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Policy Brief: Improving the energy performance of street lighting and traffic signals

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A Policy Brief for improving the energy performance of street lighting and traffic signals

Evidence, analysis, targets and indicative standards

Overview

1. This Policy Brief represents the outcome of the public consultation on street lighting and traffic signals, which was carried out earlier this year. This is in accordance with the announcement in the Energy White Paper of 23 May 2007 where the Government said it would publish a series of consultation papers setting out its analysis of how the performance of energy using products will need to improve over the next 10–20 years, including proposals for product standards and targets to phase out the least efficient products¹. This forms part of a wider annual review and policy development process, supporting delivery of the Government's objectives for energy and sustainable consumption and production.
2. To achieve the product standards and targets, a range of measures and approaches are required. These may include: international agreements; European and domestic legislation; and voluntary action through the supply chain to enhance markets for the most cost-effective energy efficient goods and services. In the Energy White Paper, the Government announced a range of policies to support delivery.
3. We believe that the standards will provide retailers, manufacturers and service providers with a benchmark to improve the performance of products they provide. In addition, we are encouraging industry to deliver improvements in product standards.
4. This Policy Brief addresses in-use energy consumption and carbon emissions associated with public street lighting, including signage and traffic signals: high-pressure sodium lamps, low-pressure sodium lamps, ceramic metal halide lamps, high-pressure mercury lamps, tungsten-filament lamps (including halogen), compact fluorescent lamps (CFLs) and light-emitting diodes (LEDs). It does not cover private external lighting (eg for private car parks). A separate Policy Brief covers all other non-domestic lighting products.

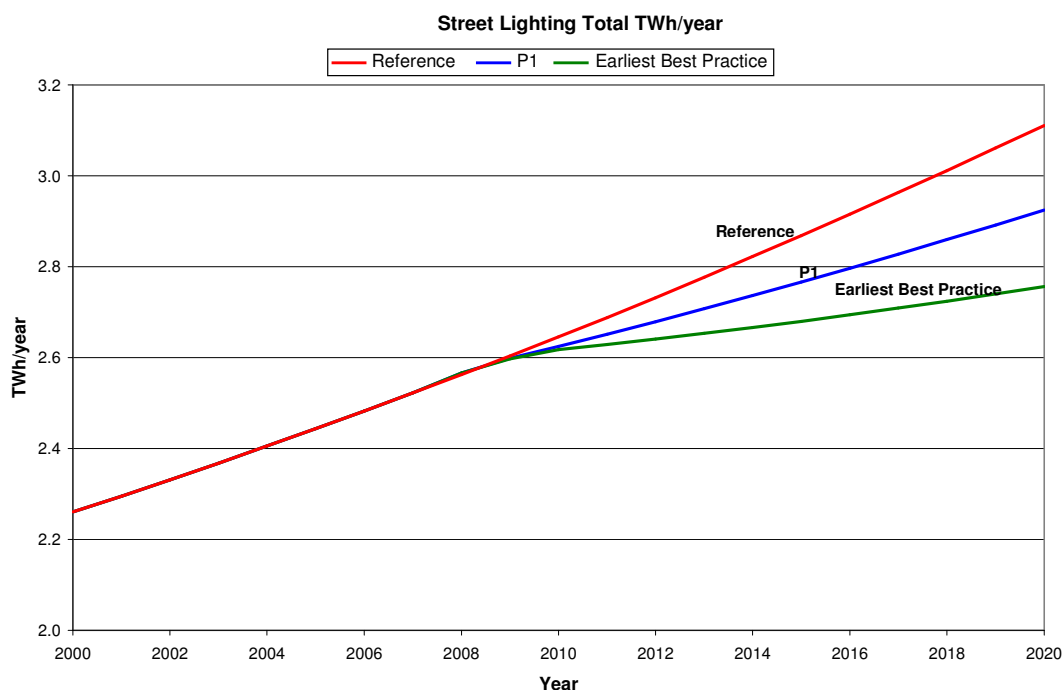
How we expect street lighting and traffic signals to contribute to future energy consumption

5. The following graph shows the Government's projections of future energy use by street lighting and traffic signals².

¹ See Energy White Paper (23 May 2007), para. 2.102.

² In deriving these projections, we generally assume an extrapolation of the current service delivery modes, rather than engaging in speculation about major changes in product functionality or mode of service delivery. However, as soon as reliable evidence emerges about a new product or mode of service delivery, the projections are adjusted to take account of these.

Total non-domestic energy consumption of UK street lighting and traffic signals (see scope in paragraph 4).



6. The Reference³ projection takes into account underlying trends in markets and technologies and the estimated or implicit impacts of historical and current policy measures. It does not, as yet, take account of the impact of all the policies announced in the Energy White Paper of 23 May 2007, which are still being developed and are not aimed at specific products.

7. The Earliest Best Practice (EBP) projection shows what would happen if the market were based on the most resource efficient options, taking into account design and production cycles, but not taking account of price or other market barriers.

8. The P1 projection sets a target level of ambition that the Government is proposing could be delivered at a reasonable cost, taking into account such things as current UK and global performance benchmarks, economies of scale and the capacity of the supply chain to take coherent action to deliver more energy efficient products⁴.

³ The Reference line or 'REF' is included as a baseline against which progress towards absolute consumption targets can be monitored. It also permits us to measure the impact of market changes in response to published targets and delivered policy measures and to assess the need for additional action. REF is updated to estimate the aggregate impact of existing policy measures, superimposed on underlying market trends, on the supply, sales and use of street and traffic lighting products – and, therefore, on public sector energy consumption. The effectiveness of market transformation policy, taken as a whole, may be assessed as the extent to which it modifies REF.

