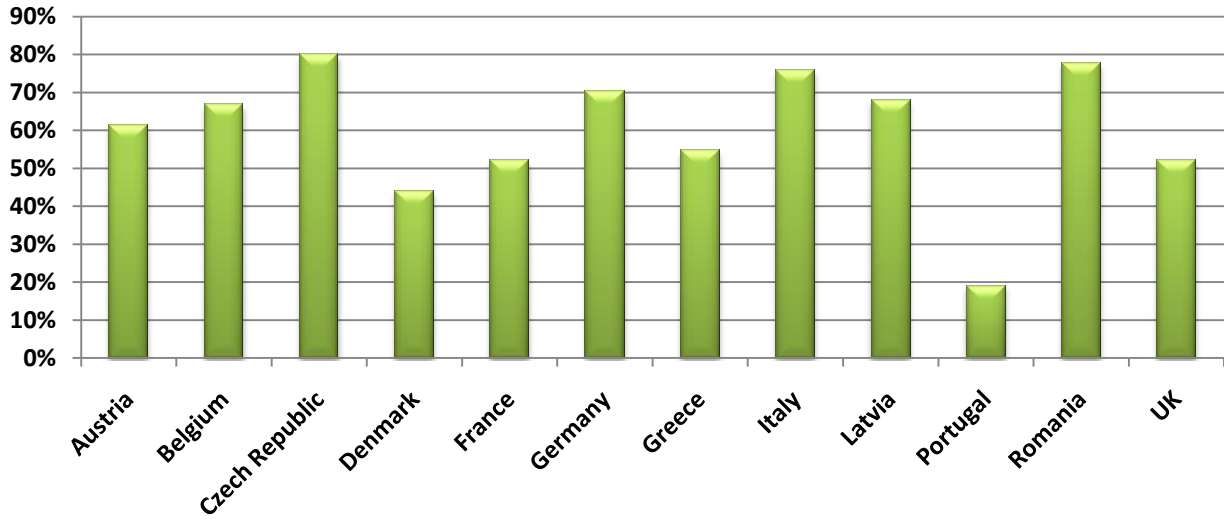


Figure 34 – Answers for different countries about if there is enough information in stores about energy consumption (percentage of "Yes").

The answers from almost all countries seem to be positive. However in Portugal (and to a less extent in Denmark) it seems that shops do not have the necessary information about products energy consumption.

8) How easy it is to explain Energy Labels to the client?

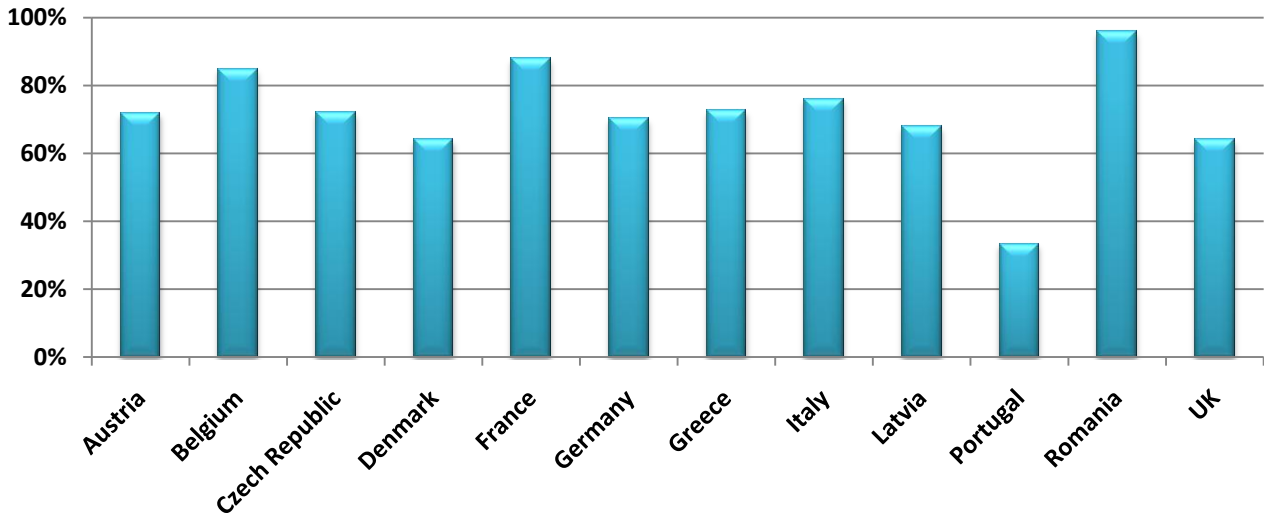


Figure 35 – Retailers from different countries opinion about Energy Labels (percentage of "Yes").

Portugal seems to be the only country where in general it is not easy to explain the existing energy labels. This result seems to confirm the previous questions for which Portugal indicated that they do not have enough information about energy consumption in shops. Other countries state that in general it is easy to explain the energy labels.

9) Do Energy Labels or other additional information about energy efficiency helps to sell more efficient equipments?

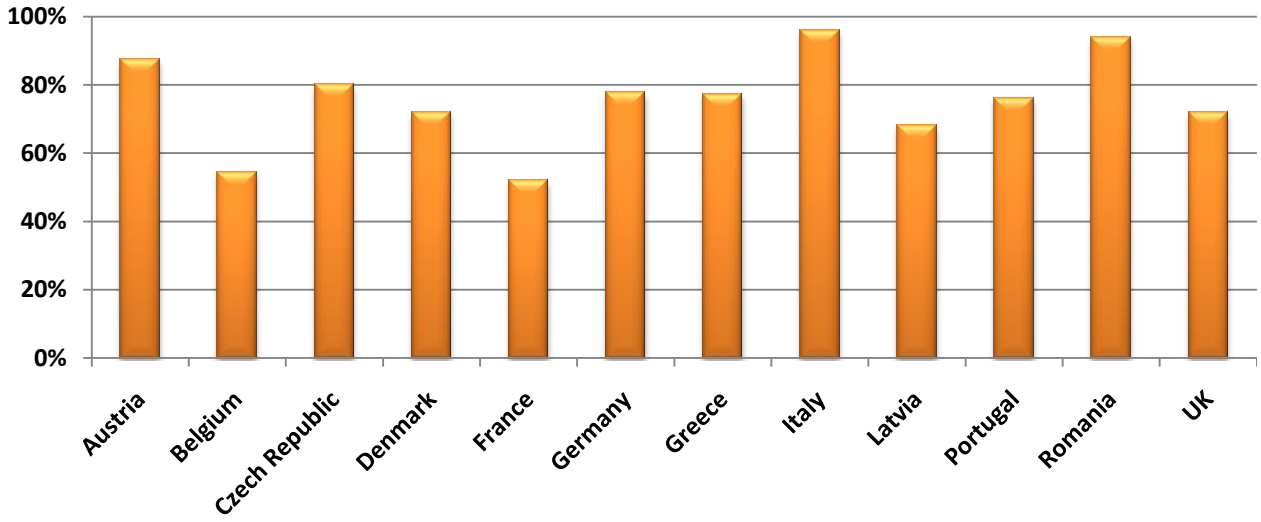


Figure 36 – Retailers opinion about if energy labels help to sell more efficient equipments (percentage of "Yes").

All countries agree that Energy Labels improve the sales of energy efficient equipments, despite the fact that they might not be easy to explain in Portugal.

10) Are you aware that some products could consume energy in off-mode (ex: TV turned off by the power switch button)?

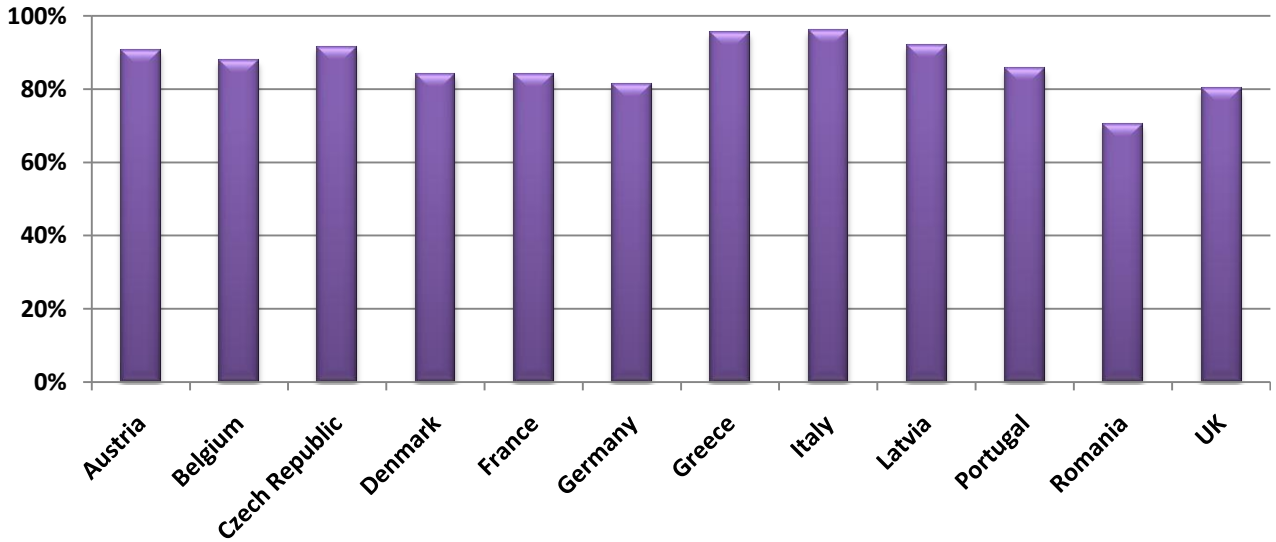


Figure 37 – Are retailers aware that products can consume energy in off-mode? (Percentage of "Yes").

The analysis to the answers to the question Nº10 of the questionnaire points out that almost all retailers are aware of appliance off-mode consumption.

11) Are you aware of any policy or study regarding standby and/or off mode consumption?

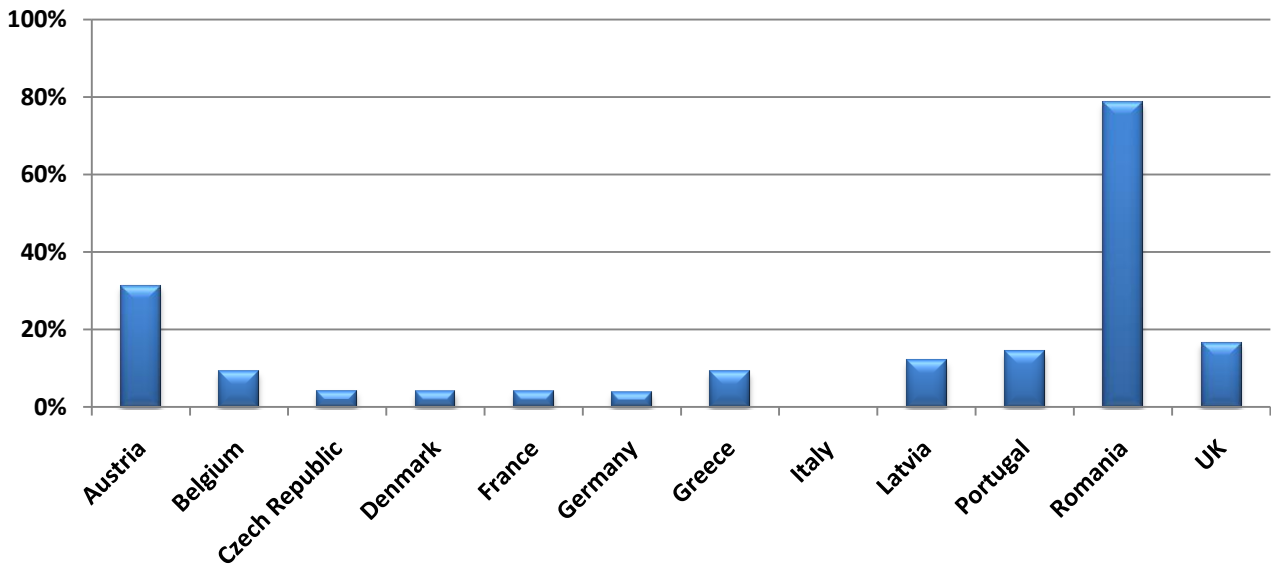


Figure 38 – Retailers knowledge of any low power mode policy or study (percentage of "Yes").

