

Lighting energy efficiency in residential buildings, evaluation and projects



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Department of Building Services
Lighting Engineering Center
ROMANIA**



EnERLIn
*Energy Efficient Residential Lighting
Initiative*
Supported by
Intelligent Energy  Europe



EnERLIn

European Efficient Residential Lighting Initiative

2006-2008 – IEE - Intelligent Energy Europe program

To develop and validate robust scenarios for **CFL promotional campaigns** in European, national and regional levels

Assuming that there are 150 million households in Europe, the energy economy by replacing only one additional 75 W GSL by one 15 W CFL is in the order of **22.5 TWh per annum**, this corresponds to **1.2 Mtonnes** of less **CO₂** per annum – EnERLIn proposal



Objectives of the EnERLIn action

- Improving the energy efficiency is a central theme of energy policy within the European Community
- Overall electric appliances - 40% of the EU total electricity consumption
- Ultimate objective of the EnERLIn program - to substantially increase the efficiency of residential lighting in a number of Member States
 - light fixture outlets and specialty stores - luminaires with CFLs (good and aesthetic ones) rather than GSL
 - promotion to all the stakeholders a quality charter to assure that the CFL that are marketed and promoted can deliver savings which last overtime and meet the customer expectations of high quality lighting
 - all the program objectives will lead to a higher market share for the most efficient CFLs and dedicated luminaires. The final beneficiaries will be end-users of equipment mainly in domestic sector.
- Several European and national programs devoted to the promotion of this type of lamps and try to limit the GLS use in households
 - campaigns very efficient and the number of CFL sales increases in Europe rapidly
 - average observed growth rate concerning CFL numbers is the order of 13.5% per year (in the order of 11.5% in western and 17% in Eastern countries)
 - annual growth rate of the global lighting industry is in the order of 0.8%

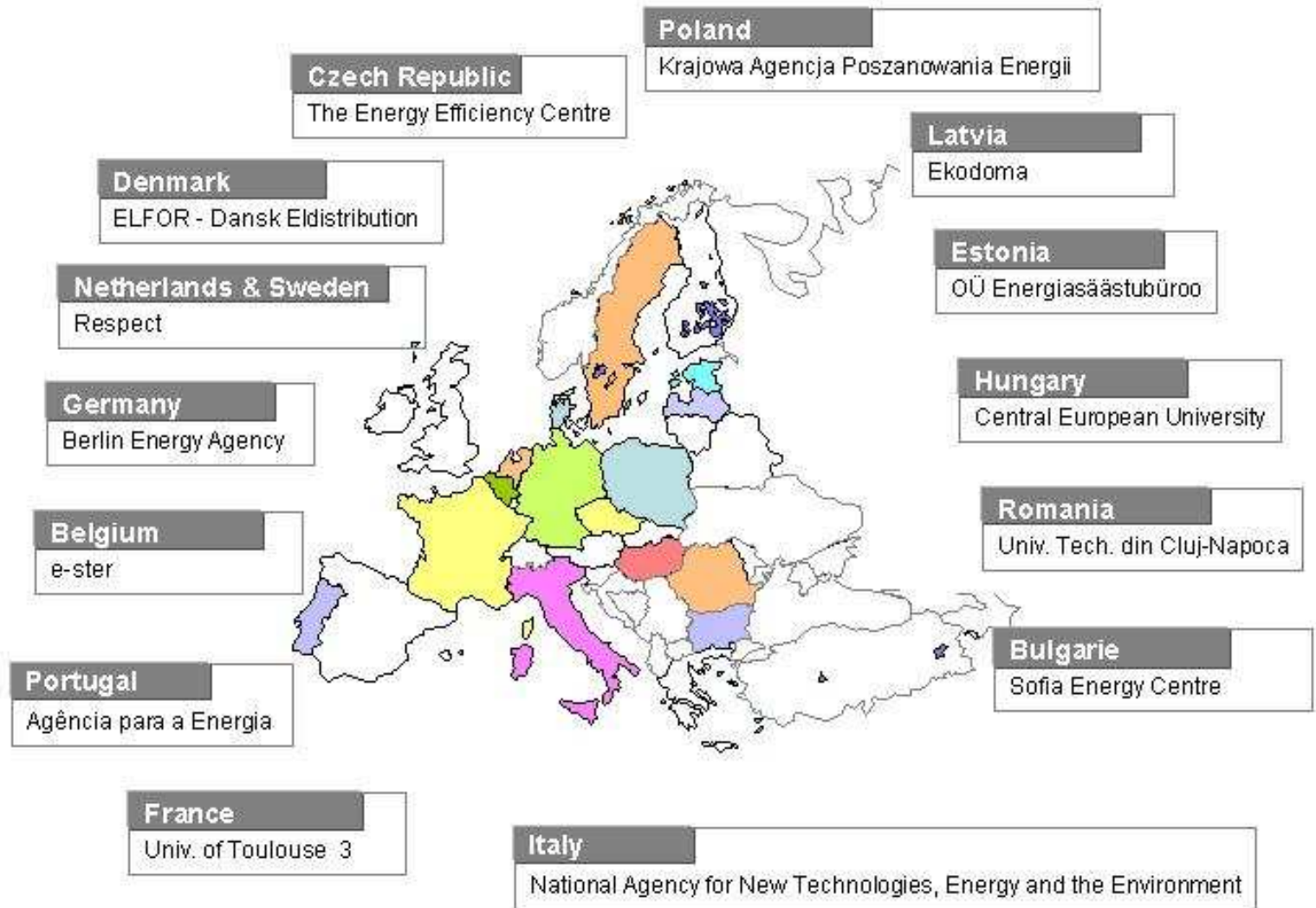
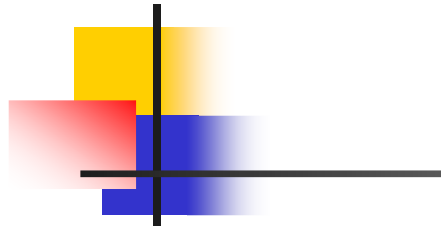


