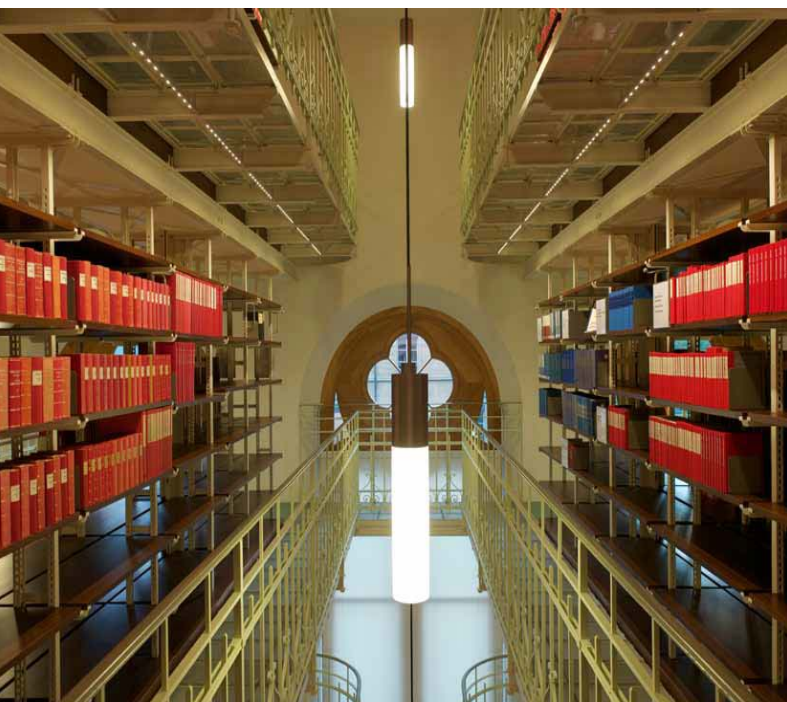


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PUBLIC PROCUREMENT OF LED LIGHTING IN EUROPEAN UNION MEMBER STATES

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PUBLIC PROCUREMENT OF LED LIGHTING IN EUROPEAN UNION MEMBER STATES*

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Executive summary

Light emitting diodes (LEDs) represent a promising emerging technology with high energy saving potential. Their rapid development provides an opportunity for Public Authorities to act as frontrunners and to enhance market transformation towards high efficient lighting systems. At the same time, defining a baseline and criteria for public purchase are key challenges faced by Public Authorities.

The report provides a detailed overview of the current status of Green Public Procurement (GPP) activities in European Union Member States. Based on the analysis of the present situation and future plans in individual countries, recommendations are made for LED specifications.

In many countries, lighting (and LEDs) is still not among the priority product groups covered by the respective Green Public Procurement documents. However, all EU Member States have good practices for the use of LEDs.

In countries where specifications for LEDs have been defined, most of the specifications include lifetime of the lamps, lumen efficacy, colour rendering and power factor. However, they tend to differ in the level of stringency. Capability of dimming, and compatibility with the main dimmers available on the market, is gaining importance and will be part of the specifications, because the dimming function offers further potential for savings.

Only a few documents cover traffic lights, even though replacement of incandescent traffic lights by LEDs can be considered as one of the cases for replication where the potential for energy savings is high and certain. Traffic lights are among the specifications developed by the European Commission within the GPP Toolkit.

Some of the organisations are sceptical about including LEDs in the requirements, as the technology is still undergoing rapid development and is immature for various applications. Various documents and studies are continuously highlighting that proper information from manufacturers, and careful design of the systems, are crucial in order for the LED system to deliver the expected performance. Future plans regard updating the specifications on lighting to cover LEDs and to enhance their use.

The future of lighting seems to be in LEDs. Public organisations play an important role as frontrunners in introducing the coming technology and enhancing market transformation. However, it seems they still remain cautious towards this technology and will include it in their GPP plans only gradually (especially for outdoor lighting systems). A clear indication and unification of the specifications from the European Union may bring the decisive push.

Introduction

Light emitting diodes (LEDs) represent a promising emerging technology. Their rapid development provides an opportunity for Public Authorities to act as frontrunners and to enhance market transformation towards high efficient lighting systems. At the same time, however, it represents a challenge for Public Authorities when they are faced with the need to define a baseline and criteria for their public purchase.

This report provides a detailed overview of the current status of Green Public Procurement (GPP) activities in European Union (EU) Member States. Based on the analysis of the present status and future plans in individual countries, recommendations in terms of specifications for LEDs are made.

Objectives of the report

The objectives of the report are:

- To identify public procurement actions on solid-state lighting (LEDs) in EU Member States;
- To describe their present status and future plans, and
- Based on this analysis, to develop specifications that may be considered by Public Administrations for the procurement of LEDs.

Methods

Identification of public procurement actions related to LEDs

A thorough desk research was conducted in summer/autumn 2011. For each country, experts in public procurement and lighting were contacted. They provided feedback and comments on the respective country analyses, resulting from the desk research. The experts were gathered through the snowball sampling method¹ and from the relevant documents (workshops, GPP documents, etc.).

The analysis focused specifically on Green Public Procurement for lighting, and more specifically for LEDs. General information on the status of Green Public Procurement in EU Member States can be found in the report of the Joint Research Centre, or on the GPP

¹ This is a method in which the existing acquaintances provide references and contacts to further addressees.

webpage of the European Commission^{2,3}. Where available, examples of cases in which LED lights were part of public procurement are described⁴.

Specifications for Public Administrations for procurement of LEDs

Specifications for Public Administrations to consider for the procurement of LEDs are based on the existing and planned GPP activities in EU Member States, giving an overview of the main characteristics and values that occur in particular specifications and guidelines. The specifications are divided into criteria for indoor and outdoor LED lighting.

² Report “Energy Efficiency in Public Procurement – Member States' experience, barriers/drivers and recommendations” by Alexandra Langenheld et al., 2010, available at http://ec.europa.eu/energy/efficiency/studies/doc/2010_05_jrc_ee_public_procurement.pdf and European Commission webpage on GPP at http://ec.europa.eu/environment/gpp/index_en.htm.

³ Therefore, where little information is available for a respective country, it does not necessarily mean this is so for Green Public Procurement in general, but rather for specifications in lighting and LEDs in particular (or it was unavailable to the authors).

⁴ More test cases can be found in the report “LED Projects and Economic Test Cases in Europe” by Michaela Valentová, Michel Quicheron and Paolo Bertoldi, 2011, available at http://ec.europa.eu/information_society/digital-agenda/actions/ssl-consultation/docs/led_report_test_cases.pdf.

Country analysis

In 2008, the European Commission adopted Communication COM (2008) 400 (Public Procurement for a Better Environment, 16 July 2008), which set a target for Member States to achieve a level of 50% Green Public Procurement (GPP) by 2010. In this Communication, the Commission also recommended the creation of a process for setting up common GPP criteria.

A first set of common GPP criteria was established in the framework of the Training Toolkit on GPP⁵ covering product and service groups in ten sectors, which had been identified as most suitable for implementing GPP⁶. A second set of GPP criteria for eight new sectors was made available in July 2010. The second set included street lighting and traffic signals⁷. Revised GPP criteria for street lighting and traffic signals and new GPP criteria for indoor lighting were published in early 2012⁸. In particular the latter ones include explicit criteria for minimum energy efficiency class and minimum lifetimes of LED lamps (both retrofit LED lamps with integrated control gear and other LED lamps).

The status of Green Public Procurement in Member States varies greatly and in particular when it comes to criteria and targets for lighting, specifically for LEDs. The status ranges from very detailed defined criteria, for both indoor and outdoor lighting, to general statements on the necessity of greening public procurement.

Furthermore, the lighting systems (especially LED-based) are evolving rapidly and it has been rather difficult to establish a baseline for the performance of LED lamps. The reasons are, among others, that manufacturers publish their own information about their systems. The quality of which varies greatly and it often happens that the information provided is even contradictory⁹.

Setting up standards is challenging, in particular as no EU energy label for LEDs has been adopted so far (even though some of the European voluntary labels do cover LEDs¹⁰ and regulation on energy label covering LEDs has been in preparation¹¹). The eco-design requirements covering LEDs have been under discussion in 2011¹².

⁵ See http://ec.europa.eu/environment/gpp/index_en.htm

⁶ Copying and graphic paper, Cleaning products and services, Office IT equipment, Construction, Transport, Furniture, Electricity, Food and Catering Services, Textiles and Gardening Products and Services.

⁷ The other product groups are Windows, Glazed Doors and Skylights, Thermal Insulation, Hard floor-coverings, Wall Panels, Combine Heat and Power (CHP), Road construction and traffic signs and Mobile Phones.

⁸ http://ec.europa.eu/environment/gpp/eu_gpp_criteria_en.htm

⁹ Mather, J. 2009. Birmingham City Council Innovation in Procurement Lighting Report 2. Global to Local.

¹⁰ E.g. Blauer Engel – see section on Germany or Austria.

¹¹ Find the draft regulation at

http://ecee.org/Eco_design/products/directional_lighting/resolveuid/3bd1ebe414da22961cc2abdb94a2c61

¹² See e.g. http://ecee.org/Eco_design/products/directional_lighting.

The following overview of the situation in the EU Member States covers developments in the Green Public Procurement for lighting, with a specific focus on LEDs.

To get an overview of the GPP in general, in the respective countries, very detailed information is available in the study “Energy Efficiency in Public Procurement – Member States' experience, barriers/drivers and recommendations” prepared by the Joint Research Centre¹³. In this report, general information on GPP, not specific to LEDs, is to a large extent based on the information from the afore-mentioned study.

For each country, a general description of the legal framework for Green Public Procurement of lighting is provided, with a specific focus on LEDs (where available and applicable). It is followed by selected practical case examples of LED public procurement, either highlighting particular case studies or broader public actions.

¹³ See note 2.

Austria

On a federal level, the National Action Plan for Green Public Procurement was adopted in Austria in July 2010¹⁴. General obligation for the federal level is to procure sustainable products using at least EU-Toolkit core criteria. The plan sets out criteria for green purchasing for various products. However, lighting is not specifically among those.

The “Check it” Guidelines¹⁵, prepared under the auspices of the Ministry of Agriculture, Forestry, Environment and Water Management, and the Chancellor's Office, provide specific recommendations on ecological procurement of different products. In total, there are 11 modules and lighting is specified in Module 7: Technical Building Systems: HVAC, Lighting and Water Use. The recommendations cover light sources, luminaires, light switches, light control and regulation, as well as outdoor lighting.

There are guidelines available also at regional level, which specify criteria for lighting. In 1998, the Public Procurement Programme of the City of Vienna (OekoKauf Wien) was launched.¹⁶ This programme provides criteria for Green Public Procurement of different product groups, including lighting. The criteria are obligatory.

The criteria were published/last updated in May 2010 and they specify, among others, maximum content of mercury, lifetime of the bulbs, or minimum light output in lm/W.

Green Public Procurement of LEDs

In none of the documents above, LED lighting is specifically mentioned. However, the Summary to the Austrian Ecolabel Directive for Lamps (UZ 47 - Kurzfassung zur Österreichischen Umweltzeichenrichtlinie – Lampen¹⁷) from the website of the Austrian EcoLabel (Das Österreichische Umweltzeichen) provides a specific technical requirement for LEDs. The summary of the UZ 47 Directive describes technical requirements for interior lighting.

The UZ 47 requirements are almost identical to the UZ 151 requirements of *Der Blaue Engel* (German Ecolabel¹⁸). The requirements cover, e.g. power consumption index, colour rendering, durability of the lamp and other. For LED lamps, a specific requirement on real power is given, as these are not limited by Regulation 244/2009¹⁹. The specific LED requirements are summarised in Table 1 below.

¹⁴ Available at <http://www.nachhaltigebeschaffung.at/node/185>.

¹⁵ Available at <http://www.oekoeinkauf.at/>

¹⁶ More at www.oekokauf.wien.at

¹⁷ The Directive is available at http://www.umweltzeichen.at/cms/upload/20%20docs/richtlinien-kf/uz47_k3a_lampen_2011.pdf

¹⁸ RAL-UZ 151 available for download at http://www.blauer-engel.de/en/products_brands/vergabegrundlage.php?id=207

¹⁹ Commission Regulation (EC) No 244/2009 requires non-directional household lamps, except for LED lamps, not to fall below a certain (electric) power factor. This is why these Basic Criteria establish requirements for LED lamps only complementarily. (See *Blaue Engel* – UZ 151)

Table 1 Criteria of the Austrian Ecolabel for LEDs

Criterion	Requirement LED-Lamps
Real power < 25 Watts	Power factor ≥ 0.75
Real Power ≥ 25 Watts	Power factor ≥ 0.90

Source: UZ 47

Furthermore, the website of the Euro **Topten Plus** Project²⁰ - www.topprodukte.at - provides criteria for the selection of LED lamps for households. The website also presents a list of LEDs available on the market, which conform to the selection criteria. The lamps are divided into three categories: 1) light bulbs replacing 15-30W E27, 2); light bulbs replacing 40-60W E27; and 3) replacement of E14 bulbs. The criteria for selection are divided into two categories – silver (topprodukt.SILBER), which are products above average efficiency, and gold (topprodukt.GOLD), which are particularly outstanding products. The criteria are:

Table 2 Topprodukte.at criteria for selection of LEDs

	Topprodukt GOLD	Topprodukt SILBER
Energy Efficiency Class	Corresponding to A	Corresponding to A
Luminous efficacy	≥ 50 lm/W	-
Lifetime	$\geq 20\ 000$ h	$\geq 20\ 000$ h
Number of switching cycles	$\geq 20\ 000$	$\geq 20\ 000$

Source: Topprodukte.at

There is a part of the website devoted to business-to-business solutions, but only halogen lamps are presented in this part.

Example of good practices²¹

In Austria, there is a number of case studies published, describing the public procurement of LEDs, mostly by Municipalities in different regions. For instance, in Graz, the City replaced incandescent light bulbs in traffic lights with LEDs, achieving important energy and financial savings²².

In street lighting, LEDs have been used, for instance, in the Municipality of Tattendorf in Lower Austria. Since 2009, the Municipality relies on the use of the latest technology in the field of public lighting and has replaced 100 pieces (as of 2010) of the previously used ball lamps (80W HQL) with LED lamps (18W LED). Thus 70% of energy costs were saved. The intention is to gradually convert all the lights in the community to this new technology. The

²⁰ Euro Topten Plus Project is supported by the Intelligent Energy Europe Programme, running from 2009 to 2011. From 2012, it will continue under the Euro Topten Max Project. More on the Project can be found at www.topten.eu.

²¹ Here, the webpage www.klimabuendnis.at provides an extensive databank of projects, including Green Public Procurement of LEDs. Other good practice examples can be found in the publishable report of the PRO-EE Project, at <http://www.pro-ee.eu/dissemination.html>.

²² For more information, see <http://www.grazer-ea.at/cms/projekte/umruestung-von-lichtsignalanlagen-auf-led/content.html> (in German).

illumination meets the street-lighting standards, according to EN13201 Class S5. An increased sense of security through better lighting, and increased well-being of the population, has also been achieved by the Project.

