

RESIDENTIAL ENERGY EFFICIENT LIGHTING BY PROMOTING FLUORESCENT COMPACT LAMPS UNDER THE FRAME OF IEE PROGRAMME ENERLIN

Florin POP, Dorin BEU

Lighting Engineering Center, Technical University of Cluj-Napoca, ROMANIA

Abstract – The Lighting Engineering Center of the Technical University of Cluj-Napoca (LEC UTC-N), Romania is involved in an European program for promoting lighting energy efficiency and energy saving measures in residential buildings - EnERLIn - European efficient residential lighting initiative, an EIE - SAVE program to promote Compact Fluorescent Lamps (CFL) in the residential sector. The EnERLIn EIE SAVE program has set out to propose and validate robust scenarios for CFL promotional campaigns on European, national and regional levels. The paper presents the state of the facts of the Compact Fluorescent Lamps (CFLs) use in households in Romania, mainly based on questionnaires surveys in residential area.

Keywords: Compact Fluorescent Lamps, Efficient Residential Lighting.

1. INTRODUCTION

Both in European Union countries and in Romania, the residential sector represents an important potential for the reduction of energy consumption. The energy consumption in this sector is focused on lighting and domestic appliances and heating/air conditioning/hot water. The efficient use of electricity is still a neglected issue, with a lack of the necessary statistic data.

Market research has indicated that in order to substantially increase the use of CFLs in the residential sector, it is essential to develop and market attractive and good quality CFLs. The rate of the households owning a CFL covers the range from 0.8 units per household in Great Britain up to over 3 units per household in Denmark. Projects from the SAVE programme consider as a reasonable upper limit the use of up to 8 units per household. An analysis of the residential lighting, realized in 100 households in Denmark, shows a lighting consumption of between 5% and 21% of the total monthly electric energy consumption of the household and the use of 24% saving lamps – linear fluorescent lamps and compact fluorescent lamps. [1, 2] However, the same market analysis from Lighting Companies show that in Western Europe energy inefficient incandescence lamps (including halogens) still represent 30% of the sales [7].

2. EnERLIn - EUROPEAN EFFICIENT RESIDENTIAL LIGHTING INITIATIVE, SUPPORTED BY INTELLIGENT ENERGY EUROPE PROGRAMME



The European Climate Change Programme (ECCP) identified residential lighting as an important area to CO₂ emission reductions. After a considerable number of promotion and rebate schemes, about 135 million CFLs are used today in European homes. However, only 30% of EU households have at least one CFL, with those households that own them having an average of three or four. The residential lighting market is still dominated by inefficient Incandescent Lamps (GSL – General Service Lamps).

The EnERLIn EIE SAVE program proposes to develop and validate robust scenarios for CFL promotional campaigns in European, national and regional levels. The European Union initiated numberless campaigns to promote compact fluorescent lamps with the purpose of increasing the market share of CFLs at 15%. The EnERLIn EIE SAVE program 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, and the ultimate objective of the program is to substantially increase the efficiency of residential lighting in a number of Member States. [10]

Objectives of the EnERLIN action. Improving the energy efficiency is a central theme of energy policy within the European Community, as indicated in the White Paper “An Energy Policy for the European Union”, since improved energy efficiency meets the three goals of energy policy, namely security of supply, competitiveness and protection of the environment. Lighting represents an important part of building energy consumption in the EU – around 10% of the total electricity consumption, ranging from 5% (Belgium, Luxemburg) to 15% (Denmark, Netherlands, and also Japan). [6]. The residential sector represents 28% from the global electric lighting energy use. [7]

Overall electric appliances in households, industry and the tertiary sector represent 40% of the EU total electricity consumption, its generation being one of the most important sources of CO₂ emissions. Several EU and National Initiatives and Directives tented to promote energy efficient lighting for services sector buildings. These efforts can be judged as very successful because nowadays the CFL market share represents 20% of the global European market whereas the same figure in world scale is limited to 17%.