Objectives of the EnERLIn action

Increased penetration of **CFL's in the residential sector**

- introducing a CFL Quality Charter that guarantees for the end-user **the CFL quality**
- designing and implementing **CFL promotional campaigns** adapted to each country sensibility

EnERLIn CONSORTIUM







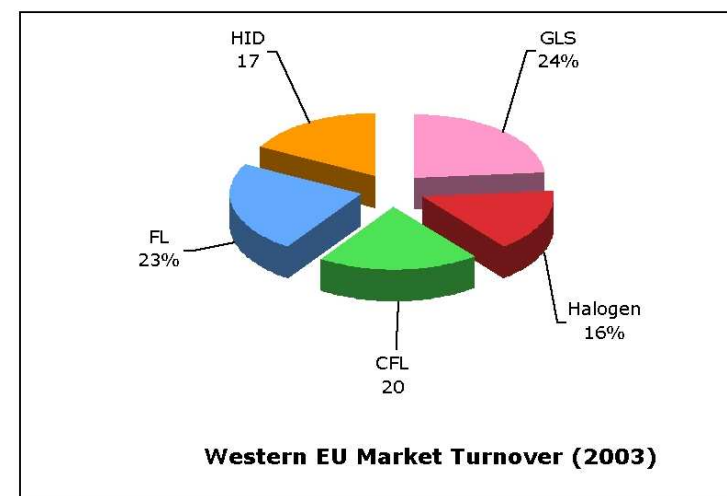
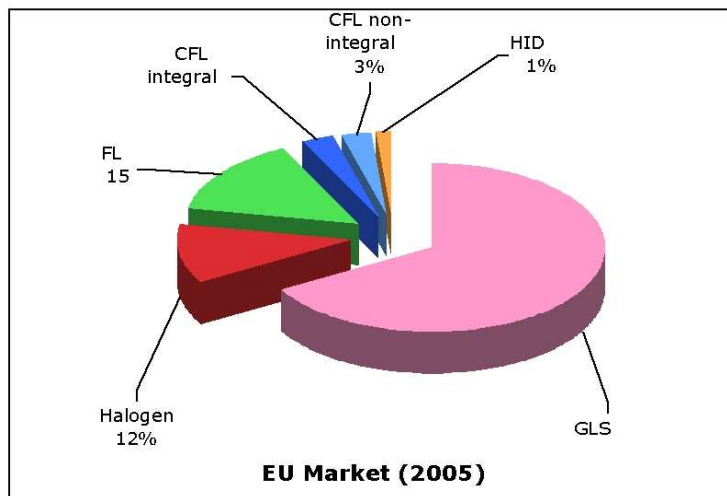
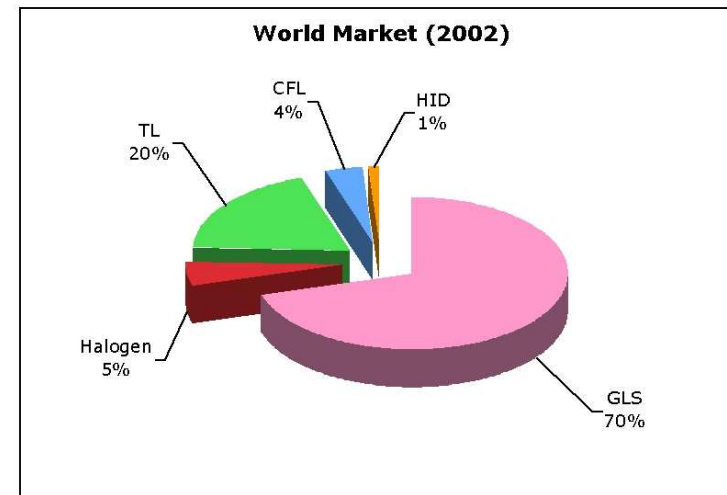
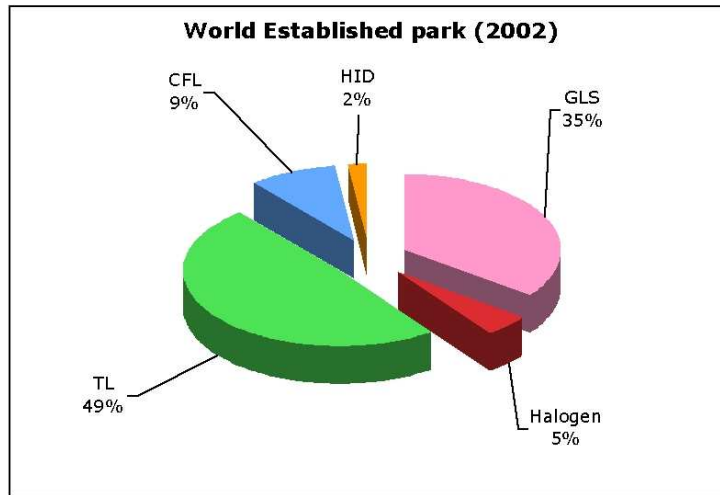
ELECTRIC LIGHTING ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR

The use rate of CFLs per household

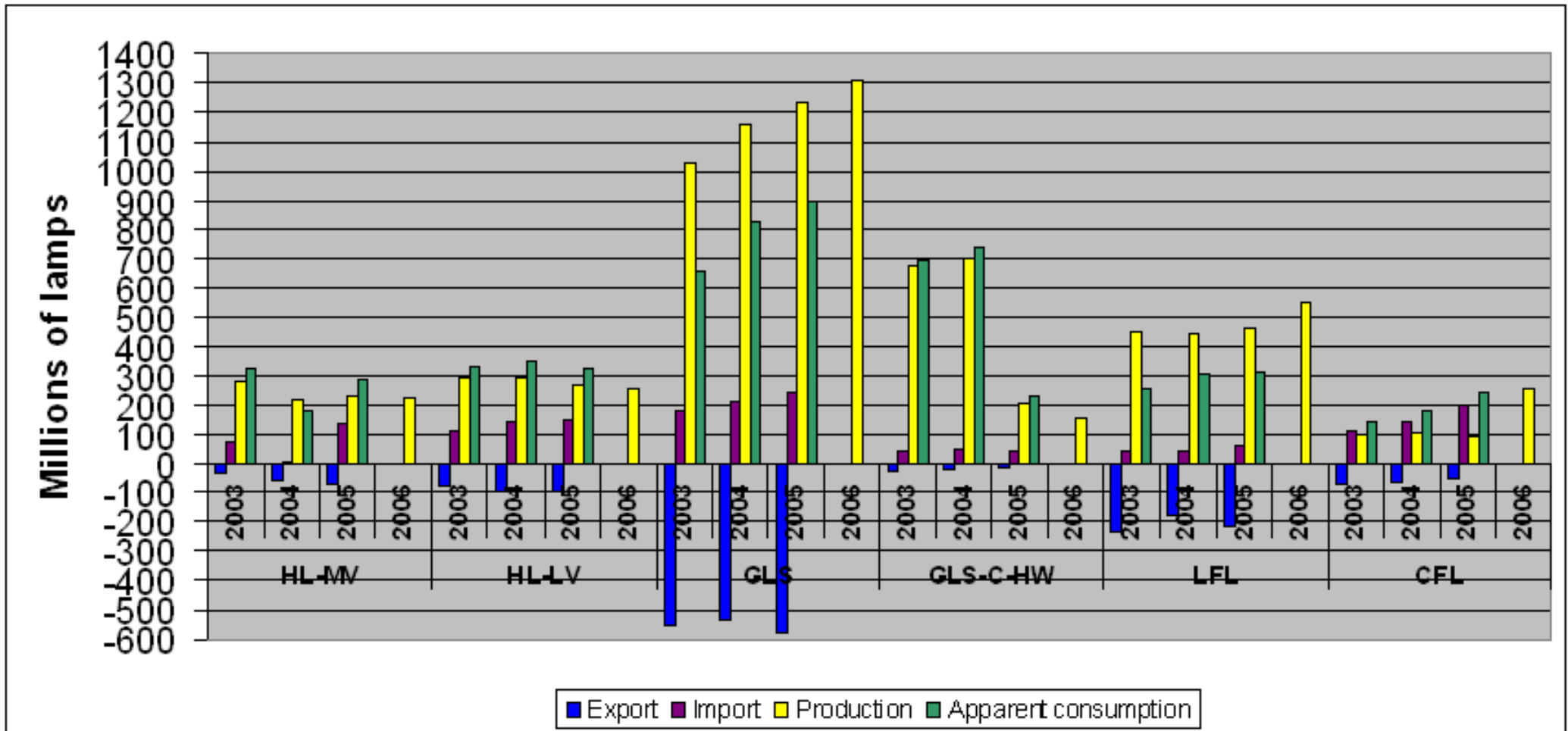
- From 0.8 units in Great Britain up to over 3 units in Denmark (2002)
- SAVE programme - a reasonable upper limit to 8 units (2002)
- Residential lighting in Denmark (2002) 100 households
 - ❖ lighting consumption 5% - 21% of the total monthly electric energy consumption of the household
 - ❖ 24% saving lamps – linear fluorescent lamps and compact fluorescent lamps.
- **EnERLIIn & CREFEN (2005 study) ~ 2 units in Romania**
- **Residential lighting consumption in Romania ~ 23% (2000 study)**

General lighting market in Europe and worldwide

from the EU-COST-529 "Efficient Lighting for the 21st century" network
Zissis - Ingineria Iluminatului 17



