The European GreenLight Programme: A Major Initiative to Reduce Electricity Consumption in Non-Residential Buildings

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ABSTRACT

Lighting accounts for a substantial part of electricity use in non-residential buildings. Despite a number of significant energy-efficient lighting initiatives from certain Member States and the European Commission (DG TREN[1]), the most recent estimations tend to show that the potential for energy savings remains high in Europe. DG TREN decided to react by launching on 7 February 2000 the European GreenLight Programme. This programme encourages non-residential electricity consumers (public or private) to commit towards the European Commission to install energy-efficient lighting technologies in their facilities wherever (1) it is profitable, and (2) lighting quality is maintained or improved. Such a programme benefits from promising prospects and the active support from the National Energy Agencies of 14 European countries. These Agencies are starting to recruit the first programme participants with the objective of getting 60 signatures within the first months.

Introduction

Lighting accounts for a significant part of the electricity consumption of commercial buildings. In offices and retail shops for instance, a SAVE[2] study estimated in 1994 that lighting represented more than 30% of the total electricity consumption (BRE 1994, 5). This is consistent with other numbers found in industrialised countries (EDF 1996; EPRI 1992). In absolute value, for the whole service sector, E. Mills and N. Borg pre-estimated in a recent draft report for the International Energy Agency that lighting represented about 250 TWh[3] in the Union (Mills 1999). Though these authors recognise that this first estimate should be treated with a degree of caution due to the lack of previous work on the subject, it shows that lighting consumption in European non-residential buildings is considerable.

The present paper reviews the latest information about the current energy saving potential in the non-residential lighting sector. Then, it shows how the European Commission plans to complement and reinforce the ongoing energy-efficient lighting activities through a European pledge programme. This programme called GreenLight was launched on 7 February 2000 to invite voluntary organisations to commit towards the Commission to upgrade their existing lighting and to design new installations using energy-efficient technologies and methods.

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[1] DG TREN is the European Commission Directorate General for Energy and Transport. This new Directorate has been created, with effect from 1st January 2000, by merging the old directorates-general "Energy" and "Transport" (http://europa.eu.int/comm/dgs/energy_transport/index_en.htm).

[2] SAVE is the non-technology energy efficiency programme of the European Union.

[3] For the European Union including Norway. The estimate is based on existing national assessments. The service sector includes: offices, shops, education, hospitals, leisure and other buildings.

A High Energy Saving Potential

Assessing the potential for energy savings in the field of non-domestic lighting is a difficult task. To start with, there is very little information on the characteristics of the lighting systems currently used in Europe. A recent SAVE study, led by the Netherlands Agency for Energy and the Environment, made an attempt at collecting such data for offices and educational buildings (NOVEM 1999). Information was gathered through the members of the European luminaire manufacturers association (CELMA) and complemented with interviews among knowledgeable persons in Europe.

Another SAVE project, scheduled to report in Spring 2000 and led by the Association of Danish Electric Utilities (DEFU), is complementing these data using lighting audits in approximately 100 buildings per country (DEFU 1999).

These SAVE projects provide sound evidence of a large energy-saving potential. For instance, they indicate that about a third of the lighting energy use could be saved if all existing lighting in offices in the EU was upgraded to typical current practice for new installations and over half if the upgrade was to best practice standards. Substantial savings could also be made in educational buildings, although they would be lower than for offices (NOVEM 1999, 85).

Although these are theoretical estimates, they are consistent with current market data which show that the penetration of efficient lighting products is low despite the fact that they have been commercialised for several years now. Ballasts for instance, have been available since more than 10 years in the electronic version (CADDET 1991). Compared to others, this version not only increases the lamp-ballast system efficacy up to 20% but also eliminates the risk to perceive flicker, can operate four lamps together, and be substantially lighter. The technology is considered mature and the experience has shown that it could be paid back in less than 3 years (BRE 1998a, 1998b). However despite these advantages, electronic ballasts made up only about 5% of market sales in Europe in 1994 (BRE 1996, 31) and approximately 15% nowadays (Borsani 1999). The same observation has been made for other energy-efficient technologies, e.g. automatic lighting control systems (ProPlan 1996).