⁴ These market-based estimates for P1 are cross-compared with the performance improvements that could be envisaged through a set of ambitious but feasible policy options, over and above those included in the Reference line to check their feasibility. Section 3 of this Policy Brief (Policies, risks and measures) describes these along with the associated risks and proposed strengthening initiatives.

9. Were Earliest Best Practice⁵ to be achieved, energy use from street lighting and traffic signal products would only rise slowly from about 2.6 TWh⁶ in 2008 to 2.75 TWh in 2020. This would represent an energy saving of 0.43 TWh (0.05 MtC, 0.2 MtCO₂)⁷ over the Reference projections for 2020.

10. Were the proposed P1 target to be achieved, it is estimated that energy use from street lighting and traffic signal products would rise to 2.9 TWh by 2020. This would represent an energy saving of 0.3 TWh (0.03 MtC, 0.1 MtCO₂) over the Reference projections for 2020.

11. We estimate that the P1 target would be achieved if, on average, products supplied and brought into use each year were to meet the indicative performance standards set out in the Appendix. These P1 targets and product standards take into account:

- Benchmark product designs and technologies.
- Underlying market and technology trends.
- The scope for delivering policy benefits at a reasonable cost.

12. We estimate this market shift could be delivered at reasonable cost. For example, it includes the use of dimmable ballasts (and dimming), and high-output lamps in new fittings. It does not assume any light levels lower than the 'Standard'⁸ values (eg using a lower road class when the road is lit with white light) nor does it assume any rapid replacement of luminaires by best practice installations.

13. If we are on track to deliver this target we would expect to see substantial shifts in the market, for example:

2010: All lamps for street lighting will, on average, conform to the performance standards shown in Appendix 1.

2009: 10% of traffic signal lamp sales will be LED.

2012: None of the UK street lighting will be supplied by high-pressure mercury lamps.

2020: 100% of all traffic signals will be LED.

14. Our analysis indicates, in principle, that the P1 target is achievable through normal market mechanisms, supported by policies to be implemented as announced in the Energy White Paper.

⁵ EBP projections assume that the current or expected best practice is introduced into the market at the earliest opportunity, taking into account current design and production cycles, but not considering price or other market barriers. This projected potential will tend to improve if there is evidence that product innovation is likely to be faster than is currently assumed.

⁶ 1 terawatt-hour (TWh) = 1,000,000,000 kilowatt-hours (kWh).

⁷ Carbon emissions for electricity are calculated from Government predictions of the electricity generation mix. Oil and gas are converted using standard Government factors. See MTP Briefing Note BNXS01 at

www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNotelD=150.

⁸ BS-EN 13201-2 Road lighting – performance requirements.

15. Where international or domestic measures rely on performance standards, we propose that we should seek to align them with the standards outlined in this Policy Brief. In particular we will:

- Press for Eco-design of Energy-using Products Framework Directive (EuP) measures to adopt performance requirements for street lighting products in line with our published indicative standards, while acknowledging the Single Market legal base for EuP and recognising that final performance requirements will need to be fully harmonised across the whole of the European Union.
- Use the indicative standards to identify the most appropriate minimum and/or forward looking standards for use in Government procurement.

16. In this Policy Brief, we set our P1 target and indicative standards based on our current understanding of what is necessary and deliverable. That analysis may change over time, for example, if new efficient technologies enter the market faster than expected; or if consumer trends change; or through international or EU action; or through policies on carbon emissions reduction more generally. We intend to maintain a continued active dialogue with businesses in the supply chain. The aim will be to review progress and to annually update this analysis, the P1 target and the indicative standards.

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1 Status of Policy Brief

17. This Policy Brief is issued as part of an annual process, as announced in the Energy White Paper, to review and update the Government's published analysis, projections, P1 target and indicative standards for more sustainable products. This updated version takes into account the views received following the first consultation and, so far as possible, addresses substantial issues raised.

2 Market overview

18. As set out above this Policy Brief addresses in-use energy consumption and carbon emissions associated with the use of public street lighting, as well as signage and traffic signals. It does not cover private external lighting, for example for private car parks.

2.1 Trends

19. A significant proportion of old street lighting stock in the UK utilises low-pressure sodium lighting. Although this lighting in terms of lumen output efficiency (lumens/watt) is very efficient, the monochromatic colour is not well liked and it is generally being replaced by the somewhat less efficient high-pressure sodium lighting. In many cases, good lighting design and more efficient luminaire optics can allow such replacements to be made without increasing the installed load (in watts).

20. Modelling suggests that significant savings in energy consumption can be made by dimming lights outside peak traffic flow hours or by using 'white light' lamps at half the standard lumen output levels. Using the best available technology also has a significant effect on energy consumption.

21. Market trends are indicated below by usage type. These are general trends and there may be a range of different products used in each application.

2.1.1 Major road lighting

22. The majority of new installations on major roads utilise high-pressure sodium lamps. Using the best available high-pressure sodium technologies (eg high output lamps with efficacy above 125 lumens/watt) can have a significant effect on the energy consumption of new schemes.

23. A significant number of older installations still use low-pressure sodium lamps.

24. The Highways Agency is assessing every lighting scheme on its merits when it is reviewed⁹ and will consider removing lighting when there is not a good safety case for retaining it.

⁹ TA49/07 Appraisal of New and Replacement Lighting on the Strategic Motorway and All Purpose Trunk Road Network; TD34/07 Design of Road Lighting for the Strategic Motorway and All Purpose Trunk Road Network.

2.1.2 Urban and residential road lighting

25. Although a significant proportion of new urban installations are still high-pressure sodium lamps, some of these will be the new whiter lamp types. There has been a move towards using white light in urban environments, especially for city beautification purposes. 'White' light is provided by a number of different technologies in addition to high-pressure sodium lamps mentioned above (eg metal halide lamps and CFLs).

