



## European Efficient Residential Lighting Initiative (EnERLIn) Université Paul Sabatier – Toulouse 3, France

### Summary

In the context of the Kyoto Agreement, the European Community and individual Member States are looking for cost-effective measures to reduce CO<sub>2</sub> emissions and combat climate change. To this end the European Commission carried out the European Climate Change Programme (ECCP) during which it identified, with stakeholders, cost-effective actions that contribute to CO<sub>2</sub> emission reductions. The ECCP identified residential lighting as an important area. To achieve considerable savings in this sector, a coherent strategy is required to transform the lighting market. To ensure a sustainable growth and use of Compact Fluorescent Lamps we propose to develop valid promotional arguments and implement coherent promotional campaigns; to train end-users in order to achieve a self-sustained CFL use growth. Concerning energy savings from CFLs, by replacing only one additional GLS lamp by one CFL per household a gain of 11 TWh corresponding to 1.2 Mtn of less CO<sub>2</sub> per annum can be achieved. The consortium work is focussed on the better promotion of Compact Fluorescent Lamps for residential use. The main outputs from the project will be the creation of new European CFL-Quality Charter, the design of attractive CFL promotional campaigns, the creation of CFL quality criteria and comprehensive databases.

#### End-user area

- New buildings
- Refurbishment of buildings
- Transport and mobility
- Financial instruments
- Industry
- Legal initiatives (regulations, directives, etc)
- Planning issues
- Sustainable communities
- User behaviour
- Education
- Other

#### Target Audience

- Citizens
- Households
- Property owners
- Schools and universities
- Decision makers
- Local and regional authorities
- Transport companies
- Utilities
- ESCOs
- Architects and engineers
- Financial institutions
- Other

#### Technical

- Energy efficiency
- Heating
- Cooling
- Appliances
- Lighting
- CHP
- District Heating
- Solar energy
- Biomass
- Wind
- Geothermal
- Hydro power
- Other

### Context

- In recent years, Compact Fluorescent Lamps (CFLs) have moved front-and-centre in sales-and in the regulatory ring. Manufacturers now package CFLs to emphasize an optimized system. Furthermore, energy conservation can be encouraged by regulation, incentives, and/or awareness campaign. Spurred by cost savings, utility rebates, and demand-side-management incentives, household owners will retrofit existing inefficient lighting systems with more energy-efficient ones. Utility rebates will prompt many end-users to upgrade their lighting systems. Later, despite the reduction in utility incentives and energy rebates, retrofits should continue to happen. And it will be no longer necessary for energy users to wait-and-see because they will be “trained” to recognise the advantages of efficient lighting. Many retrofits can be financed in such a way that the energy savings more than pay for the cost of the new lighting system: in some cases household owners even experience a positive cash flow.

### Objectives

EnERLIn project (EIE-05-0176) uses the maximum of the consortium competences in order to address the following issues:



- Quality standard: The output from the European CFL Quality Charter will be used, in addition several consortium members are National Energy Agencies and they have the possibility to transpose CFL-QC standard in their countries.
- Identify Negative arguments that potential individual users may oppose to CFLs, this issue is perfectly addressable in EnERLIn by passing through surveys and questionnaires individual users as well as to professionals that they are in contact with clients and collect "complaints".
- Scientific Arguments: The consortium includes some academic institutions that will contribute to the elaboration of unified protocols that should be used in test centres. In parallel, some consortium members have yet CFL test installations that may be used for the project aims. Finally a unique test facility will be created under the coordination of the academic institutions and with the collaboration of National Energy Agencies.
- Training: The consortium has all necessary competence in this domain. Academic institutions can help to the creation of curricula and test them in local scale. The definition of these curricula will be done jointly with all other members of EnERLIn consortium who are aware of real needs in the domain. ENEA will create the e-learning modules supervised by academic institutions.