Belgium

In Belgium, the Federal Action Plan for Green Public Procurement for 2009 – 2011²³ contains specific objectives relevant to Green Public Procurement. It also specifies groups of products which the federal government aims to address; however, lighting is not among the specified product groups.

There are several guides and circulars available at federal level, as well as regional level (Flemish Region, Walloon Region and Brussels-Capital Region). Circular P&O/DD/1 on Sustainable Development Policy in Public Procurement at federal level²⁴ obliges Federal Authorities to follow the criteria published on the website <http://www.guidedesachatsdurables.be>. The Brussels Region has adopted a circular on Eco-Friendly Criteria and Sustainable Development in Public Procurement²⁵ that lists lighting among the products covered, but it actually refers more widely to the above webpage as well. Other regional circulars cover products other than lighting (such as vehicles or printing material)²⁶.

The website www.guidedesachatsdurables.be contains a Guide on Green Procurement with a database of about 2500 criteria for 250 products and services.

For each category of products there are three steps to define environmental criteria. As a first step, the source of information is determined. The criteria of the European Commission's GPP Training Toolkit are also taken into account.

Secondly, based on existing labels, preliminary research is carried out to make a first assessment of a set of sustainable criteria for a certain product or service. In 2009, 70 products were selected for examination, in 2010, another 40 were added.

Social consultation is the third step, with the aim to check whether products and services exist on the Belgian market for the criteria, to support research for the criteria from the demand side, the supply side and NGOs, and to refine the European criteria from the GPP Toolkit. So far, about 10 products have gone through step 3.

²³ Federal Action Plan for Green Public Procurement 2009 – 2011, available at <http://www.guidedesachatsdurables.be/fr/node/18?q=fr/node/169>

²⁴ Circulaire P&O/DD/1. - Mise en oeuvre de la politique de développement durable lors des marchés publics de fournitures lancés par des pouvoirs adjudicateurs de l'autorité fédérale qui appartiennent aux secteurs classiques, available from http://www.gidsvoorduurzameaankopen.be/sites/default/files/file/Background%20documents/20050127_P_O_DD_1_FR.doc

²⁵ Circulaire relative à l'insertion de critères écologiques et de développement durable dans les marchés publics de fournitures et de services et modifiant la circulaire ministérielle du 8 juillet 1993 relative à l'Eco-consommation et à la gestion des déchets dans les administrations publiques régionales en Région de Bruxelles-Capitale., available at http://www.bruxellesenvironnement.be/uploadedFiles/Contenu_du_site/Professionnels/Themes/D%C3%A9veloppement_durable/Achats_durables/726%20-%20EVP%20-%20Projet%20Circulaire%20achats%20durables%20version%20longu.pdf?langtype=2060

²⁶ Find more at <http://www.guidedesachatsdurables.be/en/node/6482>

The guide contains eight categories related to lighting:

- low energy consuming bulbs,
- electronic ballasts,
- security lighting,
- festive lighting,
- solar lights,
- signal lights and
- road signal lights
- luminaires.

The source of information for these product categories are European Energy Label, EU Ecolabel, German *Der Blaue Engel*, Austrian label, EU Toolkit or *NF Environnement* Label. None of the products have undergone consultations in Step 3.

As part of the Euro Topten Plus Project, a database of the most efficient appliances on the Belgian market is kept up-to-date at www.topten.be. Lighting is included among the appliance categories, but LED lamps are not covered²⁷.

The database at www.achatsverts.be – a project of Ecoconso – contains detailed information on Green Public Procurement. It includes advice on lighting and specifically on LEDs. However, instead of criteria for selection, the website provides general information on advantages (low energy consumption, long lifetime and low variability of uses) and disadvantages (high investment cost) of LEDs²⁸.

In Flanders, the database at www.milieukoopwijzer.be – a project of Bond Beter Leefmilieu - contains information on Green Public Procurement for different product classes, including lighting. It advises on lighting in general (lamps – luminaires – gear) using environmental criteria. The ranking of the lamps (and thus LED) is determined by the following criteria: energy efficiency, lifetime, mercury content, packaging, type of gear.

²⁷ Note: each country (partner of the Project) selects its appliance categories in the Project. This is why LEDs are covered only in some countries.

²⁸ See more at <http://www.ecoconso.be/S-eclairer-sans-gaspiller>

Bulgaria

The Bulgarian Public Procurement Agency has issued practical guidance on public procurement with explanations and examples concerning GPP. The practical guidance was published on the website of the International Training Centre of the International Labour Organization devoted to Green Public Procurement²⁹.

The Public Procurement Agency, in collaboration with the Energy Efficiency Agency, has prepared guidelines and instructions on the application of energy efficiency and energy saving in the procurement of certain equipment and road vehicles for five priority groups of products: office equipment, air conditioning, white goods, motor vehicles, public street lighting and office lighting³⁰. However, these energy-efficiency requirements are not compulsory.

The guidelines specify requirements for office and public lighting, but only include requirements for fluorescent lamps, metal halide, sodium and high intensity discharge lamps, ballasts and fixtures. The requirements are based on Commission Regulations N° 245/2009 and N° 347/2010. Therefore, it seems that the criteria do not go beyond the eco-design requirements.

GPP NAP was adopted by the Council of Ministers on 13 October 2011. A total of six product groups were selected (copying and graphic paper, office IT equipment, air conditioners, cleaning products and cleaning services, transport and lighting – including office lighting).

The approach in this National Action Plan is to identify product groups, which are binding for Contracting Authorities at the Central Government and recommended to the Contracting Authorities under Art. 7, Items 3 and 4, of the Law on Public Procurement and Local Administration.

Criteria for product groups in the National Action Plan are consistent with the core criteria set by the European Commission Guidelines for the award of Green Procurement.

According to the Public Procurement Office representative, so far there has been no statistical data about GPP of LEDs. Until now, the regular public procurement of LEDs has been rather scarce.

Good practice example - Sungurlare Municipality³¹

In the Municipality of Sungurlare, LEDs have been installed as a pilot project. Approximately 1000 old luminaires have been replaced by 2700 new ones. The results are that, currently, all streets are lit. The lighting quality improved, among other, because the luminaires are now mounted on each pole, unlike before, when only every second or third pole was

²⁹ Available at <http://gpp.itcilo.org/index.php?id=163,167> (in Bulgarian)

³⁰ Available at http://rop3-app1.aop.bg:7778/portal/page?_pageid=173,1&_dad=portal&_schema=PORTAL

³¹ For more information, see note 4.

mounted. Despite the increase in number of luminaires, the energy costs of public lighting decreased slightly (from 28 000 BGN to 27 000 BGN).

With all public lighting shifting to LEDs, Sungurlare became the first Municipality in Europe with complete LED lighting. Importantly, dimming is possible from 0% to 120%, as well as programming of dimming levels and periods. Payback time of the whole system is three years under present Bulgarian conditions and financing is ensured through an Energy Performance Contract³².

³² Energy Performance Contract Energy Performance Contracting (EPC) is a proven and cost-efficient instrument for tapping existing energy saving potentials in the buildings sector. The main distinguishing feature of a project carried out through EPC is financing of the investments via (contractually) guaranteed cost savings, achieved through improved energy efficiency. (http://www.european-energy-service-initiative.net/fileadmin/user_upload/gea/standard_documents/Standard1_Definitions.pdf)

Cyprus

The first GPP National Action Plan was adopted in 2007. The review of the GPP NAP 2010 – 2012 was open for consultation in spring 2010. The GPP NAP identifies 12 priority product and service categories; however, lighting is not among them³³.

The GPP Action Plan, prepared by the Ministry of Agriculture, Natural Resources and Environment, sets requirements for office lighting, street lighting and traffic lighting (core criteria).

For office lighting, the compact fluorescent lamps are to be used, for street lighting mostly High Pressure Sodium lamps are used. For traffic lighting, Cyprus started replacing the old lamps with LEDs (see example). Most of the Municipalities use LEDs for Christmas street decorations.

Good practice example - Public Works Department³⁴

Several replacements of traffic signals with LEDs were implemented in Cyprus. As of autumn 2011, six junctions in Nicosia and Limassol operate with LEDs (most of them have been identified as black spots in the past).

The Public Works Department (PWD) put a proposal through for the installation of LEDs at 12 signalised junctions in Nicosia, as well as 7 Pelican Crossings in the vicinity of the International Conference Centre in Nicosia where most meetings will be held for the EU Presidency, during the second half of 2012. However, due to recent budget cuts, it has not yet been approved (lack of funds to proceed with procurement and installation).

The PWD also prepared a proposal for the Council of Ministers in order to gradually replace all signals, with older type signal heads etc., with LEDs. Nevertheless, due to recent budget cuts (in autumn 2011) the proposal has not been processed by the Council yet.

³³Country specific information on GPP available at http://ec.europa.eu/environment/gpp/pdf/national_gpp_strategies_en.pdf

³⁴ Email communication with N. Georgiou, Ministry of Agriculture, Natural Resources and Environment.

Czech Republic

Government Decision N° 465/2010, on Rules for the Implementation of Environmental Requirements in Public Procurement of State Administration and Self-Administration, was adopted in 2010. The rules are binding for the Central Government Bodies (in tenders under Act 137/2006 Coll. on Public Tenders) and can also be followed by Municipalities.

Following the rules, criteria for selected product groups are defined in specific binding methodical papers. So far, criteria for Green Public Procurement have been developed for furniture and IT office equipment.

A website on GPP has been launched by the Ministry – www.zelenenakupovani.cz (Green Public Procurement), which contains updated information on GPP in the Czech Republic.

In 2010, the Ministry of Environment launched a Programme called Green Light to Savings Partnership. Within this Programme, the Ministry established a website database (www.zelenausporam-partnerstvi.cz), which gathers the most energy-efficiency appliances in the Czech market. Among other appliance categories, there is a list of energy-efficient light bulbs. LEDs are part of this category – the database covers LEDs for households – with E14 and E27 cap. The criteria for selection are based on the criteria of the Euro Topten Plus Project in the Czech Republic (www.uspornespotebice.cz).

Table 3 LED selection criteria for the Green Light to Savings Partnership

Specification	Value
Lifetime	25 000 hours
Very good colour rendering	Colour rendering (Ra) > 80
Colour temperature	“Warm white”
Lamp cap	E27 or E14
Omnidirectional light dispersion	Dispersion radius > 180 degrees
Minimum luminous flux	80 lm

Source: www.zelenausporam-partnerstvi.cz

Good practice example – National Theatre³⁵

The National Theatre consists of four main buildings, out of which three are modern and one historical, built in the late 19th century. The renovation of the lighting system was part of the renovation of the whole complex, which was carried out through Energy Performance Contracting.

The Decision was based on a thorough energy audit of the lighting system, carried out by an external company. The management of the theatre decided, based on the audit, to include lighting (and LEDs) in the refurbishment project.

³⁵ For more information – see note 4.

LEDs were installed for all emergency lighting, which is on 24 hours a day. Originally installed incandescent light bulbs of 15W and 25W were replaced with LEDs of 2W - 4W. The overall payback period of the whole lighting renovation is less than two years.

Denmark

Environmental requirements are mandatory for Central Government, according to the Departmental Circular on Environmental and Energy Considerations in relation to public procurement. The Danish Ministry for Environment has established a Partnership for Green Procurement with the three largest Municipalities with specific targets on Green Procurement. However, lighting is not covered by the partnership³⁶.

The latest survey on Green Public Procurement in Denmark (and six other countries) is published on the EU Commission's homepage³⁷.

The Danish Energy Agency has the overall responsibility for energy-efficient procurement in Governmental Institutions. The policy has been defined in a Departmental Circular on Energy Efficiency³⁸. The Energy Agency has also entered into voluntary agreement with Local Government Denmark and the Danish Regions on energy-efficient procurement within the Regions and Municipalities³⁹.

Therefore all Governmental, Regional and Local Institutions are obliged to purchase energy-efficient products. Energy-efficient products are defined as products that comply with the energy demands in the Guideline on Energy Efficient Procurement, published by the Danish Energy Saving Trust: <http://www.goenergi.dk/offentlig>.

The database of energy-efficient products is available on a website of the Danish Energy Saving Trust - www.savingtrust.dk. The database largely covers lighting, where LEDs are specifically represented⁴⁰. The website provides a database of LEDs available on the Danish market (with E27, E14, but also GU10, GU4 and GU5.3 bases⁴¹). The characteristics that the authors suggest the consumer should look for when selecting LEDs are:

- Light quality;
- Colour temperature, and colour rendering (CRI) (of more than 80);
- Dimmability where applicable.

The database www.miljoevejledninger.dk⁴² provides Guidelines for Green Public Procurement of 46 product categories. The product categories include lighting fixtures and lamps. The main selection criterion for lamps is energy-efficiency class A. LEDs do not fall yet under the EU Energy Labelling Legislation though.

³⁶ More information in Danish at <http://www.gronneindkob.dk/>.

³⁷ See http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf

³⁸ Departmental Circular on Energy Efficiency - [http://www.ens.dk/da-](http://www.ens.dk/da-DK/ForbrugOgBesparelser/denoffentligesektor/Staten/Sider/Forside.aspx)

[DK/ForbrugOgBesparelser/denoffentligesektor/Staten/Sider/Forside.aspx](http://www.ens.dk/en-US/ConsumptionAndSavings/Public_Sector/regional_and_local/Sider/Forside.aspx)

³⁹ http://www.ens.dk/en-US/ConsumptionAndSavings/Public_Sector/regional_and_local/Sider/Forside.aspx

⁴⁰ <http://www.goenergi.dk/offentlig/produkter/belysning/lysdioder>

⁴¹ For types of bases and caps, see e.g. <http://www.lightbulbs-direct.com/article/fittings-caps-and-bases/>

⁴² Miljoevejledninger.dk website was developed as part of a project under the Environmental Protection Agency with the aim of improving the dissemination of Environmental Guidelines for professional buyers in Denmark.

In 2009, the Nordic Council of Ministers published a report “Nordic Cooperation on Green Public Procurement”. The report identifies environmental criteria for GPP. The criteria can be used as good practice examples of environmental criteria in public procurement⁴³.

In the report, LEDs are specifically excluded from assessment and criteria are not defined because “LED technology is developing very fast and it is not very common yet. However, LEDs are very energy efficient, durable and their quality of light is good.”⁴⁴

Good practice example – City of Kolding⁴⁵

A call for tender was published in January 2011 for the supply of highly energy-efficient replacement light bulbs (such as light emitting diodes - LEDs). The tender was a joint tender between Kolding and seven neighbour cities.

The criteria for selection were developed after consultation with the main stakeholders, the Danish Lighting Centre and also following guidance of the Smart SPP Project⁴⁶. The technical specifications of the tender were:

Indoor lighting	Outdoor lighting
CRI (Colour Rendering Index) >80	CRI (Colour Rendering Index) >75
Colour temperature (Kelvin) 2700-3000	Colour temperature (Kelvin) 3000-4000
General lighting-efficiency (lumen/W) > 50	General lighting-efficiency (lumen/W) > 50
Effective lighting-efficiency (lumen/W) > 40	
Lifetime (hours at L70) > 20 000	Lifetime (hours at L70) > 20 000

The award criteria were defined as life-cycle costs (weight of 55%), energy efficiency (25%) and light quality measured by CRI (20%). The life-cycle costs were further divided into purchase price (35%), lifetime (35%) and operating costs (30%).

