



EUROPEAN COMMISSION

DIRECTORATE-GENERAL FOR ENERGY AND TRANSPORT

Brussels, 1 August 2006

## **SAVING LIVES WITH DAYTIME RUNNING LIGHTS (DRL)**

### **A Consultation Paper**

*presented by the inland transport services  
of the Directorate General for Energy and Transport*

The European Commission is seeking views of interested parties on its intention to propose measures to foster the rapid introduction of Daytime Running Lights for motor vehicles. Comments are expected **until Friday, 17 November 2006** to the address mentioned under point 6 of this paper.

## Executive summary

According to the research available, Daytime Running Light (DRL)<sup>1</sup> has a high potential to increase road safety. They help road users to better and earlier detect, recognise and identify vehicles. Studies estimate the life-saving potential of DRL to be in the order of 3 to 5 % of the yearly number of road fatalities.

That is to say, if measures are taken to require the use of DRL throughout the EU, it could help saving **between 1.200 and 2.000 road fatalities per year** and thus make an important contribution to the European target of saving 25.000 lives per year on European roads.

The following research findings should also be noted in the course of assessing whether legislation on DRL for all vehicles is appropriate:

- Road users not having lighting devices, i.e. pedestrians, cyclists, mopeds **do not become** less conspicuous if all vehicles feature DRL;
- A negative effect of DRL on the visibility of motorcyclists **can not** be ascertained;
- Dedicated DRL and dipped headlamps **do not** cause glare;
- It is true that DRL increases **fuel consumption and CO<sub>2</sub>-Emissions** by up to **1.5%** if dipped headlamps are used but this is reduced to only **0.3%** in the case of dedicated DRL. However, taking into account this effect on fuel consumption and CO<sub>2</sub> emissions, the benefits of a legal obligation to use dipped headlights on existing vehicles and to equip new vehicles with automatic dedicated DRL outweigh the costs by the factor 1 to 2. i.e. **for one Euro invested into daytime running lights, there is a benefit to society of 2 Euro.**
- **14 Member States have mandatory rules on the use of DRL in force so far**, with different requirements. Furthermore, some Member States recommend the use of light during daylight without mandating them while waiting for harmonised European legislation. In order to avoid confusion and related road insecurity, a harmonised EU-wide rule could be necessary for the benefit of the travelling citizen.

Given the positive contribution that DRL can make to road safety across Europe, the adoption of EU legislation in this field must be considered very seriously. In order to provide for the **necessary flexibility**, a legislative initiative on DRL could foresee a fixed date for the

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<sup>1</sup> In this paper, the term DRL is used to describe the concept of using any lighting devices during daylight, in particular existing headlamps or dedicated lights. If the text is on the use of either existing or dedicated lights, this is mentioned explicitly.

transposition of the technical requirement to install automatic dedicated DRL on new vehicles and an appropriate period of time to transpose the user requirement for existing vehicles.

## 1. OBJECTIVE OF THE INITIATIVE

This consultation seeks views on the mandatory use and the installation of automatic dedicated DRL on all motor vehicles (also trucks and busses, mobile machinery, small four-wheeled vehicles, tractors, etc.) in circulation on EU roads. Research indicates that such a measure could make a significant contribution to reaching the target of a 50% reduction in road traffic fatalities in the EU in 2010 compared to 2001. With a general introduction of DRL, it is estimated that **between 1.200 and 2.000 lives could be saved per year** in the European Union. DRL has its strongest reduction potential in multi-vehicle accidents with cars and in accidents involving cars and bicyclists.

## 2. BACKGROUND

In some Member States, DRL have been introduced either as a mandatory obligation in the national road traffic codes or as a recommendation for motorcycles/mopeds and/or cars. Many studies have demonstrated the benefits of such measures for road safety in general.<sup>2</sup> Already in 1997, a study carried out by the Dutch road institute SWOV showed clear benefits of DRL.<sup>3</sup>

Summing up, the studies present the following picture of DRL:

- There are theoretical reasons, based on studies of human perception, to believe that DRL improves conspicuity<sup>4</sup> and that improving conspicuity can prevent accidents.
- Randomised controlled trials of DRL have found them to be effective in preventing accidents. These findings have been reproduced in non-experimental studies.
- The findings of studies that have evaluated the effects of DRL are highly consistent. Very few estimates of effect depart from the general pattern by indicating an increase of the number of accidents.