When confronted to the question Nº11 of the questionnaire, only retailers from Romania were aware of a study/policy about low power modes. It might have occurred that the SELINA project was presented before the survey was conducted.

12) In your opinion could the Standby consumption be decreased?

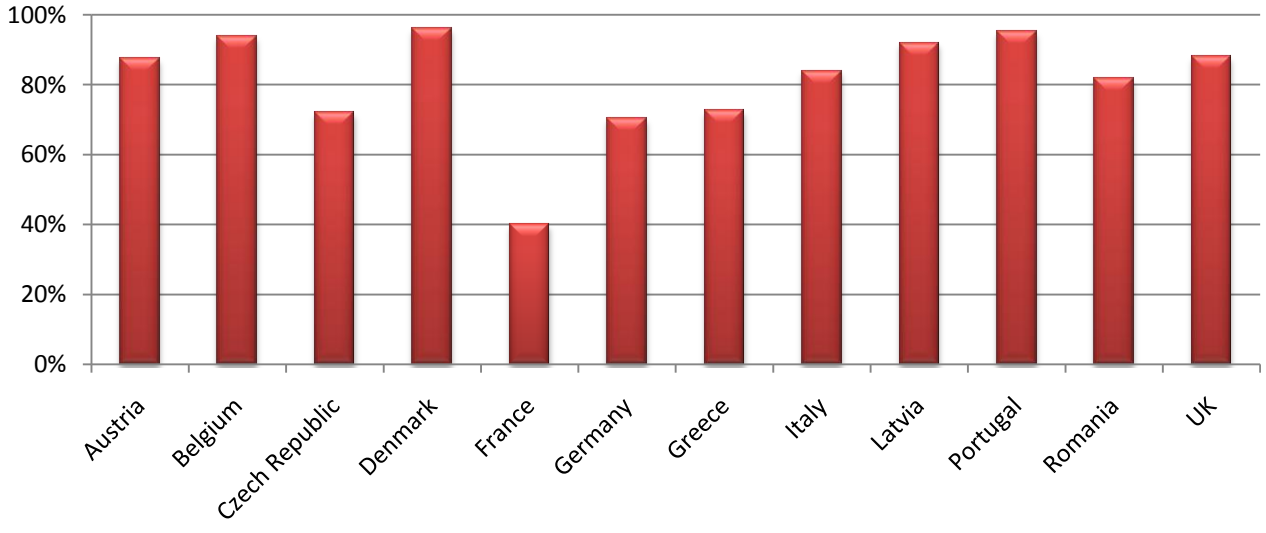


Figure 39 – Retailers' opinion regarding whether the standby consumption can be decreased (percentage of "Yes").

In general retailers believe the standby consumption can be decreased. However retailers' opinion of, how can the standby consumption be decreased are different across the different countries (see next figure).

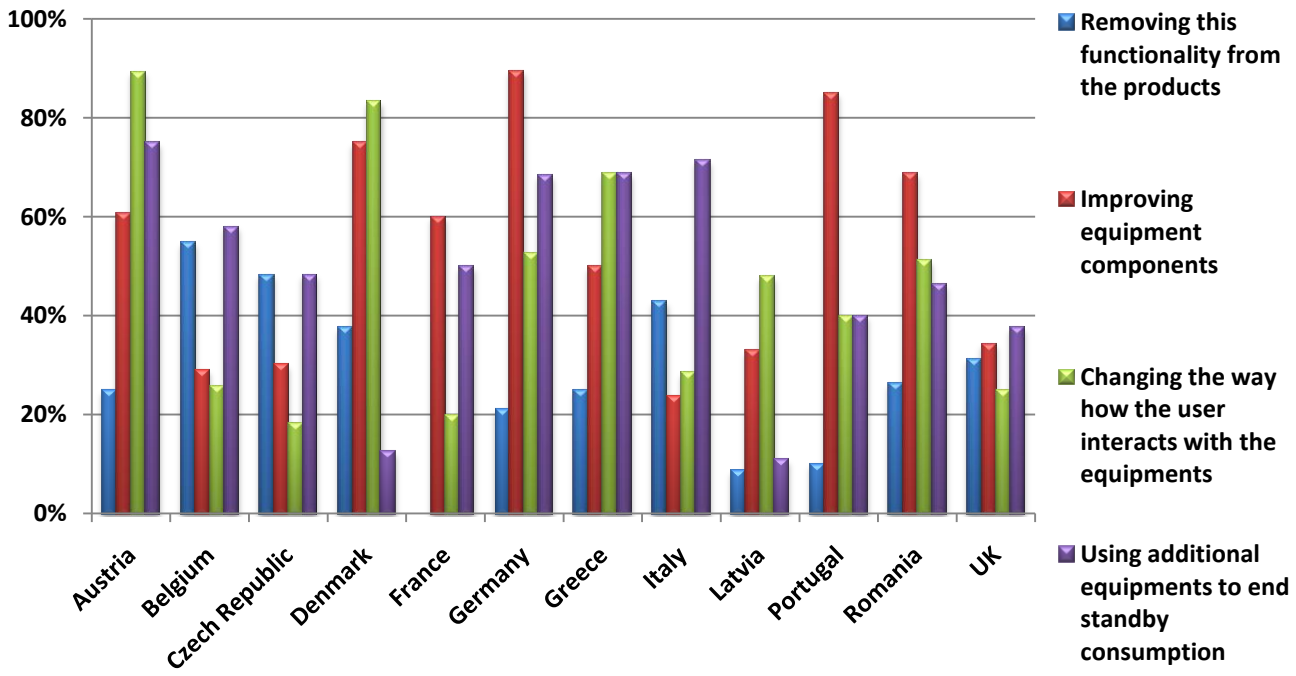


Figure 40 – Retailer's opinion of how the standby can be reduced.

Nevertheless, the two major solutions chosen by retailers are in most cases the same: the improvement of equipment components and the behavior change of the user towards the equipment operation.

5 Policies for market transformation

There is a lack of reliable data on the actual electricity consumption of appliances in low power modes (standby and off-mode) in Europe. Such data could also help to define new and better energy policies to enhance the market diffusion of highly energy-efficient appliance with low standby and off-mode energy losses.

In this frame, one main objective of SELINA project was to identify effective polices and initiatives for a market transformation towards energy-efficient products with low energy consumption in standby and off-mode.

Within this scope several tasks were carried out:

- Identification and analysis of relevant stakeholders and frame conditions, including:
    - an analysis of the role of relevant stakeholders analysis and
    - an analysis of the frame conditions for efficiency improvements (consumer behaviour, barriers and obstacles).
- Collection and identification of examples of national policies and initiatives.

5.1 Methodology

The collection of policies and initiatives on market transformation towards energy-efficient appliances with low standby consumption was based on three pillars:

1. A general overview of policies at the level of the EU and in the EU Member States was collected, based on the following sources:
    - the MURE measure database[3], which is continuously updated within the IEE project ODYSSEE-MURE, and which contains many measures on electrical appliances both in the EU Member States and at EU level. The last update of the measure database was in the first half of 2009;
    - The first National Energy Efficiency Actions Plans under EU Directive on end-use energy efficiency and energy services (EC 32/06);
    - Results from a similar survey in the IEE project REMODECE;

[3] http://www.mure2.com

- The IEA Energy Efficiency Policies and Measures Online Database[4] and other IEA publications on policies for electronic devices (e.g. IEA 2009). These sources also include measures in non-EU countries;

- A recent report for Defra / the Market Transformation Programme (Attali, et al., June 2009) including an overview of policy measures influencing the penetration of energy efficient electrical appliances in 9 European countries (Switzerland, Germany, Denmark, France, UK, Italy, Netherlands, Poland and Portugal).

2. A central issue was the collection of specific actions directly addressing consumers and retailers both taking into account actions aiming at the reduction of total energy consumption of the appliances in all operation modes and at standby and off-mode consumption in particular. This includes information and education programmes by energy agencies or other institutions, voluntary activities by retail trade or manufactures, financial support for efficient appliances, additional voluntary labels or the development of information tools for retailers. These measures were collected by all SELINA partners in their country and, if possible, in other (neighbor) countries not covered by the SELINA consortium. The measure collection was based on a common template both including a formal measure description by type of equipment addressed, actor, target group and status, and some detailed on the contents of the measure, the costs and results with regard to energy and standby savings (see Figure 41);

3. In addition to that, interesting policies in non-EU countries (e.g. Australia, Japan, U.S. and Switzerland) were also collected, using the same methodology and making use of the collaboration with IEA initiatives within the SELINA project.

[4] http://www.iea.org/textbase/pm/index_effi.asp

SELINA	**Description of national policies and actions in order to accelerate the market penetration of energy-efficient electrical appliances**
	Formal description (please fill in or tick one or more fields)
Country:	
Title:	
Type of equipment addressed:	☐ all appliances (general) ☐ big household appliances (cooling and washing appliances, ovens) ☐ air-conditioners ☐ other household appliances (coffee machines, electric toothbrush etc.) ☐ lamps ☐ consumer electronics (TVs, audio devices etc.) ☐ office equipment (PCs, peripherals, router) ☐ only standby mode ☐ specific appliance:_____ ☐ Other: _____
Actor	☐ central government ☐ regional/local authorities ☐ energy/environmental agency ☐ consumer agency ☐ retailers ☐ manufacturers ☐ financial institution ☐ Other: _____
Target group	☐ general user ☐ specific user group (e.g. young people, low income groups) _____ _ ☐ purchaser ☐ retailer ☐ manufacturer ☐ Other: _____
Status	☐ ongoing ☐ completed ☐ planned
Duration	Starting month/year: _____Ending month/year:_____
	Detailed description of the measure
Contents	
Costs	
Results	
References	

Figure 41 - Template for the measure collection.

5.2 General framework of the market for electrical appliances

According to the latest JRC status report on electricity consumption in the European Union (Bertoldi, et al., 2009), electricity consumption for standby in the residential sector in EU 27 amounted to about 43 TWh in 2007. This is equivalent to a share in total residential electricity consumption of 5.4%. In Germany, an even higher share of 6.8% or a total standby consumption in the residential sector of 9.5 TWh was calculated by (Fraunhofer IZM / Fraunhofer ISI, 2009). Therefore, though the consumption in standby and off-mode was slightly decreasing or at least constant for some important IT appliances (Figure 42), the total amount of standby and off-mode losses justifies political measures and initiatives to lower the consumption.