Eurostat data (all sectors) Casper KOFOOD, Energy piano





Customer Complains

= CFLs do not give ENOUGH lighting

- * Start up time**

- * Wrong info about equivalence**

= CFLs do not give GOOD lighting

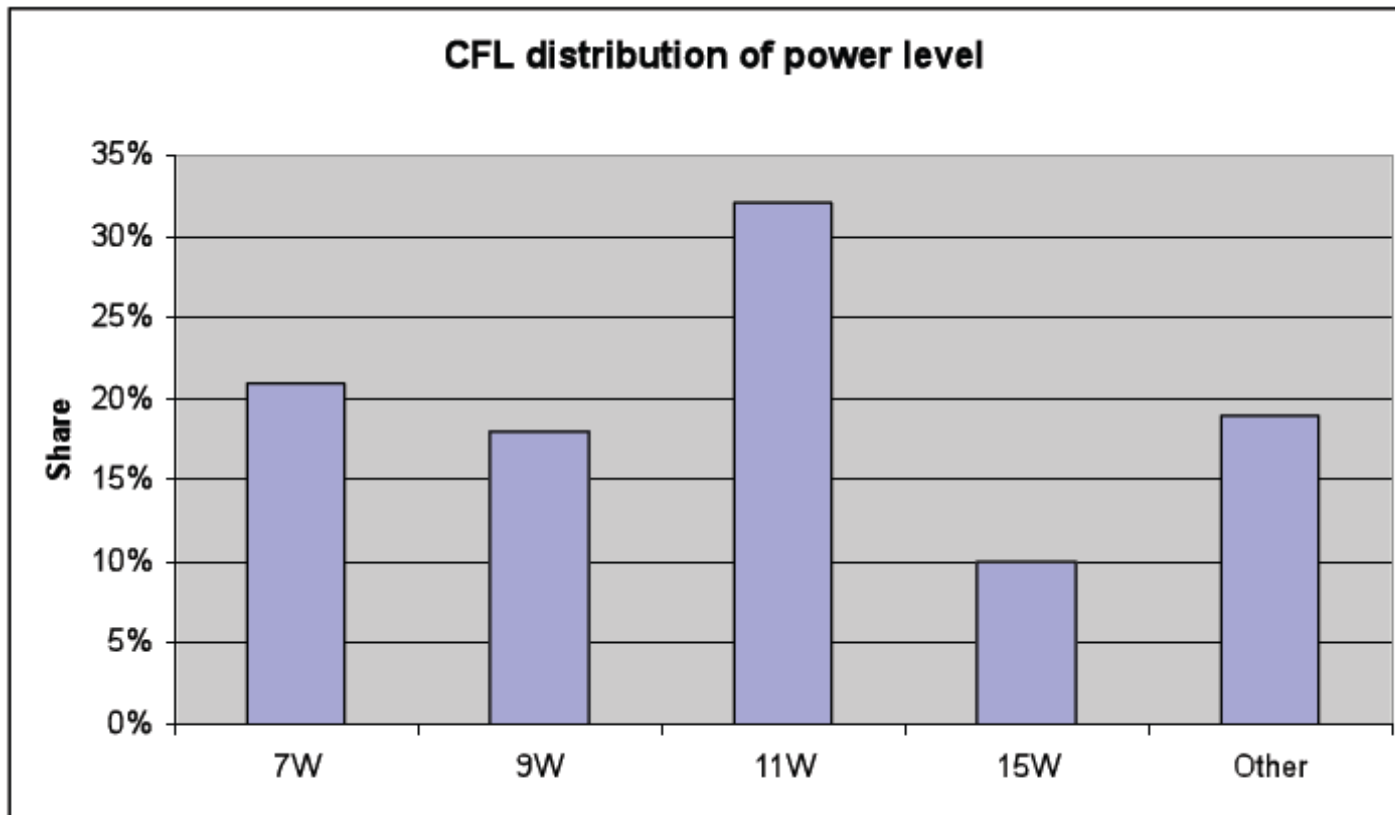


EnERLIn consortium questionnaire campaign

Up to day EnERLIn consortium identified the following fundament reasons

- Consumer dislikes classic CFL shapes, and, CFLs misfit often to “design” luminaries
- Consumer dislikes colour temperature & rendering of CFLs
- Good quality CFLs are still expensive, and, inexpensive CFLs are not reliable
- Return time is short but “diluted” and directly observable
- Plug & Play CFLs are not dimmable (this concerns the large majority of existing products)
- Consumer need all light instantaneously but CFLs need time to warm-up
- CFL dislikes rapid (or random) ON-OFF cycle and is incompatible with presence detectors
- CFL power supply dislikes mains voltage fluctuations

Efficient CFL-promotional campaigns should take into account theses negative arguments and find the way to demonstrate valid solutions to end-users



The CFL distribution power on 2000 Danish households - 2007

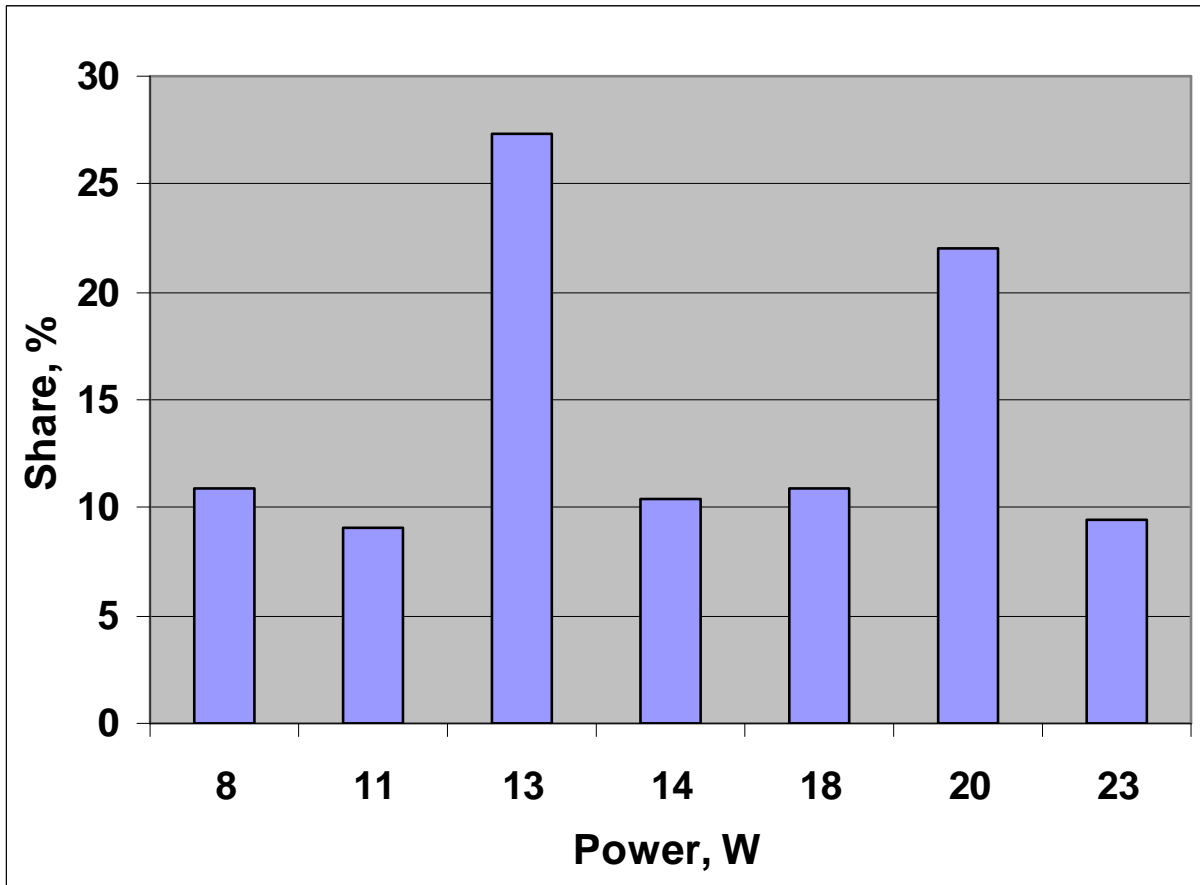
Average 9 incandescent lamps per household, **6 CFL**, and 8 halogen lamps.

16% of Danish households still do not own a CFL.