When preparing the call for tender, a list of light bulbs, which would be replaced with LEDs, was prepared by the Kolding Municipality in cooperation with the Danish Lighting Centre. However, once the offers were received from the suppliers, it turned out that it might not be possible to replace some of the intended light bulbs, because the LED lamps do “not always have better energy efficiency measured in lumen/Watt”, especially compared to energy-saving light bulbs. For other light bulbs, it turned out that there is not yet a LED alternative available on the market.

⁴³ According to the authors of the report, “the original goal was to achieve common Nordic criteria.” However, it was “not achieved due to different processes in the development of the criteria in the respective countries.” The report is available for download at <http://www.norden.org/en/publications/publications/2009-759>

⁴⁴ <http://www.norden.org/en/publications/publications/2009-759>

⁴⁵ After http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue9_Case_Study24_Kolding_Lights.pdf

⁴⁶ Kolding is a partner of this Project. More about the Smart SPP Project at www.smart-spp.eu.

Nevertheless, as published on the website of the SPP Project⁴⁷, the winning bid has the following parameters:

- Lifetime between 25 000 and 40 000 hours
- Energy efficiency between 52 and 74 lumen/W
- Payback period between 3 and 20 months
- Saving potentials between 50 and 250 EUR per light bulb over the lifetime.

The replacement of some 20 000 units (20 000 units equals the annual turnover rate for ordinary light bulbs in the eight cities participating in the joint purchase, and is not necessarily the amount of units to be replaced) is expected to generate average savings of 125 EUR per unit over the unit's lifetime. The project shows a high potential for replication in other Municipalities and their buildings.

A pilot replacement project was subsequently set up at a kindergarten for the replacement of a total of 55 light bulbs, consisting of 8 different types. The estimated saving potential for this kindergarten is 2200 kWh per year or 430 EUR per year. Other replacement projects are planned to take place in the near future for other Municipal buildings.

⁴⁷ <http://www.smart-spp.eu/index.php?id=8272>

Estonia

In the Estonian Environmental Action Plan 2007 – 2013, Green Public Procurement is identified among the planned activities to be carried out, as Task 5.5 “Setting up the system of environmentally sustainable public procurement and implementation of the system in the public sector”.⁴⁸

The Green Public Procurement Action Plan for the period 2007 – 2009 is also relevant. During a GPP seminar held in Tallinn in April 2010, the representatives of the Ministry of Environment of Estonia confirmed that actions would continue beyond this date⁴⁹. However, it is not clear whether any update of the plan has been adopted. The priority list of the products and services in the GPP AP does not cover lighting.

In light of the European Directives on GPP⁵⁰, the new Estonian Public Procurement Act contains the possibility of including environmental criteria in the public procurement process. The inclusion of environmental requirements of the procurement process remains therefore recommended, but for some authorities in the coming years, it may become mandatory for certain product groups.

There is a special website to the GPP, created under the Ministry of the Environment – <http://www.envir.ee/KHRH>.

The website provides thorough information on Green Public Procurement procedures, legal framework and evaluation tools. It offers criteria for selection for various product groups, including light bulbs. Criteria for light bulbs refer to the criteria of the EU Ecolabel⁵¹.

LEDs do not seem to be mentioned in any of the documents or criteria tools.

⁴⁸ The Action Plan is available from

http://www.envir.ee/orb.aw/class=file/action=preview/id=1101231/inglise_keeles_tegevuskava.pdf

⁴⁹ Information from the seminar at <http://gpp.itcilo.org/index.php?id=163,183>.

⁵⁰ Directives 2004/18/EC on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts and 2004/17/EC coordinating the Procurement Procedures of entities operating in the water, energy, transport and postal services sectors.

⁵¹ <http://www.emas.envir.ee/?pg=d21&lang=est>

Finland

In 2008, a “Proposal for a Sustainable Public Procurement Action Plan” was presented. According to the proposal, when purchasing services from contractors, purchasers should consider environmental impacts throughout life-cycles, and also apply the criteria used in Nordic and EU ecolabelling schemes. Furthermore, environmental labelling and energy use criteria should be applied when purchasing all kinds of electrical equipment⁵².

The Finnish Government Resolution (April 2009), adopting the final Sustainable Public Procurement Action Plan, states that “all procurement in the State Central Government, such as the Ministries, must take the environmental perspective into consideration by 2015 at the latest.” Municipal and Local Governments are recommended to consider environmental criteria “in at least 25% of procurement in 2010, and in half of procurement in 2015”. Therefore, the targets are binding for Central Government and recommended for Municipalities and State Enterprises.⁵³

In a guide by the Ministry of Employment and the Economy of Finland⁵⁴ of June 2011, it is stated that the quantitative and qualitative criteria for lighting apply also to LED luminaires, and that the manufacturer or importer shall be able to prove that the product complies with the criteria set for the distribution of luminous intensity, light output, and lumen depreciation of the source.

In January 2011, Motiva Oy published a Public Sector Procurement Guide on the economically most advantageous lighting. The Guide describes how public procuring entities should go about in tendering both planning, construction works and maintenance related to energy-efficient lighting, by considering the whole life-cycle of the procurement object⁵⁵. The procurement decision is best based on the economically most advantageous offer, which can, for instance, include the following criteria: life-cycle costs, energy efficiency in LENI (Lighting Energy Numeric Indicator, EN 15193-1). This is crucial, especially when choosing solutions based on new technology.

There is also an online database for public procurement “Hymonet” (www.hymonet.com)⁵⁶. It gives those persons responsible for procurement, information about the environmental impact of products and services. Among others, the portal provides a manual for selection of energy-efficient lighting⁵⁷. However, the criteria cover only fluorescent lamps, compact fluorescent lamps and low-voltage halogen lamps. The manual does not cover LEDs

⁵² More information can be found at <http://www.ymparisto.fi/default.asp?node=22445&lan=en>

⁵³ See <http://www.ymparisto.fi/default.asp?contentid=319422&lan=fi&clan=en>

⁵⁴ Energiatohokkuus julkisissa hankinnoissa (Energy efficiency in public procurement).

<http://www.tem.fi/files/30410/Energiatohokkuus.pdf>

⁵⁵ See the Guide at http://www.motiva.fi/julkaisut/kokonaistaloudelliset_valaistushankinnat.2193.shtml (in Finnish)

⁵⁶ Hymonet is provided by a consultancy company: The Finnish Consultancy Group. It is not free of charge and is not used to a large extent. The updating of the criteria is not based on a wide consultation (personal communication with I-M. Bergman, Motiva Oy).

⁵⁷ See the manual at http://www.hymonet.com/hymonet/tuotteet_ja_palvelut/sahkolaitteet_demo/valaistus/

specifically, because “the LED technology is developing very rapidly at the moment”. Nevertheless, it does state that “LEDs are highly recommended because they are energy efficient, sustainable, their light quality is good, and they do not contain mercury.”⁵⁸ According to the website, the manual was last updated in September 2010.

The Finnish partner of the Euro Topten Plus Project runs a regularly updated database of the most energy-efficient products on the Finnish market at www.topten-suomi.fi. It lists spot LED lamps and LED lamps replacing incandescent bulbs. The criteria for selection of LED lamps are:

- Light efficacy of at least 25 lm/W;
- Lifetime expectancy of at least 20 000 h (30% lumen maintenance);
- The colour rendering index of at least 80.

Good practice examples – Aalto University and the City of Turku

In two projects of the Lighting Unit in Aalto University⁵⁹, the use of LEDs was studied in the Municipalities and the Finnish Transport Agency. The advantages of LED technology expected by the Municipalities were:

- long lifetime and thus longer maintenance interval (yet cleaning required);
- colour of light;
- controllability;
- savings in operating costs;
- LEDs igniting immediately.

These are not necessarily the reasons why the Municipalities have started to install LED luminaires. Municipalities admit that LED technology will be a viable alternative later on, when/if the luminaires are further developed. Some Municipalities report to have installed LED luminaires in the areas important to cityscape, because of the image and colour.

Recently, a call for tender was published by the City of Turku for LED in street lighting, combined with Energy Performance Contracting⁶⁰. The procurement concerned changing the street lighting in the northern and eastern districts of the city. A pre-study was carried out revealing that the most beneficial would be to apply a lifetime of 30 years as a basis for the contract.

The work was divided into two parts: 700 mercury lights to be replaced by more energy-efficient devices and about 4000 lighting devices to be completely renewed, including the poles. The city's objective was to reduce the energy consumption of the two districts' lighting by 30%. The aim was to finance the project mainly with the energy savings accomplished and it was decided to proceed with executing the project as an energy-saving contract.

⁵⁸ See note 57.

⁵⁹ <http://lightinglab.fi/solarled/english.html> and <http://www.lightinglab.fi/ekovallo/english.html>.

⁶⁰ Email communication with Isa-Maria Bergman, Motiva Oy.

The procuring entity needed firstly to define the lighting capacity needed, thereafter to look at the options for an energy-efficient implementation. Clear objectives helped in drafting the selection criteria. The following selection criteria were used:

- Price 60% weight, whereof:
 - o the estimated efficiency savings in euros 70%;
 - o the total cost to be paid by the procuring entity (design, renewal of poles and cables) 30%;
- Quality criteria 40%, whereof:
 - o the competence of the entrepreneur 35%;
 - o the energy consumption of the lighting 30%;
 - o calculation models 15%;
 - o the products used by the entrepreneur 10%;
 - o the competence of the chief designer 10%.

France

The National Action Plan for Sustainable Procurement for 2007-2009 (PNAAPD), adopted in 2007, set specific GPP targets, including energy efficiency, for 15 product groups, to be reached through public procurement procedures.

This Plan was completed by a Communication of the Prime Minister of December 2008, titled "Exemplarité de l'État au regard du développement durable dans le fonctionnement de ses services et de ses établissements publics". It sets objectives, strategies and courses of actions for 20 product and service groups⁶¹ and indicators to be fulfilled for 13 of them; a set of products and services have quantified targets for 2010- 2012⁶².

The *Fiche* on lighting of the Circular of the Prime Minister (Circulaire du Premier Ministre) defines aims and objectives in lighting in the public sector. It sets minimum levels of efficiency for both indoor and outdoor lighting. In most cases⁶³, the efficacy levels range from 65 to 75 lm/W, depending on the application. Another requirement is to have motion controls in certain applications (e.g. with intermittent occupancy).

There are various databases of Guidelines for Green Public Procurement of Appliances. The database available at www.ecoresponsabilite.environnement.gouv.fr, established by the Interministerial Delegation for Sustainable Development, includes guidelines for 36 categories of products. One of the groups of products is street lighting. The guidelines provide general recommendations to look for long lifetime of lamps and low consumption, while limiting the light pollution⁶⁴.

For office lighting, the guide recommends to refer to the EU Ecolabel. In addition to this, reference is provided to the EU GreenLight Programme and to a guide on lighting prepared by ADEME⁶⁵.

There is the French Ecolabel (NF Environnement) for security lights⁶⁶. The list of certified products contains mostly LED lamps. The criteria for selection are:

- Lifetime of more than four years;
- Reparability (but does not apply to light sources with lifetime longer than eight years).

⁶¹ Computers, printers, paper, food, clothing, furniture, office equipment, wood products, cleaning services, waste management, green areas, cars, eco-driving, transport, water and energy, lighting, energy consumption and CO₂ emission monitoring, training, social procurement, social responsibility.

⁶² See note 2.

⁶³ One exception would be, for instance, for portable lights (éclairage d'appoint) for which the requirement is 40 lm/W.

⁶⁴ Find the recommendations at

<http://www.ecoresponsabilite.environnement.gouv.fr/fiches.php?act=2&id=21&prod=89>

⁶⁵ See <http://www.ecoresponsabilite.environnement.gouv.fr/fiches.php?act=2&id=3&prod=8>

⁶⁶ Available at <http://www.ecolabels.fr/fr/recherche-avancee/categories-de-produits-ou-services-certifies/produits-a-usage-professionnel/blocs-d-eclairage-de-securite>

- Maximum power 1.6 W;
- Low emissions (e.g. of ozone depleting gases, or emissions contributing to acid rain);
- Low mercury content;
- Limiting the volume of batteries;
- Recycling at the end-of-life of the product;
- Criteria for packaging and consumer information⁶⁷.

A list of guides for procurement of different product groups is also available at the website of the Ministry of Economy (<http://www.economie.gouv.fr/daj/guides-et-recommandations-des-gem-et-autres-publications>), however, it does not include guides on lighting at all. Conversely to other Topten sites, the www.topten.fr database does not cover LEDs.

For a good practice example, following the communication with a representative of ADEME (the French Environment and Energy Management Agency)⁶⁸, ADEME is reluctant to promote the LEDs due to the current lack of norms and labels inherent to this technology. It is believed that it may even be “dangerous to promote this technology as it is now”. Even though there are good quality products on the LED market, there is also a number of poor quality products and due to non existence of standards (i.e. energy label), it is not possible to “discriminate those products” with respect to consumers. Therefore, ADEME initiated the Annex of the International Energy Agency on solid-state lighting⁶⁹.

⁶⁷ Detailed information on the criteria at: http://www.lcie.fr/datacert/pdf/regles/Regle_NF_413_fr.pdf.

⁶⁸ Email communication with Bruno Lafitte, ADEME.

⁶⁹ Information on the SSL Annex <http://www.iea-4e.org/annexes/solid-state-lighting>

Germany

According to the Regulation of January 2008⁷⁰, it is mandatory for all Contracting Authorities at federal level to use life-cycle-costing in their Procurement Procedures to ensure energy-efficient and environment-friendly Public Procurement. On 20 August 2011, a revised Ordinance on the award of contracts came into force (award ordinance - Vierte Verordnung zur Änderung der Verordnung über die Vergabe öffentlicher Aufträge – VGV). The revised regulation takes into consideration aspects of energy efficiency in Public Procurement by implementing the Directives 2009/33/EC and 2010/30/EU.

Der Blaue Engel label (literally Blue Angel), established in 1977, currently covers more than 80 product groups. Lamps are covered by the UZ 151⁷¹. The document defines requirements for lighting concerning e.g. power consumption index, colour rendering, durability of the lamp and other. For LED lamps, a specific requirement on real power is given, as these are not limited by Regulation 244/2009⁷². The specific LED requirements are summarised in Table 4 below.

Table 4 Criteria of the *Blauer Engel*, specifically for LEDs

Criterion		Requirement LED-Lamps	
Real power	< 25 watts	Power factor	≥ 0.75
Real power	≥ 25 watts	Power factor	≥ 0.90

Source: www.blauer-engel.de

The German Energy Agency (Deutsche Energie-Agentur, DENA) runs a website <http://www.energieeffizienz-im-service.de>. The website presents online guides for various energy-efficient product categories (such as ventilation, IT equipment and other). Among the product categories are office lighting and street lighting. For office lighting, the main lamp types are described, including “white” LEDs. LED lighting is described as the lighting of the future; however it has so far been used mainly in specific installations, such as traffic lights, design, etc.