Attractive material for promotional campaigns for CFLs: The consortium will use all collected material and experience in order to define promotion campaign scenarios. The consortium will define the type of promotion media that will drive each campaign. Some preliminary tests-campaign may execute in small scale in order to test a concept before use it in a real scale operation. Once all parameters concerning the campaign will be tuned the promotional material creation will be outsourced to communication professionals.

## Process

To ensure a sustainable growth and use of CFL we propose to develop valid promotional arguments and implement coherent promotional campaigns; to train end-users in order to achieve a self-sustained CFL use growth. An important objective of this project is to identify all possible reasons of putting CFLs, compile them and provide the good answers and then translate them to a clear and understandable argumentation for the non-specialist. Thus we propose to develop and validate robust scenarios for CFL promotional campaigns at European, national and regional levels. At the same time the project is aiming at promoting 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. Of course the ultimate objective of this project is to substantially increase the efficiency of residential lighting.

The main target groups for this project are: National Energy Agencies, Energy utilities, Lighting manufacturers, Consumer defence associations, Individual consumers, Lamp and luminary retailers, Policy makers, Architects and Civil Engineers. These target groups have been selected due to their direct implication to residential lighting sector and to the energy production. Both consumers and industry are considered here.

The project should have the following phases:

- Phase one: to review the current European CFL Quality Charter, and to investigate quality and efficiency issues to arrive to a new version.
- Phase two: design of a common CFL promotion campaign. The design will include the development of common and well-structured information and dissemination material) and innovative financing schemes (ESCO, DSM, utilities).
- Phase three: implementation of national/regional promotion campaigns.
- Phase four: Collection of the campaign results and general assessment concerning the efficacy of the campaign.

The project shall gather all information about residential penetration of CFL, and market potential in order to develop the baselines (BaU scenarios). Phase five: creation of dissemination package to allow countries/regions/stakeholder not participating in the project to benefits from the results and experience made in the project to design, carry out and evaluate CFL promotion campaigns.



## Financial resources and partners

Total project cost: 1 871 kEuros (EU contribution - EACI: 48,53%, consortium self-funding 51,47%)

Consortium:

Université Toulouse 3	Academia - COORDINATOR	France
Agência para a Energia	Energy Agency	Portugal
Berliner Energieagentur GmbH	Energy Provider	Germany
e-Ster Bvba	Energy Consultants	Belgium
EKODOMA	Energy Consultants	Latvia
Ente per le Nuove Tecnologie, l'Eergia e l'Ambiente	Energy Agency	Italy
OÜ Energiasäästubüroo	Energy Consultants	Estonia
Krajowa Agencja Poszanowania Energii S.A.	Energy Agency	Poland
Respect Europe	NGO	Sweeden
Sofia Energy Centre	Energy Agency	Bulgaria
Stredisko pro efektívni využívaní energie, o.p.s.	Energy Agency	Czech Republic
Universitatea Tehnica din Cluj-Napoca	Academia	Romania
Dansk Energi Net	Association of Energy Providers	Denmark
Central European University	Academia	Hungary

## Results

National initiatives concerning CFL promotion campaigns, accompanied with inciting measures in various countries, shown that it is possible to increase the number of CFLs in households. Our objective in EnERLIn is to provide a coordinated promotion campaign in European level that may lead to an increase of 50% of the number of CFLs per household in the participating countries. Even in the case that, in average, every household in European Union replace one additional 75 W GLS by a 15 W CFL the energy gains are really considerable: Power difference between the two lamp types is 60 W, in average, a lamp in house operates around 2 500 h per annum (it depends on the geographical situation and also on the room type that the lamp is installed), under these conditions the energy gain per household is in the order of 150 kWh. Assuming that there is 150 million households in Europe the energy economy by replacing only one lamp is in the order of 22.5 TWh or 4 MTEP (1 MWh of electrical power is taken to be equal of 0,285 TEP – Tonne Equivalent Petrol). To that it should be add that a good quality CFL displays a lifetime higher than 10 000 h instead of 2 000 h for a GLS.