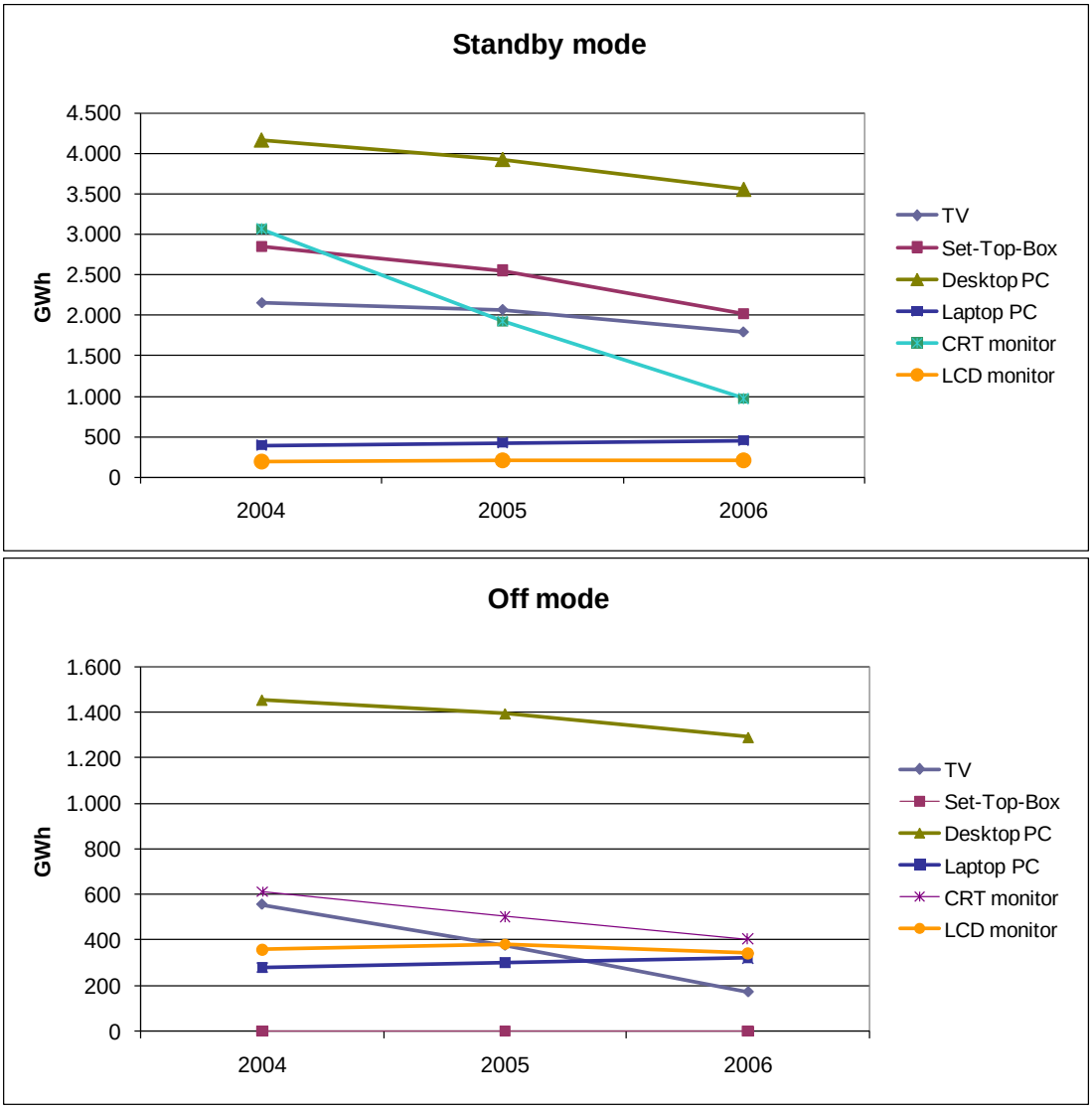


Figure 42 - Standby and off-mode losses of selected IT appliances (EU-27).

As several studies show, there are significant saving options in order to further reduce the standby and off-mode losses of electrical appliances [see e.g. (Fraunhofer ISI, September 2009), (Fraunhofer IZM / Fraunhofer ISI, 2009), (Gadgets and Gigawatts, 2009)]. In the several scenarios, which were calculated in the EuP Preparatory study on standby and off-mode (Figure 43), the estimated energy consumption in EU-25 for standby and off-mode in 2020, which is estimated in the different scenarios, ranges between 120 TWh in the worst case and 20 TWh, in the scenario with the highest energy savings.

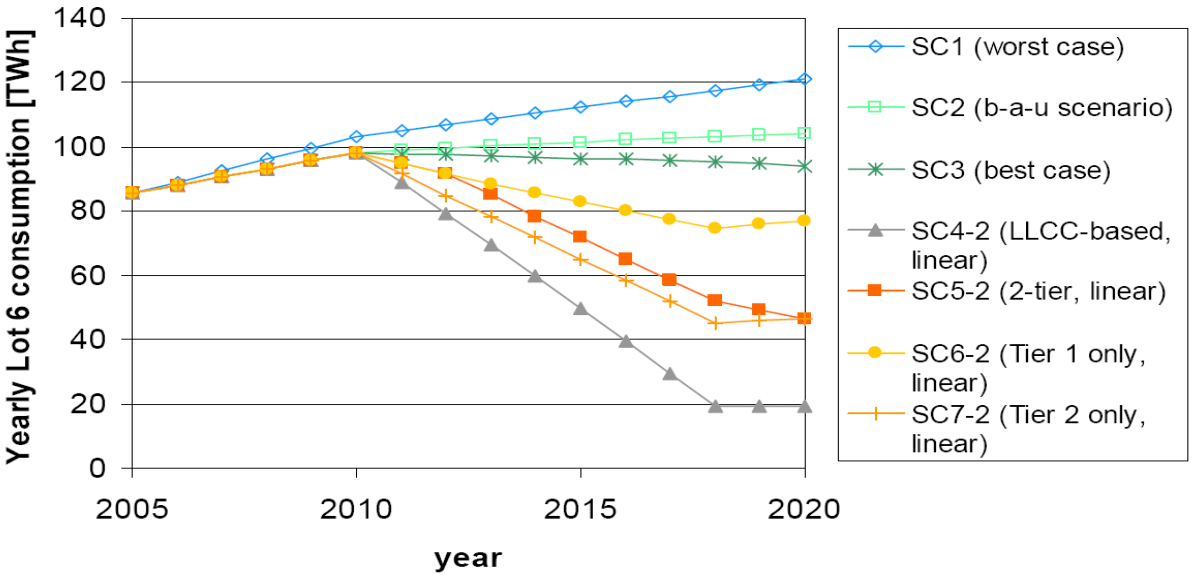


Figure 43 - Comparison of the scenarios for standby and off-mode losses in the EuP Preparatory study for standby (EuP Lot6, October 2007).

In a study for Germany (Fraunhofer IZM / Fraunhofer ISI, 2009), a saving potential of about 1.3 TWh for standby and off-mode losses in the residential sector is calculated for 2020, as difference between the business-as-usual (BAU) and a saving (GREEN IT) scenario (Figure 44).

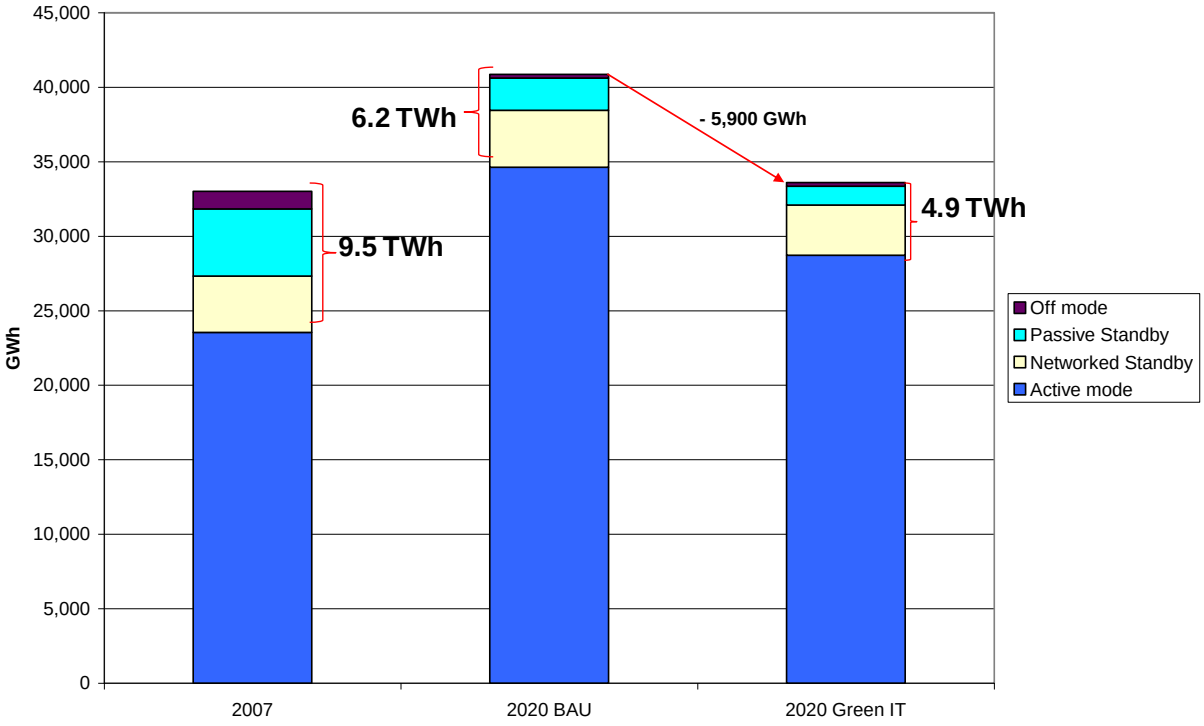


Figure 44 - Saving potential for standby and off-mode losses in the residential sector in Germany between 2007 and 2020.

5.3 Results of the measure collection

5.3.1 General overview of measures in the EU and Member States

In the European Union, the most important policy tool directed at reducing energy consumption of electrical appliances is the Eco-design Directive (2005/32/EC). It establishes a framework under which manufacturers of energy-using products will, at the design stage, be obliged to reduce the energy consumption and other negative environmental impacts occurring throughout the product life. The Directive was revised and enlarged to all energy-related in 2009 (2009/125/EC). In December 2008, the Commission adopted the Regulation No. 1275/2008 for implementing the Eco-design Directive with regard to requirements for standby and off-mode electric power consumption of electrical and electronic household and office equipment. The regulation, which comprises a wide range of products (household equipment, information and communication technologies, consumer electronics, other products as toys etc.), stipulates that from 2010 power consumption of this equipment in any off-mode condition and in any condition providing only a reactivation function shall not exceed 1 W and equipment also providing information or status display shall not exceed 2 W. From 2013, these limits are further strengthened to 0.5 W and 1 W respectively.

In addition, the EU Directive 92/75/EEC on energy labelling of household appliances, was revised in 2010[5]. The revision both included the introduction of new label classes (A+, A++, etc.) and an extension of the scope of the Directive to more energy-using and energy-related products. Up to now, the Commission has adopted four delegated acts for labelling on 28 September 2010[6]: According to that, televisions will be labelled for the first time. For household refrigerating appliances, washing machines and dishwashers the proposals represent a revision of the label design. A specific label for standby consumption, however, is not foreseen at the moment.