The street-lighting guide leads the procurer through all the stages of the procurement process (initial analysis, planning, goal setting, selection of technology or financing). The website provides a detailed guide through existing and available technologies for street lighting, including LEDs⁷³. The fact sheet on LEDs⁷⁴ contains general information on LEDs –

⁷⁰ <http://www.bmwi.de/BMWi/Redaktion/PDF/A/aav-zur-beschaffung-energieeffizienter-produkte,property=pdf,bereich=bmwi,sprache=de,rwb=true.pdf> and <http://www.bmwi.de/BMWi/Navigation/Energie/Energieeffizienz-und-Energieeinsparung/energieeffiziente-beschaffung.html> for general information.

⁷¹ See note 18.

⁷² See also note 19.

⁷³ <http://www.energieeffizienz-im-service.de/webspecial-strassenbeleuchtung/planung-finanzierung/vorhandene-und-verfuegbare-technologien.html>

their relatively short presence on the market and the need to pay attention to the operating temperatures of LEDs (which may shorten their lifetime). The fact sheet provides technical specifications of LEDs, summarised in Table 5.

Table 5 LED specifications by DENA

Specification	Criterion
Power (W)	0.1 - open
Luminance (lm)	1 - open
Lumen Efficacy (lm/W)	20 – 110
Colour	Warm white, neutral white, day white
Colour rendering index	> 80
Base	Special

Source: <http://www.energieeffizienz-im-service.de>

Guidelines on lighting have been published under the European Project Buy Smart. However, they exclude LEDs, because so far they are “meaningfully applicable only for individual applications”⁷⁵.

Detailed information and guidelines are available at the website of the Federal Environment Agency (<http://www.umweltbundesamt.de/produkte/beschaffung/>), but without reference to lighting and LEDs.

The website of the Euro Topten Plus Project, www.ecotopten.de, provides information on energy-efficient lighting, including tips on LEDs. Useful information on LEDs is provided also by the portal www.licht.de⁷⁶.

Good practice example – Isernhagen outdoor lighting

In the course of the construction work at the school in Isernhagen⁷⁷ in the summer of 2009, the areas around the school complex were reconstructed and the wiring of outdoor lighting extended for the new building and bicycle stands of the High School.

It turned out that the 30-year-old lights (80W high pressure mercury vapour discharge lamps) were in a bad state. It was therefore decided to replace all 22 luminaires with modern LED systems.

In November 2009, the new energy-efficiency lighting system was launched. Besides a significantly better quality of light, energy savings of almost 70% were achieved. The project

⁷⁴ http://www.energieeffizienz-im-service.de/fileadmin/InitiativeEnergieEffizienz/webspecial_strassenbeleuchtung/Downloads/Technische_Daten_blaetter/LED.pdf

⁷⁵ See information from the Buy Smart Project, http://www.buy-smart.info/media/file/236.BuySmart_Leitfaden_Beleuchtung.pdf

⁷⁶ Information on LEDs available at <http://www.licht.de/de/licht-know-how/beleuchtungstechnik/lampen/lampentypen/leds/>

⁷⁷ For more information, see <http://www.energieeffizienz-im-service.de/webspecial-strassenbeleuchtung/projektstart/schaffung-eines-guten-beispiels.html>

plays an exemplary role in the community and has enhanced implementation of further street-lighting modernisation projects.

The project is a part of good practice examples on the website devoted to Green Procurement of outdoor lighting. The authors specifically mention that such good examples are very important, in particular for LEDs, which are a new technology. Careful planning is therefore crucial, because there is often no previous experience with such technology in the community. Such good examples have a strong power to convince the population, or other local players, to support further modernisation projects.

Greece⁷⁸

There are two main categories of measures in relation to the public sector that are described in the Greek National Energy Efficiency Action Plan: Regulatory and National Initiatives/ Programmes for supporting actions, such as Green Public Procurement.

Concerning the regulatory measures, which are directly relevant to lighting, it is namely the mandatory replacement of all low energy-efficiency lighting equipment in the public and wider public sector.

So far, no GPP NAP has been developed yet. However, Law 3855/2010 “Measures to improve energy efficiency in end-use, energy services and other provisions” to effectively coordinate and promote GPP, foresees the establishment of an Inter-Ministerial Committee that will elaborate the National Action Plan for promoting Green Public Procurement, foreseen to be delivered by the end of 2012.

In 2010, Law 3855/2010 “Measures to improve energy efficiency in end-use, energy services and other provisions” was enacted. This law foresees, among others, the identification of the minimum requirements on energy efficiency for the procurement procedures for several categories of products of the public and wider public sector, as well as the implementation of methodologies for a life-cycle cost minimisation of purchased products, or respective methodologies, which ensure their economic sustainability.

However, all these provisions do not integrate specific targets in relation to the share that all these energy-efficient products should have under a specific timetable. These targets are foreseen to be set by the National Action Plan for GPP.

As far as guidebooks or guidelines are concerned, Law 3855/2010 foresees the enactment of a Ministerial Decree that will define the minimum requirements for energy efficiency in Public Procurement and will promote the implementation of the methodology of minimising the life-cycle cost of the products purchased (or other methods), in order to ensure their economic viability.

A specific initiative, described in the 2nd NEEAP, entitled “Building the Future” is also expected to serve as a multiplier in disseminating the benefits of GPP. The “Building the Future” Project is a comprehensive programme to improve the energy efficiency of the building stock of Greece. It is a partnership between the public sector, the manufacturing industry and citizens and it includes a total of 12 interventions on residential and commercial buildings, including replacement of artificial lighting.

⁷⁸ Based on personal communication with Mr. Yannis Vougiouklakis, CRES.

Hungary

The National Action Plan on Green Public Procurement has been drafted already in 2007, but according to European Commission information, has not been adopted yet⁷⁹.

The first draft of the GPP NAP selected seven main product groups. The second draft, from the 2009 National Action Plan, defines the target for the three product groups, which are obligatory in centralised purchasing, and mandatory in the procurements of Municipalities – office equipment, vehicles, copying and graphic paper. Lighting is not covered in the draft.

A special website, devoted to Green Public Procurement, www.zold-beszerzo.hu, was under construction at the time of writing this report.

In 2002, the Centre for Environmental Studies (www.ktk-ces.hu) published the Green Procurement Manual for Hungarian Municipalities. It also published a report on “Procurement of Energy Efficient Products - European Best Practices”. The report covers the period from 2004 to 2006. The latter also provides a good practice example of LED installation in street lighting in Budapest (see below).

In July 2006, the Council of Budapest approved a Green Public Procurement Regulation, the first Local Authority Green Procurement Regulation in Hungary. It is based on the Green Procurement Manual for Local Authorities, mentioned above.

Good practice example – Municipality of Budapest⁸⁰

The Project of LEDs at the Liberty Bridge in Budapest was carried out in 2009. It was a pilot project of the City of Budapest, following the adoption of the Green Procurement Regulation in 2006.

More than 800 light fittings were installed to provide Liberty Bridge’s ornamental lighting. More than 70% of those lights (584) are LED-based. In total, the installed power of the system is 40.7 kW, of which LEDs account for 13.1 kW. The total costs of the project were 1.66 million EUR. The estimated lifetime expectancy of the lighting system is 15 years and 30 years for the street lighting. Longer lifetime brings significant direct and indirect economic benefits and reduced waste.

The electricity savings compared to the original concept, which used halogen lighting, are estimated at 40 000 EUR per year. Total savings are estimated at 100 000 EUR per year.

⁷⁹ See note 33.

⁸⁰ http://ec.europa.eu/environment/gpp/pdf/news_alert/Issue13_Case_Study31_Budapest_Bridge.pdf

Ireland

In January 2012 the “Green Tenders, Action Plan on Green Public Procurement was launched⁸¹. The action plan focuses on eight priority areas: Construction, Energy, Transport, Food and Catering Services, Cleaning Products and Services, Paper, Uniforms and Textiles, and ICT. Lighting is classified under energy-using products in the energy sector. One of the themes of the Action Plan is the focus on “life-cycle thinking” in GPP.

As to energy-using products, the GPP NAP states that “the European Union (Energy Efficient Public Procurement) Regulations 2011⁸² obliges Public Bodies to only purchase equipment and electric vehicles from the Triple E register.”⁸³ It provides a good practice example of public procurement of LEDs in Tralee Town Council (see below).

The main two pieces of legislation on Green Public Procurement in Ireland are S.I. (Statutory Instrument) N° 542 of 2009 (Energy End-Use Efficiency and Energy Services Regulations 2009) and S.I. 151 of 2011 (Energy-Efficient Public Procurement)⁸⁴. The S.I. N° 151 of 2011 amends S.I. N° 542 of 2009 in a way that Public Bodies, when purchasing or leasing particular equipment and vehicles, shall only procure those that:

- “Are explicitly listed on the Triple E Register, or Meet the energy-efficiency criteria published by SEAI [Sustainable Energy Authority of Ireland] for the relevant product categories.”⁸⁵

The SEAI website contains a pool of information on public sector support and best practice case studies in public procurement. SEAI also runs the Accelerated Capital Allowance Programme (ACA). The ACA is a tax incentive, which aims to encourage companies to invest in energy saving technology. In order to qualify for the support, products need to be selected from the ACA Specified List, which currently covers 10 different equipment categories and 52 associated technologies. The list is updated regularly and only energy-efficient equipment that meets the relevant eligibility criteria is listed⁸⁶.

For LED lamps and luminaires, specific eligibility criteria (to be met in addition to the general eligibility criteria) are⁸⁷:

⁸¹ See more information and the Plan for download at <http://www.environ.ie/en/Environment/SustainableDevelopment/GreenPublicProcurement/News/MainBody,29206,en.htm>

⁸² Find the regulation at www.attorneygeneral.ie/esi/2011/B28347.pdf

⁸³ Find the register at http://www.seai.ie/Your_Business/Triple_E_Product_Register/

⁸⁴ Available at

http://www.seai.ie/Your_Business/Public_Sector/Funding_Finance_Procurement/Public_Sector_Procurement_Requirements/Public_Sector_procurement_requirements.html

⁸⁵ www.attorneygeneral.ie/esi/2011/B28347.pdf

⁸⁶ See the list here http://www.seai.ie/Your_Business/Accelerated_Capital_Allowance/

⁸⁷ Criteria for lighting are available at http://www.seai.ie/Your_Business/Triple_E_Product_Register/Triple_E_Categories_and_Criteria/Lighting_Units.pdf

- The photometric data of the luminaire, or lamp, must have been measured and tested in accordance with EN 13032-1&2 “Light and lighting – Measurement and presentation of photometric data of lamps and Luminaires” or IES LM-79-08 “Electrical and photometric measurements of Solid- State lighting products”;
- Must have a light output (in lumens) not less than 90% of initial light output, after 6000 hours of continuous operation, and which is tested according to: IEC/PAS 62612 “Self ballasted LED-Lamps for general lighting services – performance requirements” or IES LM-80-08 “Measuring Lumen maintenance of LED light sources”;
- A minimum lumen output of 150 lumens for the whole lamp or luminaire;
- A colour rendering index of not less than Ra = 70;
- A rated Correlated Colour Temperature between 2500 and 6500K;
- Luminaires must meet the minimum efficacy of 45 lm/cW (luminaire lumen per circuit Watts). Lamps must meet the minimum efficacy criteria: 45 lm/cW (lumen per circuit Watt) both for directional and omnidirectional lamps.

The criteria were published in September 2010.

The database contains a list of models, which comply with the TripleE (ACA) criteria⁸⁸. (In autumn 2011, there were 8 LED lamps and 11 LED luminaires out of about 1800 lighting units in the database.)

Good practice example - Tralee Town Council LED lighting

SEAI, working with Local Authorities and Local Energy Agencies, has identified three key high consumption areas that require a more assertive energy-saving strategy:

- Water Services
- ICT and
- Public Lighting (representing a further 30-40% of the average Local Authority's energy consumption).

Energy-Efficiency Working Groups have been established to help all Local Authorities in the identification, analysis and implementation of energy-saving measures in these services.

In 2008, Tralee Town Council replaced nine 70W High Pressure Sodium street lamps and ten 400W Metal Halide floodlights in Tralee Town Square, with seven power adjusting 77W LED streetlights and ten 88W LED floodlights.

The project delivered energy savings of 68%, as well as reducing maintenance intervals, while providing comparable lighting levels and clearer and more even lighting coverage. In addition, lighting levels from each unit can now be customised for better operational flexibility.

The feedback from the business community in the vicinity of the Town Square was extremely positive, as is exemplified by the following remarks: “The new lights in the Square are fantastic; there is no comparison between the lights that were there before and the clear

⁸⁸ <http://triplee.seai.ie/AcaProducts/Search.aspx>

bright light that is there now... I can't praise the new lights enough." Or "The new lights improve the security in the Square and the whole area appears clearer and better-lit now."

The National Action Plan on Green Public Procurement was adopted in 2008. It is anticipated in the plan that at least 30% of Regions, Provinces, Metropolitan Towns and Municipalities with more than 15 000 inhabitants, as well as National and Marine Parks, have Green Purchase Procedures⁹⁰.

The measures to be adopted under the National Action Plan (mainly the minimum environmental criteria) will guide Public Bodies on the application of the GPP and provide the instruments to support GPP strategies. Consequently, this will help promoting greener goods, services and contracts of works.

In the field of intervention under the GPP Action Plan, two important regulations are to be harmonised:

- CIPE Resolution 57 of 2 August 2002 on the “Italian Environmental Strategy 2002/2010” providing “the integration of the environmental factor into the market” by attributing to the public sector “the fundamental role in stimulating the supply”, establishing as a target that at least 30% of the goods procured by Public Authorities should also meet environmental requirements by 2007.
- The Ministerial Decree 203/2003, which introduced an obligation for all Public Bodies and companies, in which the majority of the capital is public, to procure manufactured items and goods made with recycled, post-consumption materials, entered in the Recycling Register, amounting to at least 30% of their annual requirement.

The Italian Action Plan sets certain quantitative objectives to be attained by 2009. In order to bring the level of “environmentally preferable” procurement into line with the highest European levels, it promotes that:

- the minimum environmental criteria, when available, are incorporated into CONSIP calls for tenders, where technically feasible, taking CONSIP’s programme of activities into account;
- at least 30% of the Regions, Provinces, Metropolitan Cities and Communes, with a population of over 15 000, adopt procurement procedures complying with the minimum environmental criteria;
- bodies managing national parks and protected maritime areas, coming under the Ministry of the Environment, incorporate the minimum environmental criteria in their purchasing procedures.

It is expected that an indicator for the percentage of total environmentally preferable spending, compared with total expenditure on goods, services and works purchased by such bodies will be defined, to be quantified thereafter as more data become available.

⁸⁹ General information on GPP based on communication with Patrizia Pistochini, ENEA.

⁹⁰ See note 13.

Furthermore, for each category identified, where possible, targets will be defined in terms of the expenditure incurred for procurement, complying with the minimum environmental criteria as a percentage of the total for all comparable national public spending, those targets will be set out in individual technical annexes.

The integration of those criteria into the purchasing contract award procedures, drawn up by the Public Authorities, will also be promoted, as set out in Article 1 of Legislative Decree 165/2001.

The National Action Plan refers to specific decrees, issued by the Ministry for the Environment, Land and Sea, identifying a set of “minimum” environmental criteria for each type of purchase within the sphere of the commodity categories identified.