26. Metal halide lamps, in particular, have increased in efficiency over the last five years. However, in existing lighting schemes more efficient lamps will not reduce energy use unless lower wattage lamps are available (with the same light output as the older lamps) or a dimming ballast is used to reduce both the light output and energy use. These ballasts have only recently been developed for metal halide lamps. Otherwise, the extra efficiency is only manifested as extra light output¹⁰.

27. Dimming ballasts can also be used to reduce light levels outside peak traffic flow and to compensate for the lamp lumen depreciation¹¹.

28. The extra light output from using more efficient lamps can be utilised in new schemes (as long as the column spacing can be changed¹²). Using the best available metal halide technologies with efficacy over 110 lumens/watt can have a significant effect on the energy consumption of new schemes.

29. There is a trend towards using central management systems in new schemes to allow full light level control.

30. One factor that needs taking into account is that, in the future, the ageing population might require higher lighting levels for accident prevention.

2.1.3 Traffic signals

31. LEDs provide the best available technology in energy efficiency terms for traffic signals as they can reduce the energy consumption by at least a factor of three or four with currently available technology and potentially more. The lack of a standard for lamp monitoring is presently limiting take-up. Red lamp monitoring is a mandatory requirement where pedestrian signals are used. Some suppliers are offering lamp monitoring but there are difficulties with interoperability between signals and signal controllers not provided by the same supplier. Other factors slowing adoption of LED signals include cost, reliability and warranty periods. Several respondents to the

¹⁰ Efficiency is expressed in terms of luminous efficacy, which is the amount of light emitted for the number of watts of power required. If two lamps have the same power rating (in watts) then they will use the same energy to run; the more efficient lamp will produce more light for that same amount of power.

¹¹ Lamps have a higher light output when new than when they are nearing the end of their life. If a lighting scheme is designed to give light levels to the standard BS EN 13201 at the end of life, it will be too bright when first installed. Dimming ballasts can be used to reduce the light level and save some energy at this early stage.

¹² To make use of the extra light, the column spacing needs to be increased so that each lamp lights a larger area. In some situations it may be necessary to retain the columns in the same positions as before.

2007/08 consultation exercise suggested that the Market Transformation Programme (MTP) assumption regarding the adoption of LED traffic signals was too conservative. This assumption will be revisited in discussion with trade bodies and the assumption will be updated as appropriate.

2.1.4 Traffic signs

32. Until recent years much of the signage has been lit with fluorescent lamps. Now CFLs are a significant part of the market and LEDs are starting to make an impact in this area due to their long life and low maintenance requirements. Some standalone lit traffic signs are now operated by photovoltaic panels. This approach is especially advantageous in areas with no nearby mains sources. For certain applications high-reflectivity road signs may replace lit signs.

2.2 Price

33. In general, the market is extremely price sensitive with manufacturers under pressure to offer products at the lowest possible initial cost. This has been a barrier to improving energy efficiency, as anything that is perceived to have the potential to add cost, such as the inclusion of best practice components, is treated with caution. In many cases, street lighting is specified by sub-contractors who also have the maintenance responsibility. Although any such specification will need to be approved by the local authority, a sub-contractor will often go for tried-and-tested technologies to reduce the risk of maintenance problems.

2.3 Innovation

34. Innovation is an important factor in market development and is covered in Section 4.

3 Policies, risks and measures

35. In the Energy White Paper, the Government said it would:

- Take steps within the UK to improve the take up of energy efficient products and work internationally, and through the EU to stimulate global innovation and competition to raise standards and to bring a greater choice and efficient products to UK consumers.
- Deliver on our Gleneagles G8 commitments to promote international co-operation on product labelling and standards and help develop practical standards to reduce standby power.
- Work with the UK supply chain to encourage delivery of more efficient goods and services.
- Publish a series of consultation papers, of which this is one, setting out our analysis of how the performance of energy using products will need to improve between now and 2020, including proposals for indicative product standards and initiatives to phase out the least efficient products.

36. As set out above, our analysis indicates, in principle, that the P1 target is achievable through normal market mechanisms, supported by policies to be implemented as announced in the Energy White Paper.

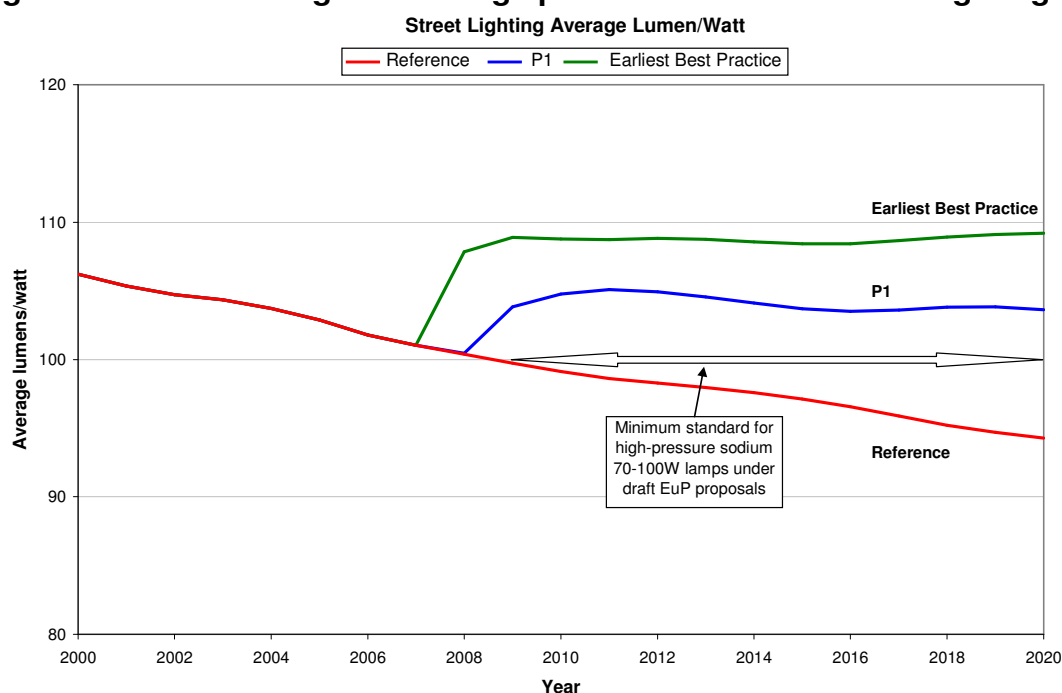
37. In this Section we consider the potential for policy to assist in delivering P1. We identify:

- Policies we believe are already helping to deliver higher environmental performance standards.
- Supporting policies that could assist in delivering P1 in the event that the market fails to deliver it.
- The risks that these policies may not deliver efficiency improvements.
- Further actions that may be necessary to achieve the Government's targets.

38. Figure 3.1 illustrates how existing and proposed policy instruments and initiatives could support the delivery of more efficient new products – specifically for street lighting.

39. The graph plots the data in the Appendix (ie the indicative performance standards for the basket of new products), which correspond to the P1 projection. Also shown on the graph are equivalent performance values for the Reference and EBP projections. This illustrates the sales-weighted *average*¹³ performance of new products under the different projections. It should be noted that a higher figure represents a higher efficiency product.

Figure 3.1 Sales-weighted average performance – new street lighting



¹³ Note: this is not a suggested minimum standard; products can be sold that are less efficient than these values as long as the average efficiency of all products sold equals this figure.

40. It can be seen from Figure 3.1 that, after an initial sharp increase, there are only very small variations in the P1 indicative performance standards with time. This curve suggests that, although in many cases the low-pressure sodium lighting (which is of high-efficiency, but low light quality) is being replaced with high-pressure sodium or compact metal halide lighting of a lower lamp efficacy, the overall luminous efficacy of the lighting scheme should be able to be maintained through using best practice products and good lighting design.

41. The initial sharp increase in the P1 standard reflects the assumption that the EuP Directive (see Section 3.3.2) will eliminate the remaining high-pressure mercury stock and move the replacement stock towards best practice lamps.

42. The major proposed policy for street lighting is the EuP Directive. The draft proposals have different efficacy minimum standards for different lamp types and wattages. As an illustration, figure 3.1 shows the proposed value for high-pressure sodium lamps of wattages between 70 W and 100 W. This lamp type represents the 'average' lamp sold in the UK at present.

3.1 Market analysis, projections and targets

Current status

43. This is our first annual Policy Brief, as committed to in the Energy White Paper, addressing how the performance of street lighting and traffic signals will need to improve between now and 2020, including proposals for product standards and initiatives to phase out the least efficient products. The intention is to update this analysis on a yearly basis.

44. Tables showing the target average performance levels that street lighting products need to achieve to realise the P1 target are provided in the Appendix. These tables also provide a metric against which developments in the market can be measured.

45. The intention is to monitor progress against the current projection for technology and market development, to consult on the evidence and, annually, to review and update the published analysis and policy response, including indicative product performance levels for new products supplied to the UK market.

46. The Government projections are based on data collected in 2000. No up-to-date information is available on the product mix in the UK. Market data is also weak for discharge lamps as there are many suppliers to the UK market of these products who are not members of the Lighting Industry Federation (which collects the most reliable data in the lamp sector).

Policy: Publish and update UK market and technology plans annually.

Start date: 2007.

Reference: Announcement in Energy White Paper 2007.

Next deliverables:

- 2008: Monitor market developments, refine models and consult on possible amendments to this Policy Brief.
- 2008: Publish an updated P1 target and indicative product standards.

Acknowledged risks

47. There is a risk that products will develop in a direction that differs from that which was initially expected in the projections (ie the P1 target will not be met). To offset this risk, the Government may consider:

- Whether or not a more ambitious P1 target could be set as part of the review process.
- Pursuing measures designed to further accelerate the use of innovative technologies.

48. Weaknesses in knowledge about market and technology trends, and the relationship between the performance of products measured under test conditions and what is achieved in real life could all lead to reduced effectiveness of the policy programme.

Strengthening initiatives

- Ongoing: Government will continue to monitor areas to identify where it may be beneficial to strengthen the evidence base on street lighting and traffic signal products.

3.2 Engaging the supply chain

3.2.1 Supply chain initiatives

Current status

49. In line with announcements in the Energy White Paper, the Government will ask major UK manufacturers, specifiers and contractors to compete to supply and demand street lighting in line with the indicative standards set out in the Appendix.

50. The supply chain for street lighting can be subject to some quite complex partnership relationships. For instance, in new residential developments the building contractor (or his appointed sub-contractors) may install the street lighting. Other local authorities have maintenance and management contracts with companies who, themselves, specify replacement lighting schemes. Although a local authority has the overall responsibility for approval of any scheme, there are many factors (as well as energy efficiency) that are considered in the scheme design. It would be strongly preferable if all scheme designs were carried out by suitably qualified designers.

51. Many local authorities pay a flat rate for electricity consumption and do not gain from energy efficiency; they are reluctant to provide accurate inventories as they may be undercharged currently. There is also a significant time interval between a new product being available and Elexon (the pricing body) giving the product a suitable code to reflect its energy efficiency. Inventories are reviewed by Elexon on a yearly basis.