An important task in the frame of EnERLIn is to understand why end-user avoid (or dislikes) CFLs for residential use. After compiling various information coming from different countries we established the following list of barriers:

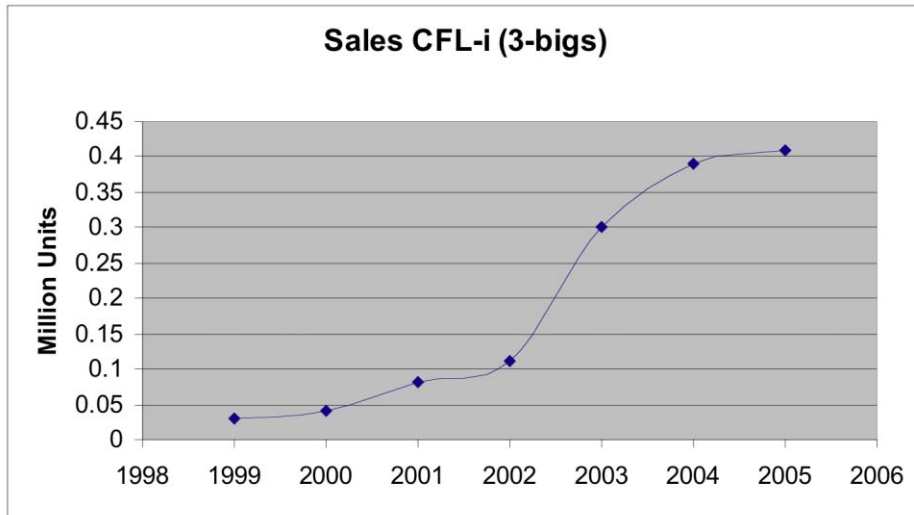
- Consumer dislikes classic CFL shapes, and, CFLs misfit often to “design” luminaries
- Consumer dislikes colour temperature & rendering of CFLs
- Good quality CFLs are still expensive, and, inexpensive CFLs aren’t reliable
- Return time is short but “diluted” and directly observable
- Plug & Play CFLs aren’t dimmable
- 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



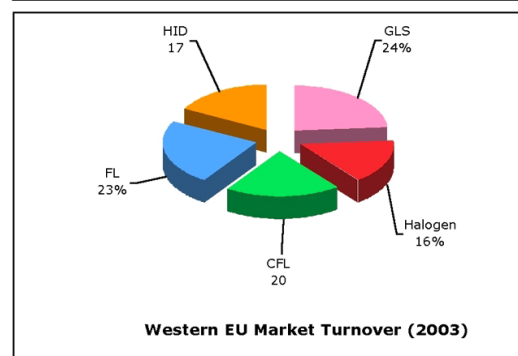
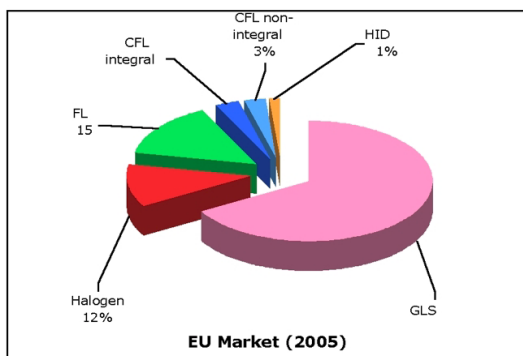
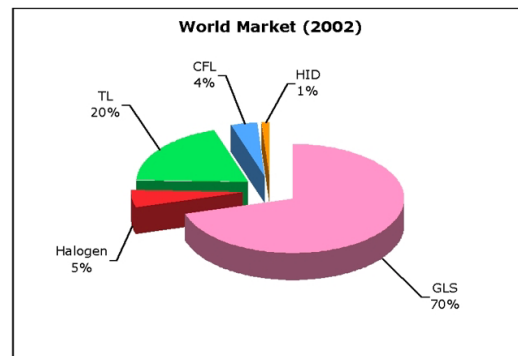
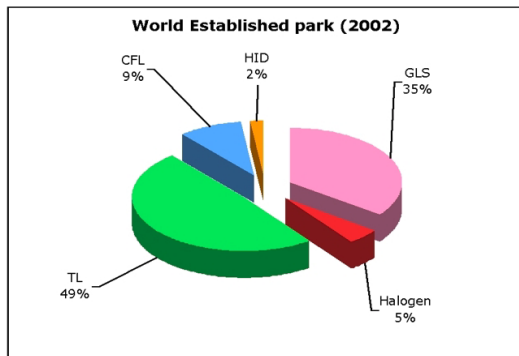
Case Study 295: Université Paul Sabatier-Toulouse 3 , FRANCE

