EU GPP Criteria for Street Lighting & Traffic Signals

Green Public Procurement (GPP) is a voluntary instrument. This document provides the GPP criteria developed for the Street Lighting and Traffic Signals product group. The accompanying Technical Background Report provides full details on the reasons for selecting these criteria and references for further information.

For each product/service group two sets of criteria are presented:

- The core criteria are those suitable for use by any contracting authority across the Member States and address the key environmental impacts. They are designed to be used with minimum additional verification effort or cost increases.
- The comprehensive criteria are for those who wish to purchase the best products available on the market. These may require additional verification effort or a slight increase in cost compared to other products with the same functionality.

1. Definition and Scope

These EU GPP criteria cover the units used for street lighting and traffic signalling. Poles, building mounts, or any other type of support and the required fixing mounts are not covered here (see Construction GPP).

1.1 Street Lighting

For the purpose of these EU GPP criteria a public street light will be defined as a:

> "Fixed lighting installation intended to provide good visibility to users of outdoor public traffic areas during the hours of darkness to support traffic safety, traffic flow and public security" [1]

This is derived from EN 13201 and does not include tunnel lighting, private car park lighting, commercial or industrial outdoor lighting, sports fields or installations for flood lighting (for example monument, building or tree lighting). It does include functional lighting of pedestrian and cycle paths as well as roadway lighting.

Replacement lamps form the majority of regular procurement, and in the replacement lamps criteria of this GPP specification, only high intensity discharge lamps for street lighting are considered. In particular high pressure sodium and metal halide lamps are the focus of the lamp efficacy criteria. These are both

[1] EuP Lot 9 Study: Public Street Lighting, VITO, January 2007, http://www.eup4light.net

used in street lighting, but for different kinds of applications, each with its own advantages. For example, metal halides are best suited for clear white illumination, for example in city centre streets, where the light gives the true colours of objects around it, whereas high pressure sodium lamps are well suited to general street lighting, with their yellow colour which has the advantage of attracting fewer insects and thereby requiring less maintenance and cleaning. They also have long operational times, from three to six years.[2]

The Technical Background Report outlines in more detail why high-intensity discharge (HID) lamps are the focus of these criteria, but in brief this is due to the following:

- Both the Eco-design Lot 9 Study on Street Lighting[3] and the main trade body for lamps[4] consider that the most predominantly used lamps in street lighting are high-intensity discharge lamps (HID).
- Compact Fluorescent Lamps (CFLs) are only used for slow road categories; they are not used at all for medium and fast road categories. Sales for the slow road category are limited (13%) compared to HID lamps (87%)[5].
- The road category is important in making purchasing decisions, as different lamp types for the same road category have comparable environmental impacts[6].
- CFLs are mainly used for domestic and office lighting applications, which would represent a different product group to street lighting and traffic signals.
- Although the use of LEDs for street lighting is increasing, there is a limited requirement for replacement lamps, partly because there are fewer LED installations but also because of the longer lifetime of LEDs.

The criteria for luminaires and lighting systems cover all types of lamps, including CFL and LED lamps as well as HID lamps. Where a new lighting system is being designed, a system approach has been adopted based on the maximum energy efficiency indicator. This is given by the average system power divided by the area to be lit and the required road surface luminance (classes ME or MEW in EN 13201-1) or the required horizontal illuminance (classes CE or S in EN 13201-1). The Technical Background Report gives more information about the power density criteria and how they were derived.

For comprehensive criteria, tougher energy efficiency limits are proposed. For both core and comprehensive criteria, further reductions in energy efficiency indicators are the subject of award criteria.

Dimming can save energy and an award criterion for the proportion of dimmable lighting has also been included. It is important that lighting controls are commissioned so that they work properly and maintenance staff can adjust them. Consequently a contract performance clause on lighting commissioning is proposed. Another contract performance clause covers information provision, so that maintenance staff can make adjustments if necessary.

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[2] European Lamp Companies Federation, 'Saving Energy through Lighting'. Available from http://buybright.elcfed.org/uploads/fmanager/saving_energy_through_lighting_jc.pdf
[3] EuP Lot 9 Study: Public Street Lighting, VITO, January 2007, http://www.eup4light.net
[4] http://www.elcfed.org/documents/-56-finelc_road_map_11_07.pdf
[5] EuP Lot 9 Study: Public Street Lighting, VITO, January 2007, http://www.eup4light.net
[6] EuP Lot 9 Study: Public Street Lighting, VITO, January 2007, http://www.eup4light.net

Waste is generated when replacing a lighting system with a new one. A contract performance clause requires installers to use the relevant channels for collecting and recycling of the replaced lighting systems in accordance with the WEEE Directive.

1.2 Traffic Signals

For the purposes of this report traffic signals will be defined as:

> "Red, yellow and green signal lights for road traffic with 200mm and 300mm roundels. Portable signal lights are specifically excluded."

This is in accordance with EN12368:2006 Traffic Control Equipment – Signal Heads.

2. Key Environmental Impacts

The key environmental impact from street lighting and traffic signals is energy consumption in the use phase and associated greenhouse gas emissions. Other environmental impacts could potentially result from the use of certain substances e.g. mercury and light pollution, depending on the location of the lighting. Therefore the core criteria focus on energy consumption, in particular lamp efficacy and ballast efficiencies for street lighting and promotion of LED traffic signals. Setting energy efficiency requirements for lamps will lead to a reduction in their overall mercury content. The comprehensive criteria include further aspects on energy consumption and luminaire design, in balance with the required energy efficiency criteria.

Key Environmental Impacts	GPP Approach
• Energy consumption, in all phases, but especially the use phase of street lighting and traffic signals • High energy consumption from the use of incandescent bulbs in traffic signals • Use of natural resources and materials and generation of waste (hazardous and non-hazardous) • Potential pollution of air, land and water due to the use of hazardous materials e.g. mercury • Light pollution from street lighting	• Purchase lamps with high lamp efficacy • Purchase efficient ballasts • Promote the purchase of lighting systems with a low energy consumption for the light provided • Promote the use of LEDs in traffic signals • Encourage the use of dimmable ballasts where circumstances allow • Promote lamps with a lower mercury content • Promote the use of luminaires that limit light emitted above the horizon[7]

Please note that the order of impacts does not necessarily translate to the order of their importance.