52. The few remaining tungsten-filament traffic signals are likely to be impacted by the supply chain initiative in the domestic lighting sector (covered in detail in the Domestic Lighting Policy Brief). Discussions have been held with the Lighting Association and with the European Lamp Companies' Federation (ELC). The Government is encouraging lighting retailers and manufacturers to:

- Increase the sales-weighted average efficiency of lamps for the domestic market.
- Phase out the least efficient domestic lighting products over the period to 2011.

53. Retailers representing a sizeable proportion of the UK domestic market, along with UK energy suppliers, are leading this initiative, which was announced in September 2007.

54. The products targeted for phasing out include the standard GLS (general lighting service) lamps.

Acknowledged risks

55. Wholesalers and/or manufacturers might not be prepared to compete to supply tungsten-filament lighting products in line with the indicative standards set out in the Appendix.

56. Insufficient funding could lead to pressure to reduce product/system specifications, with the result that energy efficiency standards are not achieved.

Strengthening initiatives

- 2008: Government will continue to consider where further actions could be employed to encourage manufacturers, wholesalers and retailers to work to meet a more ambitious P1 target and product standards. This could help to sustain successful supply chain initiatives.
- 2008 The CSS¹⁴ to publish guidance on 'Invest-to-save' strategies.

3.2.2 Metrics: market development

Current status

57. For manufacturers, retailers, wholesalers and service providers to respond to the Government's request for initiatives on product standards, it is important that they can easily assess if individual products, or a basket of goods, will meet the Government's indicative performance standards.

58. Where a number of design parameters are involved (increasingly the case), this can become a complicated task. A pragmatic and flexible approach to setting performance standards that can adapt to new information and understanding is needed, especially given the move towards giving attention to the whole-life impacts of goods and services, and where the science of lifecycle impacts is less well established.

¹⁴ CSS – (formerly the County Surveyors Society) represents local authority chief officers.

59. Association for Street Lighting Electrical Contractors (ASLEC) and Highways Electrical Manufacturers and Suppliers Association (HEMSA) are proposing to develop a 'Carbon Footprint Calculator' which will focus on:

- Lamps - the impact of a current installation compared to a new design.
- Transport - the impact of plant and equipment at different levels of use.
- Power factor - how the maintenance of lighting circuits can reduce energy consumption by 50%.

Acknowledged risks

60. The technical complexity of this area may deter the adoption of standards by the supply chain.

Strengthening initiatives

- Ongoing: The Government could work with the ASLEC/HEMSA Environmental Forum to supply information on best practice performance standards for street lighting.

3.3 EU and International policy actions, programmes and initiatives

61. Street lighting and traffic signal products are internationally traded goods where unilateral UK policy actions may have only a limited impact on the design of products placed on the UK market. Therefore, the Government has committed to work at the international level to promote international action to bring forward more sustainable products.

3.3.1 International collaboration

Current status

62. The UK is committed to promoting international co-operation¹⁵ on product labelling and standards and, generally, on policy towards more sustainable products.

63. Defra has been instrumental in establishing the International Task Force for Sustainable Products (ITFSP) which seeks to ensure the harmonisation of policy options with those of other countries to maximise impact in a global market led by the supply chain. Defra operates the secretariat for the ITFSP.

64. Within the ITFSP, product working groups called Global Sustainable Product Networks (GSPNs) have been established for lighting, electric motors, home entertainment equipment and compliance. These are developing test standards (where needed) and a harmonised set of product performance standards. At present the GSPN on lighting is developing test standards (where needed) and a harmonised set of product performance standards for CFLs. CFLs are used in illuminated signs

¹⁵ For example, the International (Marrakech) Task Force on Sustainable Products (see www.itfsp.org).

and some street lighting fittings so this initiative may have a small beneficial effect on street lighting. Other products will be considered at a later date.

Policy: Supporting the ITFSP.

Start date: June 2006.

Reference: See www.itfsp.org

Next deliverables:

2008: IEC to consider amendments to IEC 60969.

Acknowledged risks

65. There is a risk that commitment to the ITFSP and the GSPNs will not be sustained by all international partners or that insufficient implementation support will be provided.

Strengthening initiatives

- Ongoing: Government will continue to review the effectiveness of this initiative. Alternative options, such as strengthening voluntary agreements or EuP criteria could be considered should a robust international approach not materialise. It may also be feasible to run the GSPNs on a more informal basis to continue influencing major international partners.

3.3.2 Mandatory standards

Current status

66. The Framework Directive on the Eco-design of Energy-using Products (EuP) (2005/32/EC)¹⁶, adopted in 2005, allows the European Commission (EC) to set performance requirements for products placed on the EU market.

67. A preparatory product study has been completed for street lighting and a final report was published in March 2007¹⁷. The UK has contributed information and opinion to the preparatory studies, and will be pushing for ambitious, but realistic and achievable, targets to be adopted in the individual product measures.

68. The preparatory study has outlined a number of possible options for improving the energy efficiency of street lighting. The only options that apply to old stock are lamp replacements (eg replacing high-pressure mercury lamps with high-pressure sodium retrofit lamps that would have a very limited effect in the UK, which has few of these lamps in the stock). The other options include lamp, ballast (including the use of dimming ballasts for high-powered lamps) and luminaire improvements to be applied to new stock.

69. A draft implementing measure was published in May 2007 and debated at a stakeholder meeting in June 2007. The meeting questioned whether a product standards approach was the best course of action for street lighting. The EC is

¹⁶ See MTP Briefing Note BNXS03;

www.mtprog.com/ApprovedBriefingNotes/pdf.aspx?intBriefingNotelD=389

¹⁷ See www.eup4light.net

considering whether a service approach would be appropriate. For instance, it may be possible to define street lighting efficiency in terms of maximum watts per kilometre for a particular class of road lighting (as defined in BS EN 13201-2). The EC Energy Services Directive¹⁸ may be a suitable instrument to pursue this approach.