Criteria adopted/submitted for comparison, specific to lighting

With the Ministerial Decree of February 2011 (Gazzetta Ufficiale N° 64 of 19 March 2011⁹¹), minimum efficiency criteria for street lighting have been adopted. For GPP [the initial analysis of the system needs should be taken on a life-cycle cost basis.](#)

The criteria were drafted on the basis of a preceding thorough background report⁹² and contain minimum efficiency requirements for High Intensity Discharge Lamps (HID) and LEDs⁹³.

The criteria are divided into three main parts – 1) criteria for HID lamps and LED systems, 2) criteria for luminaires and 3) criteria for lighting systems⁹⁴. Each set is further divided into mandatory technical requirements and award-winning technical requirements. The main criteria set the minimum level at which the procurement can be qualified as “green”. The award-winning criteria allow a selection of products with better environmental performance.

Below the mandatory (must) and awarding (target) criteria for LED lamps and LED systems are presented.

⁹¹ See the Decree at <http://www.dsa.minambiente.it/gpp/file/GU%20DM21-2011.pdf>

⁹² Find the report at http://www.dsa.minambiente.it/gpp/file/Relazione_accompagnamento_CAM_illuminazione_pubblica.pdf.

⁹³ Find the criteria at http://www.dsa.minambiente.it/gpp/file/GU%20SO%20n.74%20arredi_tessili_it_ill_All3.pdf

⁹⁴ The need to develop separate policies for luminaires and lighting systems arises from the consideration that the luminaire is a simple component of the lighting system, while the reference standards for user safety call for compliance with minimum lighting requirements, which can be obtained either with different technologies (LED, discharge source etc.) or with different installation geometries. It was necessary to "direct" technical data related to the lighting system to an indicator of energy consumption and performance freed from the technology used. The environmental *criteria for luminaires* are only related to the replacement of lighting fixtures, without modification of the system's equipment and thus without the ability to optimise the installation geometry. The environmental *criteria for lighting systems* are related to the construction of a new lighting system. Since the energy consumption of the lighting systems is affected not only by light sources and optical characteristics of the devices, but also by the kind of geometry set-up adopted, reference is therefore made both to the lighting unit installed and to the boundary characteristics which define the geometry of the lighting system.

Table 6 Criteria for LED lamps and LED systems - Italy

Colour temperature [K]	Minimum criteria	Award criteria
	Luminous efficacy of LED [lm/W]	
K ≤ 3000	≥ 45	≥ 50
3000 < K ≤ 4000	≥ 60	≥ 70
K > 4000	≥ 65	≥ 80

Hours of functioning	Minimum criteria	
	Maintenance factor	Failure rate
50 000	≥ 0.7	≤ 50%

Source: http://www.dsa.minambiente.it/gpp/file/GU%20SO%20n.74%20arredi_tessili_it_ill_All3.pdf

The document further lists information requirements, which need to be provided on LED lamps, which are in addition to the data on Table 6, lifetime of the lamps or photometric measurements, etc.

Furthermore, the Italian database of the Euro Topten Project (www.eurotopten.it) covers LED lamps (as replacement of incandescent light bulbs). The criteria for selection are unavailable from the website.

Good practice example – Rating system by Hera Luce s.r.l.

Based on the information provided by the experts on GPP of LEDs⁹⁵ contacted, up to now there is little or no evidence of good practice in the public procurement of LEDs. The reason is that Municipal Authorities have so far only installed LED fixtures without requiring any minimum efficiency criteria.

However, an interesting rating system has been made by Hera Luce s.r.l., which brings together Italian minimum efficiency criteria for public lighting, International EuP (Energy-using Product) Policies and Best Available Technologies. To promote energy-efficient technologies, Hera Luce has developed a public illumination rating system that could make everyone aware of the real efficacy of both luminaries and lighting installations.

Knowing that an incorrect installation would cause energy waste, even with the most efficient lighting fixture, a luminaire efficiency index could be useful when defining outdoor luminaire performance specifications used in tender documentation. On the other hand, with a lighting installation index it is possible to define a solution, which can achieve the best performances in outdoor illumination.

The efficacy is rated in terms of a set of energy efficiency classes from A+ to G (similar to building energy classes), where a class C level signifies the adoption of a Best Practice. The

⁹⁵ Email exchange with Emanuela Venturini, Agenzia Regionale per la Prevenzione e l'Ambiente dell'Emilia-Romagna and Alessandro Battistini, ECO LIGHTING CONSULTING.

Hera Luce rating system, approved by most luminaire manufacturers, could become a useful tool for authorities and technicians.

Returning to the selection criteria for LEDs, the Hera Luce system may be applied favourably to public procurements (because it can be applied to all kinds of fixtures, from HIDs to LEDs). For example a “C” class, for both LED luminaires and lighting installations, could be chosen as a minimum criterion; whereas the “B” and “A” classes could be granted a higher score.

Latvia⁹⁶

A GPP NAP, as part of the National Environmental Policy Plan 2004-2008, was adopted in 2008. The information provided by the European Commission, NAP for GPP for 2009-2011, has been under discussion⁹⁷.

Public Procurement Law, amended on 1 September 2009, fully complies with new EU Procurement Directives 18/2004/EC and 17/2004/EC. The law is favourable towards Green Procurement and defines ways the public procurer may obtain both environmentally friendly, sustainable, and best economic offers through the introduction of environmental criteria.

Nevertheless, application of environmental criteria is voluntary. According to the law, environmental criteria can be introduced as part of technical specifications, tender documentation, or criteria for selection of the best economic offer.

In 2008, the Ministry of Environment introduced Green Public Procurement as one of its tasks and developed a set of recommendations for Green Procurement in Latvia. One of them is the document "Recommendations for promotion of Green Public Procurement in State and Municipal Institutions". The document includes a strategy for the introduction of Green Public Procurement, a description of the legislative framework, and environmental criteria for six groups of products: office paper, cleaning supplies and services, office appliances, vehicles, office furniture, and food products and catering – lighting is not among the priority product groups⁹⁸.

⁹⁶ Based on http://ec.europa.eu/environment/gpp/pdf/national_gpp_strategies_en.pdf, <http://www.buy-smart.info/green-procurement/national-procurement-standards/latvia> and http://www.varam.gov.lv/lat/darbibas_veidi/zalais_publicais_iepirkums/ (in Latvian).

⁹⁷ See http://ec.europa.eu/environment/gpp/pdf/national_gpp_strategies_en.pdf

⁹⁸ The other document is "Recommendations for promotion of environmentally friendly construction".

Lithuania

The National Green Public Procurement Implementation Programme and the Implementation Measures of GPP, for the years 2010-2011, were approved by the Minister of Environment in 2010. The Implementation Measures of GPP for a new period – 2012-2015 – are being developed now and were foreseen for approval at the end of 2011.

Resolution N° 1257 (27 October 2011) of the Government of the Republic of Lithuania, in force from January 2012, sets out shares of Green Procurements, which shall be applied by the Governmental Institutions⁹⁹ until 2015 (25% of purchases shall be green in 2012¹⁰⁰, at least 25% in 2013, at least 30% in 2014, and not less than 35% in 2015)¹⁰¹.

Pursuant to Order N° D1-508 (28 June 2011) of the Minister of Environment, in Lithuania, there are core and comprehensive environmental criteria approved for 25 products on the basis of the common EU green criteria. For public procurement to be recognised as green, goods, services or works shall meet all core environmental criteria established for those particular goods/services/works¹⁰².

There are environmental criteria established for light bulbs, street lighting and traffic signals. The core environmental criterion for traffic signals is that 100% of traffic signal purchases shall be LEDs. This includes the installation of new, or upgraded, traffic signals and the replacing of existing lamps.

The contracting authority may choose to award the contract to the most economically efficient tender (compared to the pure lowest prices criterion). In this case, the award criteria may be the environmental characteristic, such as the most energy-efficient lamps (LED or other) available.

The environmental criteria for street lighting will be updated in 2012, with the opportunity to incorporate GPP criteria for fluorescent and LED lamps. In autumn 2011, GPP criteria for indoor lighting, including LED lamps, were under development.

Furthermore, the Ministry of Environment of the Republic of Lithuania provides a list of certified products, which also contains several LED lamps¹⁰³.

⁹⁹ National Authorities and other State Institutions and Organisations under the Government of the Republic of Lithuania, Office of the Prime Minister of the Republic of Lithuania, Ministries and Organisations under Ministries.

¹⁰⁰ More precisely, Green Public Procurement contracts of all public contracts for goods, services and works, for the purchase of which core (mandatory) and comprehensive (advisable) environmental criteria are established.

¹⁰¹ For more information see

http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_e?p_id=410092&p_query=&p_tr2=2=

¹⁰² See http://www3.lrs.lt/pls/inter3/dokpaieska.showdoc_e?p_id=403512&p_query=&p_tr2=2=

¹⁰³ See the list here www.am.lt/VI/files/0.679235001308637436.xls

The database of the most efficient products on the Lithuanian market, under the Euro Topten Plus Project, lists E27 LED lamps¹⁰⁴. The criteria for selection of the LEDs to be included in the database are:

- energy efficiency equal to energy class A or better;
- luminous efficacy at least 25 lm/W;
- average lifetime not less than 20 000 hours;
- on/off (switching) cycles more than 75 000;
- warm-up time not more than 30 seconds;
- producer of LED bulbs should have ISO certification.

Good practice example - Central Project Management Agency

In Lithuania, the Central Project Management Agency acts as the central purchasing authority. It is responsible for implementing transparency and environmental initiatives in public procurement, and does this by establishing electronic framework agreements for a range of product groups. Nearly 12% of all the Lithuanian purchasing authorities have used these frameworks. Over 60 different product specifications (including LED bulbs) can be chosen, offered in the online catalogue where green products are specially marked¹⁰⁵.

¹⁰⁴ See the criteria here <http://www.top-10.lt/Produktai/Lemputes/LED-E27>

¹⁰⁵ More information available at https://www.cpo.lt/kategorijos/elektros_lemputes

Luxembourg

The Public Procurement Act of 2003 (Loi du 30 juin 2003 sur les marchés publics)¹⁰⁶ generally stipulates that procurers, when awarding public contracts, shall consider issues concerning the environment and promote sustainable development.

The website portal on public procurement (<http://www.marches.public.lu/>) contains guides on procurement of different product groups, related to construction work. Lighting is not covered.

The database of the most efficient light bulbs in Luxembourg is maintained at www.oekotopten.lu (as part of the Euro Topten Plus Project) and it lists efficient light bulbs, too. LEDs are not specifically depicted and the criteria for selection of energy-efficient lighting are:

- energy efficiency class A (B for “candle” and “globe” shaped bulbs) and
- lifetime of 10 000 hours (15 000 hours for tubular CFLs).

¹⁰⁶ Find the Act here <http://www.legilux.public.lu/leg/a/archives/2003/0093/index.html>

Malta

The National Action Plan on Green Public Procurement (2011 – 2013) was adopted in August 2011¹⁰⁷. The Plan establishes GPP targets for 18 product and service groups and proposes a series of measures to reach the targets. One of the target groups is street lighting and traffic signals. The NAP GPP foresees that in the first year, 10% of public expenditure and 10% of public contracts, involving this product group, will be administered through tenders compliant with the EU Common GPP Criteria for this particular group. In the second year, the target increases to 20% and in the third year to 30%. The requirements apply to all tenders due for publication after 1 January 2012.

It seems that the criteria for the product groups will correlate with that set by the European Commission in its GPP Toolkit¹⁰⁸. National GPP Guidance Documents based on the common EU GPP criteria, and online GPP Checklist, are to be uploaded online¹⁰⁹.

An assessment of public procurement of the priority product groups was carried out. Based on this, the National Green Public Procurement Guidelines for Street Lighting and Traffic Signals¹¹⁰ require that 100% of traffic signal purchases shall be LEDs.

The specific minimum requirements for traffic signals are summarized in the table below (Table 7).

Table 7 Requirements for traffic signals - Malta

Module Type	Maximum Wattage (74C)	Nominal wattage (at 25C)
300mm Red Ball	17	11
200mm Red Ball	13	8
300mm Red Arrow	12	9
300mm Green Ball	15	15
200mm Green Ball	12	12
300mm Green Arrow	11	11

¹⁰⁷ The GPP NAP is available at <https://secure2.gov.mt/tsdu/file.aspx?f=6365>

¹⁰⁸ Ibid, Appendix 2.

¹⁰⁹ See more at <https://secure2.gov.mt/tsdu/gpp-procurers>

¹¹⁰ Available for download at <https://secure2.gov.mt/tsdu/file.aspx?f=6735>

The Netherlands

In Netherlands, there is no separate GPP NAP, but GPP targets are included in the National Action Plan on Sustainable Development from 2003¹¹¹. The Public Authorities set themselves clear goals. The National Government was aiming at all of its purchases to be 100% sustainable by 2010. Municipal Authorities were aiming for 75%, and the Provincial Authorities and Water Boards 50% in 2010. All parties committed themselves to 100% sustainable purchases in 2015. The 100% sustainable public procurement objective means that the organisation uses the core sustainability criteria in all its tendering and procurement processes and also guarantees that these will be included in the resulting contract¹¹².

The Ministry of Housing, Spatial Planning and the Environment, together with other Public Authorities, has developed sustainability criteria for various product groups purchased by Public Authorities. Criteria are developed in a way that the total costs do not increase substantially (based on life-cycle costs) and that there is sufficient market supply meeting the core criteria¹¹³.

The core criteria set the minimum level of sustainability required for a purchase. Use of the core criteria per product group is required in order for a purchase to be earmarked 'sustainable' by the monitor. For several product groups, award criteria have also been developed. The award criteria encourage front-runner suppliers and/or progressive public purchasers¹¹⁴.

Criteria for public lighting were published in March 2010¹¹⁵. The product group covers all lighting in public space. Apart from criteria for selection, the document includes information on the overall process of lighting design and how to make it sustainable (including points of consideration in the preparatory phase).

The core criteria (minimum requirements) include:

- The public lighting system must at least comply with the energy performance of label D in the Public Lighting Energy Labelling Manual, April 2009, from NSVV (Netherlands Lighting Expertise Foundation) and NL Agency;
- The public lighting system must be dimmable or technically suitable for being dimmed.

Following the calculation formulas of the label, it implies that to comply with the core criteria for Sustainable Public Procurement of Public Lighting, the installation should at least have an efficiency of:

- $<0.044 \text{ W/lux/m}^2$ for residential areas

¹¹¹ For reference see note 2.

¹¹² See more at <http://www.agentschapnl.nl/en/programmas-regelingen/what-sustainable-public-procurement>

¹¹³ Ibid.

¹¹⁴ For a number of product groups, no environmental criteria have been developed, but information is given about environmental aspects relevant to the purchase.

¹¹⁵ Find the criteria for lighting at <http://www.agentschapnl.nl/sites/default/files/bijlagen/Criteriadocument%20Public%20Lighting.doc.pdf>

- $<0.674 \text{ W}/(\text{cd}/\text{m}^2)/\text{m}^2$ for motorways

The award criteria are:

- energy saving design of the system (evaluation on the basis of kWh saved per year);
- light pollution (least additional pollution);
- sustainability of manufacturing the product (use of recycled materials, possibility of re-use, etc.);
- the three elements (energy saving, light pollution and sustainability of manufacturing) are to be assessed also in terms of "technical reality content", strength/solidity/lifetime of (the parts of) the system and maintenance expected during the lifetime.