The MURE measure database, which was developed and is continuously updated within the EU-IEE project “ODYSSEE-MURE” (www.mure2.com), shows more than 160 policy measures at the level of the EU and its Member States addressing the electricity consumption of household appliances in the residential sector and of office equipment in the tertiary sector. Almost half of these measures are legislative measures (many of them are the national implementation of the EU measures mentioned above), in addition there are some financial and information measures mainly at the national level (Figure 45). A similar result can be drawn from the IEA database on energy efficiency measures[7].

[5] Directive 2010/30/EC of the European Parliament and of the Council of 19 May 2010 on the indication by labelling and standard product information of the consumption of energy and other resources by energy-related products, OJ L 153/1, 18.06.2010.

[6] See http://ec.europa.eu/energy/efficiency/labelling/energy_labelling_en.htm

[7] http://www.iea.org/textbase/pm/index_effi.asp

Total number of measures: 162

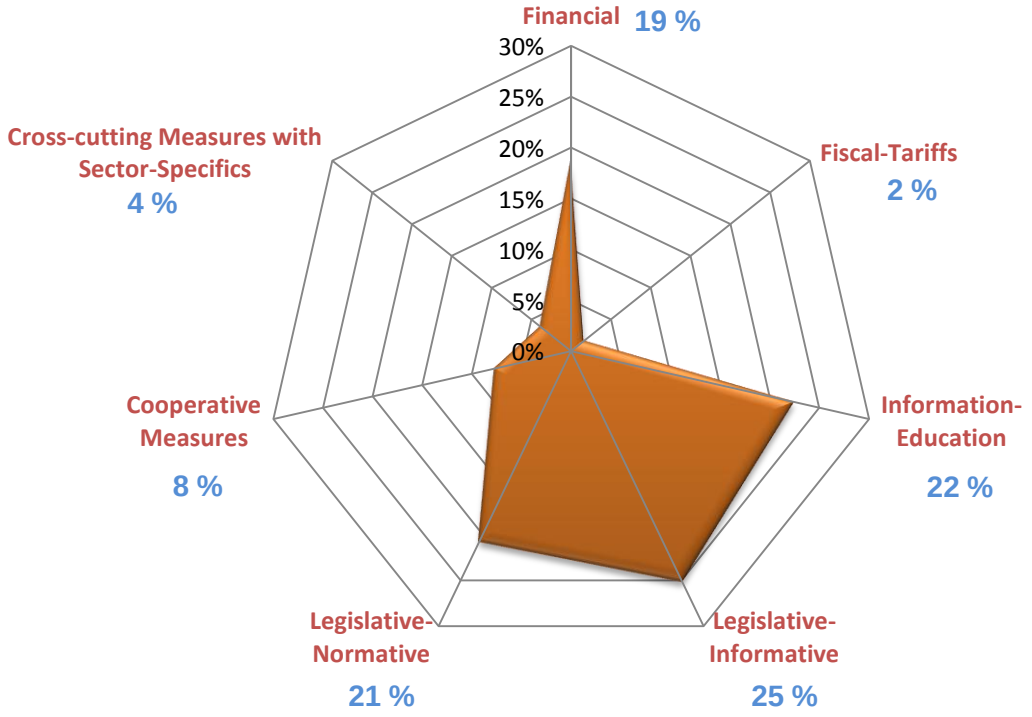


Figure 45 - Policy measures addressing energy consumption of residential appliances and office equipment in the tertiary sector (EU, EU Member States, Norway and Croatia).
Source: MURE measure database as of November 2010 (www.mure2.com)

In the report for Defra / the Market Transformation Programme (Attali, et al., June 2009), 17 policy instruments have been identified which are already used or planned to enhance the market transformation for domestic appliances in nine European countries taken into account:

- Regulatory measures: informative labels, minimum standards; enforcement activities; taxes; obligations on energy suppliers;
- Financial incentives: subsidies; R&D;
- Voluntary measures: endorsement labels; information campaigns; voluntary agreements; training;
- Other instruments: data and market analysis; public procurement; technology and cooperative procurements; identification of most efficient products.

One of the main result of the study was that the nine European countries considered in the study have implemented different strategies how to use these policy instruments: whereas in Denmark and UK, an explicit product strategy is applied with a comprehensive approach

covering all types of instruments, France, Germany, Italy, the Netherlands and Switzerland have implemented many activities, but not always in a comprehensive framework. In Poland and Portugal, fewer measures are implemented than in the other countries.

5.3.2 Measures collected in SELINA partner countries and other European and non-European countries

In addition to the more general measures already described, one target of the SELINA project was the collection of specific actions directly addressing consumers and retailers both taking into account actions aiming at the reduction of total energy consumption of the appliances in all operation modes and at standby and off-mode consumption in particular. This includes information and education programmes by energy agencies or other institutions, voluntary activities by retail trade or manufactures, financial support for efficient appliances, additional voluntary labels or the development of information tools for retailers.

The measure collection was based on a common template both including a formal measure description by type of equipment addressed, actor, target group and status, and some detailed on the contents of the measure, the costs and results with regard to energy and standby savings. In the end, more than 100 measures have been collected within the SELINA project by the partners (Table 9).

The most important measures types are informative and educative measures (61) and financial measures (16).

Table 9 - Overview of the measure collection in the SELINA project.

Measure Collection within the SELINA project: Final results									
		Measure Type							
Country	**Partner**	Financial	Fiscal-Tariffs	Information-Education	Legislative-Informative	Legislative-Normative	Cooperative Measures	Cross-cutting	**Total**
Austria	TUG-IFEA			3		1			**4**
Belgium	e-ster	1		2					**3**
Denmark	IT Energy			5					**5**
Czech Republic	SEVEn	4		5					**9**
France	Armines	2	1	7	3	3			**16**
Germany	Fraunhofer ISI	1		7					**8**
Greece	CRES	1		1					**2**
Ireland	Intertek			5					**5**
Italy	eERG	3	1	1	1				**6**
Latvia	Ekodoma				1				**1**
Portugal	ISR-UC	1							**1**
Romania	ARCE			5					**5**
Sweden	ISR-UC			1	1				**2**
Switzerland	ISR-UC	1		1		1			**3**
UK	Intertek	2		12	1	1			**16**
Non-European countries	ISR-UC			6	4	4	3		**17**
Total		**16**	**2**	**61**	**11**	**10**	**3**	**0**	**103**

Interesting examples of measures in the field “information-education” which were collected for the European countries are summarized in the next table. The same is shown in Table 11 for financial measures. The detailed description of all measures collected for European countries can be found at the project website (www.selina-project.eu) on the specific document with the collection and analysis of the policies and initiatives.

Table 10 - Examples for policies and actions mainly in the field “information-education” to accelerate the market penetration of energy-efficient electrical appliances in the SELINA partner countries and other European countries.

Country	Measure title	Description and results
Austria	Quick-Check	“Quick-check” is an online tool to calculate the electricity consumption of a private household. It was developed by E-Control and the Austrian Energy Agency and shall allow the user to get more information on the energy consumption of all electrical appliances available in the household. In addition, electricity saving options are given and the benefit of these possible savings is calculated in Euro/kWh.
Belgium	Websites informing on energy-efficient appliances	Two websites are available helping the buyer in making quick decisions when buying an appliance. One is organised by an EU-IEE project (Top Ten) in collaboration with the Brussels’ Energy Agency and one is organised by the Federal Belgian Environmental Administration.
Czech Republic	Prazak family is saving with PRE	This is an activity in Prague which was based on the EU-IEE project REMODECE. Six most “energy wasting” families have been chosen and got an energy advice, resulting in energy savings of 14 to 31 %. Linked to that, the biggest electricity distributor in Prague, PRE, initiated a large energy saving campaign, in which these families were the actors.
Denmark	Campaign “Turn off the switch – or spend money on nothing”	In winter 2003/2004, a campaign was carried out giving information on standby consumption and how much money can be saved by turning off the appliances. The campaign was well-known in the population.
Denmark	AutoPowerOff plug banks	Campaign of the Danish Electricity Savings Trust in 2007/2008 promoting the wider use of AutoPowerOff plug banks in cooperation with producers and several major retail chains. The total costs of the campaign amounted to around 1.2 million Euro. The annual savings per household per plug range between 25 and 137 kWh/year.
France	Mandatory information on the importance of energy savings	Decree for the promotion of energy efficiency by energy selling or energy service companies 2006-1464 of November 28 2006: All advertisement of a company selling energy or energy services should include the sentence: "L'énergie est notre avenir, économisons-là ".
France	The Energy party	Week of events around energy organized by the local energy

		information centres.
Germany	Campaign "Aus. Wirklich Aus?" ("Off – really off")	Information campaign on the importance of standby consumption of electrical appliance in one Federal country, Schleswig-Holstein, in the beginning of the 2000s. The campaign used a wide range of media (information brochure, spots on TV, radio and cinema, website) and tried to address the consumers (esp. young people) in a witty way.
Germany	Initiative Energie Effizienz	The *Initiative EnergieEffizienz* is a nationwide platform for action targeting the efficient use of electricity in all consumer sectors. It is organised by the German Energy Agency (dena) as a public/private partnership project in co-operation with energy supply companies. Retail trade and craftsmen, existing consumer advice centres and regional energy agencies are also integrated in the concept of the campaign. With regard to private consumers the campaign is especially focused on reducing standby losses, supporting efficient lighting with high comfort and raising energy efficiency of "white" household appliances.
Germany	Information Campaign on Climate Protection	On 1 March 2008, the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) started an information campaign on climate protection in cooperation with the German Energy Agency (dena) and Consumer Associations. The main parts of the campaign are • A "Climate Hotline" by phone, which is available 24 hours per day (0180/200 4 200). • A brochure "Die Klima-Prämie", which informs on financial incentive programmes for climate protection, energy saving tips, and advice possibilities on climate protection and energy savings. • Advertisements in daily and weekly journals.
Germany	Information on energy consump-tion of TVs in shops	Two big electronic retail chains (SATURN, MEDIA-MARKT) voluntarily inform on energy consumption in standby and active mode of all TVs sold in the shop. The initiative was based on a proposal by a German NGO (BUND).
Greece	Campaign with information leaflets	An information leaflet with behavioural possibilities to save electricity was added to the electricity bill sent to the consumers.
Italy	Technical sheets for the quantification of energy savings	Within the White Certificate scheme, which was introduced in Italy in 2005, technical sheets for the quantification of energy savings for many electrical appliances and lamps have been developed.
Portugal	Plan for promotion of the efficient consumption	Several measures under a DSM scheme of a big electricity utility: subsidies for efficient cooling appliances, energy saving bulb as a present, energy audits, information campaign.
Romania	Information campaigns	Several information campaigns have been initiated by the energy agency.
Sweden	Technology procurement	Since the 1990s, about 40-50 "technology procurement" projects have been performed in Sweden. Though no projects

		are going on now, many "technology procurement" inspired working groups have been established with purchasers groups.
Switzer-land	Energy label for coffee machines	The Swiss Government introduced a voluntary energy label for coffee machines following the example of the EU energy label.
UK	Various guides explaining energy labels	In UK, various guides have been published by several institutions explaining how to use the mandatory EU energy label and some EU and national voluntary energy labels.
UK	Energy advice centres funded by the Energy Saving Trust	Twenty-one advice centres help people to reduce their energy consumption by several activities (information and advice, leadership for regional initiatives etc.). Advice is given by phone, email and in person. They also carry out targeted campaigns and run events to promote sustainable energy use.
UK	Carbon Emission Reduction Target (CERT)	CERT is a legal obligation placed on qualifying energy suppliers to undertake a range of measures designed to reduce carbon dioxide emissions. The energy suppliers can fund price reductions on the most efficient products or give products away for free. The scheme has mainly focussed on insulation and lighting, but efficient appliances are also allowed (e.g. refrigerators rated A+ and A++, standby savers).