Policy: EU Framework Directive for Eco-design of Energy-using Products (EuP).

Start date: 2005 (Framework Directive adopted).

Reference: http://ec.europa.eu/energy/demand/legislation/eco_design_en.htm

Next deliverables:

- 2008: Final agreed version of implementing measure or alternative course of action identified.
- 2009: New regulation comes into force.

Acknowledged risks

70. The timing for delivery of standards via EuP is uncertain. Delivery of the UK's preferred standards via EuP is also uncertain since the EuP has a Single Market legal base so any final performance requirements will need to be fully harmonised across the whole of the European Union.

71. There is also a significant risk that current regulatory processes will not be able to respond sufficiently nimbly to a rapidly changing market, leading to ineffective regulation and market drivers.

72. There is a risk that lamp replacements will not result in energy savings but only in more light output. There is a further risk that lowering energy use and maintaining standard lighting levels may be incompatible in some cases.

73. The biggest risk to the policy achieving significant energy savings is the low rate of renewal of street lighting. At present only about 3% of lighting is renewed each year, leading to lifetimes of installations of 30 years or more.

Strengthening initiatives

- The Government will consider the value of including a mechanism for regular review and updating of product criteria in the product implementing measure.
- Ongoing: The Government will continue to monitor the effectiveness of the regulatory processes in question and consider whether to press the European Commission to ensure lamps remain a priority for regulatory action under this Directive. However, the current timetable indicates that an implementing measure will not come into force before 2009 with the phase out schedule beginning in subsequent years. The Government will work with the supply chain in an effort to phase in new standards in advance of this measure (see Section 3.2.1).

¹⁸ Directive 2006/32/EC 'End use efficiency and energy services' at http://eur-lex.europa.eu/LexUriServ/site/en/oj/2006/l_114/l_11420060427en00640085.pdf

- UK Government will consider whether to encourage EuP to include product requirements for low-pressure sodium systems as well as high intensity discharge (HID) systems.

74. To avoid the risk that lamp replacements will not result in energy savings but only in more light output, manufacturers should consider producing more replacement lamps with reduced wattage requirements at equivalent lumen output.

75. Government will consider whether to commit to encourage earlier replacement of low efficiency street lighting (eg via an 'invest to save' campaign), but would need to add requirements for such replacements to be lower energy using while still maintaining standard lighting levels. The CSS intends to publish guidance on 'Invest-to-save' strategies during 2008. The further use of key performance indicators (KPIs) will be considered as a route to achieving early replacement.

76. Many residential schemes use low-pressure sodium lamps that are very energy efficient (albeit with unpleasant monochromatic orange light) and are often, at present, lit below standard light levels. Although alternative light sources such as high-pressure sodium with improved luminaire design may make better use of the light, it may not be able to compensate for all the deficiencies of the old scheme to produce a good modern lighting scheme of lower energy use.

3.3.3 Product information

Current status

77. At present there are no effective EU-wide mandatory or voluntary energy labelling schemes for street lighting and traffic signals. Labelling of street lighting products is being addressed under the EuP Directive (see Section 3.3.2).

Acknowledged risks

78. Proliferation of national labelling schemes could confuse users (ie local authorities, PFIs) and create a barrier to trade.

Strengthening initiatives

- 2008: The Government could press for the EC (via EC Energy Labelling Framework Directive¹⁹ and the EuP Directive (see Section 3.3.2)) and suppliers to provide harmonised product information.

3.3.4 Metrics: test and measurement

Current status

79. Adequate performance test and measurement methodologies are a critical prerequisite for all product policy. In fast-moving product sectors such as street lighting

¹⁹ MTP Briefing Note BNXS37;
www.mtprog.com/ApprovedBriefingNotes/BriefingNoteTemplate.aspx?intBriefingNoteID=396

and traffic signals, it is important that formal standards keep pace with the development of new technologies, products and patterns of usage.

80. In the street lighting and traffic signals sector, where products are designed for global markets, harmonised standards are likely to encourage competition and investment in improved designs.

Acknowledged risks

81. There is no adequate harmonised test standard available for the performance of electronic ballasts for discharge lamps. The lack of this standard has implications for setting minimum standards of performance for ballasts under the EuP Directive implementing measures (see Section 3.3.2).

82. There is a lack of suitable metrics for LED street lamps. There is also a need to develop international standards for LEDs to ensure that high quality products enter the market.

83. Development of formal test standards may not keep pace with policy needs. For example a new performance standard is required for ballasts for high-intensity discharge lamps to support the EuP Directive policy.

Strengthening initiatives

- The Government could identify areas where standards are a critical issue and work with appropriate formal bodies to agree effective and reliable performance measurement methodologies (eg the HID (metal halide) ballast standard and LED standards mentioned above).

3.4 UK policy actions, programmes and initiatives

3.4.1 Public procurement

Current status

84. The Government published its Sustainable Procurement Action Plan (SPAP) in March 2007, re-affirming its commitment to use Government procurement to drive the market for energy efficient products. Alongside the Action Plan, it published updated and extended standards for an increased range of products that are mandatory for Central Government departments. Defra consulted on energy efficient products, which has informed the minimum mandatory standards for this product group in the revised **Buy Sustainable Quick Wins** (published in July 2008). We are reviewing the approach to setting mandatory standards with the newly formed Centre of Expertise for Sustainable Procurement.

85. Guidance on energy efficiency and energy savings as possible assessment criteria in public sector tendering was published in July 2008 as part of the Energy Services Directive. The Directive also sets out a number of options relating to public sector procurement of energy using products, buildings and energy services, which the Government consulted on during the winter of 2007. The outcome of this consultation will be announced shortly.