### 2.1. EXISTING LEGISLATION

There is as yet no EU legislation on DRL. However, DRL features as an important road safety topic within the recent report of the High Level Group "CARS 21: Competitive Automotive Regulatory System for the 21st Century". Dedicated automatic DRL is one out of 7 priority devices in the road safety domain to be installed in new vehicles in the coming years.<sup>5</sup>

It is also important to remember that, as part of the discussions related to the pedestrian protection directive 2003/102/EC, a voluntary agreement between the Commission and the automobile industry was foreseen, by which the latter undertook among others to equip all

<sup>2</sup> For an overview of existing studies: TNO Human Factors, Daytime Running Lights, Final Report, October 2003, [http://europa.eu.int/comm/transport/roadpublications/projectfiles/drl\\_en.htm](http://europa.eu.int/comm/transport/roadpublications/projectfiles/drl_en.htm). More recently: BAST, Abschätzung möglicher Auswirkungen von Fahren mit Licht am Tag in Deutschland, Bergisch Gladbach 2005.

<sup>3</sup> Koonstra, M.J., Bijleveld, F.D. and Hagenzieker, M.P., The safety effects of daytime running lights. R-97-36. SWOV Institute for Road Safety Research, Leidschendam 1997.

<sup>4</sup> Conspicuity: the fact of being obvious to the eye or mind or attracting attention.

<sup>5</sup> CARS21 : Final Report, December 2005. The final report is available on the website of DG Enterprise: <http://europa.eu.int/comm/enterprise/automotive/pagesbackground/competitiveness/cars21.htm>

future vehicles with dedicated automatic DRL with a view to improve pedestrian protection. At that time, there were still some doubts concerning the exact impact of this measure on vulnerable road users, and therefore the DRL issue was not pursued further.

## 2.2. EXPERIENCE WITH DAYTIME RUNNING LIGHTS

In countries that already have DRL legislation, it was found that the opposition against DRL greatly subsided and that acceptance levels were generally high after its implementation. This can be said of experiences made in Denmark, Sweden, Norway and Canada.

For the time being, **Canada** is the only country requiring the installation of DRL as mandatory equipment in all vehicles. A Canadian study comparing 1990 model year vehicles (the first ones to be required to have DRLs) with 1989 vehicles estimated a **statistically significant 11% reduction** in daytime multiple-vehicle crashes other than rear-end impacts.<sup>6</sup>

Other countries, such as Austria, the Czech Republic, Denmark, Hungary, Italy, Finland and Sweden, as well as Norway and Israel ask the drivers of vehicles to turn on their headlights during day time. The situation is as follows for the EU Member States concerned:

Country	DRL Where?	DRL When?
Denmark	All roads	All year
Estonia	All roads	All year
Finland	All roads	All year
Italy	Motorways and out of urban roads	All year
Latvia	All roads	All year
Lithuania	All roads	November - March
Austria	All roads	All year
Poland	All roads	October - February
Portugal	Indicated roads	All year
Sweden	All roads	All year
Slovakia	All roads	October - March
Slovenia	All roads	All year
Czech Republic	All roads	All year
Hungary	Out-of urban roads	All year

Furthermore, some Member States recommend the use of light during daylight without mandating them while waiting for harmonised European legislation.

It can be said that **non-binding recommendations on DRL have only a mixed success**. A case in point is **France**. A French report<sup>7</sup> of the year 2000 concluded that the implementation strategy with the largest acceptance level in France would be a technical measure, where dedicated DRL with an intensity somewhere between dipped headlights and parking lights are switched on and off automatically. The Dutch authorities also favour automatic dedicated DRL, and consider the light sensitive switch for dipped headlights to be a sensible option.