Table 11 - Examples for financial policies and actions to accelerate the market penetration of energy-efficient electrical appliances in the SELINA partner countries and other European countries.

Country	Measure title	Description and results
Belgium	Rebates for energy-efficient appliances	In the city of Brussels, rebates for the purchase of energy-efficient big household appliances are given: for A++ refrigerators and freezers and A dryers : € 100,--; for: € 100,--; for gas-fired tumble dryers : € 400,--.
Czech Republic	"Scrap Premium" on white appliances	In 2009, the CEZ group initiated a 2 month programme in cooperation with two selected electronic retail stores. Customers got a premium of 1000 CZK (ca. 38 Euro) when buying a new most efficient white appliance and handing over the old appliance, which was ecologically recycled.
Czech Republic	Discounts and subsidies under EnergiePlus+	Activity of EON, which is a big electricity and gas supplier in the southern parts of the Czech Republic. In cooperation with one producer of white appliances and a special retail chain, a bonus is paid for a purchase of energy efficient white appliances and discounts are given for the purchase of efficient light bulbs and energy saving devices (switch socket power boards, timer).
Germany	"energy efficiency – now! for households and companies" - campaign	"BUND" and "co2online" (NGOs) together with two big retail chains – "MEDIMAX" and "ElectronicPartner" – offered consumers in September 2010 an exchange of their old cooling device by a highly efficient A++ appliance of a brand manufacturer by supporting the purchase with up to 100€ and disposing of the old device. For an appliance from 399€ on consumers are supported by 50€, is the amount 699€ or higher the incentive is 75€, cooling devices which cost at least 999€ are subsidized by 100€.
Greece	Financial support programme "Change Air-condition"	The programme "Change Air-condition" subsidized part of the cost for the replacement of old air-conditioning units with new energy efficient ones, fulfilling specific criteria (inverter technology and high efficiency class). The programme was co-financed by the European Regional Development Fund (ERDF). Each end-user could replace up to 2 air-conditioning units. The subsidy could be up to 35% of the cost of the new air-conditioning unit, but was limited to 500€ per unit. A prerequisite for the subsidy was that the replaced equipments were properly uninstalled and handed in to the Recycling Company.
Italy	Tax deduction for the purchase of efficient refrigerators and freezers.	Gross tax deduction equal to 20% of the amounts remaining payable by the taxpayer, up to a maximum deduction of €200 per appliance for the replacement of refrigerators, freezers and combinations by the purchase of similar appliances of energy class not inferior to A+ .
Switzer-land	Subsidies for A++ devices	There are different programmes and actions from Swiss utilities to promote highly efficient white appliances by subsidizing A++ devices. As an example, an electricity saving funds of Zuerich

		pays up to 400 CHF per purchased A++ freezer or refrigerator.
UK	Sony TV trade in	Between £50 and £150 price reduction on the price of a Sony television if an old CRT is traded – in at time of purchase. Reduction dependent on the size of the new television (Aug.-Nov. 2009).
UK	Bosch – Trade-in and cash back schemes	Bosch Trade in for built-in and integrated appliances: 25% discount from a range of built-in and integrated appliances + Bosch Cash back scheme for a limited number of most efficient appliances: cost of first year of electricity between £25 to £45 depending on product (covers washing machine, dishwasher, tumble dryer, fridge freezer and freezer).

The overview shows that in most countries, information programmes (esp. brochures, leaflets, websites, national labels) are the dominating measure type (also see the next figure). In some countries, however, financial subsidies for very energy-efficient appliances, often paid by an energy utility and not by the government, play an important role, too (e.g. in the Czech Republic or Switzerland). Energy savings are indicated for all measures for which this information is available. In general, the impact of a financial programme is easier to quantify than the single impact of an information campaign, which often serves as an accompanying measure for regulations (labels, minimum efficiency standards) or fiscal and financial measures.

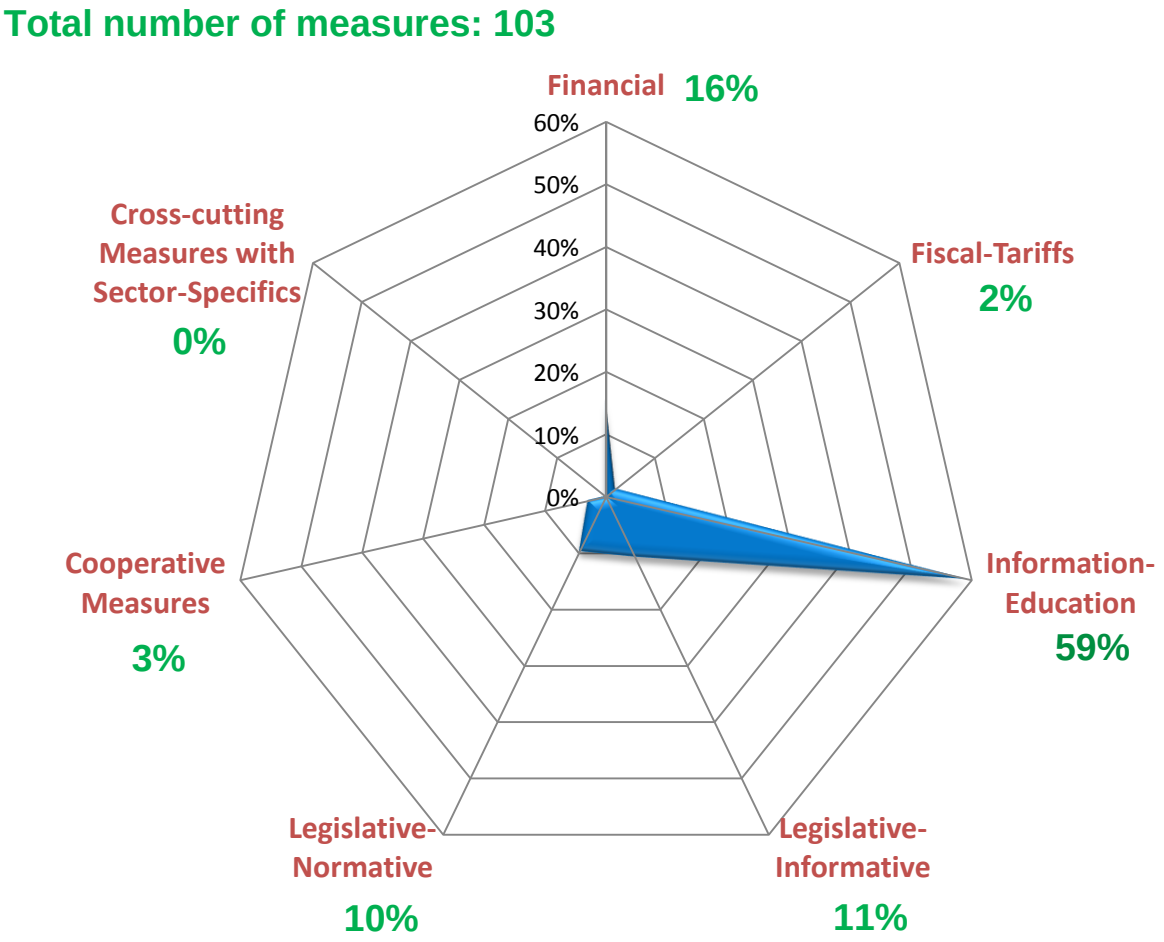


Figure 46 - Characterisation of the measure types collected in the SELINA project.

The most important measure types collected in the SELINA project for the European Countries can be characterized as follows:

Information-education:

- Most important measure type (almost 60 %);
- Mainly brochures, leaflets and websites. In some countries: national label;
- Actors: mainly energy agencies, partly retail trade;
- In the Czech Republic, some activities directly result from EU projects (e.g. REMODECE).

Financial:

- In some countries subsidies (Czech Rep., Italy, Greece, Portugal, Switzerland and Germany) for energy-efficient appliances (A+, A++).
- Actors: mainly energy utilities, partly central government.
- Often only paid for a relatively small time period.

Measures only aiming at standby and off-mode:

- No measures ongoing or planned, but some campaigns in the beginning of the 2000s.
- Denmark: “Turn of the switch – or spend money on nothing”.
- Germany (only one Federal state): “Off – really off”.

In addition to the survey in Europe, a limited survey on measures in non-European countries was also carried out. The measures which were collected can be found at the project website (www.selina-project.eu). In almost all countries included in this survey (Australia, United States, Korea, Japan and China) the main policies in these countries are Minimum Energy Efficiency Standards in combination with labelling (e.g. that kind of measures which is also dominating at the level of the EU).

In these countries, there are more policies directly addressing standby than in Europe, both including minimum standards and labelling. In Korea, e.g., the existing voluntary standby label for appliances <1Watt shall become mandatory from 2010 (see the next figure).

Figure 47 - Standby labels in Korea.

6 Policy recommendations for market transformation

6.1 Stakeholders in the market

When political measures and initiatives are designed in order to better exploit these saving potentials, the relevant stakeholders and frame conditions of the market for electrical appliances have to be taken into account. This can ensure that the measures are widely accepted by the main actors and have the desired impact. The market of electrical appliances is characterised by a wide range of different actors and frame conditions at the level of policy, manufacturing, trade and end-users, as it is shown in the next figure. The main actors on this market are the producers, retail trade, and buyers, but their actions are embedded in a broader frame of several other stakeholders, as e.g. associations, NGOs, or political actors at the level of the EU and at the national or even regional level.

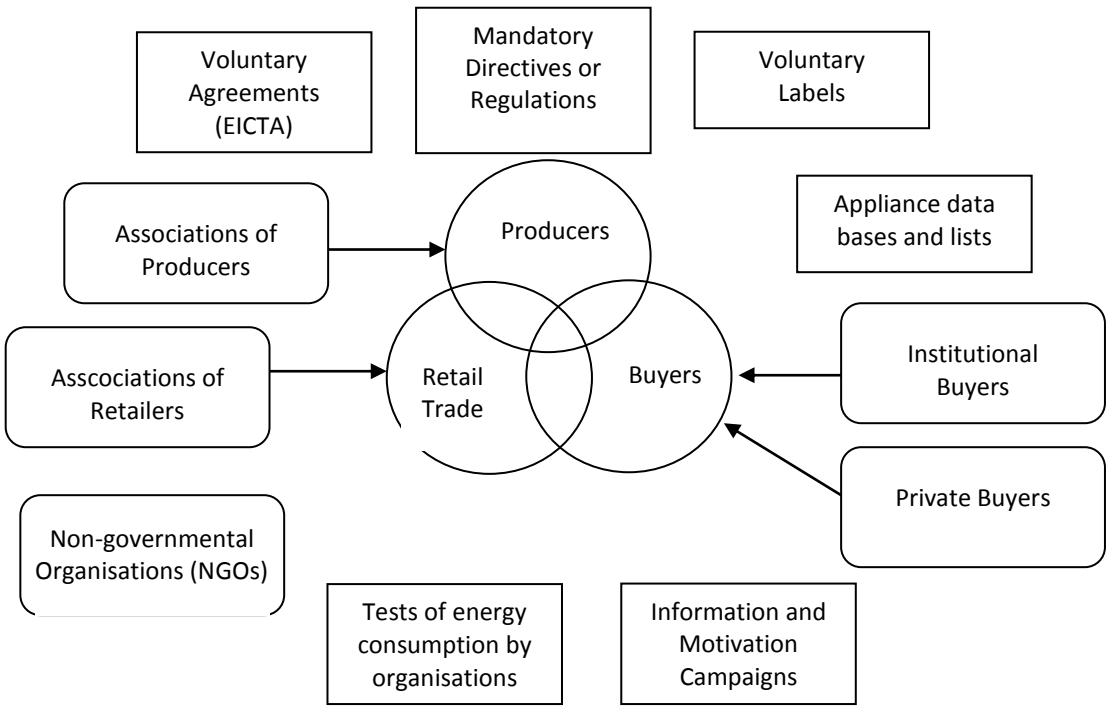


Figure 48 - Relevant stakeholders and frame conditions of the market for electrical appliances.