[7] See the CELMA Guide on Obtrusive Light is which is available at: http://www.celma.org/archives/temp/First_edition_Celma_Guide_on_obtrusive_light.pdf

Detailed information about the street lighting and traffic signals product group, including the information about related legislation and other sources can be found in the Technical Background Report.

3. EU GPP Criteria for Street Lighting and Traffic Signals

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">3.1 EU GPP criteria for street lighting equipment</td></tr>
<tr><td>SUBJECT MATTER</td><td>SUBJECT MATTER</td></tr>
<tr><td>Purchase of high efficiency lighting equipment (lamps, ballasts, luminaires)</td><td>Purchase of high efficiency lighting equipment (lamps, ballasts, luminaires)</td></tr>
<tr><td>TECHNICAL SPECIFICATIONS</td><td>TECHNICAL SPECIFICATIONS</td></tr>
<tr><td>1. High Pressure Sodium lamps with a colour rendering index Ra < 60 shall have at least the following luminous efficacy:

<table>
<tr><th>Nominal Lamp Wattage (W)</th><th>Rated Lamp Efficacy (lm/W) – Clear</th><th>Rated Lamp Efficacy (lm/W) – Coated</th></tr>
<tr><td>W ≤ 45</td><td>≥ 62</td><td>≥ 60</td></tr>
<tr><td>45 < W ≤ 55</td><td>≥ 80</td><td>≥ 70</td></tr>
<tr><td>55 < W ≤ 75</td><td>≥ 91</td><td>≥ 82</td></tr>
<tr><td>75 < W ≤ 105</td><td>≥ 105</td><td>≥ 95</td></tr>
<tr><td>105 < W ≤ 155</td><td>≥ 114</td><td>≥ 107</td></tr>
<tr><td>155 < W ≤ 255</td><td>≥ 125</td><td>≥ 120</td></tr>
<tr><td>255 < W</td><td>≥ 138</td><td>≥ 133</td></tr>
</table>

Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps that meet these standards. All new systems shall include fittings for lamps that meet the above specification. High pressure sodium lamps designed to operate on high pressure mercury ballasts are exempted.

Verification: The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.</td><td>1. High Pressure Sodium lamps with a colour rendering index Ra < 60 shall have at least the following luminous efficacy:

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<tr><td>W ≤ 45</td><td>≥ 65</td><td>≥ 62</td></tr>
<tr><td>45 < W ≤ 55</td><td>≥ 82</td><td>≥ 72</td></tr>
<tr><td>55 < W ≤ 75</td><td>≥ 93</td><td>≥ 83</td></tr>
<tr><td>75 < W ≤ 105</td><td>≥ 107</td><td>≥ 96</td></tr>
<tr><td>105 < W ≤ 155</td><td>≥ 117</td><td>≥ 110</td></tr>
<tr><td>155 < W ≤ 255</td><td>≥ 130</td><td>≥ 121</td></tr>
<tr><td>255 < W</td><td>≥ 140</td><td>≥ 136</td></tr>
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Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps that meet these standards. All new systems shall include fittings for lamps that meet the above specification. High pressure sodium lamps designed to operate on high pressure mercury ballasts are exempted.

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2. Metal Halide lamps with a colour rendering index Ra < 80 shall have at least the following luminous efficacy. **Nominal Lamp Wattage (W)** / **Rated Lamp Efficacy (lm/W) – Clear** / **Rated Lamp Efficacy (lm/W) – Coated** W ≤ 55 / ≥ 85 / ≥ 80 55 < W ≤ 75 / ≥ 100 / ≥ 85 75 < W ≤ 105 / ≥ 105 / ≥ 90 105 < W ≤ 155 / ≥ 110 / ≥ 95 155 < W ≤ 255 / ≥ 100 / ≥ 92 255 < W / ≥ 92 / ≥ 100 Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps that meet these standards. All new systems shall include fittings for lamps that meet the above specification. **Verification:** The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.	**2.** Metal Halide lamps with a colour rendering index Ra < 80 shall have at least the following luminous efficacy: **Nominal Lamp Wattage (W)** / **Rated Lamp Efficacy (lm/W) – Clear** / **Rated Lamp Efficacy (lm/W) – Coated** W ≤ 55 / ≥ 95 / ≥ 85 55 < W ≤ 75 / ≥ 105 / ≥ 90 75 < W ≤ 105 / ≥ 115 / ≥ 95 105 < W ≤ 155 / ≥ 118 / ≥ 98 155 < W ≤ 255 / ≥ 105 / ≥ 100 255 < W / ≥ 110 / ≥ 105 Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps that meet these standards. All new systems shall include fittings for lamps that meet the above specification. **Verification:** The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.
3. Metal Halide lamps with a colour rendering index Ra ≥ 80 shall have at least the following luminous efficacy. **Nominal Lamp Wattage (W)** / **Rated Lamp Efficacy (lm/W) – Clear** / **Rated Lamp Efficacy (lm/W) – Coated** W ≤ 55 / ≥ 85 / ≥ 65 55 < W ≤ 75 / ≥ 94 / ≥ 70 75 < W ≤ 105 / ≥ 95 / ≥ 75 105 < W ≤ 155 / ≥ 96 / ≥ 75 155 < W ≤ 255 / ≥ 97 / ≥ 80 255 < W / ≥ 98 / ≥ 80 Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps	**3.** Metal Halide lamps with a colour rendering index Ra ≥ 80 shall have at least the following luminous efficacy. **Nominal Lamp Wattage (W)** / **Rated Lamp Efficacy (lm/W) – Clear** / **Rated Lamp Efficacy (lm/W) – Coated** W ≤ 55 / ≥ 90 / ≥ 70 55 < W ≤ 75 / ≥ 100 / ≥ 75 75 < W ≤ 105 / ≥ 101 / ≥ 80 105 < W ≤ 155 / ≥ 102 / ≥ 80 155 < W ≤ 255 / ≥ 103 / ≥ 85 255 < W / ≥ 104 / ≥ 85 Lamps that meet the above specification shall be purchased for existing street lighting systems where the existing system permits the use of lamps