EnERLIN questionnaire campaigns

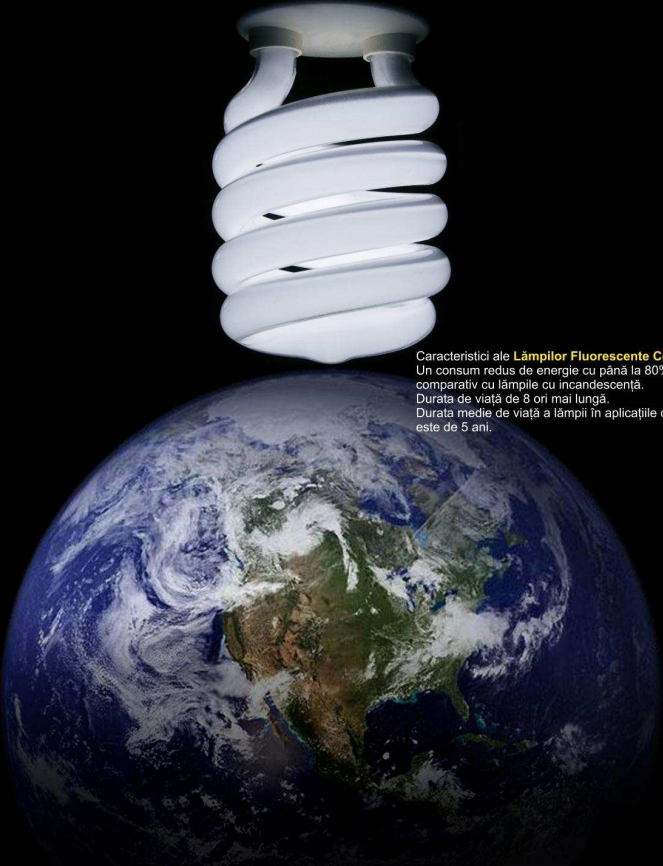
- Seven steps **November 2006 – May 2008**
 - EnergoBit and Pragmatic - the electric equipment dealers
 - Electrica distribution company
- 545 answers (households), 1804 CFLs, **3.31** units per people
 - seems to be too great
 - questioned people known well the energy efficient lamps
- Finally, both campaigns - CREFEN (**November 2005**) and EnERLIN (**November 2006 – May 2008**) denote on average **2.82 CFLs per household.**



**CFL distribution power in Romania
- EnERLIIn**

UTC-N Lighting Engineering Center 2007 – 2008 promotional campaign

- to manage the entire **promotional campaign**;
- to prepare the **EnERLIn leaflet** in cooperation with the subcontractors offered to the target people;
- to prepare a **CFL Guide** in cooperation with the subcontractors for the use of the Architects and Electric and Lighting Installations Designers;
- to promote the EnERLIn programme and achievements in the **local and national media** - local: TV, newspaper; national - "Electrician" journal;
- to join the **local dealers stands** at the National and Regional exhibitions and fairs by presenting the EnERLIn posters, in cooperation with the subcontractors;
- to participate at the Electric and Lighting **scientific events** with the papers related with the EnERLIn programme and achievements;
- to cooperate with **New Green Light programme of ARCE Romania** (ARCE - **R**omanian **A**ssociation for the **E**nergy **C**onservation) by promoting energy efficiency in residential lighting installations.



Caracteristici ale Lămpilor Fluorescente Compacte:
Un consum redus de energie cu până la 80% mai mic comparativ cu lămpile cu incandescență.
Durata de viață de 8 ori mai lungă.
Durata medie de viață a lămpii în aplicațiile de interior este de 5 ani.

Programul EnERLIn
European Efficient Residential Lighting Initiative
Inițiativa unui iluminat rezidențial eficient energetic
prin promovarea Lămpilor Fluorescente Compacte în locuințe

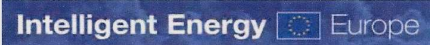
Obiectivele EnERLIn:
Creșterea substanțială a eficienței iluminatului rezidențial într-un număr de state membre și candidate UE.
Promovarea unei oferte largi de LFC ieftine care să răspundă unor necesități diversificate privind dimensiunile, formele, redarea culorii și conexiunea.

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Coordonator program:
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Student Poster Contest Winner

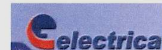


Universitatea Tehnică
din Cluj-Napoca
Centrul de Ingineria
Luminatului

S.C. EnergoBit S.R.L.

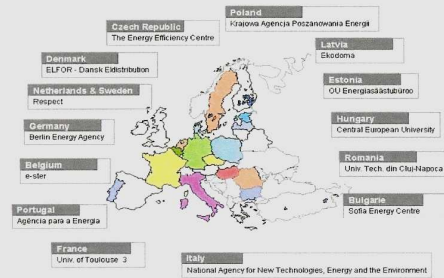
S.C. PRAGMATIC COMPREST S.R.L.

S.C. Filiala de Distribuție și Furnizare
a Energiei Electrice
ELECTRICA TRANSILVANIA NORD S.A.



Programul enERLIn - European Efficient Residential Lighting Initiative
Inițiativa unui iluminat rezidențial eficient energetic
prin promovarea Lămpilor Fluorescente Compacte în locuințe
Grant EIE/05/176/SI2.419666 (2006-2008)

Consortiul programului



Obiectivele enERLIn

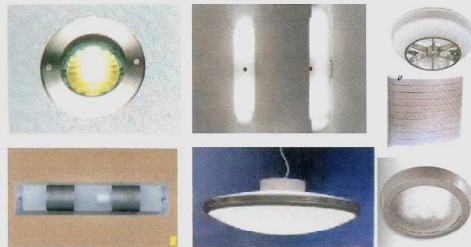
Creșterea substanțială a eficienței iluminatului rezidențial
într-un număr de state membre și candidate UE

Promovarea unei oferte largi de
Lămpi Fluorescente Compacte
ieftine care să răspundă unor necesități diversificate
privind dimensiunile, formele, redarea culorii și
conexiunea