Furthermore, there are specific (core and award) criteria for advertising light, limiting the maximum power of lighting for a given area in m^2 .

Summarising the current position in the Netherlands, lighting controls are the major issue. As put by R. van Heur, "the right amount of light, at the right time, in the right place" is the key goal¹¹⁶. The Dutch Public Lighting Directive of 2011 (by the Dutch Federation for Illumination - NSVV) also strongly focuses on dimming and lighting control¹¹⁷.

Good practice example - pilot test cases by the NL Agency¹¹⁸

From 2008 to 2010, the NL Agency coordinated an evaluation of over 40 pilots of LEDs in 25 Municipalities (with about 600 lights). Meanwhile, hundreds of LEDs in Dutch Municipalities and Provinces were implemented.

Some conclusions from the survey are that:

- LED lighting provides savings of 10 to 15%. Given the rapid development of LED lamps, the savings may even increase in the next few years;
- LED lamps can be precisely targeted and are often dimmable;
- LED lamps are robust and have a long life;
- Residents and road users are generally satisfied with light level, light colour and safety, particularly where sufficient attention is given to the lighting design;
- LED is suitable for public lighting, especially in residential areas, but only with proper lighting design and proper information.

¹¹⁶ Personal communication with R. Van Heur, Laborelec.

¹¹⁷ See more at http://www.nsvv.nl/publicaties/t0_p0_m7_i124.htm

¹¹⁸ More at <http://www.agentschapnl.nl/programmas-regelingen/led-openbare-verlichting>

Poland

The Second National Action Plan on Sustainable Public Procurement for 2010-2012 was developed by the Public Procurement Office and adopted by the Council of Ministers on 14 June 2010¹¹⁹. The NAP contains a schedule of activities and the timeframe for their conduct. GPP Toolkit is promoted by the NAP¹²⁰. The Public Procurement Office has also elaborated a tag on its website on Green Public Procurement ("Zielone Zamówienia Publiczne")¹²¹.

In November 2010, product specifications for Green Public Procurement of road lighting and traffic lights were published¹²². The document was developed within the Working Group under the Ministry of Economy. The recommended environmental criteria have been developed by the Working Group for Lighting, consisting of the representatives of Unions and Professional Associations, Academia and Public Administration. Recommended criteria have been verified by the Public Procurement Office and industry organisations consulted.

For road lighting, the criteria omit LED lamps and LED modules. The reason is the lack of properly documented data at this stage to specify the requirements for the criterion. However, it is foreseen that criteria for LED products will be included in subsequent updates of the product sheet, as it is expected that the role of LEDs in road lighting will increase in the near future.

However, LEDs are specifically promoted for traffic lights. General criteria relating to traffic signals are that it is recommended that at least 50% of the signals delivered are equipped with LED modules. This applies to both the installation of new signals and to modernisation of the existing LED indicators.

The maximum power consumption of traffic signals with LED basic requirements is summarised in the table below.

Table 8 Maximum power consumption of traffic signals with LED - basic requirements - Poland

Type of the system	Maximum power (74°C)	Rated power (25°C)
300 mm red roundel	17	11
200 mm red roundel	13	8
300 mm red with arrow	12	9
300 mm green roundel	15	15
200 mm green roundel	12	12
300 mm green with arrow	11	11

Note: Values are for a single optical system control circuit (not just the LED). Requirements given in the table are for single-power optical systems and not the entire traffic signal.

¹¹⁹ See more at <http://www.zielonezamowienia.gov.pl/index.php?pg=1>

¹²⁰ See note 33.

¹²¹ See the website at <http://www.uzp.gov.pl/cmsws/page/?F;291>

¹²² Find the specifications at <http://www.zielonezamowienia.gov.pl/mod/getdata.php?t=2&sp=95>

Portugal

The National Strategy for Green Public Procurement (2008-2010) was approved by Government in May 2007. It sets targets for the inclusion of environmental criteria in procurement procedures for seven priority groups of products/services. Lighting is not a priority group by itself, but is included in the group "Design and construction of public works, including lighting and equipment"¹²³.

The Portuguese Euro Topten Plus database, www.topten.pt, provides a list of the most efficient lamps on the Portuguese market. The database also includes LED lamps. The criteria for LED lamps, in order to be included in the database, are:

- Luminous efficacy at least 25 lm/W;
- Average lifetime of at least 15 000 hours;
- Colour temperature maximum 3500 K;
- Colour rendering index Ra ≥ 80.

LNEG, the National Laboratory for Energy and Geology, prepared, under the Project "Pro-EE - Public Procurement boosts Energy Efficiency", a fact sheet on LED street lighting (May 2010). This fact sheet was compiled considering a market research and results of several meetings held with suppliers/manufacturers of this technology.

A first finding is that it is necessary to assess every situation where a new installation is required, on a case-by-case basis, as LED lighting might not be suitable for all applications. The technical/environmental requirements for LEDs in the guidelines, include luminous efficacy, average lifetime, colour rendering index, colour temperature, as well as aspects relating to toxic substances, intelligent energy management, eco-design requirements (e.g. possibility for recovery and re-use), compliance with Waste Electrical and Electronic Equipment Directive (WEEE Directive), and other¹²⁴.

These criteria were recently improved under the Project SMART-SPP - Innovation through Sustainable Procurement, where LNEG (National Laboratory for Energy and Geology) assisted the Municipality of Cascais in the development of criteria for LED public lighting. The criteria, as well as other practical information regarding the activities that were carried out, are summarised in a case study document¹²⁵. The main performance specifications defined are:

¹²³ Email communication with P.Trindade, Laboratório Nacional de Energia e Geologia.

¹²⁴ More information on the criteria at http://www.pro-ee.eu/fileadmin/pro_ee/inhalte/dokumente/3-5Criterios_LEDS_24052010_Portugal_en.pdf

¹²⁵ http://smart-spp.eu/fileadmin/template/projects/smart_spp/files/Case_studies/EN_Cascais_SMARTSPP_Case-Studies.pdf

Table 9 Criteria for LED lighting – Smart-SPP Portugal

	Criteria
Luminous efficacy (light source + electronic and electrical components + optics)	≥ 80 lumen/Watt
Overall useful lifetime (MTTF)	≥ 65 000 hours Equipment must have an effective heat dissipation mechanism.
Luminous flux depreciation at the end of the useful lifetime of the lamp (L70)	Max. 30 %
Colour Temperature	Max. 4500 K
Ingress Protection Rating (IP)	≥ IP66
Shock Resistance Class (IK)	≥ IK08
Power Factor	≥ 0.90
Luminance	≥ 10 lux
Access to components (in case of fault)	Easy access to components and these can be replaced without difficulty
Luminous flux regulation capacity of lamp group	Depending on luminosity available and programming
Control and monitoring system	Possibility of future expansion

Good practice example - Northern Alentejo¹²⁶

With the aim to test LED technology for Public Lighting, an installation of 62 LED luminaires was carried out in November 2009 in four Municipalities of Northern Alentejo (Castelo de Vide, Marvão, Portalegre and Sousel). A direct substitution of the existing luminaires, equipped with 150 W High Pressure Sodium Lamps, by 80 W LED luminaires was carried out.

Direct results of the project were annual electricity savings of 24 MWh (53%) (and electricity cost savings of 2 350 EUR), as well as reduced maintenance and equipment (lamps) costs. The pilot project was launched in four locations throughout the region. There were no specific criteria for choosing the LED luminaires; it was an offer by a specific company.

However, as a result of the pilot study, some conclusions can be made. Firstly, it turned out that a direct substitution of luminaires might not be a good solution (inter-distance between light spots may influence light distribution). It was observed that the difference in light colour affects the streets and their surroundings, both on light flow (technical equipment) and on light perception (to the human eye). Furthermore, it also turned out that an adequate and continuous monitoring and warranty is needed.

New public lighting projects may be promoted in 2012-2013. Nonetheless, the Regional Authorities are currently refurbishing the traffic lights, changing more than 500 optics with incandescent bulbs by LED optics.

¹²⁶ Personal communication with Tiago Gaio, AREANATEjo.

Furthermore, there are many other cities that are choosing to replace conventional public lighting systems with LED. Another example of LED applications is the first highway in Europe with LED lighting (replacement of 220 high pressure sodium fixtures along an A25 highway junction).

Romania

Currently, in Romania there are no specific national criteria for public procurement of lighting or LEDs, but the Romanian Public Authorities have the possibility to use the EU Ecolabel, GPP criteria or other.

The Draft of the National Action Plan on Green Public Procurement has been in the process of preparation and adoption. It should be finished in 2012 and then approved by Government Decision¹²⁷.

The proposed targets are voluntary for the first year of implementing the NAP, but will become mandatory in the next years¹²⁸. In the future, the national target, regarding the percentage of sustainable public procurement from the entire value of public procurement, will be set. Each public institution in Romania will comply with the national target of sustainable public procurement¹²⁹.

Environmental criteria will be applied to seven priority product groups identified in the GPP NAP; lighting is among those product groups. The target for lighting equipment would be 50% of the public procurement to be GPP¹³⁰.

A Romanian public procurement contract can include provisions on specific sustainable requirements for the tendering process. The requirements can be based on the environmental systems and standards, such as the EU Ecolabel, the set(s) of GPP criteria from the European Commission, European or International Ecological Management Standards, etc.

A website devoted to Green Procurement is maintained at <http://www.achizitiiecologice.ro/>. Guidelines on the website do not cover lighting.

¹²⁷ Personal communication with A. Banu, Ministry of Environment and Forests.

¹²⁸ See note 33.

¹²⁹ Personal communication with A. Banu, Ministry of Environment and Forests.

¹³⁰ See note 33.

Slovakia

The Slovak National Action Plan for Green Public Procurement 2007 - 2010 was approved on 7 November 2007 by Government Resolution No. 944¹³¹. The priority of the Slovak NAP GPP¹³² was to increase GPP so as to “come closer” to 50% by 2010, which is the target set by the European Commission. Another priority is to implement good quality environmental requirements in public procurement. To this end, one of the activities is to prepare guidelines for GPP in Slovak conditions. Priority product groups are not defined in the GPP NAP.

During the time of writing the report (December 2011), the National Action Plan for Public Procurement in the Slovak Republic for 2011–2015 was in the process of interdepartmental comments. By 31 December 2011 it was to be submitted to a Government meeting. By adopting the document, the activities in GPP would have a follow up.

The Slovak Environmental Agency provides information on Green Public Procurement on its website¹³³. In 2009, guidelines for public organisations on public procurement have been drafted as a result of a pilot project on GPP¹³⁴. They provide recommendations for seven selected product groups; however, lighting is not included in these priority groups.

Similarly, in 2008, the Slovak Environmental Agency, in cooperation with the Ministry of Environment of the Slovak Republic, published a “Guide for public procurers: Basic information, regulations, processes and recommendations for Green Public Procurement”¹³⁵. There are examples of specifications for six product groups, but lighting is not among them.

So far, there are no specifications for LED procurement in Slovakia; however, some may be in preparation. The Slovak Environmental Agency has prepared a draft of specifications for the product group “Indoor lighting”. However, the document had not been finalised at the time of writing this report.

¹³¹ See the plan at <http://www.rokovania.sk/File.aspx/ViewDocumentHtml/Uznesenie-8403?prefixFile=u>

¹³² <http://www.rokovania.sk/File.aspx/ViewDocumentHtml/Mater-Dokum-29052?prefixFile=m>

¹³³ See <http://www.sazp.sk/public/index/go.php?id=1704>

¹³⁴ Find the Guideline (in Slovak Príručka pre verejné organizácie o možnostiach realizácie environmentálne vhodného vykonávania svojich činností a zeleného verejného obstarávania) at <http://www.sazp.sk/public/index/go.php?id=1857>

¹³⁵ See the Guide here http://www.sazp.sk/public/index/open_file.php?file=CEM/GPP/Prirucka_SAZP.pdf (In Slovak)

Slovenia

The Slovenian National Action Plan on Green Public Procurement, including the Policy Statement, was adopted on 21 May 2009¹³⁶. The Action Plan anticipates that in 2012, 50% of public purchases should be “green”.

The Regulation introduces basic and additional environmental requirements. Basic requirements have to be taken into account in public procurement. Additional requirements are to be used when the procurer wants to promote higher standards of environmental protection, as defined in the basic environmental requirements.

The Decree (Regulation) on Green Public Procurement, adopted in 2010¹³⁷, sets 10 priority areas where environmental aspects have to be considered. One of the priority areas is renovation and construction of public lighting (Priority Area 7). Lighting is also included in Priority Area 6, which covers construction, renovation and maintenance of buildings, including, among others interior lighting.

In the guidelines for Priority Area 6, the criteria define that for public purchase of interior lighting, the energy label has to be used. No further details or specifications for LEDs are provided¹³⁸. The criteria for Priority Area 7 – public lighting, covers only high pressure sodium lamps and metal halide lamps¹³⁹.

In autumn 2011, a new version of the Draft Decree on GPP was circulated, and it must be noted that, in this version, lighting has been left out completely¹⁴⁰. Therefore, if the draft version were to be adopted, the above statements would be cancelled out.

¹³⁶ Find the plan at

http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/javnar/UredbaZelenJN/Akcijski_ZeJN.PDF

¹³⁷ Available at http://www.mf.gov.si/si/delovna_podrocja/sistem_javnega_narocanja/predlogi_predpisov/

¹³⁸ Find the guidelines at

http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/javnar/UredbaZelenJN/Priloga_06_gradnje_17_01_2010.pdf

¹³⁹ Find the specifications at

http://www.mf.gov.si/fileadmin/mf.gov.si/pageuploads/javnar/UredbaZelenJN/Priloga_07_razsvetljava_17_01_2010.pdf

¹⁴⁰ Personal communication with M. Tomsic, Building and Civil Engineering Institute ZRMK.

Spain

The Spanish Green Public Procurement Action Plan was approved in 2008 by Order PRE/116/2008¹⁴¹. The Plan specifies eight priority product groups for which objectives have been set up, including both environmental and energy-efficiency criteria, on the one hand, and consumption reduction criteria, on the other hand. In the field of energy consumption, the Spanish GPP NAP refers to the criteria of a reduction of 9% in 2010 and 20% in 2016 in public buildings of the Spanish State Administration. This refers to all kinds of energy consuming equipment, like heating and cooling, office equipment and lighting. (On 4 November 2011, a report evaluating the state of Green Procurement was published and approved by the Council of Ministers¹⁴²). A set of codes and good practices was adopted in October 2011 for maintenance contracts and minor works, paper and publications and building cleaning services.

On a regional level, the Basque Agency for Environmental Management (www.ihobe.net) published manuals on Green Public Procurement, including criteria for 24 product groups. For lighting, three levels of criteria are provided for procurers – basic, advanced and excellent.

Both the “advanced” and “excellent” criteria stipulate that LED lamps (or CFLs!) are to be installed in areas where the requirements are not very stringent, but where the light is on permanently (such as corridors, toilets, etc.)¹⁴³.