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Verification: The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.</td>
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<td>4. Ballasts for high intensity discharge lamps shall have the following minimum efficiency:

<table>
<tr><th>Nominal lamp Wattage (W)</th><th>Minimum ballast efficiency ($\eta_{ballast}$) %</th></tr>
<tr><td>W < 30</td><td>70</td></tr>
<tr><td>30 < W ≤ 75</td><td>80</td></tr>
<tr><td>75 < W ≤ 105</td><td>82</td></tr>
<tr><td>105 < W ≤ 405</td><td>86</td></tr>
<tr><td>W > 405</td><td>91</td></tr>
</table>

Where:
• Ballast efficiency ($\eta_{ballast}$) means the ratio between the lamp power (ballast output) and the input power of the lamp-ballast circuit with possible sensors, network connections and other auxiliary loads disconnected.

Multiwattage ballasts must comply with the requirements for each wattage at which they operate.

Verification: The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met. The measurement method is given by IEC/EN 62442-2 (currently under preparation).</td>
<td>4. Ballasts for high intensity discharge lamps shall have the following minimum efficiency[8]:

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<tr><th>Nominal lamp Wattage (W)</th><th>Minimum ballast efficiency ($\eta_{ballast}$) %</th></tr>
<tr><td>W ≤ 30</td><td>80</td></tr>
<tr><td>30 < W ≤ 75</td><td>87</td></tr>
<tr><td>75 < W ≤ 105</td><td>89</td></tr>
<tr><td>105 < W ≤ 405</td><td>91</td></tr>
<tr><td>W > 405</td><td>93</td></tr>
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Where:
• Ballast efficiency ($\eta_{ballast}$) means the ratio between the lamp power (ballast output) and the input power of the lamp-ballast circuit with possible sensors, network connections and other auxiliary loads disconnected.

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<td>5. Requirements concerning packaging for lighting equipment.</td>
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</table>

[8] These are based on Ecodesign third stage requirements, due to come into force eight years after the introduction of the Ecodesign Regulation for Tertiary Lighting, i.e. in April 2017.

<table>
<tr>
<td>Where cardboard boxes are used, they shall be made of at least 80% post-consumer recycled material.

Verification: Products holding a Type I ecolabel shall be deemed to comply, provided that this ecolabel fulfils the requirements listed above. Other appropriate means of proof will be also accepted such as written evidence from the manufacturer that the above clause is met.</td>
<td>Laminates and composite plastics shall not be used. Where cardboard boxes are used, they shall be made of at least 80% post-consumer recycled material. Where plastic materials are used they shall be made of at least 50% post-consumer recycled material.

Verification: Products holding a Type I ecolabel shall be deemed to comply, provided that this ecolabel fulfils the requirements listed above. Other appropriate means of proof will be also accepted such as written evidence from the manufacturer that the above clause is met.</td>
</tr>
<tr>
<td></td>
<td>6. Ballasts for compact fluorescent lamps shall all be electronic.

Verification: The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met.</td>
</tr>
<tr>
<td></td>
<td>7. High pressure sodium lamps and metal halide lamps shall have the following lamp lumen maintenance and lamp survival factors:

<table>
<tr><th>Lamp Type</th><th>Burning Hours</th><th>LLMF</th><th>LSF</th></tr>
<tr><td>MH Lamps</td><td>12,000 (W ≤ 405)</td><td>≥ 0.80</td><td>≥ 0.90</td></tr>
<tr><td>HPS Lamps</td><td>12,000 (W ≤ 75)</td><td>≥ 0.80</td><td>≥ 0.90</td></tr>
<tr><td>HPS Lamps</td><td>16,000 (75 < W ≤ 605)</td><td>≥ 0.85</td><td>≥ 0.90</td></tr>
</table>

Lamp Lumen Maintenance Factor (LLMF) is defined as the ratio of the luminous flux emitted by the lamp at a given time in its life to the initial luminous flux.

Lamp Survival Factor (LSF) is defined as the fraction of the total number of lamps, which continue to operate at a given time under defined conditions and switching frequency.

Luminous flux is a quantity derived from radiant flux (radiant power) by evaluating the radiation according to the spectral sensitivity of the human eye. W is the lamp power in Watts.</td>
</tr>
</table>

	Verification: The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.
	8. Luminaires shall have an optical system that has an ingress protection rating as follows: a. IP65 for road classes ME1 to ME6 and MEW1 to MEW6 b. IP54 for road classes CE0 to CE5, S1 to S6, ES, EV and A **Verification:** The tenderer shall provide the technical specification of the luminaire or a written declaration to demonstrate this criterion is met. EN13201-1 explains the road classes.
AWARD CRITERIA	**AWARD CRITERIA**
1. Additional points shall be awarded for lamps that meet the following lamp lumen maintenance factors (LLMF) and lamp survival factors (LSF): **Burning Hours** **2000** **4000** **8000** **16000** LLMF 0.98 0.97 0.95 0.92 LSF 0.99 0.98 0.95 0.92 **Verification:** The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.	**1.** Additional points shall be awarded for replacement lamps for existing fittings that meet the following lamp lumen maintenance factors (LLMF) and lamp survival factors (LSF): **Burning Hours** **2000** **4000** **8000** **16000** LLMF 0.98 0.97 0.95 0.92 LSF 0.99 0.98 0.95 0.92 **Verification:** The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate this criterion is met.
2. Additional points shall be awarded for HID lamps that have a mercury content not greater than that given in the table below, where W is the lamp power in Watts: **Lamp type** **Mercury content (mg/lamp)** HPS lamps ($W \leq 155$) 25 HPS lamps ($155 < W \leq 405$) 30 HPS lamps ($W > 405$) 40 MH lamps ($W \leq 95$) 5	**2.** Additional points shall be awarded for HID lamps that have a mercury content not greater than that given in the table below, where W is the lamp power in Watts: **Lamp type** **Mercury content (mg/lamp)** HPS lamps ($W \leq 155$) 20 HPS lamps ($155 < W \leq 405$) 25 HPS lamps ($W > 405$) 35 MH lamps ($W \leq 95$) 2