These market data, together with the potential estimates reported above, are converging indicators that much savings could be achieved. Added to the other benefits of energy-efficient lighting upgrades, they constitute robust arguments for deploying intensive energy conservation measures in the field of non-residential lighting. These other benefits are for instance: the improvement of user visual conditions and environmental consciousness, the economic benefits, the market opportunities, the stimulation of other demand side management projects etc.

The Need to Deploy New Conservation Efforts

The energy saving potential represented by lighting in the non-residential sector has been recognised and given high priority worldwide. In Europe, it has impulsed a number of conservation activities under the initiative of the European Commission and some Member States.

In 1993-94, the European Commission DG XVII (Energy)[4] commissioned the UK Building Research Establishment (BRE) to conduct a comprehensive study on measures to promote energy efficient lighting in the commercial sector in Europe. This study concluded that "mandatory standards are likely to produce the largest energy savings". It concluded also that "the production of performance standards, particularly for fluorescent lamp ballasts, appears from this study to be one of the most effective actions which the EC could take to reduce energy consumption for lighting in commercial buildings and is thus worth further consideration and development" (BRE 1994, 6). Consequently, DG XVII elaborated a proposal for a Directive on Energy Efficiency Requirements for Ballasts for Fluorescent Lighting (EC 1999). Based on a comprehensive cost/benefit analysis (BRE 1996) and discussions with industry, DG XVII adopted three progressive levels of minimum efficiency requirements. A phased approach was foreseen, associated with long transition periods before the entry into force of each level. Assuming the Directive is adopted by 1.1.2001, it will come into force on 1.1.2002. It will then concern all newly produced ballasts placed on the Community market. In terms of electricity reduction, the Directive alone is estimated to reduce by about 10 % the electricity consumption of fluorescent lighting by the year 2020.

A recent survey commissioned by DG XVII has highlighted the fact that some Member States have also carried out outstanding energy-efficient lighting activities in commercial buildings (NOVEM 1999). Especially noteworthy in this respect are for instance: the market transformation programme initiated in Sweden (including procurement, benchmarks, demonstration, etc.), the various programmes at both government and utility level in the Netherlands (voluntary agreements, tax incentives, rebates, etc.), the lightswitch programme initiated in 1998 and run by the UK Energy Saving Trust (including information, training and rebates), and other examples elsewhere.

However, as the survey concludes, "certain Member States have not yet undertaken significant initiatives" (NOVEM 1999, 5), and, as said earlier, the saving potential in Europe remains high. Along the lines of Kyoto commitments,[5] there is a need to gather new efforts while complementing the ongoing national initiatives and increasing the impact of the ballast Directive.

To reach that goal, the Commission followed the suggestion made by the experts who had studied the pros and cons of various measures to promote energy efficient lighting in the commercial sector (BRE 1994). Their suggestion was to establish a European pledge programme. The Commission has developed that idea in the form of a EU GreenLight programme, inspired from the US Green Lights programme.[6]

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[4] Now merged with DG Transport into the new Energy & Transport DG (DG TREN).

[5] Reduction of 8% of EU greenhouse gases emissions by 2008-2012 compared to 1990 levels.

[6] Green Lights programme has run since 1991. In 1999, Green Lights marketing was incorporated into the Energy Star Buildings Programme.

The European GreenLight Programme

The GreenLight programme[7] was officially launched on 7 February 2000 (see logo on figure 1). It is a voluntary pollution prevention programme that helps non-residential electricity consumers (public or private), referred to as Partners, save money and reduce pollution by increasing the energy efficiency of their lighting (see diagram on figure 2). The core of the programme is a Registration Form, signed by the Partner and the Commission, in which the Partner commits to:

For existing spaces: upgrade at least 50% of the spaces owned or on long term leases where the Internal Rate of Return of the investment exceed 20%[8] or alternatively reduce the total aggregate lighting electricity consumption by at least 30%.