The second edition of Guidelines of the Aragon Region (Compras verdes: compra y contratación pública verde en Aragón)¹⁴⁴ provides specifications and a catalogue of products for 11 product groups, for the most part based on the Basque Manual. One of the groups pertains to lighting. The criteria for procurement are of general nature (compliance with Regulation 245/2009/EC or Norm EN 12464-1). However, following the recommendations, the guidelines provide a catalogue of 12 specific light sources, out of which 9 are LED-based. The recommended models are both for office lighting and street lighting.

The Institute for Energy Diversification and Saving (IDAE) provides ample information on street lighting and LED traffic lights on its website. IDAE has prepared, in cooperation with CEI (the Spanish Lighting Committee), a document on Technical Requirements for LEDs in outdoor lighting¹⁴⁵. The purpose of the document is to develop technical requirements to be

¹⁴¹ Available at http://noticias.juridicas.com/base_datos/Admin/o116-2008-pre.html

¹⁴² See <http://www.marm.es/es/ministerio/planes-y-estrategias/plan-de-contratacion-publica-verde/default.aspx>

¹⁴³ Find the specifications at http://www.ihobe.net/documentos/imagenpaginas/consumo/iluminacion/Iluminacion_Criterios_N_avanzado-C.pdf

¹⁴⁴ Find the guidelines at http://www.aragon.es/estaticos/GobiernoAragon/Departamentos/AgriculturaGanaderiaMedioAmbiente/MedioAmbiente/Documentos/Areas/EducaSensib/catalogo_comprasverdes.pdf

¹⁴⁵ Find the requirements at http://www.idae.es/uploads/documentos/documentos_Requerimientos_LED_010611_e1c3d71a.pdf

met by technical products and the companies themselves offering LED technology. These recommended specifications will be valid until there are specifications from the EU¹⁴⁶.

By the Resolution of 14 September 2011 of the Secretariat of State for Energy, which publishes the Resolution of the Institute for Energy Diversification and Saving (IDAE)¹⁴⁷, the Second Aid Programme was launched. The Programme supports replacement of traffic light optics with LED technology and is aimed at Local Councils (for results of the First Aid Programme, see example below).

The resolution provides a regulatory basis for the replacement of incandescent light or halogen bulbs in traffic lights with LED technology. IDAE provides the relevant optics to the Local Councils, which in turn commit to meeting given requirements for their suitable assembly and use. It is estimated that annual savings of 960 MWh per 1000 replaced traffic lights will be achieved.

The Programme is financed from a specific budget approved by IDAE, amounting to 30 000 000 EUR. The actions fall within Action Plan 2008-2012 of the Energy Saving and Efficiency Strategy in Spain.

Alcorcón Local Council published a tender for comprehensive maintenance and repair of its street lighting installations. The tender was based on an audit previously carried out by IDAE and CEI (the Spanish Lighting Committee). The winning offer includes, among others, installation of a LED system, on a trial basis and for citizens' appraisal, in a given square in the Municipality.

The Barcelona City Council is introducing LED technology in the replacement of 13 000 traffic lights in the city, with an estimated annual saving of 800 000 EUR¹⁴⁸. Ecoinstitut Barcelona participated, as the expert organisation in GPP, in the implementation of innovative procurement activities in Spanish Municipalities, funded by the Intelligent Energy Europe (IEE) Programme: in the PRO-EE Project (Public Procurement boosts Energy Efficiency¹⁴⁹), general guidelines for the procurement of innovative energy-consuming products were established, including LED Street Lighting. The cities of San Sebastian and Murcia integrated energy-efficient public procurement in their Local Energy Efficiency Action Plans (LEAP).

The SMART-SPP Project (Innovation through sustainable procurement¹⁵⁰), with the City of Barcelona as Spanish pilot partner, identifies emerging technologies, including innovative lighting solutions based on LEDs and OLEDs, and provides tools for the calculation of life-cycle costs and CO₂ emissions of products.

¹⁴⁶ Communication with A. Saez de Vero, IDAE.

¹⁴⁷ Find the Resolution at <http://www.boe.es/boe/dias/2011/09/20/pdfs/BOE-A-2011-14941.pdf>

¹⁴⁸ Communication with A. Saez de Vero, IDAE, and also http://w110.bcn.cat/MediAmbient/Continguts/Vectors_Ambientals/Energia_i_qualitat_ambiental/Documents/Fitxers/dossierbalanenllumenatmontjucipmi.591.pdf

¹⁴⁹ Information on the project at www.pro-ee.eu

¹⁵⁰ Information on the project at www.smart-spp.eu

LED street and indoor lighting is an emerging technology with a fast market development and has been promoted by Spanish Municipalities, committed to GPP or LEAP, during the last two years: the City of Barcelona decided in 2010, after a pilot project with LED street lighting in six pilot areas, that the technology still has to evolve, but seems to be available in a short term in competitive conditions.¹⁵¹

In this sense, most Municipalities, which started with the introduction of LED lighting, are implementing pilot projects which allow to compare LED products from different providers; which means that Spanish Public Authorities are actually not developing specific technical criteria for public procurement of LED lighting, but are still mainly comparing technologies available on the market in a test phase and using the specifications provided by manufacturers.

Good practice example – Aid Scheme for Traffic Lights

The First Aid Scheme for replacement of traffic lights by LEDs¹⁵² was launched in 2007 (published in the Spanish Official Gazette, BOE, of 28 September 2007). The reason was the large potential for savings (about 80% reduction possible, by replacement of incandescent lights by LEDs). Another advantage is the increased traffic safety thanks to higher reliability and durability, as well as better luminance, as perceived by the human eye.

Within the programme, IDAE provided the requested optics to every Local Council, the assembly was at their expense. The programme led to the replacement of a total number of 462 300 traffic light optics with LED ones in 600 Local Councils. The installation has enabled to reduce electric power consumption by 86 760 MWh/year, which means cutting back the capacity demand of the electric grid by 26 600 kW.

Given the fact that there are nearly 100 000 traffic lights in Spain to be replaced with LED technology, the total electricity saving potential is estimated at 80 GWh/year.

¹⁵¹ Find more at <http://w3.bcn.es/fitxers/premsa/dossierinformeledsv5.592.pdf>

¹⁵² More details at <http://www.idae.es/index.php/id.680/relmenu.404/mod.pags/mem.detalle>

Sweden

The Swedish National Action Plan on Green Public Procurement (2007 – 2009) was adopted in 2007¹⁵³. At the time of writing this report the new Action Plan of 2011 was in progress at the Ministry¹⁵⁴.

The Swedish Environmental Management Council (MSR) implements GPP and has developed criteria for different product groups. So far, there are 10 product areas and about 50 product groups within them. Product area “Street and property” has a subcategory (product group) on outdoor lighting, whereas indoor lighting is covered in product area “Office”.

In January 2011, MSR prepared a second version of the document “The Swedish Environmental Management Council's Procurement Criteria for Indoor Lighting - Products”¹⁵⁵, which describes criteria for indoor lighting (first version dates from 2007). The criteria are divided into three levels: basic level (basic environmental criteria, good availability on market), advanced level (environmentally advanced with higher demand for verification) and spearhead level (best environmental alternative).

Most of the criteria are technology-independent, but some criteria (spearhead criteria) are set on such a high level that currently most probably only LED will meet the requirements (for example on mercury content or energy efficiency)¹⁵⁶.

The document defines basic requirements for LEDs. The requirements are shown in Table 10 below.

Table 10 Basic criteria for LEDs by MSR, Sweden

Light source	Requirement level	Energy requirement ¹⁵⁷	Light quality requirements ¹⁵⁸	Service life requirements ¹⁵⁹
LEDs	Basic	Energy Class A	Ra ≥ 80	20 000 hrs

Source: MSR, http://www.msr.se/en/green_procurement/criteria/Office/Lighting-products/

Note: LEDs 34A/134/CD IEC 62612 Ed 1 or in accordance with the recommendations for service life and lighting efficacy for LEDs published by the Swedish Lighting Sector organisation Belysningsbranschen, "Rekommendationer kring livslängds- och ljusutbytesangivelser för LED-moduler" (2008) or in accordance with IES LM 79 and 80.

The document specifically sets advanced criteria for emergency lighting, which should be equipped with LED, if possible. If another light source is used, it must have a service life of at least 10 000 hours and provide at least 20 lumen/W. For emergency luminaires “without

¹⁵³ Information on the GPP NAP at http://www.msr.se/en/green_procurement/Swedish-National-Action-plan-for-GPP/

¹⁵⁴ See note 33

¹⁵⁵ Find the criteria at http://www.msr.se/en/green_procurement/criteria/Office/Lighting-products/

¹⁵⁶ Personal communication – Stålberg, A., Swedish Environmental Management Council

¹⁵⁷ Energy classes are regulated by the European Commission Directive 98/11/EC on energy labelling.

¹⁵⁸ Ra ≥ 80 means full colour. Ra ≥ 90 means full colour special.

¹⁵⁹ For tubular fluorescent lamps and single-capped fluorescent lamps, lifetime is presented as service life, i.e. 10% lamp failure and 10% depreciation (0.90 x 0.90). For self-ballasted lamps (low-energy lamps), halogen lamps and LEDs (i.e. light sources with integrated ballasts), lifetime is presented as average service life = 50% of the light sources in the system are expected to have gone out.

pictogram”, the document states that “alternatively, emergency luminaires shall not be illuminated during normal operation, or shall have reduced lighting that increases to full lighting during battery operation”.

The advanced criteria for LEDs are summarised in Table 11 below.

Table 11 Advanced criteria for LEDs by MSR

Energy requirements: lighting efficacy	Light quality:	Energy requirements: lighting efficacy
67 lm/W	Ra ≥ 90, and colour temperature 2700-3000 K	25 000 hours

Source: MSR, http://www.msr.se/en/green_procurement/criteria/Office/Lighting-products/

The spearhead criteria state that points in the evaluation should be added for every thousand hours of service, on top of mandatory requirements.

Other environmental criteria cover, for instance, use of lead, cadmium and substances covered by the REACH list. Life-cycle costs of the luminaire and of the light source should also be calculated.

It is foreseen that, in future, criterion on luminous efficacy for LEDs will be added.

The document further sets criteria for luminaires, pertaining to the quality and characteristics of light. The criteria are stability of the luminaire, uniformity of light, and emission of glare.

Fixed luminaires shall be intended to be for light sources, or have an integrated light source with a lighting efficacy of at least 65 lumen/Watt, including losses of the luminaire's ballast or other integrated components. The luminaire should also be provided with a dimming function.

In 2009, procurement criteria for outdoor lighting were published. Criteria for LEDs in outdoor lighting are not specifically covered, as at the time of publishing the document, there were no standards for how luminous efficacy, lumen maintenance, etc. should be measured for LED light sources. However, a standard is under preparation and it is foreseen that requirements, with respect to LED light sources, will be included under the next revision of the criteria document. The lighting criteria may be updated in 2012.

The Swedish Topten Project (<http://www.toptensverige.se/>) provides a database of LED lamps for indoor lighting. In order to be included in the database, the lamps have to meet the following criteria:

- Lumen efficacy of at least 34 lm/W;
- For classic LED lamps with base E27, the luminance must be at least 300 lm;
- Colour temperature should be maximum 3500 K;
- CRI higher than 80;

- LED lamps will be tested in the laboratory and the producer should have ISO certification (9000 or 14 000) or be approved in the sample for international TopTen: Topten.info.

Good practice example - Västerås¹⁶⁰

In 2009, solar-powered LED lamps were installed in the pedestrian and bike lanes on the outskirts of Västerås. The new lighting system was introduced on a three-kilometre long pedestrian and cycle path, on a part that previously had no lighting. Batteries that are charged during the daytime (even if the weather is cloudy) power the LEDs.

The lighting system is equipped with motion sensors. Therefore, if a person walks or cycles past the lights, depending on the speed, one or more lights in front switch on. When the person passes the pole, the lights are switched off again after a few seconds.

The system's maintenance costs are estimated to be about one-tenth of the operation and maintenance costs of a traditional street lighting system (with 70 W High Pressure Sodium lamps). The payback period is 8 years (or 3.5 years for a 1000 piece installation).

¹⁶⁰ For further details, see <http://msr.se/sv/Informationsmaterial/Goda-exempel/Lysdioder-sparar-energi-i-Vasteras/> and www.activelights.se

United Kingdom

The Government's UK Low Carbon Transition Plan highlights the potential for public sector demonstration projects to accelerate the uptake of ultra-efficient lighting¹⁶¹. Central Government Departments are required to buy lighting that meets minimum energy efficiency standards (Government Buying Standards) set by Defra (Department for Environment, Food and Rural Affairs).

The UK sustainable procurement criteria (Government Buying Standards)¹⁶², run by Defra, currently cover 12 major product groups and the products include criteria set at two levels - 'mandatory minimum' and 'voluntary best practice'. However, lighting is not included.

The Energy Saving Recommended logo, issued by the Energy Saving Trust (EST), is awarded to household products that are tested and considered "best in class" (within the top 10%-20% of the respective consumer market). Certified products are listed on the EST website¹⁶³ and they include LED lamps and LED luminaires.

The EST document, LED Luminaire Requirements Version 3.0 – 2010, was issued in September 2010 and it contains requirements for performance, packaging and quality of LED luminaires, which apply for approval under the EST Energy Saving Recommended scheme¹⁶⁴. The specification covers three main groups of LED luminaires:

- Luminaires for exterior lighting (group A)
- Luminaires for interior lighting (Group B), and
- Luminaires for general purpose (Group C).

Group A typically covers floodlight, bulkhead or others specifically designed for use as safety or security lighting (Class 101). Group B is further divided into the following classes:

- Recessed LED luminaires designed to replace interior halogen spotlights/floodlights (Class 201);
- LED luminaires designed to replace interior CFL, e.g. under kitchen unit lighting (Class 202);
- LED luminaires designed to replace fixed interior ceiling and wall luminaires (Class 203);
- LED recessed luminaires for general illumination (Class 204).

Group C includes the class of portable LED luminaires, power supplied from a permanent 13A socket (class 301).

Performance requirements for individual classes are summarised in Table 12 below. The table is indicative, highlighting the main specifications.

¹⁶¹ DECC, UK Low Carbon Transition Plan, July 2009

¹⁶² <http://sd.defra.gov.uk/advice/public/buying/>

¹⁶³ <http://www.energysavingtrust.org.uk/In-your-home/Energy-Saving-Trust-Recommended-products>

¹⁶⁴ The criteria were first issued in 2008 and have been revised twice since.

Table 12 Performance requirements for LEDs by the Energy Saving Trust – Energy Saving Recommended

Class	Power factor	Lifetime (hours)	Lumen Maintenance (%)	Luminaire efficacy (lm/W)	Colour rendering index (Ra)
101	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	≥ 45 lm/W*	≥ 70
201	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	Performance specified in data sheets	≥ 80
202	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	≥ 40 lm/W	≥ 80
203	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	≥ 45 lm/W*	≥ 80
204	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	Performance specified in data sheets	≥ 80
301	For luminaire ≤15W ->0.7 For >15W - >0.9	≥ 35 000	70%	≥ 45 lm/W	≥ 80

Source: Energy Saving Trust: LED Luminaire Requirements Version 3.0 – 2010 from September 2010

*If glassware cannot be removed, then ≥ 40 lm/W.