MH lamps ($95 < W \leq 245$) 15 MH lamps ($W > 245$) 30 **Verification:** According to the Ecodesign Directive (2009/125/EC) and Commission Regulation (EC) 245/2009, Annex III, mercury content is to be specified in product information on freely accessible websites and in other forms that are deemed appropriate. A copy of the layout of the packaging and a link to the tenderer's website where the mercury content is specified can be requested as verification.	MH lamps ($95 < W \leq 245$) 9 MH lamps ($W > 245$) 27 **Verification:** According to the Ecodesign Directive (2009/125/EC) and Commission Regulation (EC) 245/2009, Annex III, mercury content is to be specified in product information on freely accessible websites and in other forms that are deemed appropriate. A copy of the layout of the packaging and a link to the tenderer's website where the mercury content is specified can be requested as verification.
3. Additional points shall be awarded for ballasts for high intensity discharge lamps that have the following minimum efficiency: **Nominal lamp Wattage (W)** **Minimum ballast efficiency ($\eta_{ballast}$) %** $W \leq 100$ 85 $100 < W$ 92 Where: • Ballast efficiency ($\eta_{ballast}$) means the ratio between the lamp power (ballast output) and the input power of the lamp-ballast circuit with possible sensors, network connections and other auxiliary loads disconnected. Multiwattage ballasts must comply with the requirements for each wattage at which they operate. **Verification:** The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met. The measurement method is given by IEC/EN 62442-2 (currently under preparation). Equivalent measurement methods can be also accepted.	**3.** Additional points shall be awarded for ballasts for high intensity discharge lamps that have the following minimum efficiency: **Nominal lamp Wattage (W)** **Minimum ballast efficiency ($\eta_{ballast}$) %** $W \leq 100$ 90 $100 < W$ 94 Where: • Ballast efficiency ($\eta_{ballast}$) means the ratio between the lamp power (ballast output) and the input power of the lamp-ballast circuit with possible sensors, network connections and other auxiliary loads disconnected. Multiwattage ballasts must comply with the requirements for each wattage at which they operate. **Verification:** The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met. The measurement method is given by IEC/EN 62442-2 (currently under preparation). Equivalent measurement methods can be also accepted.
4. Where metal halide lamps are identified as the most suitable lamp type, additional points shall be awarded for those lamps that meet the relevant comprehensive criterion for luminous efficacy.	**4.** Additional points shall be awarded where luminaires are compatible with systems equipped with appropriate dimming and control systems that take account of daylight availability, traffic and weather conditions,

Verification: The tenderer shall provide the technical specification of the lamp or a written declaration to demonstrate that this criterion is met.	and also compensate for the variation over time in surface reflection and for the initial dimensioning of the system due to the lamp lumen maintenance factor. **Verification:** The tenderer shall provide the technical specification of the luminaire or a written declaration to demonstrate this criterion is met.

Core criteria	Comprehensive criteria
3.2 EU GPP criteria for design of street lighting	
SUBJECT MATTER	**SUBJECT MATTER**
Resource and energy efficient design of new lighting systems or renovation of the existing lighting system	Resource and energy efficient design of new lighting systems or renovation of the existing lighting system
SELECTION CRITERION	**SELECTION CRITERION**
Where a new lighting system is being designed, the tenderer shall demonstrate that the design will be undertaken by personnel with at least three years experience in lighting design and/or having a suitable professional qualification in lighting engineering or membership of a professional body in the field of lighting design. **Verification:** The tenderer shall supply a list of the persons responsible for the project, including managerial staff, indicating educational and professional qualifications and relevant experience. This should include persons employed by subcontractors where the work is to be sub-contracted. The tenderer shall also supply a list of lighting schemes the tenderer has designed over the last three years.	Where a new lighting system is being designed, the tenderer shall demonstrate that the design will be undertaken by personnel with at least three years experience in lighting design and/or having a suitable professional qualification in lighting engineering or membership of a professional body in the field of lighting design. **Verification:** The tenderer shall supply a list of the persons responsible for the project, including managerial staff, indicating educational and professional qualifications and relevant experience. This should include persons employed by subcontractors where the work is to be sub-contracted. The tenderer shall also supply a list of lighting schemes the tenderer has designed over the last three years.