86. The NHS (England) published its Sustainable Procurement Action Plan in August 2007. Similar action plans for local authorities are being produced.

87. The Government is committed to identifying stretching-forward looking standards to provide longer-term signals to business and to encourage innovation. The Government is exploring the potential of the 'Forward Commitment Procurement Model'²⁰ to encourage the early uptake of LED traffic signals.

88. In addition, all local authorities have made commitments to sustainable development plans that, in many cases, will have included plans for energy efficiency in street lighting. There has been no national initiative to facilitate best practice procurement in street lighting because specification of street lighting is devolved to local authority level.

89. The Highways Agency has produced a new specification for the design of street lighting for motorways and trunk roads⁹.

90. As part of the UK Energy Efficiency Action Plan²¹, the Government has announced that 'revolving loan funds' have been made available for energy efficiency work in the public sector; such loans may be available for street lighting renewal.

Policy: UK Government Sustainable Procurement Action Plan.

Start date: 2007.

Reference: www.sustainable-development.gov.uk/publications/pdf/SustainableProcurementActionPlan.pdf

Next deliverables:

- 2008: Revised Government procurement standards announced.

Acknowledged risks

91. Specifying fixed threshold values in procurement specifications may result in 'lock in' to incumbent technologies by excluding alternative products and lead to innovation being stifled. Outcome-based specifications (based on say a lighting level, rather than a specific technology), along with challenging and progressive threshold values, can help to minimise this.

92. The high cost of energy having a significant negative impact on local authority budgets and the implementation of improvements.

93. Government's commitment to reduce road traffic accidents and crime may have an effect on the provision of road lighting

94. Growth in the 24-hour culture and the provision of CCTV surveillance will require higher levels of, and better quality, illumination than currently installed, which will increase rather than reduce energy consumption.

²⁰ See www.berr.gov.uk/files/file35312.pdf

²¹ <http://www.defra.gov.uk/environment/climatechange/uk/energy/pdf/action-plan-2007.pdf>

Strengthening initiatives

- 2008: The Government will consider including standards and overall targets specifically for the procurement of street lighting, where applicable, within its formal procurement guidelines that are at or above the performance targets in the Appendix.
- Strengthened leadership and scrutiny of performance on sustainable procurement throughout Government as set out in the SPAP. This could include requiring local authorities to have regularly reviewed lighting policies.
- Transforming Government procurement agenda will build procurement capabilities and capacities within Departments and improve delivery of agreed policies.
- 2008: The UK Lighting Board may consider whether to develop a specification for best practice in street lighting.
- 2008: Sustainable procurement operations board are exploring the potential of forward commitment procurement to accelerate the uptake of LED traffic signals.
- 2008 onwards: Local authorities will consider embedding the best practice specification in their contracts and planning requirements.

3.4.2 Product information

95. At present, there is no mandatory energy labelling scheme for street lighting and traffic signals in the UK. Suggestions for a labelling scheme for street lighting may be pursued through the EuP Directive – see Section 3.3.2.

3.5 Other policies with potential to impact on street lighting and traffic signal products

3.5.1 Promoting energy/carbon savings in industry and commerce

96. The Carbon Reduction Commitment, a mandatory emissions trading scheme aimed at the large non-energy intensive sector, is expected to start in 2010. The CRC will incentivise energy saving measures across 5,000 of the larger commercial and public sector organisations – including retail premises, hotels and offices. As the CRC will cover indirect energy usage by these organisations, it should be expected to add to demand for energy efficient lighting products in the commercial sector.

3.5.2 EC Energy Services Directive

97. It is feasible that use could be made of the EC Energy Services Directive²² to set minimum standards for lighting energy use or building energy use (using the Energy Certificates bands to describe minimum standards). Implementation of this policy could stress the importance of designing lighting schemes to provide the right light in the right place when it is needed.

²² DIRECTIVE 2006/32/EC on energy end-use efficiency and energy services;
http://europa.eu.int/eur-lex/lex/LexUriServ/site/en/oj/2006/l_114/l_11420060427en00640085.pdf

4 Other potential measures

98. This Section looks towards other measures that may need to be developed to enable the desired average energy performance to be achieved.

4.1 Product/services innovation

99. The most promising innovation in non-domestic lighting is the development of LEDs. MTP has reviewed the possible course of development of these products²³. EPSRC has given significant funding to fundamental research and the Carbon Trust is starting to support applied research in this area. In spring 2006, the Department of Trade and Industry (now Department for Business, Enterprise and Regulatory Reform (BERR)) called for research on LEDs. The Technology Strategy Board has invited tenders for projects under its March 2008 research call.

100. Two knowledge transfer networks (KTNs) have been set up. The Photonics Cluster Business Network (www.photonicscluster-uk.org) was developed to provide support and guidance for LED manufacturers, especially small and medium sized businesses and the UK Displays and Lighting Network plays a similar role primarily for organic LEDs and electroluminescent technologies being developed for display lighting with potential uses in traffic signage.

101. LED street lights are only just being trialled in the UK in small quantities and the UK trails behind many countries (eg the USA, Singapore, Canada) in this respect.

102. One of the major risks in a new and fast developing technology is that poor understanding of the technical requirements for high-efficiency operation of LEDs may lead to a number of poor quality products reaching the market that may then be in the lighting stock for quite a few years (LEDs can have lifetimes > 30,000 to 50,000 hours if operated at the correct temperature). Effective dissemination of best practice will assist in mitigating this risk. A risk to the growth of LED systems is that the red lamp monitoring of LED traffic signals is not yet solved satisfactorily.