Other criteria relate to the light pattern. The document also includes an outline of a timeline for updates of the specifications, pertaining to improved performances, but also functionalities such as capability of dimming. A more detailed description of the criteria is available from the website¹⁶⁵.

The Government Procurement Service, an Executive Agency of the Cabinet Office, runs an online database of products for Green Public Procurement - www.buyingsolutions.gov.uk. However, among the eight product groups, lighting is missing.

Furthermore, the Forward Commitment Procurement Model¹⁶⁶ provides a commitment to buy an innovative product that is still under development, if it meets a certain specification. It is a programme within the Government to stimulate innovation through public procurement. The Rotherham Foundation NHS Trust, with support from the Department for Business, Innovation and Skills and the Department of Health, is using this model to develop a £2 million high-efficiency lighting system for hospital wards.

¹⁶⁵ See <http://www.energysavingtrust.org.uk/Consultancy-and-certification/Energy-Saving-Trust-Recommended/Product-certification/Light-Emitting-Diodes-LEDs-Lamps-and-Luminaires>.

¹⁶⁶ See more at <http://www.bis.gov.uk/policies/innovation/procurement/forward-commitment>

Good practice example - London Borough of Bromley¹⁶⁷

In cooperation with the Eastern Shires Purchasing Organisation and Global to Local, the London Borough of Bromley has tested LED office lights at two locations in the Civic Centre.

One of the aims of the project, carried out under the Smart SPP Project, was to prove the concept to implement LED lighting in office refurbishments. Current lighting systems are typically warm white light fluorescent T5 or T8 tubes.

The project has shown that the market is developing fast; however, there is a great variation in the quality of the products and systems supplied. As there are still no quality standards for LED lighting (neither in the UK nor in Europe), systems from some suppliers were of poor quality and even dangerous (i.e. failing to meet minimum health and safety standards).

After a thorough analysis, LEDs have not been widely implemented in the project. However, important conclusions, which are pertinent to other public procurers, were drawn. Firstly, the quality of the offers varied greatly. Secondly, the characteristics of the light cast by LEDs differ from fluorescent tubes. It means that fixing LEDs into existing luminaires can compromise the functional performance of the LEDs.

Despite the above, the borough plans on further LED installations and is also willing to explore LEDs in street lighting.

¹⁶⁷ Excerpted from http://www.smart-spp.eu/fileadmin/template/projects/smart_spp/files/Case_studies/EN_London_SMARTSPP_Case-Studies.pdf

Specifications for public procurement of LED Lighting

Even though it is still a recent technology, LEDs are more and more used in various applications. Public organisations use LEDs in their lighting projects and across Europe, many specifications to procure LEDs have already been developed in recent years.

Table 13 below provides a summary of countries in which GPP specifications for LED lighting have been published.

Table 13 Green Public Procurement of LED Lighting in EU Member States

Country	Green Public Procurement Guidelines for LEDs	Document/Organisation
Austria	No*	
Belgium	No	
Bulgaria	No	
Cyprus	No	
Czech Republic	No	
Denmark	Yes	Energy Saving Trust
Estonia	No	
Finland	No	
France	Yes	NF Environnement
Germany	Yes	DENA (German Energy Agency) + <i>Blauer Engel</i>
Greece	No	
Hungary	No	
Ireland	Yes	Accelerated Capital Allowance Programme
Italy	Yes	Ministerial Decree N° 64/2011
Latvia	No	
Lithuania	Yes**	
Luxembourg	No	
Malta	Yes	Tourism and Sustainable Development Unit
The Netherlands	No***	NL Agency
Poland	Yes	Product specifications for GPP of road lighting and traffic lights

Portugal	No****	
Romania	No	
Slovakia	No	
Slovenia	No	
Spain	Yes	IDAE Regional Governments*****
Sweden	Yes	Swedish Environmental Management Council
United Kingdom	Yes	Energy Saving Trust – Energy Saving Recommended

* There are no official GPP guidelines for LEDs. However, the Austrian Ecolabel provides specific technical requirements for LEDs.

** There is a requirement that traffic signals are to be LEDs. Furthermore, the Ministry of Environment of the Republic of Lithuania provides a list of certified products in which LEDs are covered.

*** NL Agency defines criteria in terms of Energy Label requirements, which could be met by LEDs, but don't cover LEDs specifically.

**** The guidelines for LEDs have been prepared under two European projects – proEE and Smart-SPP.

***** Furthermore, guidelines under the pro-EE project were prepared.

Moreover, in the following countries, the Topten websites, which include the most efficient products on the respective markets, have been established and cover LED lighting:

Austria
Czech Republic
Finland
Lithuania
Portugal

The following table (Table 14) highlights Member States where Life-Cycle Costs (LCC) are used in Green Public Procurement of LEDs or lighting in general.

Table 14 Life-cycle costs in Green Public Procurement of lighting

Country	LCC specification
Finland	Public Sector Procurement Guide by Motiva Oy – life-cycle costs to be considered
Germany	Evaluation of measures through LCC as part of DENA guidelines
Italy	Ministerial Decree on efficiency criteria for street lighting: the initial analysis of the system needs should be taken on a life-cycle cost basis
The Netherlands	Sustainability criteria are based on life-cycle costs of the systems
Sweden	Criteria developed by MSR specify that life-cycle costs of the luminaire and the light source should be calculated. The Swedish Environmental Management

Council (SEMCO) has developed several excel tools for calculating life-cycle costs in public procurement. In addition to a general tool, specialised ones are available for indoor and outdoor lighting*

* http://www.msr.se/en/green_procurement/LCC/

In the framework of European projects on Green Public Procurement tools have been developed for life-cycle costs calculation for (LED) lighting. One detailed tool has been developed by the Smart SPP Project¹⁶⁸; another tool for calculation of life-cycle costs for lighting has been prepared by the Buy Smart project¹⁶⁹. The calculation tools have been used in practice; for instance life-cycle costs were the main evaluation criteria (55% weight) in tender by the city of Kolding (Denmark) developed under the Smart SPP Project.

However, it is important to note, from the start, that there are countries (or organisations), which still specifically omit LEDs from their public procurement specification documents, because they believe that LED technology is still too immature to be included in public tender requirements. Nevertheless, it is foreseen to include specifications for LEDs in the lighting requirements in the future (see example in Lithuania).

Criteria described here below are based on the specifications developed and used in different EU Member States. The specifications have been developed both by governmental and non-governmental organisations and are either compulsory or voluntary. The following tables present a summary of the criteria, divided into specifications for indoor lighting and outdoor lighting.

For most specifications, ranges of values are presented, as they appear in the country specific documents. The data were collected in December 2011.

Specifications for indoor LED lighting

For indoor lighting, the specifications pertain mainly to direct replacements of incandescent light bulbs with caps E27 and E14. Table 15 below shows the various values that appear in the national documents.

¹⁶⁸ Find the Smart SPP LCC calculation tool at <http://www.smart-spp.eu/index.php?id=7633>.

¹⁶⁹ Find the Calculation Tool for Lighting at <http://www.buy-smart.info/downloads2/lighting4/lighting5>.

Table 15 Specifications for indoor LED lighting

Specification	Criteria
Lumen output	70 lm (CZ) 150 lm for the whole luminaire (IE) 300 lm (SE)
Lumen efficacy	Min. 25 lm/W (FI, LT, PT) Min. 34 lm/W (SE) 20 – 110 lm/W (DE) Min. 45 l/cW* (IE) Min. 45 lm/W (UK) Min. 50 lm/W (AT)
Power factor	Min. 0.75 or 0.9 (rated power < and ≥ 25W respectively – DE and AT) Min. 0.7 or 0.9 (rated power ≤ and > 15W respectively) - UK
Colour rendering (CRI)	Ra > 70 (IE, UK) Ra > 80 (CZ, DK, FI, DE, PT, SE) Ra > 90 (SE, advanced criteria)
Colour temperature	“Warm white” (CZ) “Warm white, Day white, Neutral white” (DE) 2500 – 6500 K (IE) Max. 3500 K (PT, SE Topten) 2700 – 3000 K (SE, MSR advanced criteria)
Lifetime	Min. 15 000 hours (PT) Min. 20 000 hours (AT, LT, 30% lm maintenance in FI) Min. 25 000 hours (CZ, SE, average service life advanced criteria) Min. 35 000 hours (UK)
Energy efficiency class	Corresponding to A (AT)
Switching cycles	Min. 20 000 (AT) Min. 75 000 (LT)

Sources: Austrian UZ 47, German UZ 151, DENA (DE), Top ten from Austria, Finland, Lithuania, Portugal, Sweden, Green Light to Savings (CZ), Danish Energy Saving Trust, SEAI Ireland, MSR Sweden, UK EST. The abbreviation in brackets behind each value indicates the country of origin for the given specification.

* Lumens per circuit Watts. Applicable to whole luminaires as well.

** Lifetime is presented as average service life = 50% of the light sources in the system are expected to have gone out.

It is clear from the data that, apart from colour rendering, the values for different specifications vary significantly in different documents. The minimum lifetime of LEDs ranges from 15 000 hours to as much as 35 000 hours. Specifications of the minimum lumen efficacy range from 20 – 110 lm/W. However, most commonly, the required lumen efficacy is about 40 – 45 lm/W.

Besides that, other specifications define minimum flux of the LED lamps (Min. 70 lm) or the light dispersion (which for replacements of incandescent light bulbs should be omnidirectional). Some criteria relate to general characteristics, such as ISO certification by the producers.

Qualitative criterion of **dimmiability** of the lights/luminaires has also been included in the specifications¹⁷⁰. Dimmiability is also the topic for future development of LED procurement criteria.

For other types of LED lighting systems, the French Ecolabel (NF Environnement) defines specifications for security lights, which are, among others, maximum power of 1.6W and lifetime of more than four years. The UK Energy Saving Trust provides specifications for portable LED luminaires, which are similar to outdoor luminaire criteria (power factor for luminaire $\leq 15\text{W}$ $\rightarrow 0.7$, for $>15\text{W}$ $\rightarrow 0.9$, lifetime min. 35 000 hours, lumen maintenance 70%, lumen efficacy min. 45 lm/W and CRI min. 80).

In the Netherlands, specific requirements for LEDs do not seem to have been adopted yet. However, the NL Agency has been running a great number of pilot projects and analysing the performance and use of LEDs in different applications¹⁷¹.

Specifications for outdoor LED lighting

Specifications for outdoor LED lighting are less common than specifications for indoor lighting. **Table 16** below summarises the specifications and values from Italy, Portugal and the United Kingdom.

¹⁷⁰ In Denmark, Sweden and the UK.

¹⁷¹ See e.g. in note 112.

Table 16 Specifications for outdoor LED lighting

Specification	Value
Lumen efficacy	≥ 45 – 65 lm/W* (IT) ≥ 50 – 80 lm/W** (IT) ≥ 40 – 45 l/W*** (UK) ≥ 80 lm/W (PT)
Power factor	≥ 0.90 (PT) ≥ 0.7 or 0.9 (rated power ≤ and > 15W respectively) (UK)
Colour rendering (CRI)	≥ 90 (PT) ≥ 80 (PT)
Colour Temperature	≤ 4500 K (PT)
Maintenance Factor	≥ 0.7 (IT)
Lumen Maintenance	70% (UK)
Luminous flux depreciation at the end of the useful lifetime of the lamp (L70)	≤30% (PT)
Lifetime (Overall useful life-span for PT)	≥ 65 000 hours (PT) ≥ 50 000 hours (IT) ≥ 35 000 hours (UK)
Failure rate	≤ 50% (IT)

Sources: IT, PT, UK

*Minimum criterion depending on colour temperature – lower boundary for colour temperature of less than 3000 K, the upper boundary for more than 4000 K

** Award criterion depending on colour temperature – lower boundary for colour temperature of less than 3000 K, the upper boundary for more than 4000 K

*** Depending on the type of luminaire, defined by the Energy Saving Trust

Other qualitative criteria are ingress protection rating \geq IP66 and shock resistance class (IK) \geq IK08. Similarly to indoor lighting, the ability of the system, and of the lights to be dimmed, is required as well. The criteria also cover accessibility to components in case of failure, or possibility of future expansion for control and monitoring systems.

Even though replacement of incandescent traffic lights by LEDs is one of the good practice examples in which LEDs have already started to be used on quite a common basis¹⁷², only the document on requirements for street lighting and traffic lights, developed by the Working Group under the Ministry of Economy in Poland, specifies criteria for LED traffic signals. Similarly, Malta National Authority newly requires use of LEDs when purchasing traffic signals and defines minimum requirements.

¹⁷² See e.g. the “Report on LED projects and economic test cases in Europe” available at http://ec.europa.eu/information_society/digital-agenda/actions/ssl-consultation/docs/led_report_test_cases.pdf

Conclusions

The status of Green Public Procurement of lighting differs significantly in the EU Member States, from lighting not being among the priority product groups at all to very detailed specifications, both for indoor and outdoor lighting systems.

LEDs are covered only by part of the GPP lighting specifications and it seems that more specifications have been developed for indoor lighting than for outdoor lighting so far. Some of the conclusions from the documents reviewed are presented here:

- In many countries, lighting (and therefore LEDs) is still not in the priority product groups covered by the respective Green Public Procurement documents. Among others, the representatives claim to be waiting for specifications from the European Union. However, there are good practices for the use of LEDs in all EU Member States.
- In the countries where specifications for LEDs are defined, the criteria differ in the level of stringency and in the characteristics they cover. Most of the specifications include lifetime of the lamps, lumen efficacy, colour rendering and power factor.
- Only a few documents cover traffic lights, even though replacement of incandescent traffic lights by LEDs can be considered as one of the (few) cases for replication, where the potential for energy savings is high and certain. Traffic lights are among the specifications developed by the European Commission within the GPP Toolkit.
- Some of the organisations are sceptical about including LEDs in the requirements, as the technology is still undergoing a rapid development and is deemed immature.
- The documents and studies keep on highlighting that proper information from manufacturers, and careful design of the systems, is crucial in order for the LED system to deliver the expected performance.
- From the qualitative characteristics, capability of dimming and compatibility with the main dimmers, available on the market, is gaining importance and will be part of the specifications, because a dimming function offers further potential for savings.
- The Guidelines for Specification of LED Lighting Products 2011¹⁷³ emphasise that LED systems are in many ways more complex than traditional lighting systems. Therefore, if the LEDs are to provide the performance they are expected to (long life, energy savings, etc.), all the other components, which are parts of the LED fixture, need to be equally functional. The specifications therefore need to cover also the other components.

¹⁷³ Prepared under the Lighting Industry Liaison Group, available at e.g. <http://www.theilp.org.uk/uploads/File/Technical/Downloads/LED%20Specification%20guide%202011.pdf>

- Future plans pertain to update the specifications on lighting to cover LEDs (Lithuania) or to enhance them (Sweden).

The future of lighting seems to be in LEDs. Public organisations play an important role as frontrunners in introducing the coming technology and enhancing market transformation. However, it seems they still remain cautious towards this technology and will include it in their GPP plans only gradually (especially for outdoor lighting systems). A clear indication and unification of the specifications from the European Union may bring the decisive push.

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