TECHNICAL SPECIFICATIONS	TECHNICAL SPECIFICATIONS
1. Where a new lighting system is being provided for a traffic route (classes ME or MEW in EN 13201-1), the maximum energy efficiency indicator, given by the average system power divided by the required road surface luminance and the area to be lit, must not exceed the following values: **Lamp Wattage (W)** / **Maximum energy efficiency indicator ($W/cd/m^2 \cdot m^2$)** $W \leq 55$ — 0.974 $55 < W \leq 155$ — 0.824 $155 < W$ — 0.674 **Verification:** A calculation provided by the lighting designer showing the total and the average power consumed by the lighting system, including lamps, ballasts, sensors and controls, divided by the required road surface luminance and the total area to be lit (including the roadway and, where relevant, footway). Where lighting can be dimmed, the average system power is the mean power consumed by the system averaged for periods with different consumptions. The lighting designer should also show that the lighting meets the relevant performance standards in EN 13201, equivalent national standards or best practice guides, or those set by the public authority. Depending on the type of road and its requirements, these may include luminance, uniformity, control of glare and lighting of surroundings. The public authority may accept higher values of SLEEC where there are particular constraints, for example unusual mounting heights or locations for columns, or where the street lighting is intended to be ornamental or decorative, or where there are unusually strict limits on spill light or demanding colour rendering requirements. In some cases up to double the guideline SLEEC could be acceptable.	**1.** Where a new lighting system is being provided for a traffic route (classes ME or MEW in EN 13201-1), the maximum energy efficiency indicator, given by the average system power divided by the required road surface luminance and the area to be lit, must not exceed the following values: **Lamp Wattage (W)** / **Maximum energy efficiency indicator ($W/cd/m^2 \cdot m^2$)** $W \leq 55$ — 0.824 $55 < W \leq 155$ — 0.674 $155 < W$ — 0.524 **Verification:** A calculation provided by the lighting designer showing the total and the average power consumed by the lighting system, including lamps, ballasts, sensors and controls, divided by the required road surface luminance and the total area to be lit (including the roadway and, where relevant, footway). Where lighting can be dimmed, the average system power is the mean power consumed by the system averaged for periods with different consumptions. The lighting designer should also show that the lighting meets the relevant performance standards in EN 13201, equivalent national standards or best practice guides, or those set by the public authority. Depending on the type of road and its requirements, these may include luminance, uniformity, control of glare and lighting of surroundings. The public authority may accept higher values of SLEEC where there are particular constraints, for example unusual mounting heights or locations for columns, or where the street lighting is intended to be ornamental or decorative, or where there are unusually strict limits on spill light or demanding colour rendering requirements. In some cases up to double the guideline SLEEC could be acceptable.
2. Where a new lighting system is being provided for a conflict area such as a road intersection or shopping street, or a residential road, pathway	**2.** Where a new lighting system is being provided for a conflict area such as a road intersection or shopping street, or a residential road, pathway

or cycle track (classes CE or S in EN 13201-1), the maximum energy efficiency indicator, given by the average system power divided by the required horizontal illuminance and the area to be lit, must not exceed the following values: **Required illuminance (lux)** / **Maximum energy efficiency indicator (W/lux·m^2)** $E \leq 15$ lux / 0.054 $E > 15$ lux / 0.044 **Verification:** A calculation provided by the lighting designer showing the total power consumed by the lighting system, including lamps, ballasts, sensors and controls, divided by the required horizontal illuminance and the total area to be lit. Where lighting can be dimmed, the average system power is the mean power consumed by the system averaged for periods with different consumptions. The lighting designer should also show that the lighting meets the relevant performance standards in EN 13201, equivalent national standards or best practice guides, or those set by the public authority. Depending on the type of road and its requirements, these may include illuminance and uniformity. The public authority may accept higher values of SLEEC where there are particular constraints, for example unusual mounting heights or locations for columns, or where the street lighting is intended to be ornamental or decorative, or where there are unusually strict limits on spill light or demanding colour rendering requirements. In some cases up to double the guideline SLEEC could be acceptable.	or cycle track (classes CE or S in EN 13201-1), the maximum energy efficiency indicator, given by the average system power divided by the required horizontal illuminance and the area to be lit, must not exceed the following values: **Required illuminance (lux)** / **Maximum energy efficiency indicator (W/lux·m^2)** $E \leq 15$ lux / 0.044 $E > 15$ lux / 0.034 **Verification:** A calculation provided by the lighting designer showing the total power consumed by the lighting system, including lamps, ballasts, sensors and controls, divided by the required horizontal illuminance and the total area to be lit. Where lighting can be dimmed, the average system power is the mean power consumed by the system averaged for periods with different consumptions. The lighting designer should also show that the lighting meets the relevant performance standards in EN 13201, equivalent national standards or best practice guides, or those set by the public authority. Depending on the type of road and its requirements, these may include illuminance and uniformity. The public authority may accept higher values of SLEEC where there are particular constraints, for example unusual mounting heights or locations for columns, or where the street lighting is intended to be ornamental or decorative, or where there are unusually strict limits on spill light or demanding colour rendering requirements. In some cases up to double the guideline SLEEC could be acceptable.
	3. Luminaires shall be designed and installed to ensure that ULR, the proportion of light emitted by the luminaire going above the horizon is limited as specified in the table below, without detriment to the overall energy efficiency of the system for which it is designed.

	Reference lighting classes of the roads / **Maximum ULR for street lighting luminaires** **Functional (*)** / **Amenity (*)** ME1 3% - ME2 3% - ME3 3% - ME4 5% - ME5 10% - ME6 10% - CE0 3% 10% CE1 3% 15% CE2 3% 15% CE3 3% 15% CE4 5% 20% CE5 10% 20% S1 3% 15% S2 5% 20% S3 10% 20% S4 - 25% S5 - 25% S6 - 25% S7 - 25% **Verification:** The tenderer shall provide the technical specification of the luminaire or a written declaration to demonstrate this criterion is met. Any other proof has to be accepted.
AWARD CRITERIA	**AWARD CRITERIA**
1. Where a new lighting system is being provided, credit will be awarded if energy efficiency indicators are less than 90% of those given in the relevant table for core criteria 1 and 2 above. **Verification:** Calculation as specified in the relevant criterion above.	**1.** Where a new lighting system is being provided, credit will be awarded if energy efficiency indicators are less than 90% of those given in the relevant table for comprehensive criteria 1 and 2 above. **Verification:** Calculation as specified in the relevant criterion above.

2. Where dimming is required and/or beneficial, additional points will be given in proportion to the percentage of dimming in relation to the lamp power. **Note:** The use of dimming ballasts will depend on location and other aspects, for example ambient light levels. **Verification:** The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met.	**2.** Where dimming is required and/or beneficial, additional points will be given in proportion to the percentage of dimming in relation to the lamp power. **Note:** The use of dimming ballasts will depend on location and other aspects, for example ambient light levels. **Verification:** The tenderer shall provide the technical specification of the ballast or a written declaration to demonstrate this criterion is met.
	3. Additional points shall be awarded for luminaires in proportion to the reduction of light emitted above the horizon beyond the standards specified in Comprehensive Criteria 3, without detriment to the overall energy efficiency of the system for which it is designed. **Verification:** The tenderer shall provide the technical specification of the luminaire or a written declaration to demonstrate this criterion is met.