For new spaces: choose new installations so that no alternative installation exists that would:

1. maintain or improve the lighting quality provided by the chosen installation and
2. consume less electricity and
3. represent a supplementary investment for which the Internal Rate of Return would exceed 20%.[9]

In addition, the Partner shall:[10]

- complete the upgrades within 5 years of joining the programme;
- send a progress report every year.
- appoint a Corporate Manager responsible for assuring the Programme execution.

While the Commission does not provide actual funds for the lighting upgrades, it provides support to the Partners in the form of information resources and public recognition (plaques on building, advertisements, exclusive use of the logo, awards, etc.)

Figure 1. GreenLight Logo

Lighting professionals interested in promoting GreenLight and assisting its Partners are strongly encouraged to register as GreenLight Endorsers. In return, the Endorsers get public acknowledgement for their efforts to support the GreenLight Programme.

[7] http://www.eu-greenlight.org

[8] Internal Rate of Return is calculated over a 15-year time period. Alternatively, Partners can decide to use as profitability test the least Life Cycle Rule. The rule consists in accepting an energy-efficient lighting investment when the resulting Net Present Value (NPV) of the investment over its lifetime (minimum 5 years) is above or equal to zero.

[9] Same as above.

[10] For more details, see the Registration Form on the GreenLight web site (www.eu-greenlight.org).

Joining the GreenLight Endorser Programme proceeds through a Registration whereby the registrant agree:

- to appoint a responsible person;
- to promote the GreenLight Programme and its goals;
- to supply the Commission up-to-date information on its products, technologies and services relevant for the GreenLight Programme;
- to educate its clients on the benefits of energy-efficient lighting practices and on the GreenLight Programme;
- to lay out a specific plan for promoting the GreenLight Programme.

In addition, endorsers fulfilling any of the optional requirements below can use in their advertisement and promotional materials the title of "Main Endorsers":

- create a GreenLight Programme area in their facilities ;
- create a display area in at least five large airports or train stations throughout the European Union;
- help to upgrade and to create a visible GreenLight Programme area at a famous site;
- display endorsement of the GreenLight Programme in all the European advertising for products and services in the lighting area;
- enrol five potential clients in the GreenLight Programme in a year.