103. Other new technologies that can make a useful impact on energy consumption are solar timers and the use of low-level luminaires or LED markers at rural roundabouts or junctions. Consideration can also be given to whether whole-road lighting is appropriate for some built-up areas or whether footpath and road-margin lighting is preferable.

4.2 Education

104. Use of education programmes for manufacturers, contractors, consultants, and local authority and central government lighting engineers, together with information for councillors and the public.

²³ Revised 2008 version now available as BNCL12 at <http://www.mtprog.com/SelectProductStrategy.aspx?intSelection=2&intSector=8>

5 Potential impacts

105. This Section provides a partial analysis of the more significant potential impacts of the proposals contained herein.

5.1 Consumer cost/benefit analysis

106. There is very little benefit to be had in street lighting by just changing the lamp type used as fittings are designed specifically for a particular lamp type.

107. Owing to the cost of the whole fitting (£250+ for lamp, ballast and luminaire) there will be very long payback times (much greater than 10 years²⁴) on replacement solely on simple payback terms. It will only be economic to use the best available technologies when a street lighting scheme is first installed or when a major updating programme is planned. The extra cost of upgrading to a dimming ballast, for example, could be paid back in about 4 years for a 250 W lamp²⁵.

108. There is a large backlog of street lighting that is in serious need of refurbishment on safety grounds (as the columns are ageing and could collapse). There would be additional social benefits to be had by increasing investment to replace these fittings with the best available new fittings.

5.2 Business impacts

109. Owing to the current very low rate of refurbishment (~3% per annum), the policies will have little impact on the general market for some years – there will still be a significant market for all replacement lamps. Perhaps the sector that would be most impacted would be the home-building sector in which a developer would have to install a scheme that is better quality than they might otherwise have installed, which could have cost implications. It is not always the case, however, that most efficient fittings are more expensive, but there may need to be a trade-off with aesthetic considerations (although it is not the case either that the most efficient fittings are necessarily aesthetically unpleasing).

110. Almost all discharge lamps are manufactured outside the UK, so the policies will have little impact on UK lamp businesses. Fittings are manufactured in the UK but it is not expected that the policies will have significant cost implications to UK businesses.

5.3 Waste impacts

111. Currently, discarded discharge lamps make up the largest proportion of lamps entering the waste stream. About 70-80% of the aggregated waste from all lamps is glass, with metals being the second most common waste material. The composition of the metal waste component is not known to MTP at the moment. It should be

²⁴ EuP preparatory study on street lighting (Lot 9) published on www.EUP4light.net

²⁵ Assuming that 25% of the electricity is saved at 6 pence/kWh and an additional cost of £60 for the dimming ballast.

noted that these fractions differ for different lamp types. For example, for high-pressure sodium the glass fraction is typically 70% and metals 30%²⁶.

112. Most discharge technologies rely on a small mercury dose for their operation. High intensity discharge lamps contain more mercury than fluorescent lamps. Discharge lamps are routinely processed to recover their mercury for re-use. This is more controllable and environmentally benign than allowing mercury to be released directly into the atmosphere at a power station. Research is enabling the mercury content of lamps to be reduced further, and mercury-free lamps may become practicable in the future (zinc may be a substitute for mercury in discharge lamp types and LEDs are mercury free (although they still require careful recycling) and have the advantage of very long lifetimes).

113. Lower lighting levels and better control of luminaires can reduce sky glow and light pollution.

5.4 Health impacts

114. There are no known adverse health impacts from street lighting on humans as light levels are relatively low. Animals and plants can suffer from high levels of street lighting as it affects their seasonal responses and circadian rhythms. There is a risk that white light may have a greater impact on animals (especially bats) than the more monochromatic light sources. Dimming or switching off street lighting outside peak hours would reduce this effect, although there are concerns regarding personal security if street lighting is switched off.

6 Further information

115. The following MTP publications (available from www.mtprog.com/) are linked to this Policy Brief and present the underlying evidence base of information such as further explanations, definitions, assumptions and important background information:

BNCL10	Waste issues in street lighting
BNCL12	Light-emitting diodes; Innovation briefing note
BNXS01	Carbon Emission Factors for UK Energy Use

²⁶ Source: European Lamp Companies Federation.

Appendix

Indicative performance standards for street lighting products

116. Table A1 shows the target average performance specifications for new street lighting products supplied to UK end-users. These correspond with the Government’s underlying published stock models and projected energy consumption in each sector.

117. These specifications may be used directly in suitable policy instruments (eg the supply chain initiative) and provide a metric against which developments in the market can be measured.

118. The underlying stock modelling is subject to an ongoing consultation and review process. More detail on the modelling, current market analysis and data downloads are available via the MTP’s What-If tool (<http://whatif.mtprog.com>)

Table A1 Sales weighted average efficiency for street lighting

Year	Average lumens/watt
2000	106.21
2001	105.36
2002	104.73
2003	104.36
2004	103.72
2005	102.88
2006	101.79
2007	101.05
2008	100.45
2009	103.83
2010	104.77
2011	105.10
2012	104.94
2013	104.57
2014	104.10
2015	103.69
2016	103.50
2017	103.60
2018	103.80
2019	103.83
2020	103.63

119. It can be seen from Table A1 that from 2008 there is an initial sharp increase followed by only very small variations in the P1 indicative performance standards with time. This suggests that, although in many cases the low-pressure sodium lighting (which is of high-efficiency, but low light quality) is being replaced with high-pressure sodium or compact metal halide lighting of a lower lamp efficacy, the

overall luminous efficacy of the lighting scheme should be able to be maintained through using best practice products and good lighting design.

120. The initial sharp increase in the P1 standard reflects the assumption that the EuP Directive (see Section 3.3.2) will eliminate the remaining high-pressure mercury stock and move the replacement stock towards best practice lamps.