Core criteria	**Comprehensive criteria**
3.3 EU GPP criteria for installation of street lighting	
SUBJECT MATTER	**SUBJECT MATTER**
Resource and energy efficient installation of new lighting systems or renovation of the existing lighting system	Resource and energy efficient installation of new lighting systems or renovation of the existing lighting system
SELECTION CRITERION	**SELECTION CRITERION**
Where a new or renovated lighting system is being installed, the tenderer shall demonstrate that the installation will be undertaken by personnel with at least three years experience in installation of lighting systems and/or having a suitable professional qualification in electrical or building services engineering, or membership of a professional body in the field of lighting.	Where a new or renovated lighting system is being installed, the tenderer shall demonstrate that the installation will be undertaken by personnel with at least three years experience in installation of lighting systems and/or having a suitable professional qualification in electrical or building services engineering, or membership of a professional body in the field of lighting.

Verification: The tenderer shall supply a list of the persons responsible for the project, including managerial staff, indicating educational and professional qualifications and relevant experience. This should include persons employed by subcontractors where the work is to be sub-contracted. The tenderer shall also supply a list of lighting schemes the tenderer has installed over the last three years.	**Verification:** The tenderer shall supply a list of the persons responsible for the project, including managerial staff, indicating educational and professional qualifications and relevant experience. This should include persons employed by subcontractors where the work is to be sub-contracted. The tenderer shall also supply a list of lighting schemes the tenderer has installed over the last three years.
TECHNICAL SPECIFICATIONS	**TECHNICAL SPECIFICATIONS**
1. The tenderer shall provide the following for installation of new or renovated lighting systems: • Disassembly instructions for luminaires • Instructions on how to replace lamps, and which lamps can be used in the luminaires without decreasing the stated energy efficiency • Instructions on how to operate and maintain lighting controls • For daylight linked controls, instructions on how to recalibrate and adjust them. • For time switches, instructions on how to adjust the switch off times, and advice on how best to do this to meet visual needs without excessive increase in energy consumption **Verification:** Confirmation that written instructions will be provided to the contracting authority.	**1.** The tenderer shall provide the following for installation of new or renovated lighting systems: • Disassembly instructions for luminaires • Instructions on how to replace lamps, and which lamps can be used in the luminaires without decreasing the stated energy efficiency • Instructions on how to operate and maintain lighting controls • For daylight linked controls, instructions on how to recalibrate and adjust them. • For time switches, instructions on how to adjust the switch off times, and advice on how best to do this to meet visual needs without excessive increase in energy consumption **Verification:** Confirmation that written instructions will be provided to the contracting authority.
CONTRACT PERFORMANCE CLAUSES	**CONTRACT PERFORMANCE CLAUSES**
1. The tenderer shall ensure that new or renovated lighting systems and controls are working properly and using no more energy than is required. • Daylight linked controls shall be calibrated to ensure that they switch off the lighting when daylight is adequate • Time switches shall be set to appropriate switch off times to meet visual needs without excessive increase in energy consumption If following commissioning of the system, the lighting controls do not	**1.** The tenderer shall ensure that new or renovated lighting systems and controls are working properly and using no more energy than is required. • Daylight linked controls shall be calibrated to ensure that they switch off the lighting when daylight is adequate • Time switches shall be set to appropriate switch off times to meet visual needs without excessive increase in energy consumption If following commissioning of the system, the lighting controls do not

appear to meet all the above requirements, the tenderer shall adjust and/or recalibrate the controls so that they do. **Verification:** Statement by the tenderer that the relevant adjustments and calibrations have been carried out.	appear to meet all the above requirements, the tenderer shall adjust and/or recalibrate the controls so that they do. **Verification:** Statement by the tenderer that the relevant adjustments and calibrations have been carried out.
2. The tenderer shall ensure that the lighting equipment (including lamps and luminaires and lighting controls) is installed exactly as specified in the original design. **Verification:** Schedule of installed lighting equipment with appended manufacturers' invoices or delivery notes, and confirmation that the equipment is as originally specified. **Note:** This contract performance clause is intended to eliminate the substitution of inferior lighting products at the installation stage. Where substitution is inevitable because the originally specified products are unavailable, the tenderer shall provide a replacement schedule and calculation showing that the installation with the substituted products still complies with the relevant lighting design criteria in 3.2 above.	**2.** The tenderer shall ensure that the lighting equipment (including lamps and luminaires and lighting controls) is installed exactly as specified in the original design. **Verification:** Schedule of installed lighting equipment with appended manufacturers' invoices or delivery notes, and confirmation that the equipment is as originally specified. **Note:** This contract performance clause is intended to eliminate the substitution of inferior lighting products at the installation stage. Where substitution is inevitable because the originally specified products are unavailable, the tenderer shall provide a replacement schedule and calculation showing that the installation with the substituted products still complies with the relevant lighting design criteria in 3.2 above.
3. The tenderer shall implement appropriate environmental measures to reduce and recover the waste that is produced during the installation of a new or renovated lighting system. All waste lamps and luminaires and lighting controls shall be separated and sent for recovery in accordance with the WEEE directive. **Verification:** The tenderer shall provide written confirmation setting out how the waste has been separated, recovered or recycled.	**3.** The tenderer shall implement appropriate environmental measures to reduce and recover the waste that is produced during the installation of a new or renovated lighting system. All waste lamps and luminaires and lighting controls shall be separated and sent for recovery in accordance with the WEEE directive. **Verification:** The tenderer shall provide written confirmation setting out how the waste has been separated, recovered or recycled.

Explanatory notes

The contracting authority shall have regard to local circumstances (road type, usage, average climatic conditions) and different availability of street lighting technology on the markets to determine the best available technology for the need identified. Where possible, in addition to the GPP criteria outlined in this Product Sheet, the contracting authority should also consider that new street lighting systems will be in place for a significant number of years, and should therefore consider choosing the best available technology available for the specific need identified.