Analysis of possible barriers to implement CFL's has been carried out in order to understand the human mechanism regarding willingness and avoidance to implement CFL. The result showed that around 30% households do not want to have CFL's in their home and that reasons for not having CFL's are many.

From an analysis of the marked data concerning sales of CFL from the main lighting equipment importers it is possible to see a constant growth in sales. In year 1999 in Latvia have been sold 0,03 million CFL-i, while in year 2005 the number raised to 0,41 million. To our opinion that this fast increase, in particular between 2001-2004 (see figure below) of sales is both directly and indirectly linked to CFL-promotion campaigns. In the last year, from mid of 2004 to beginning of 2006 the sales of the 3-bigs have registered stagnation.

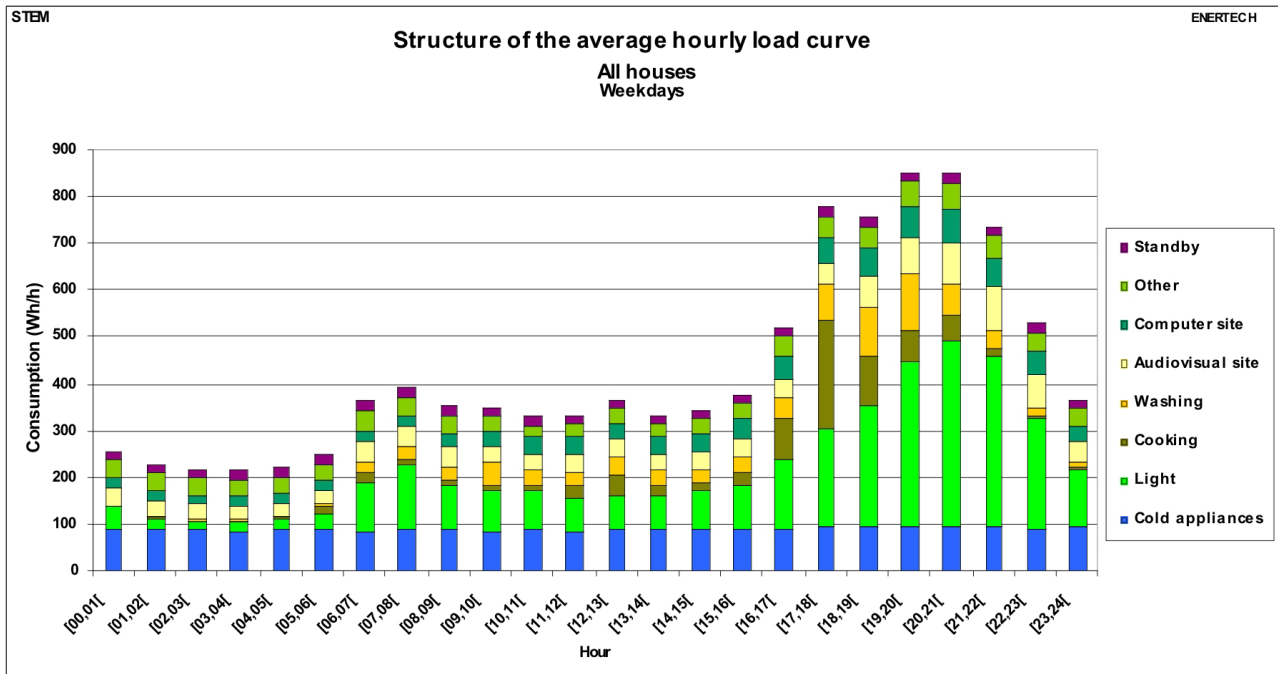


Information concerning general market in Europe and worldwide is also collected. As example the following graphics are obtained from Lighting industry passing trough the EU-COST-529 "Efficient Lighting for the 21<sup>st</sup> century" network illustrate the market penetration of various type of light sources for general lighting.





In Sweden the average installed power for lighting is in the order of 1480 kW per household. The following graphics show the relative weight of lighting consumption by household during each hour of the weekday.



### Lessons learned and repeatability

- A first tool for estimating energy consumption due to lighting in the residential sector is established and used to predict the impact of various scenarios in the horizon of 2030. It has been shown that convincing end-user to use more good quality CFLs instead of classic bulbs may lead to 21% energy gains associated to a 13% increase of available light compared to 2006 situation. In the opposite, if nothing achieved in that direction, the energy consumption for lighting will increase by 24% for (only) 11% more light...