The starting point for actions and policies to enhance the market transformation of more efficient electrical appliances with low standby consumption should be the main barriers preventing the uptake of existing saving options at the level of the main actors. These are:

- for **buyers**: information deficits both with regard to the purchase of energy-efficient appliances and to the use of these appliances;
- for **retail trade**: knowledge deficits and low importance of energy efficiency in the selling process;
- for **producers**: energy efficiency is no market access requirement and energy-efficient technical solutions may cause additional costs for the producer.

Within this general framework of the market for electrical appliances, there is a wide range of possible policy tools in order to address the barriers and to bring about long-term market transformation towards more efficient electrical appliances:

- Minimum energy performance standards (MEPS) are a suitable policy tool in order to remove the worst performing products from the market.
- Mandatory or voluntary energy efficiency labels, which aim to provide consumers and retailers with information at the point of sale and enable suppliers to gain market recognition for efficient products;
- Fiscal and financial measures as e.g. grants or tax reductions for highly efficient appliances, or low interest loans;
- Market-based instruments as the establishment of white certificate schemes creating a market for energy efficiency;
- Co-operative instruments as voluntary agreements with producers of energy-using appliances, voluntary DSM measures of energy suppliers or technology procurement for energy efficient appliances;
- Information and education programs and activities both addressing consumers (as buyers and users of electrical appliances) and retailers.

The actor-specific targets of these possible measures could be:

- Motivation of the producers to develop, produce and offer electrical appliances with low energy consumption and especially low standby- and off-mode losses.
- Possibility for the buyers to easily inform themselves on the energy and standby consumption of appliances and motivation to buy appliances with low consumption.

Retailers have an important multiplier function within the buying act. They should be made sensitive to the importance of low power modes and informed so that they can give convincing

advice to the customer. Retailers training programmes should be developed within each country to take into consideration country specificities.

6.2 Factors influencing market penetration

6.2.1 Market overview for energy efficient appliances

The main stakeholders concerned by efforts to reduce standby consumption of electric appliances are consumers, retailers and manufacturers. Successful policies have to address all of them. Above all, results of the SELINA project give a deeper insight into retailer's awareness and attitudes towards energy-efficient appliances but also show the need for measures concerning the motivation of private consumers to contribute to energy savings by:

- investments in energy-efficient appliances and
- energy-efficient user behaviour.

A more complex situation of decision making processes and frame conditions for user behaviour is given in the case of equipment of companies and administrations. Here the transparency of electricity consumption and the motivation to save energy is very low, and decision making is influenced by more actors such as company owners, building or procurement managers, persons responsible for IT equipment, department heads, technicians and maintenance staff, etc. Therefore e.g. information campaigns have to address a larger variety of actors. Additionally new appliances and innovative uses emerge, for instance for communication purposes ever more rapidly. As a result there is an urgent need that policy makers anticipate such trends and address manufacturers, so that equipment can be designed in the most efficient way from the outset.

As far as the market for energy efficient appliances is concerned, there have been a number of studies concerning the impact of the labelling directive, which can be regarded as a first major approach to extinguish information deficits. Various references and examples shall be given to illustrate the necessary steps towards market penetration more clearly. These publications track the increased take up of higher efficiency appliances since 1998. Of the appliances covered by implementation directives the impact has been greatest for white goods, particularly refrigerators, freezers and washing machines. The majority of these products sold today carry an A or B rated label or better compared with the majority of products sold in 1994 carrying a D rated label or worse.

Overall the increased uptake of higher efficiency appliances has led to significant improvements in the average efficiency of newly purchased appliances. For refrigerators and freezers, washing machines and dryers the improvement in average efficiency since 1996 is estimated to be in the range of 20 – 35%. This move to higher efficiency appliances contributed to annual energy savings over this period in the order of 24 TWh to 34 TWh. That is a reduction of around 10 to 12% in the energy consumed by these products. It is estimated that with the current policies already in place, 65 TWh to 75TWh per year could be saved by

2010[8]. Although this is not solely a result of labelling regulations, the effect of the latter is estimated to be significant and to account for up to 50% of the new uptake of energy efficient products[9].

Energy labels offer one example to analyse the increasingly efficient market for household appliances. In regards to standby consumption, a moderately decreasing but significant impact can be found, with an overall consumption of 5.4% in the EU and 6.8% (Bertoldi, et al., 2009) in Germany thus justifying political intervention.

Yet it should be noted that the differences between national markets are still striking depending on national institutions and national endorsement labels. Additionally the extent of measurement and verification plays a significant role to verify the real progress made on the market. As verification of the correct classification as this is expensive and time consuming not all countries are equally eager to investigate on test in specified laboratories (Gruber, E., Schlomann, B., 2006). As a result the market penetration of energy efficient applications is differing strongly within the European Union. Nevertheless, a general action plan to promote a further uptake concerning the major stakeholders can be identified and policy agendas identified.

6.2.2 Consumer attitudes

Regarding the attitudes of consumers it can be found, that an increased public sensitivity for environmental concerns correlates positively with an increased willingness to pay (WTP) for energy efficient products. On a national level it was found that markets showing a high appreciation of "green arguments" also experience a higher uptake of efficient appliances (Attali, et al., June 2009). So as to overcome information asymmetries, energy labels, like the A-G labels, the energy star labels or public and private evaluation and advertising can offer potent solutions. Voluntary efforts like the Blue Angel (Blaue Engel) label or the Computer Bild energy evaluations as provided by a public private collaboration in Germany can help to increase public awareness further. For this effect to take place the underlying information asymmetries from a consumer's perspective need to be overcome: Information and education need to be provided by the state to sharpen public awareness and point out possible benefits like reduced environmental benefits, life-cycle costs and energy savings is necessary. This includes the provision of information about active- and standby energy consumption in schools as well as public institutions. In regards to highly efficient appliances the "Energy Boy" (please see Figure 47) can be used as an example to inform consumers further. Most NGOs agree on this point and explicate that the most important aspect in deepening market penetration is accurate and understandable product information for consumers. People should be able to clearly identify the top class appliances within the labelling scheme. Therefore, the

[8] Data based on: "Impact assessment study on a possible extension, tightening or simplification of the framework directive 92/75 EEC on energy labelling of household appliances", Europe Economics, Fraunhofer ISI et al., London, 2008

[9] Ibid, p.3

classification needs to allow for quick, cheap information, for example through clear assignment to the energy efficiency class and correct classification (Gruber, E., Schlomann, B., 2006).

Another supporting feature for more energy efficient products is related to brand awareness. Quality brands offer generally a higher share of energy efficient products due to market competition and the need for development. Although it seems doubtable whether a policy involvement is helpful, Italy indirectly fostered the purchase of high quality products by offering a discount for energy efficient cooling appliances in 2007 (A+ rated or higher) – with remarkable success[10], i.e. a doubling of sales of A++ cooling appliances and an increase of about 40% for A++ freezers.

Possible barriers from the consumers point of view is an increased importance of purchasing price and heavy market competition thus favouring low-price, high-energy products. Additionally trend products, like bigger, American-styled fridges, include increased energy consumption, thus creating a preference for energy inefficient products. Yet, it should be mentioned that today's big appliances also offer smart technologies, like weight-based washing or auto-off functions for TVs. Politically bonus/malus programmes, energy labels and public information all offer a way to increase public awareness and steer the market towards more energy efficient products.

The problems concerning customer behaviour can be illustrated by examining the example of electricity metering, which can provide significant benefits but is rarely used in private households.

Example: Advanced electricity metering

Electricity consumption should be made more transparent for the users. Advanced electricity meters, together with appropriate software and presentation, can give a feedback of past and current energy consumption. In addition they can show the influence of different types of electric appliances on the load curve. This information enables the consumer find out main points of electricity use in his household and where it is profitable to think about saving possibilities. This technology and information should be simple, easy to understand and to apply by the consumer. It must be easy to monitor the individual consumption and to compare it over time or with the consumption of others, for instance with a mean value of other comparable households.

Environmental psychology revealed influencing factors of user behaviour, such as habits, consciousness, motives, and social norms. "Smart meters" and feedback can contribute to a change of habits and a higher consciousness by addressing attention to energy consumption. As a result a kind of social norm can be introduced via a sense of competition when presenting comparisons to others. The relevance of electricity costs will also be strengthened. The

[10] Yet it should be noted that the measure as such was not created to increase the share of quality brand cooling appliances, but rather for highly efficient products.

identification of types of appliances helps to balance conflicting motives, e.g. real needs, comfort or financial aspects.

It is assumed however that the acceptance of smart metering by private households is not very high if they have to pay for the installation and the service. Only consumers who are already strongly interested in environment and energy saving may invest in this technology. Therefore additional actions should be taken:

- The combination of smart metering with variable tariffs, e.g. peak and off-peak tariffs motivates consumers to deal with cost saving by shifting the use of certain appliances to off-peak hours (see below).

Additional features of "intelligent houses" could promote investments in the technology, above all safety, but also comfort aspects. For example, a control of systems on a display in-house or remote can give an overview of open windows, unlocked doors, on-mode of appliances, etc. Especially for elderly persons it could be interesting to be connected to family or institutions in case of emergency or to call on services ("Ambient Assisted Living Programmes"). There is still a need for technical development and monitoring of projects which combine energy saving, safety aspects, comfort, and assistance in innovative metering and control systems. These systems have to be transparent, easily operated and capable of being influenced by the user.

6.2.3 Retail traders

Regarding the selling strategies of retailers to convince customers it appears that most of the time, arguments used by retailers are the product functionalities and price as well as brand and appliance design. Energy advice appears at the bottom of the argument list. Regarding energy advice, the feature that has the more important influence on the sales are the energy labels, followed by the product nominal power. Following the SELINA study however on average 74% of the interviewed retailers in interviews underline the possible benefits that client may gain from energy efficient appliances (please see section 4 of this report). Following the opinion of retailers, more energy labels or energy consumption information could lead customers to buy more energy efficient equipments. However, the top priority of clients consists of price and functionalities of the products, showing that the advices given by retailers are in agreement with the client's needs.

The structure of the retail market can strongly influence the way efficient products are sold in Europe. Depending on the marketing strategies retailers usually aim at increasing their shares in market or marking products up to receive higher profits from each unit sold. When focusing on mark-ups, retailers typically choose to sell energy efficient products. Efficiency is a quality that can easily be communicated to customers and is strongly favoured by people aiming at low life-cycle costs and are responsive to green issues. This holds in particular if the energy savings are big enough to compensate on the extra costs in the long run. High volume markets, as is often the case in the UK and Poland, force retailers to increase output and become more price-focused. Thus generally less efficient low-end products are promoted (Attali, et al., June

2009). Given a tendency towards perfect markets, a no-win situation might be created in regards to energy efficiency: Profit margins for manufacturers and retail agents fall whilst consumers receive products poor quality products at low prices but high life-cycle costs. For energy efficient appliances to achieve a high market penetration it seems unfavourable to have a concentrated retail market: Given only few and strong retailers on the market a fierce price competition seems more likely and producers have to give in to retail pressures, thus limiting the range of high-end choice products. As a policy maker, labelling and information campaigns can increase awareness for low quality products and incentives for lowering the price for high-end products can be set.