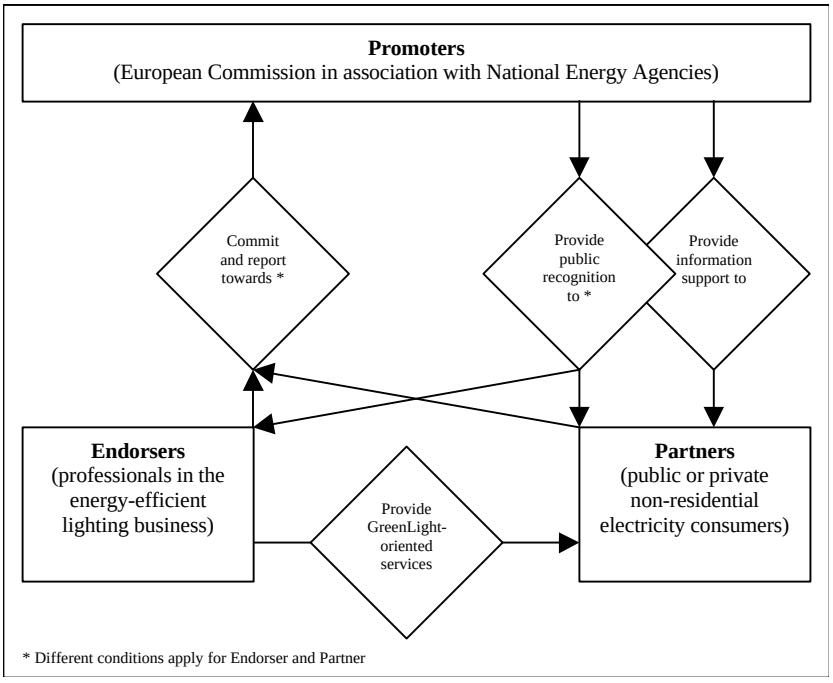

Figure 2. GreenLight Entities Relationship Diagram

Encouraging Prospects for GreenLight

In USA, the Green Lights Programme has become the flagship of EPA's voluntary pollution-prevention initiatives. EPA claims that Green Lights in US had generated 7 TWh electricity savings by 1997 (EPA 1998). According to Hoffman more than 158 million square meters were upgraded and reported by Green Lights partners in 1996 (Hoffman, Wells & Kopko 1998, 1). DeCanio conducted a statistical analysis on the database of all lighting upgrades performed within the framework of Green Lights between January 1991 and January 1995. He found that "excluding outliers and internally inconsistent observations, the average payback of 3673 Green Lights projects reported to EPA as of the beginning of 1995 was 3.3 years (…) The IRR of 3394 projects (excluding outliers) during the same period had a mean of 44.7%" (DeCanio 1998, 445).

In Europe, the concept of committing top management to energy-efficiency measures was applied within the framework of energy-efficiency programmes dealing with more than only lighting. This was the case in Sweden with the industry-directed EKO-Energi programme and in the UK with the "Making a Corporate Commitment" campaign (IAEEL 1999). Both have had a significant impact according to their organisers.

Generally speaking, the GreenLight concept is in line with the Community strategy for energy efficiency (EC 1998), which strategy received the positive opinions from the Council and the European Parliament.

Discussions[11] took place with individual Member States, industry, and other stakeholders in Europe. They pointed out the various differences between the European lighting situation now and the one of USA during Green Lights years. They consequently stressed the need to adapt the upgrade options according to the European context.[12] They also asked to adapt the profitability criterion to take into account the fact that some countries are more comfortable with Life Cycle Cost analysis.

Discussions also concerned the projected electricity price drops and the need to highlight additional arguments than simply the financial benefits (e.g. user satisfaction and productivity) (NOVEM 1999). The GreenLight brochure was designed in such a way.

But overall, provided a few adjustments and a certain flexibility, GreenLight was felt to be a new complementary action to Member States' policies and programmes, to existing Community instruments (e.g. minimum efficiency standards, labeling) and to foreseen Community measures, e.g. public and technology procurement (EC 2000).

GreenLight is considered as an instrument to overcome some of the key market barriers associated to cost-effective investments in energy efficient lighting technologies and methods:

by providing appropriate technical support to its Partners, including guidelines, case studies, list of contact persons, etc., GreenLight can help overcoming the most ubiquitous barrier to energy efficiency, namely the lack of or incomplete information.

[11] Beside discussing the GreenLight programme privately with various stakeholders, the European Commission presented it during a number of workshops and conferences in the period 1998-99 e.g. (Berrutto, Conti & Bertoldi 1999b; Berrutto et al. 1999; Conti 1998).

[12] For instance, the replacement of inefficient 38 mm (T12) tubes with 26 mm (T8) tubes will concern few upgrades since T8 lamps are already representing 90-95% of full-size fluorescent tubes sales in Europe. Source: (Borsani 1999). An other example concerns ballast substitution which has to considered in the light of the European Directive on Electromagnetic Compatibility.

By putting the emphasis on communication and public recognition aspects, GreenLight has the potential to increase significantly the visibility of energy efficiency inside companies and thus become a big stimulus for other demand management projects.

GreenLight Partners will learn to make profitable upgrades a priority not only in spaces owned but also in spaces on long term leases. The fact that the programme is implemented at the scale of Europe makes it also more appealing to multinational companies.

In financial terms, GreenLight can help reaching sufficient production volume for economies of scale to make the cost of certain energy-efficient products more competitive. It can transform the way organisations make decisions about efficient lighting investments: e.g. it can help transform the rules of budgeting, especially in public institutions, to finance energy efficiency investments from savings in running costs. It can also make decision-makers more sensitive to economic parameters such as Net Present Value and Internal Rate of Return which consider returns beyond the payback period. Finally, in the European context where Energy Service Companies (ESCOs) have not yet taken off[13] (Butson 1998; Kindermann 1998), it is hoped that GreenLight can foster their development while building on the experience that the Commission has already gained in this domain through the SAVE programme.