The ultimate objective of the EnERLIN program is to substantially increase the efficiency of residential lighting in a number of Member States and Candidate Countries, and this can be done by offering them good arguments necessary to overcome the above cited barrier. To achieve successful residential market transformation we should promote that both light fixture outlets as well as design and specialty stores display their luminaires with CFLs (good and aesthetic ones) rather than GSL. At the same time the program 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. 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 are devoted to the promotion of this type of lamps and try to limit the GLS use in households. These campaigns are today very efficient and the number of CFL sales increases in Europe rapidly. The 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). It should notice that the annual growth rate of the global lighting industry is in the order of 0.8%. [10]

EnERLIN consortium. 14 partners from 14 countries constitute the proposed consortium, covering a large part of the Europe from north to south and from east to west. This is an important issue; because, concerning lighting the reaction of the individual

customers is quite different from a country to the other (north countries prefer low colour temperatures lamps, hot ambiance, and south countries are more sensitive to high colour temperatures, cold ambiance). The consortium includes western countries with high GDPs compared to eastern countries that they just integrated EU (Poland, Hungary, Czech Rep., Latvia and Estonia), and the newest EU countries (Bulgaria and Romania). The ENERLIN consortium is strongly cross-disciplinary including National or Regional Energy Agencies (ADENE, KAPE, ENEA, SEC, SEVEN, BE), one ESCO in Belgium, academic institutions (France, Hungary and Romania), a values-based consultancy focussing on sustainability (Respect) as well as independent consulting SMEs (Ekodoma, Energy Saving Bureau). Each partner has solid experience with EU projects (especially from DG TREN), and strong links with international organisms like CIE and projects like ELI, other European networks (COST-529) and programs (GreenLight). Some partners are quite influential for policy-making bodies in both national (regional) and European levels.

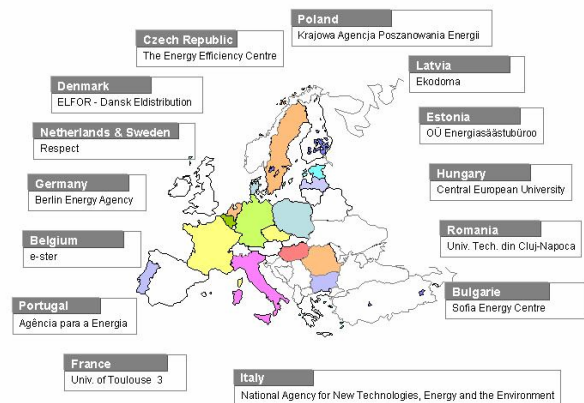


Figure 1 The EnERLIN consortium map

The Romanian National Strategy in the energy efficiency field - 2004 underlines that the residential sector has a primary energy saving potential at 3.6 millions tones equivalent petrol through 6.8 million tones of the total final consumers; it means more than 50%. This potential can be capitalized by the rehabilitation of the buildings thermic insulation, the improvement of the heating and lighting systems and of the electric domestic appliances.

3. ANALYSIS OF ELECTRIC LIGHTING ENERGY CONSUMPTION IN THE RESIDENTIAL SECTOR IN ROMANIA

The statistic data [11] for the period 2000 – 2004 allow us to determine the variation of total household

consumption, total number of household consumers, average consumption per household consumer, and of the specific consumption kWh/m² per year - Figure 2. During November 2005 a preliminary study has been realized using feed-back reply forms concerning the usage degree of GSL and CFLs in households in

Western Romania. We received 295 replies, namely 220 apartments (with 1–4 rooms - living room and bedrooms) and 75 houses (with 2–more than 7 rooms - living room and bedrooms). The light source equipment is presented in Table 1, and the average installed power - in Figure 3.

Table 1 Light source usage statistics for GSL and CFLs in Romanian households.