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Tipuri de corpuri la care se folosesc Lămpi Fluorescente Compacte



Caracteristici ale Lămpilor Fluorescente Compacte

- un consum redus de energie cu până la 80% mai mic pentru același flux luminos emis comparativ cu lămpile cu incandescență
- durata de viață de 8 ori mai lungă comparativ cu lămpile cu filament
- durata medie de viață a lămpii în aplicațiile de interior este de 5 ani (la 3,3 ore funcționare/zi)
- au soclu de tip E14, E27 sau B22
- multiple aplicații posibile datorită gamei largi disponibile
- temperatura de culoare este de 2700, 3000, 3500, 4000 și 6000 K (alb cald, intermediar și rece)
- sunt disponibile în variante de puteri de 6, 9, 11, 16 și 20 W, echivalent cu puteri de respectiv 25, 40, 60, 75 și 100 W pentru lămpi cu incandescență
- sunt plasate în clasele de energie A și B în cadrul sistemului european de marcare a randamentului energetic

Tipuri de Lămpi Fluorescente Compacte



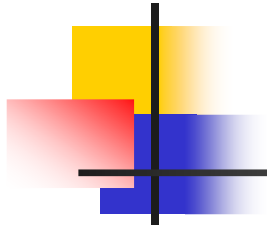
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Promotional Poster and Leaflet



LIGHT FAIR Las Vegas 2006 Suvagau

- **Compact fluorescent lamps (CFLs).** The big news in CFLs was the proliferation of a new standard base for CFL fixtures that **allows bulbs and fixtures to be interchanged freely**. This overcomes a major obstacle for widespread use of CFLs (if you buy a 26 W fixture, you must use a 26 W CFL). To solve this problem, Energy Star worked with manufacturers to develop the GU24 standard. Consumers who purchase fixtures that use GU24 components will be able to change out lamps/ballasts of varying wattage and lumen output to meet their specific lighting needs, making the switch just as easy as it's been to screw in a 60 W incandescent light bulb to replace a 75 W bulb. Both MaxLite and TCP introduced new products with the GU24 base ranging from **9 to 27 W**.



- 2008 EU directive to change light bulbs in residential sector
 - with the effect on the production of new bulbs
- New CFL quality charter - 2008
 - comparison CFL/GLS - previous 1:5 ratio, a new **1:4** is indicated
- 2020 EU Vision
 - a target of **20% energy efficiency savings**, requiring homes, offices and streets to switch to energy saving lighting