A recent market survey commissioned by the European Commission Joint Research Centre showed that attitudes towards joining the programme were generally favourable. In this market survey, a total of 43 public and private organisations were contacted: 6 in Denmark, 12 in France, 15 in Italy and 10 in Spain. They were big companies with a median number of employees of 3000. In each country, the sample covered different sectors: office, retail, education, healthcare, hotel, industry, transport and leisure/sport. The results were reported in an earlier publication (Berrutto et al. 1999). In summary, they showed first that all companies without exception agreed that an energy-saving investment could be profitable and that 3/4 of the respondents, no matter the sector to which they belonged (public or private), answered positively when asked if the "Green Image" was part of their communication strategy.

Although most interviewees said they preferred to use payback time as an investment parameter (average criterion: 3 years), more than 80% of the people agreed with the definition of profitability mentioned in GreenLight. Moreover, a large majority of respondents in each country, representing overall 3/4 of the interviewees, said that it would be possible to appoint a GreenLight Implementation Director, as well as a Communication Director, and to allocate approximately one person-year for every 500,000 m^2 of facility space. The same large majority of the people found also no problem in reporting their results to the Commission. As for the 5-year period to carry out the profitable upgrade, it was judged sufficient by at least half of the interviewees in each country.

The situation was more contrasted when talking about financial commitment. A slight majority of respondents in France and Spain said that the initial investment of about 5-20 Euros per m^2 would be achievable. However, the trend was reversed for Denmark and clearly negative in Italy where 3/4 of the respondents refused such a commitment. The lack of capital and the inability to get financing for projects are well-known barriers to energy

[13] The present market for ESCOs in Western Europe is estimated to be only 150 million Euro p.a. (Brown 1999; Matter 2000). As for the market potential, estimates differ greatly from one author to the other but it is unanimously considered to be huge.

efficiency investments. It shows the need to describe how these barriers can be overcome using various financing strategies. In particular, the role of Energy Service Companies (ESCO) could be further explained. Except for Spain, there was a majority of respondents in each country who didn't know what an ESCO was and the kind of service it could offer. In fact, information, training, and software tools appeared to be the most important supports needed by the interviewees in all countries (except Denmark). In addition, they also asked for guarantees and demonstration.

Finally, when the interviewed companies were asked what kind of GreenLight Promoter they would be the most receptive to, their first choice whatever the country went always to the national energy agencies.

These agencies responded favourably and manifested much interest in the programme. They decided to form a network of European GreenLight Promoters.

A Strong Network of European GreenLight Promoters

The GreenLight Promoters are meant to relay the execution of the programme in the European Member States, in particular to:

- tailor the programme according to the market situation and consumers' preferences in each country. They take into account national lighting programmes already underway, carried out by national organisations or local utilities. They avoid conflict or competition with similar programmes.
- Market aggressively the programme to enrol the largest number of companies.
- Fund the programme together with the European Commission. The amount of resources must be enough to set up and provide financial support for maintaining a structure of a few people.
- Monitor the progress of GreenLight in their country.
- Deploy an extensive communication plan that helps market GreenLight.
- Tailor and disseminate the technical support for GreenLight Partners.

Up to now, organisations from 14 countries joined in February 2000 a timely SAVE kick-off pilot project aimed at helping them start their GreenLight activities (see figure 3). This pilot project is meant to:

- demonstrate and showcase the benefits of GreenLight upgrades and concept.
- Demonstrate the ability of the energy agencies to promote GreenLight.
- Foster a network of national information centres on energy-efficient lighting.

This pilot project has a total duration of 23 months and is divided into 6 tasks:

- customisation and dissemination of the GreenLight information support through the Internet.
- Enrolment and briefing of strategic pilot companies in various business fields (public/private, offices/schools/hospitals/hotels/etc.).
- Audit, recommendations, pre-monitoring on 3 to 5 case study buildings per country.
- Lighting retrofit and commissioning of these buildings.
- Post-monitoring to provide a sound demonstration of the benefits.
- Intensive communication toward potential GreenLight Partners.