In regards to the labelling directive so far, it was found that the share of correctly labelled appliances in retail stores was relatively high for the large white appliances (between 62 and 70%), whereas the main problems occurred in the case of electric ovens (45%) and air-conditioners, which had the lowest level of compliance (26%). With regard to the overall compliance by type of shop, the highest share of correctly labelled appliances was found in department stores (69%) and electro superstores (66%), i.e. in the big chains, whereas the lowest share of correct labelling (39%) was observed in kitchen and furniture stores, i.e. sales channels where visual viewpoints are very important for sales promotion (Gruber, E., Schlomann, B., 2006). According to the survey results, especially kitchen and furniture stores are very concerned about the appearance of the kitchens on display and therefore often place the labels or data strips inside the appliances and not on top or in front as demanded by the Directive. It seems that the regulation in its current form is least suited to this channel of distribution and is thus less accepted than in other parts of the retail trade. Regarding the SELINA studies it was shown that in the retailers' opinion, more information about the energy consumption of the products and the expected economic savings that the client could gain from efficient equipment would help the clients to choose more efficient appliances. However, this is an opinion shared by only about half of the salesmen (please see section 4 of this report). This trend also holds across countries in Europe. One of the only arguments which present a significant difference between countries is the energy consumption advice. For Portugal and UK it can be seen that this point appears in at the bottom of the list of the retailers' advice priorities.

Additionally an increase in electricity prices, as well renders high quality, energy efficient appliances cheaper and more viable, particularly in combination with information and labelling campaigns about future savings. Given a large offer and highly diverse range, retailers can effectively promote energy efficient appliances more easily as they stick out of the mass of products and show up a legitimate selling point that retail agents can exploit. On the other hand this point can also used the other way round when as relative profit margins increase with increasing energy efficiency. A++ products are often significantly more expensive than A or A+ rated appliances, as they can be considered high-end products and come with a premium. Following a simple logic of supply and demand this automatically reduces the possible quantity of units sold. In order to keep up the high standards, labels need to be revised regularly, thus giving an incentive to retailers and producers to keep on increasing the quality of their products.

6.2.4 Producers

Following from this another influence factor is the choice of business models and the relation between manufacturers and retailers. Depending on the market structure, appliance prices do not necessarily reflect manufacturing prices. Most European market for electronic applications are dominated by retail traders, and as a result show price mechanisms based on retailers strategies. As a result the relation between quality and price becomes blurred, information is harder to acquire and energy efficient products are harder to identify. For policy makers it is important to understand how the appliance markets work so as to intervene in coherent ways (if necessary). In order to overcome this problem, labelling provides a yardstick for consumers and producers.

From the point of view of the European manufacturers, the labelling scheme represents a factor of competitiveness and a driver for innovation. The manufacturers' associations, however, addressed their concerns about cheap imports of white goods from outside the European market. They fear a distortion of competition due to incorrect classification. As there is no control at European level before white goods from outside Europe are introduced onto the European market, some foreign producers may falsely classify their goods. Another important point for manufacturers is the scale of the labelling scheme as an open scale reflects more technological progress. In many countries however enforcement could still be improved.

This connects to another point of market surveillance and enforcements. Generally producers favour strict enforcements so as to provide a level playing field. This holds in particular for upper class producers who tend to be ahead of current legislations. Market surveillance needs to cover the whole market and must not allow for cheating or abuse of information rights, in particular in highly competitive markets. In regards to the national monitoring activities very large differences in resources used for market surveillance can be found depending on the Member State. In regards to labelling, for example, the Netherlands and Denmark spend about 300.000 Euro annually, while a number of countries do not spend anything at all. Similarly, some countries make 60-70 tests annually while others do not make any tests. It is, however, difficult to assess and compare Member States' market surveillance activities since the degree to which Member States test appliances with the objective of measuring compliance of a product against several Directives (several requirements) varies strongly. This point of view was confirmed by various participants of the industry in the SELINA workshops (for more information, please see the workshop conclusions document (D5.2) on SELINA website). Manufacturers of energy efficient appliances generally favour strict but foreseeable measures, as it gives them time to prepare as well as another sales point. For policy makers it is necessary to offer stringent and foreseeable targets on a medium to long run timescale. As competition of manufacturers is persistent in all European countries, the regulatory context should be set alike.

At the same time care should be taken from the side of policy makers, when involving stakeholders in the decision process of political measures. Manufacturing organisations in particular are much better organised for lobby work than other type of stakeholders due to their relative local or national importance (in terms of employment, taxes etc). If at all, front

runner industries should be invited, who hold an interest in further deepening market penetration of sophisticated appliances. Additionally NGOs and retailers can be invited as well to produce a complementary view on the issue.

Note that this point is particularly important in regards to the exogenous shocks: Out of all stakeholders, manufacturers can be expected to suffer the most from a crisis, as the industry does not hold a price buffer like retailers. As a result any kind of energy development would in theory be seen as a punishment at times of crisis and might be rejected categorically.

6.1 The role of policy makers

Information campaigns in Europe should explicitly address household consumers and retailers. Additionally consulting on energy related issues is necessary to improve information deficits and make people aware of the possibilities at hand. There is a need for continuing campaigns for private consumers, on the one hand because of emerging new appliances and uses, and on the other hand because consciousness and behavioural measures have to be activated from time to time. As one of the most efficient measure it is proposed to promote the use of portable electricity metering devices which show current and accumulated electricity consumption of individual electrical appliances.

Information campaigns directed at employees in buildings of the tertiary sector are a suitable way to raise energy awareness and influence the attitude of employees. For companies and administrations it is important to involve decision makers on all levels into information activities. An efficient type of information could be the realisation of individual “energy saving campaigns”. It is offered by trained personnel for instance of an energy agency and includes information materials of all kind, “switch off”-stickers, metering of consumption, feedback, displays, presentations, workshops for technicians, IT managers, etc., competitions of saving ideas, and an inspection of individual workplaces. These campaigns have been carried out with great success in Switzerland and on a regional level in Germany. Additionally equal weight should be given to balancing market power between retailers and producers, so as to keep interest in providing the most efficient appliances. Policy makers should keep an eye on well-functioning markets showing significant competition and no price based competition as this would decrease market potentials for highly efficient products and restrain consumer brand awareness. The inherent problems envisaged in this report can be illustrated on the example of a two level electricity tariff.

Example: Two level electricity tariff

Nowadays, electricity costs tend to decrease with increasing consumption due to a fixed part (e.g. for metering). This means that tariffs send users a signal which is contrary to energy saving. SELINA, REMODECE and other projects can help to define a standard consumption of households based on structural conditions, such as household size or dwelling area. This standard demand will be allocated by a low price electricity tariff, and any consumption above this standardized value will be more expensive. It will be a problem however to identify the structural factors of a household without allowing the energy supplier a too deep insight into

the household. Therefore this measure would be more appropriate for companies and organisations. A standard consumption could be defined based on the NACE classification. Existing national electricity consumption guidelines have to be checked and adjusted, taking as example the Italian progressive tariff structure for the captive customers (>90% of the residential sector).

As this measure will be difficult to implement in households another solution is proposed, which is based on the disaggregation of the electricity consumption in a household. It presupposes that the “standby consumption” can be identified in the load curve by a certain algorithm. This part of the consumption could be allocated with a higher price than the remaining consumption. If the algorithm allows it, also the consumption of cooling appliances, such as refrigerators, freezers or combined equipment could be included in a higher tariff, because they have a well-defined load curve with regular intervals. For example, a constant standby consumption of about 2 kWh per day could be priced three times higher than the fluctuating consumption of about 8 kWh per day in order to guarantee the same total amount of cost.

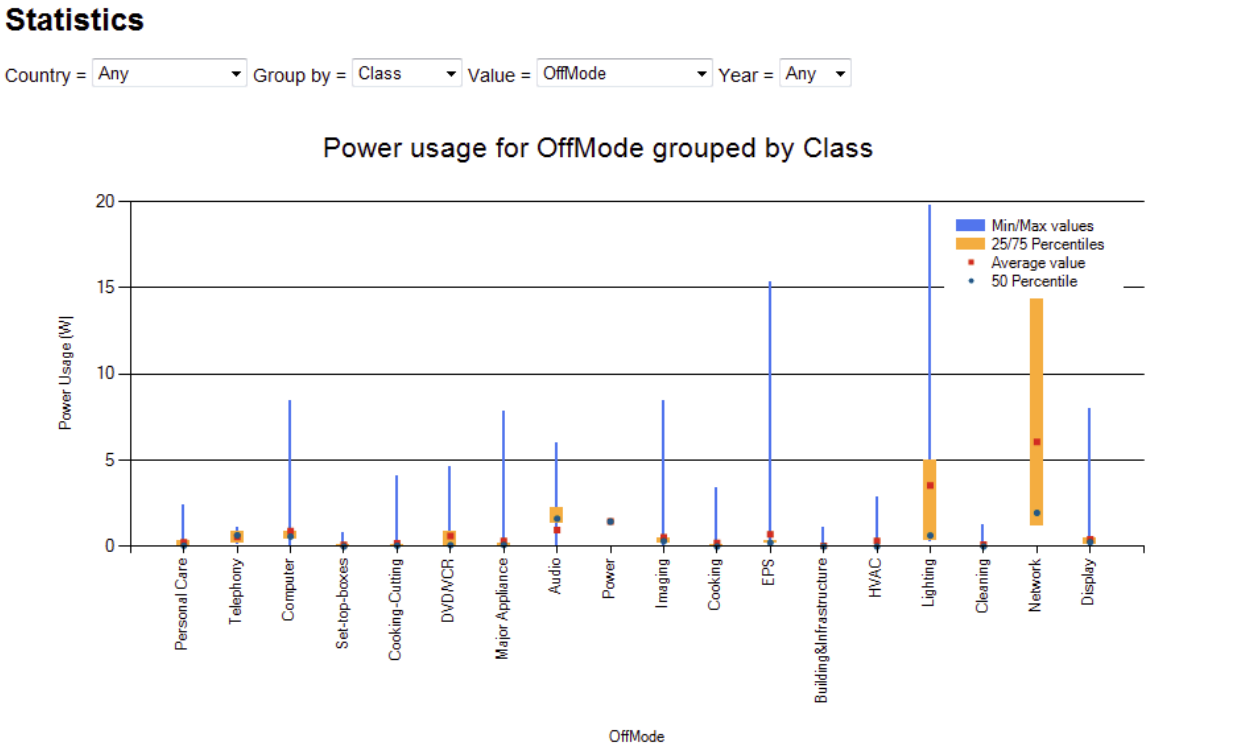
7 SELINA online database

The SELINA database can be accessed through the following websites: www.selina-project.eu and www.selina-database.eu

7.1 Accessible Data

The SELINA database is a public online tool that everyone can access and search the input power values, in low power modes, of more than 6000 equipments.

At the online SELINA database there are no double measurements presented.