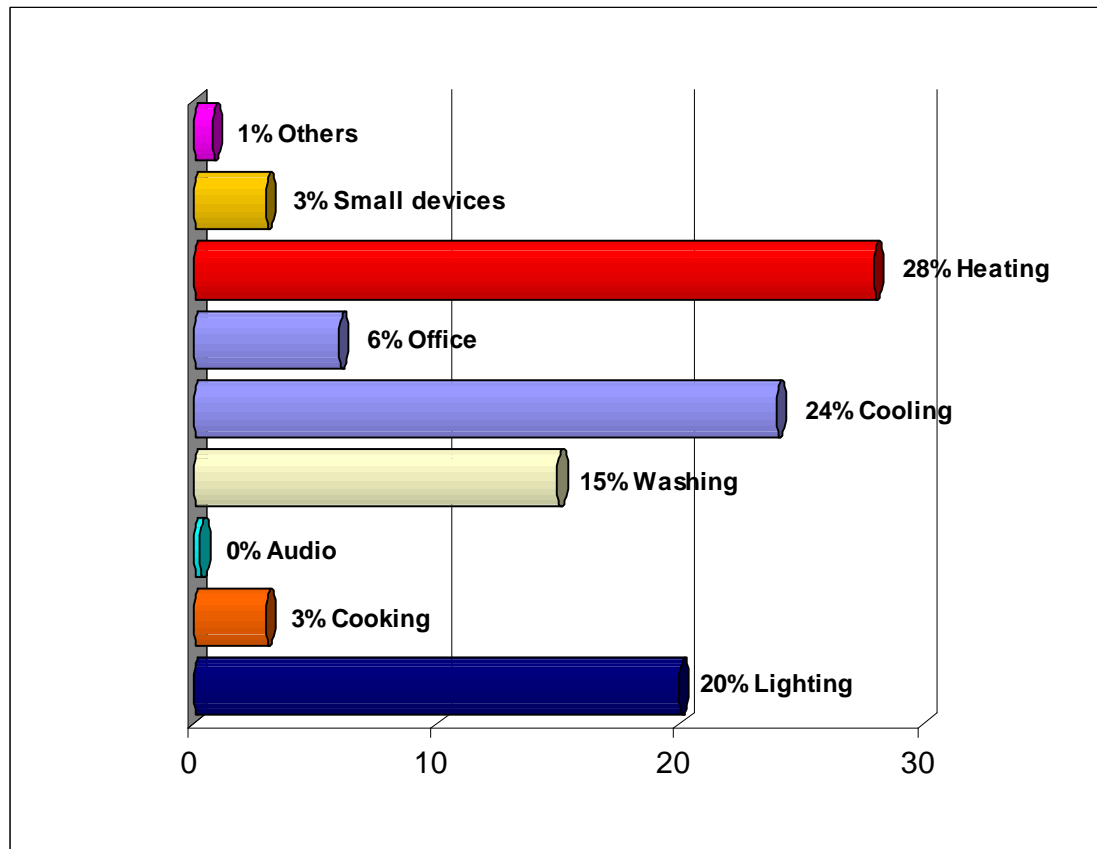
CREFEN

INFORMATIC SYSTEM FOR ENERGY EFFICIENCY IN RESIDENTIAL SECTOR

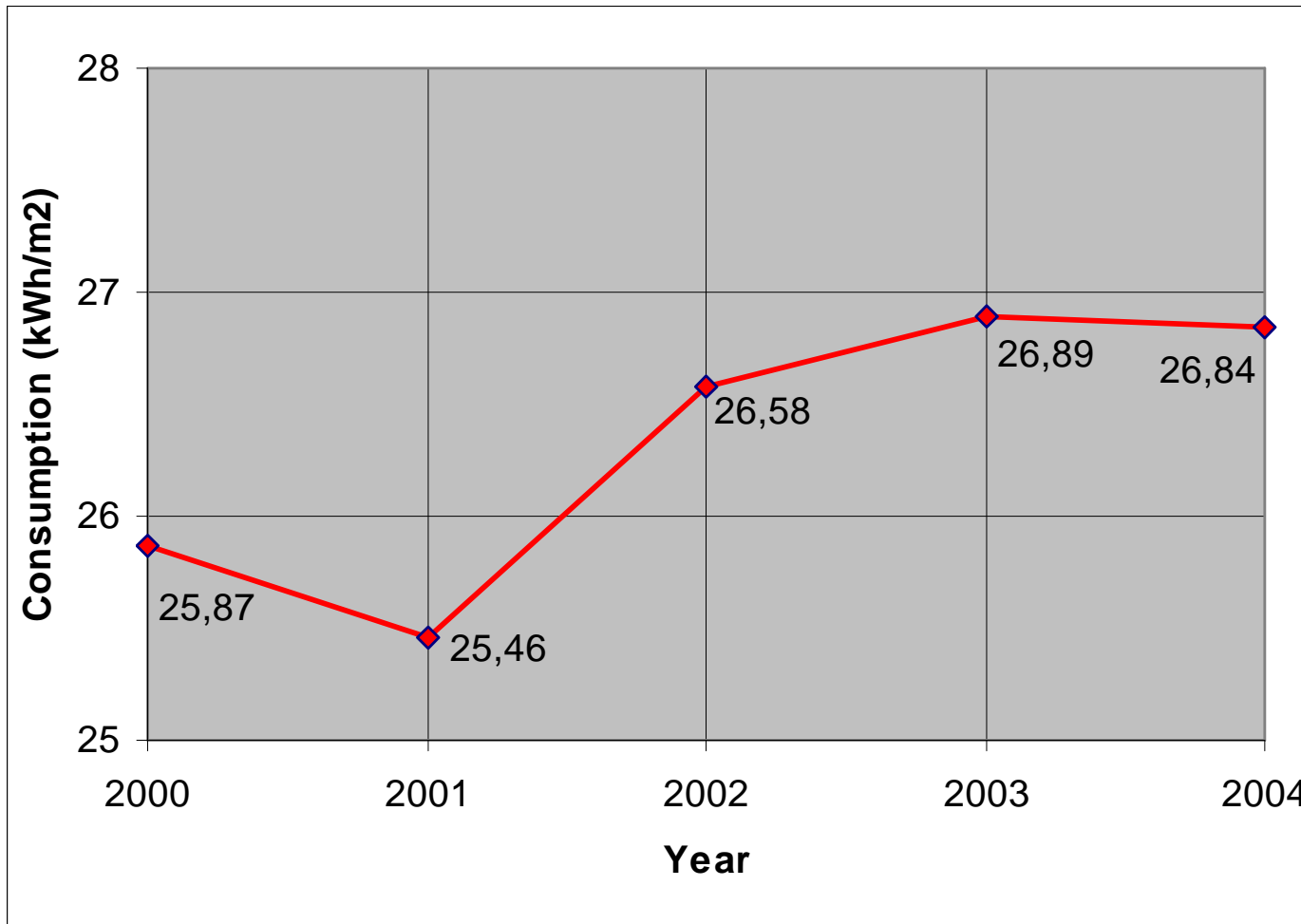
2006-2008 – Romanian CEEX Research program

*to achieve an integrated software system
tools for assessing, prognosis and training
the specialists and consumers*

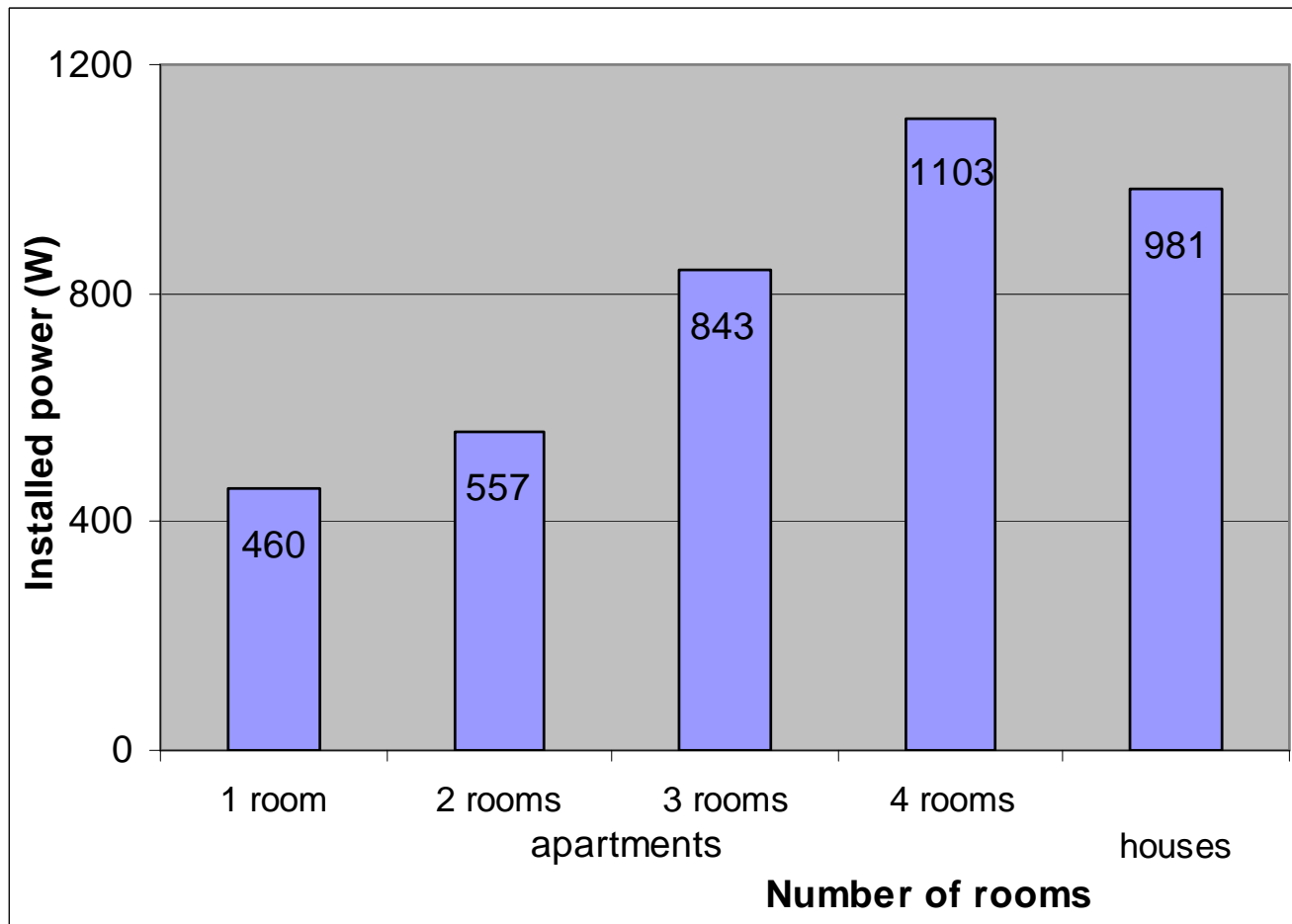
Consumption of household appliances – CREFEN survey