Besides strengthening and catalysing GreenLight (in a sense by "priming the pump"), this preliminary project will be the opportunity to customise and translate the GreenLight support materials for dissemination through the web. This information will target the people inside GreenLight companies responsible for financial/planning tasks as well as those more involved in technical activities. The formers will be provided with general information on the programme (including overall results and success stories), together with advise on how to implement GreenLight, secure the necessary funding, optimise lighting maintenance and waste disposal, get the right contacts. As for the technical staff, they will have access to information on how to audit their lighting installations, identify a list of possible upgrades, calculate their profitability, and verify the actual savings after upgrade.

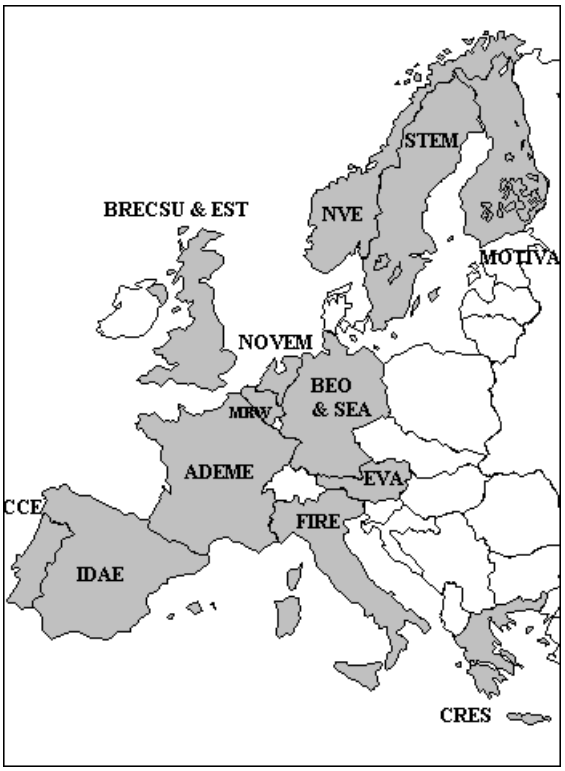

Figure 3. Network of European GreenLight Promoters[14]

[14] Austria (Austrian Energy Agency); Belgium (Wallonne Region Ministry); Denmark (Danish Energy Agency); Finland (Energy Information Center for Energy Efficiency and Renewable Energy Sources); France (French Agency for Energy Management and Environment); Germany (Project Management Organisation for Biology, Energy and Environment & Saarländ Energy Agency); Greece (Centre for Renewable Energy Sources); Italy (Italian Federation for the Rational se of Energy); The Netherlands (Netherlands Agency for Energy and the Environment); Norway (Norwegian Water Resources & Energy Directorate); Portugal (Centre for Energy Conservation); Spain (Institute for Energy Saving and Diversification); Sweden (Swedish National Energy Administration); UK (Building Research Establishment).

Conclusion

Despite the significant energy-efficient lighting activities impulsed by the European Commission and certain Member States in the non-residential sector, the energy savings potential remains high. To react, the Commission launched on 7 February 2000 the EU GreenLight programme which aims at overcoming some of the market barriers to energy efficiency while consolidating ongoing conservation activities. The key idea of GreenLight is to elevate decision-making about efficiency in buildings to senior corporate officials.

A powerful European-wide network of active GreenLight Promoters was constituted. This network is currently settling the programme and attracting major GreenLight Partners and Endorsers. Registrations have started with the objective of collecting at least 60 signatures within the first months. Among them will be visible organisations that will help GreenLight to take off.

At the centre of this network, the European Commission plays the role of co-ordinator and seeks to maximise the significant added value inherent to this pan-European collaboration. At the same time, the Commission keeps on promoting and monitoring GreenLight in a diligent way. In the future and in the perspective of the European Union enlargement, the Commission will also strengthen the GreenLight-related contacts initiated with the Eastern countries that are candidates to the accession (Berrutto, Conti & Bertoldi 1999a).

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