In particular, the need to control light pollution may be greater in certain locations, for example in rural areas or near dwellings. The contracting authority may wish to specify lower upward light ratios than those given in the criteria above, and introduce additional requirements limiting light spill to dwellings. Guidance on these issues is given in national standards and in CIE (International Commission on Illumination) Technical Report CIE-150[9].

The contracting authority should consider only lamps that meet the minimum requirements outlined in the criteria. The purchase of High Pressure Mercury should be avoided where possible, as these are due to be phased out in 2015. Where alternative lamps to MH and HPS are identified as suitable for the intended use the contracting authority should ensure they choose the best available technology. This may include for example LEDs. LEDs have a number of potential benefits, which include savings on power consumption and associated reductions in GHG emissions, reduced investment payback times, maintained brightness over their lifetime and reduced maintenance as a result of longer lamp lifetimes. However the use of LEDs would need to be considered on a case-by-case basis taking into account specific circumstances and requirements to ensure their use was suitable.

Different GPP criteria are given for lamps with high colour rendering indexes, as is the case of HPS lamps with a colour rendering index $Ra \geq 60$ and MH lamps with a colour rendering index $Ra \geq 80$. A high colour rendering index enables colours to appear more natural, as they would under daylight or tungsten light. As these lamps are generally less energy efficient, they should only be purchased where there is a particular reason for doing so, for example in a busy shopping street where people congregate. Alternatively white light with a good colour rendering index (for example MH lamps with the colour rendering index in the range $60 \leq Ra < 80$) may allow lower illuminances to be used and hence save energy.

Award Criteria: Contracting authorities will have to indicate in the contract notice and tender documents how many additional points will be awarded for each award criterion. Environmental award criteria should, altogether, account for at least 15% of the total points available.

Where fluorescent lamps are being replaced, the contracting authority is advised to ensure the most energy efficient versions are used as replacements.

Note: Standards covering the measurement of efficiency of HID ballasts are currently in preparation and will be a requirement at stage 3 of Regulation 245/2009.

[9] CIE Technical Report 150. Guide on the limitation of the effects of obtrusive light from outdoor lighting installations. CIE, Vienna, 2003.

Cost considerations

When purchasing high-intensity discharge (HID) lamps, it is important to not only consider the initial cost of the lamps, but also the lamp efficacy. Although high-pressure mercury (HPM) lamps may appear to be cheaper, it must be remembered that these types of lamps have a lower lumen efficacy; therefore they will require more watts to give the same lumen output as a high-pressure sodium (HPS) lamp or a metal halide (MH) lamp.

Changing from HPM lamps will provide energy savings, and therefore cost savings, as HPS lamps and MH lamps will use less power (watts) than a HPM lamp to provide the same lumen output. These benefits will however depend on other factors, for example, are the sockets the same and will the light distribution change therefore requiring other changes to the street light system e.g. a different luminaire/ballast. On a replacement only basis, a long payback would be expected if the whole fitting i.e. lamp, ballast and luminaire has to be changed, e.g. greater than ten years[10].

Therefore to ensure street lighting provides maximum energy savings at reasonable capital costs, it is important in terms of cost considerations for the contracting authority to consider this GPP specification and the best available fittings for new lighting systems and refurbishment of existing systems, for example upgrading ballasts. Obviously where fittings allow, more efficient lamps should be used depending on the location and specific light use requirements.

Some contracting authorities do not meter electricity consumption for street lighting, and the cost of electricity is calculated based on the number of units and their nominal wattage, multiplied by the number of hours of use. Where street lighting is upgraded to improve energy efficiency, the contracting authority should normally seek to renegotiate the electricity charges.

Good street lighting design may be able to reduce costs by the resulting increase in distance between the streetlights and lower lamp power. However this will need to be balanced against requirements, for example local health and safety requirements regarding spacing and lighting requirements for specific uses.

Furthermore, using lamps that have longer lifetimes and better lumen maintenance will result in longer maintenance times, therefore reducing costs. This will also reduce the indirect impacts incurred through replacement and maintenance, such as vehicular emissions and the associated impacts from manufacturing and distributing more components, mainly lamps. A detailed life cycle costs analysis on street lighting can be found in EuP Lot 9 Study: Public Street Lighting[11]

It should be noted that limited information and data is available regarding the costs considerations for street lighting.

[10] Policy Brief: Improving the energy performance of street lighting and traffic signals, DEFRA, July 2008. Available from http://www.mtprog.com/spm/files/download/byname/file/2006-07-10%20Policy_Brief_street_lighting%20fin.pdf

[11] EuP Lot 9 Study: Public Street Lighting, VITO, January 2007, http://www.eup4light.net

<table>
<tr><th>Core criteria</th><th>Comprehensive criteria</th></tr>
<tr><td colspan="2">3.4 EU GPP criteria for traffic signals</td></tr>
<tr><td>SUBJECT MATTER</td><td>SUBJECT MATTER</td></tr>
<tr><td>Purchase of energy efficient traffic signals.</td><td>Purchase of energy efficient traffic signals.</td></tr>
<tr><td>TECHNICAL SPECIFICATIONS</td><td>TECHNICAL SPECIFICATIONS</td></tr>
<tr><td>1. Where contracting authorities are installing new or upgrading old traffic signals the power consumed by the signal modules shall not exceed the following values:

<table>
<tr><th>Module Type</th><th>Operating Wattage (at 25ºC)</th></tr>
<tr><td>300mm Red Ball</td><td>10</td></tr>
<tr><td>200mm Red Ball</td><td>8</td></tr>
<tr><td>300mm Red Arrow</td><td>9</td></tr>
<tr><td>300mm Amber Ball</td><td>10</td></tr>
<tr><td>200mm Amber Ball</td><td>8</td></tr>
<tr><td>300mm Amber Arrow</td><td>9</td></tr>
<tr><td>300mm Green Ball</td><td>12</td></tr>
<tr><td>200mm Green Ball</td><td>9</td></tr>
<tr><td>300mm Green Arrow</td><td>9</td></tr>
</table>
The wattage requirements in the table above are to be met by the individual module, not the traffic signal heads. These levels include power demand from the lamp power circuit.