- The consortium identified some reasons that today refrain consumers from CFL use in residential sector: Consumer dislikes classic CFL shapes, and, CFLs misfit often to “design” luminaires; Consumer dislikes colour temperature & rendering of CFLs; Good quality CFLs are still expensive, and, inexpensive CFLs aren’t reliable; Return time is short but “diluted” and directly observable; Most of Plug & Play CFLs aren’t dimmable; 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
- End-user is very regarding on CFL-Quality. Low quality devices “pollute” the market and seriously impede the increase of market penetration of that energy efficient technology. A systematic CFL-quality control is imposed in EU level following a well-defined unique testing protocol and associated with readable and compulsory labelling.
- There is a significant lack of knowledge and data on the penetration and the trends in use of various lighting technologies in households. This is especially true in Eastern European countries, therefore it is difficult to clearly articulate what we would like to achieve with a campaign and whom exactly we could target in order to increase efficient light sources penetration.

**Contact for more information:**

Project Web Site: <http://www.enerlin.enea.it>

Organisation / Agency: Université Paul Sabatier – Toulouse 3

Main contact : Prof. Georges ZISSIS

Address: LAPLACE – 3R2 ; 118 rte de Narbonne; 31062 Toulouse; France

Tel: +33 5 6155 6996

Fax: +33 5 6155 8447

E-mail: [georges.zissis@laplace.univ-tlse.fr](mailto:georges.zissis@laplace.univ-tlse.fr)

Web Site: <http://www.laplace.univ-tlse.fr>

Printed reports or other literature available:

Title: EnERLIn Interim Technical Report, Sept 2007	Cost: <i>Free (on request)</i>
Title: Manual for CFL campaign design and questionnaires, Sept 2007	Cost: <i>Free (downloadable)</i>
Title: Energy efficiency in interior lighting – a Romanian case study, F.Pop et al, Invited Conf., October 2006	Cost: <i>Free (on request)</i>
Title: The quest of the perfect light source, G.Zissis et al, Invited Conf., June 2007	Cost: <i>Free (on request)</i>
Title: Sources de lumière et éclairage : de la technologie aux économies d'énergie, G.Zissis, Nouvelles Technologies de l'Énergie vol 4 Edition Lavoisier, ISBN 978-2-7462-1716-4, 2007	Cost: <i>320 € (4 volumes)</i>
Title: Proceedings Illuminat 07 (Cluj-Napoca), Editor F.Pop, 2007	Cost: <i>100 € (on request)</i>