ELECTRIC LIGHTING ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR



ELECTRIC LIGHTING ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR





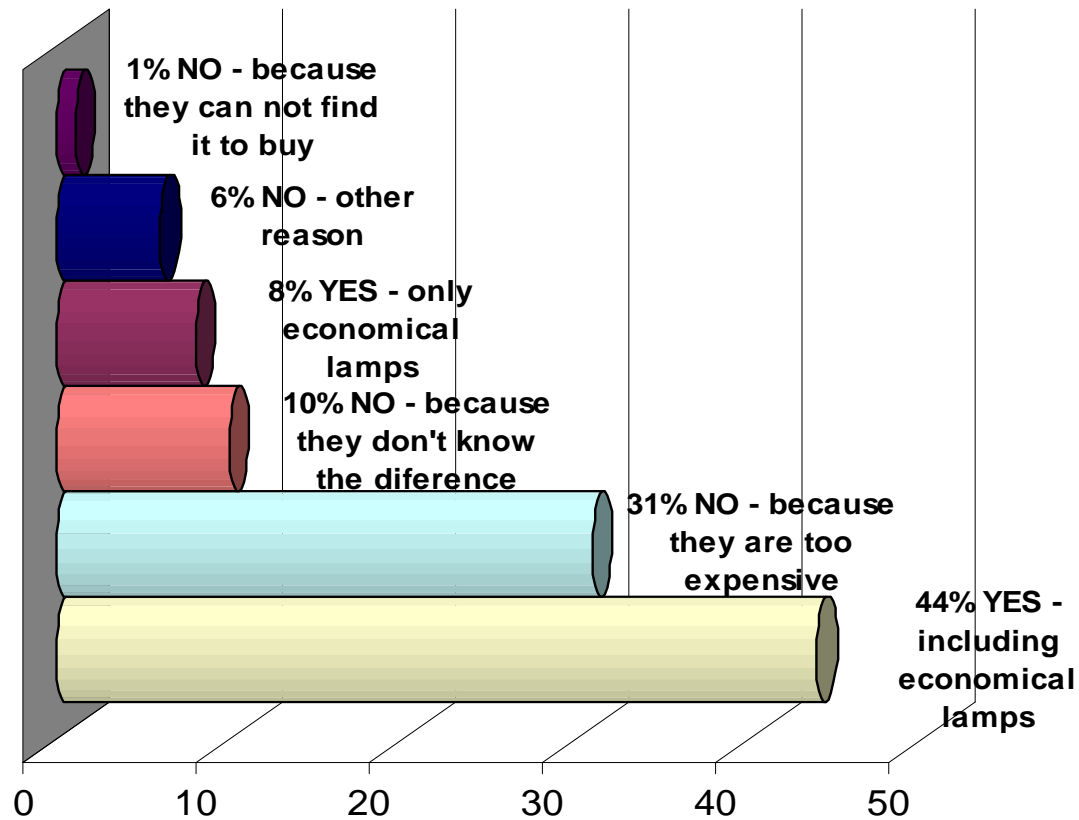
CREFEN questionnaire campaign

November 2005 questionnaires study

- the usage degree of GSL and CFLs in households in NW Romania
- **295 replies** 220 apartments (with 1–4 rooms)
 75 houses (with 2–more than 7 rooms)
- the installed lighting power - average value of **0.835 kW/household**
- **1.91** units per household

Household		GSL		CFL		Installed power
Type	No.	Units	Average	Units	Average	kW
Apartment	220	2624	11.98	367	1.67	0.770
Single-family house	75	1088	14.51	196	2.61	1.028
Total	295	3712	12.58	563	1.91	0.835

Motivation of the CFLs use – CREFEN survey





Conclusions

Replacing only one GSL with CFL **in each household of Romania** would lead to a decrease of the household electric energy consumption of around **45,246 MWh/year**.

*theoretical evaluation - the household electric lighting energy consumption – 2004
– assuming 23% for lighting = 1,840,000 MWh/year , average number of lamps per household in Romania = 12, ratio between the electric energy consumption of GSL to CFL with the same luminous flux = 5*

This value corresponds to a saving in the CO₂ emissions of about **2.425 kTones CO₂** (1 kWh=0.0536 kg CO₂ according to the average values considered for European countries).



Aknowledgment

This work is supported by the IEE under the frame of the **EnERLIn** as Intelligent Energy Europe project and under the frame of the **CREFEN** as CEEEX project.

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