Verification: The tenderer shall provide the technical specification of the individual modules within traffic signal heads, or a written declaration to demonstrate this criterion is met.</td><td>1. Where contracting authorities are installing or upgrading traffic signals they should include the following minimum requirements in tender documentation.

<table>
<tr><th>Module Type</th><th>Operating Wattage (at 25ºC)</th></tr>
<tr><td>300mm Red Ball</td><td>8</td></tr>
<tr><td>200mm Red Ball</td><td>7.5</td></tr>
<tr><td>300mm Red Arrow</td><td>7</td></tr>
<tr><td>300mm Amber Ball</td><td>9</td></tr>
<tr><td>200mm Amber Ball</td><td>8</td></tr>
<tr><td>300mm Amber Arrow</td><td>7</td></tr>
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<tr><td>200mm Green Ball</td><td>8</td></tr>
<tr><td>300mm Green Arrow</td><td>7</td></tr>
</table>
The wattage requirements in the table above are to be met by the individual module, not the traffic signal heads. These levels include power demand from the lamp power circuit.

Verification: The tenderer shall provide the technical specification of the individual modules within traffic signal heads, or a written declaration to demonstrate this criterion is met.</td></tr>
</table>

2. Requirements concerning packaging for traffic signal purchases. Where cardboard boxes are used, they shall be made of at least 80% post-consumer recycled material. **Verification:** Products holding a Type I ecolabel shall be deemed to comply, provided that this ecolabel fulfils the requirements listed above. Other appropriate means of proof will be also accepted such as written evidence from the manufacturer that the above clause is met.	**2.** Requirements concerning packaging for traffic signal purchases. Laminates and composite plastics shall not be used. Where cardboard boxes are used, they shall be made of at least 80% post-consumer recycled material. Where plastic materials are used they shall be made of at least 50% post-consumer recycled material. **Verification:** Products holding a Type I ecolabel shall be deemed to comply, provided that this ecolabel fulfils the requirements listed above. Other appropriate means of proof will be also accepted such as written evidence from the manufacturer that the above clause is met.

Explanatory notes

The contracting authority should specify in their tender documents which installation/part of the installation should meet the criteria. The specified wattage requirements are currently met by LED lamps.

The Type I or ISO 14024 ecolabels are those where the underlying criteria are set by an independent body and which are monitored by a certification and auditing process. As such they are a highly transparent, reliable and an independent source of information. These labels have to meet the following conditions:

- The requirements for the label are based on scientific evidence
- The ecolabels are adopted with the participation of all stakeholders, such as government bodies, consumers, manufacturers, distributors and environmental organisations
- They are accessible to all interested parties.

In public procurement, procurers may require that the criteria underpinning a certain ecolabel must be met, and that the ecolabel may be used as one form of proof of compliance. They are however not allowed to request that a product carries an ecolabel. Moreover, procurers may only use ecolabel criteria which refer to characteristics of the product or service itself or production processes, not those relating to the general management of the company.

Where the verification for the criteria states that other appropriate means of proof can be used, this could include a technical dossier from the manufacturer, a test report from a recognised body, or other relevant evidence. The contracting authority will have to satisfy itself on a case by case basis, from a technical/legal perspective, whether the submitted proof can be considered appropriate.

Cost considerations

There are a number of cost considerations that the contracting authority will need to taken into account when purchasing traffic signals.

The cost of Light Emitting Diode (LED) traffic signals has been a barrier to the wider implementation of these types of traffic signals over the years, although some countries such as USA and Germany have implemented replacement programmes to upgrade traffic signals to LEDs.

The costs[12] for a standard (incandescent) red-amber-green head is currently around €187.5 compared to over €750 for an equivalent LED model however LED prices are falling rapidly. Therefore, although the initial up-front costs are more for LEDs, overall lifetime costs are lower thanks to a reduction in energy used and far lower maintenance costs[13]. Other designs allow the use of LEDs with common traffic controllers and reduce replacement costs to €250 – €375 per head[14].

Although the initial capital costs for installation of LED traffic signals is more than conventional (incandescent) versions, the payback following the installation of LED traffic signals has proved to be relatively short as a result of reduced electricity charges and maintenance costs, as the examples below demonstrate. The benefits will be further increased if the price of energy keeps on increasing, as has been the trend over recent times.

A European example of replacing conventional traffic signals with LED traffic signals is provided by the city of Freiburg in Germany. Here 53 traffic signals were replaced in 2006 with projected annual savings of €155,000 as a result of lower maintenance costs and a reduction of 350,000 kilowatts in power consumption, equating to a reduction in emissions of CO_2 of 240 tonnes. The financing of this project is over 15 years, with annual repayments of €140,000, which is less than the total savings per year[15].

In the USA for example, the California Energy Commission has estimated that a city converting all traffic signals at an intersection (cross-roads) with LEDs will reduce energy use by an estimated 70%, resulting in a simple payback of three to five years. In the city of Portland, Oregon nearly all red and green incandescent traffic lights were replaced in 2001 with LEDs. This resulted in net payback in less than three years due to energy and maintenance savings totalling $400,000[14], approximately €284,000[16].

[12] Costs have been converted from Pounds Sterling to Euros using an exchange rate of €1.25 to £1.
[13] http://www.reuk.co.uk/UK-Traffic-Lights-57000-Tonnes-Of-CO2.htm
[14] Quick Hits, Traffic Signal, UK ERC, December 2006. Available from http://www.ukerc.ac.uk/Downloads/PDF/06/0612_Traffic_Signals_QH.pdf
[15] http://w1.siemens.com/innovation/en/news_events/innovationnews/innovationnews_articles/lighting/smart_financing_for_new_traffic_signals.htm
[16] Savings have been converted from US Dollars to Euros using an exchange rate of €0.71 to $1.