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

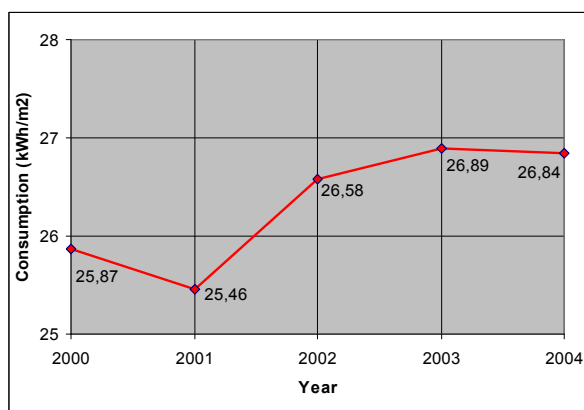


Figure 2 Household consumption per m² in Romania - [9, 12]

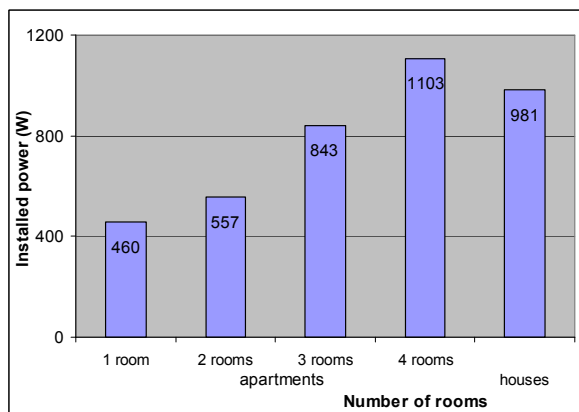


Figure 3 Average installed power in residential lighting - [9]

The analysis of the presented data allows us to estimate a few characteristics of electric energy consumption of households. The annual electric lighting household consumption in Romania in 2004 was about 6.83 kWh/m²/year (based on the average consumption of 255.3 kWh/household/year and average household surface of 37.39 m²/household and the average contribution of the consumption on the lighting circuits - 25% according to the study [2]).

4. EnERLIN QUESTIONNAIRE CAMPAIGN

A preliminary EnERLIN questionnaire campaign was promoted by two subcontractors of the project in November 2006, to have informative results for a better start of the Promotional Campaign on September - December 2007. This short campaign with 169 answers from the custom people of the electric equipment dealers pointed out that some questions from proposed questionnaires have to be changed, because they are without relevance or confused. An interesting result is related with the average number of the CFLs: 4.06 units per people. It seems to be too great, mainly due to the fact that the questioned people known well the energy efficient lamps. Starting its own promotional campaign as subcontractor, PRAGMATIC prepared a new format of the EnERLIN questionnaire together with a leaflet targeted to its customers/end users. In a first step - May 2007 -, there were 56 answers and 132 CFLs used, an average rate of 2.36 units per people; about 68% of the customers use the CFLs. We may notice a discrepancy between different questionnaire campaigns between 1.91 - 2.36 - 4.06 units per people (family, house). The whole average number of the CFLs is 2.66 units per people (family, house) - three questionnaire campaigns, 520 people/houses, 1381 used CFLs, November 2005 - May 2007.

The further EnERLIN Promotional campaign will pointed compact areas – all households from a street with single family houses, a residential district of bloc of flats in a city, a county village.

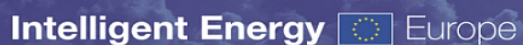
5. CONCLUSIONS

The estimative total electric energy consumption and the total lighting energy consumption in the residential sector, presented as a conclusions of our study, are of 255.3 kWh/household/year, value that fit in the references limits. The mounting of a single CFL in each household of Romania would lead to a decrease of the household electric energy

consumption of around 45,246 MWh/year. [8] The predictable economic impact of this study will be established by the adoption of policies towards an electric energy consumption reduction, both locally and nationally. It is essential to increase the awareness of the energy efficiency both by users and by the electric energy providers, in order to reduce the consumption peaks that are specifically due to lighting.

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