Source Data

Class	Number of measurements	Minimum (W)	Maximum (W)	Average (W)	25 Percentile (W)	50 Percentile (W)	75 Percentile (W)
Personal Care	212	0	2.37	0.25	0	0.05	0.36
Telephony	14	0.09	1.12	0.55	0.15	0.66	0.84
Computer	392	0	8.48	0.91	0.41	0.58	0.84

Figure 49 – SELINA online database – Statistics screenshot.

In the "Statistics" area (Figure 49), the users can access all the data of the measurement campaigns, and filter it through the dropdown boxes, filtering the information: by country; by class, domain or appliance; by year of the measurement and also by the type of low power mode.

7.2 Standby Calculator Tool

The Standby Calculator Tool can be accessed through the following websites: www.selina-project.eu and www.selina-database.eu

The Standby Calculator Tool can be used to calculate the consumed energy, the annual cost and the equivalent CO_2 emissions.

In order to compare the results in an easy way, a diagram that shows the energy consumption of the different models is presented. Furthermore, the values for the most efficient device are also showed, in order to have an additional comparison.

It is also possible to make a comparison between two different equipment models if the "Compare two appliances" check box is selected.

The Standby Calculator Tool is user friendly and very easy to use. Anyway, the next topics present a quick user guide for the Standby Calculator Tool:

Electricity Cost

The cost of one kWh should be inserted, in a currency of your own choosing.

Hours on standby pr. Day

The number of hours spent by a specific appliance in the standby mode per day should be noted. The standby time is defined as the time when the appliance is not performing its main function, and is not switched off.

Standby type

The type of standby should be chosen.

Appliance class

Appliances are divided into classes based on their main function. For example, if you are looking for an OBH blender model 6658, the Appliance class Cooking-cutting should be chosen.

Appliance type

The type of appliance can be chosen. If the example of the OBH blender model 6658 is considered, the choice in this box should be "Blender".

Appliance brand

For the chosen Appliance type, a list of brands measured in the project will appear. If the example of the OBH blender model 6658 is considered, the choice in this box should be "OBH".

Appliance model number

The Appliance model number is the product key given by the manufacturing company. If the example of the OBH blender model 6658 is considered, the choice in this box should be “6658”.

Calculate

After successfully filling in the boxes above, the calculate button will calculate: Energy consumption, annual cost and CO_2 equivalent environmental pollution. The calculation will be carried out for the appliance selected by you and compared with the results from the most efficient model from this appliance type. The results will be displayed as numbers and in a box chart.

Compare two appliances

This function enables the user to enter two different appliances from the same appliance type, to compare standby consumption. If the function is chosen it adds an extra appliance to both the written results and the box chart.

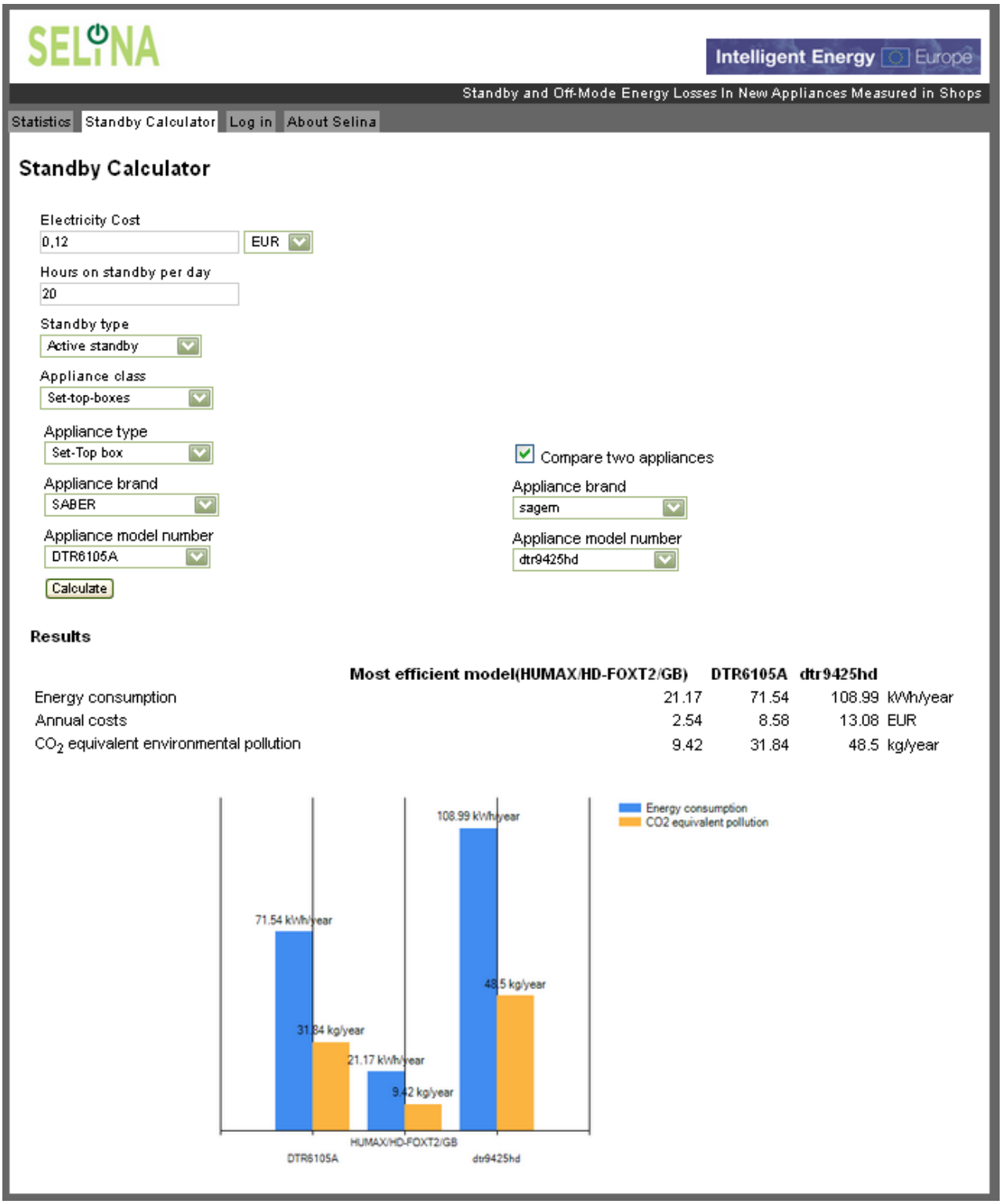


Figure 50 – Standby Calculator Tool screenshot.

8 Conclusions and Recommendations

The SELINA project developed a common measurement methodology and created extensive data collection of off-mode and standby input power values for more than 6000 different products, allowing for the first time, the collection of a large representative sample of low power mode measurements for the EU market of electrical and electronic appliances in 12 geographically diverse countries.

An analysis of the measurement accuracy was performed, showing an average error of about 12%. The standard deviation was also calculated, which has a value of about 20%. This indicates that the measurement method in the shops probably be improved.

It was found that 18.5% of the appliances, whose off-mode power was measured, do not respect the EU regulation threshold of 1 W. When the measurements are compared to the 2013 threshold of 0.5 W, the number raises to 41.5%.

Regarding standby mode input power, 31% of the measured products did not comply with EU regulation limit for the 2010 threshold. When the measured values are compared to the 2013 limit, the number of products over the EU regulation target increases to 66.4%.

When comparing the 2009 and 2010 measurements, only a slight decrease of the share of appliances exceeding the EU regulation limits was observed.

The SELINA measurements were compared with the data from the APP (Asian Pacific Partnership), more specifically Australia, India, Korea, USA, Canada and New Zealand for the years 2007-2010. The result was that, the SELINA's project gathered values, in off-mode and standby, are very similar to the ones measured in these countries, reflecting the global nature of the World market of electrical and electronic appliances.

The results of the retailer's survey showed that, despite of retailer's consciousness of the products energy consumption and energy labels, other types of arguments like the appliance price or functionalities are more frequently used to sell a product. This could be due to a lack of information in shops about the equipment energy consumption. Furthermore, the results show that retailers try to adapt their advice to the customers' needs (price and product functionalities).

Retailers assume that publishing more information regarding the energy consumption of products and some kind of cost saving calculator/reference would influence the clients to buy more efficient equipments.

Retailers in general show that they have a good knowledge about the presence of low power modes. Yet only Romanian retailers have demonstrated knowledge about any study/policy related to low power modes. It should be kept in mind that these results could also depend on information spreading in each country regarding low power modes.

During the surveys some retailers admitted that sometimes they are "forced" to advise products, not always efficient, because some products are not being sold and to avoid stock

problems, leading the clients to buy inefficient products. Another problem revealed by retailers was that sometimes a bonus is given to salesman if they sell specific products chosen by the shops, so the salesmen are led to sell whatever the shop wants them to sell. More exhaustive surveys deserve to be carried out in order to evaluate not only the retailer's awareness, but also the shops policy towards energy efficiency.

It is expected that SELINA project can support the successful national implementation of the regulation implementing the Eco-design Directive with regard to standby consumption by providing information on the present status from the measurement campaign. It can also help to embed this implementation in a broader national strategy to enhance the market transformation towards energy-efficient appliances since it gives a deeper insight into retailer's attitudes towards energy-efficient appliances and an overview of successful and innovative policy measures at the level of retailers and consumers.

The survey on measures enhancing the market transformation towards more energy-efficient electrical appliances showed a wide range of actions and policy tools in the SELINA partner countries. In national workshops, which mainly took place in the late summer/early autumn 2010, these measures were presented and discussed with all relevant national stakeholders.

It is expected that the policy recommendations, on this report, will help to integrate successful and innovative policy measures at the level of retailers and consumers in a broader national energy efficiency strategy for electrical appliances. By cooperation with other projects and activities, the SELINA project also aims at the integration of the most important policy measures collected within the SELINA survey in more extensive measure databases on energy efficiency, e.g. the MURE database or the IEA activities.

In most countries, information programmes (particularly brochures, leaflets, websites and national labels) are the dominating measure type. In some countries, however, financial subsidies for very energy-efficient appliances, often paid by an energy utility and not by the government, play an important role, too (e.g. in the Czech Republic or Switzerland). In general, the impact of a financial programme is easier to quantify than the single impact of an information campaign, which often serves as an accompanying measure for regulations (labels, minimum efficiency standards) or fiscal and financial measures. It appears that it is important to keep in mind product changes, like increased network connectivity, which could largely change the low power mode consumption.

The concept of a warning label on products with standby consumption is supported. This appears to be a feasible approach for some products and modes. However, that warning label should not be necessary where there are mandatory requirements such as Minimum Energy Performance Standards (MEPS) that cover relevant products and modes.

Special care is required when promoting low standby products (without consideration of other attributes) to ensure that there are no perverse effects such as the inadvertent promotion of products with low active mode efficiency and high energy consumption. It is desirable to follow a vertical approach to standby, where low power modes are combined with active modes to give total energy consumption. It is preferable for products where the total energy

consumption is significant. The definition of usage patterns under such a vertical approach is necessarily product specific and this could vary by region or country.

It is recognized that equipment connected to networks is of growing importance. It is recommended that increased efforts to compile data and measurements of networked products from a variety of sources in order to obtain better information on networked product characteristics needs to be made.

The new technologies offer many opportunities for energy savings potential but also there are some threats which need to be recognized and understood. There is a strong need to ensure that energy saving paradigms and strategies become a core consideration in all future product designs.

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ISR - University of Coimbra