<sup>6</sup> Aurora, H., et al.: Effectiveness of daytime running lights in Canada. TP 12298 (E). Transport Canada. Ottawa, 1994

<sup>7</sup> Robert, C.: La question de l'allumage des feux de croisement de jour. Rapport pour le Ministre de l'équipement, des transports et du logement. Conseil Général des Fonts et Chaussées (CGPC), Paris 2000.

Technical specifications for automatic dedicated DRL on new cars have already been established through the European UN/ECE-87 regulations for daytime running light.

### 2.3. RESULTS OF A COMMISSION STUDY

In 2003, the Commission services requested a study so as to gain conclusive evidence on the costs and benefits of implementation of DRL,<sup>8</sup> with the following objectives:

- to assess the effectiveness of the currently legislated requirements for the use of DRL in the EU and elsewhere, and how that legislation has been implemented in these countries.
- to assess the various evaluations and make specific cost-effectiveness recommendations for the introduction of DRL, taking into account the various positive and possible negative road safety impacts (casualty reduction ranges for various types of road users) and environmental impacts (increased fuel consumption and CO<sub>2</sub> production).
- to produce various implementation strategies for DRL in the EU, as well as further specific recommendations for implementation maximising the positive effects, while minimising the negative effects.

The study concluded that the use of DRL reduces the number of multi-party daytime accidents for cars by between 5-15%. All studies that have evaluated the effects of using DRL for cars have found a reduction of the number of accidents, but the size of the estimated reduction varies from one study to another. The benefits of DRL are greater for fatal accidents than for injury accidents and are likely to be greater at latitudes further away from the Equator than at latitudes close to the Equator.

It is likely that **DRL has a favourable effect on accidents involving pedestrians, cyclists or motorcyclists**. In fact, the main gain to be obtained from cars using DRL is not counteracted by any possible negative effect to more vulnerable road users. Pedestrians will see cars with DRL sooner than without. Motorcyclists will see cars with DRL and will be able to avoid a collision.

Contrary to widespread fears, the fact that cars are using DRL does not seem to diminish the effect of any motorcyclist's DRL. There have been numerous experiments under laboratory conditions and field experiments which corroborate that finding (*see* also under 3.3).

### 2.4. OPTIONS FOR IMPLEMENTATION

Based on the experience of countries which already have DRL legislation and on the attitudes of non-DRL countries, the Commission's services are considering the following five options for implementation:

1. **The use of DRL is required on all motor vehicles from a certain date.** This is a simple behavioural measure, which does not include any new technical standards for vehicles. Drivers are simply required to turn on their dipped-beam headlights at any time. This option is referred to as the "behavioural option", or "option 1".
2. The use of DRL is required by all existing motor vehicles from a certain date. **In addition, new motor vehicles will be required to have an automatic switching-on**

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<sup>8</sup> *See footnote 1.*

**of dipped beam headlights.** This option is referred to as the "behavioural plus low beam option", or "option 2".

3. The use of DRL is required by all motor vehicles from a certain date. **In addition, new cars sold after the same date will be required to have dedicated DRL that are switched on automatically.** This option is referred to as the "behavioural plus automatic dedicated DRL option", or "option 3".
4. New cars sold after a certain date are required to have an **automatic switching-on of dipped-beam headlights.** Cars that do not have automatic DRL **will not be required** to turn on low beam headlights. This policy option is referred to as the "automatic low beam option", or "option 4".
5. New cars sold after a certain date are required to have **dedicated DRL** that are turned on automatically. Cars that do not have dedicated DRL **will not be required to turn** on their dipped beams. This policy option is referred to as the "automatic dedicated DRL option", or "option 5".

A cost-benefit analysis was performed for each of these five policy options for the mandatory use of DRL. The results of these analyses are summarised in the following table.

Benefits and costs	Alternative policy options				
	Behavioural measure	Behavioural + low beam	Behavioural + automatic dedicated	Automatic low beam only	Automatic dedicated only
<b>Benefits (negative amounts denote costs - million Euro, present values)</b>					
Accident reduction	47,076	49,430	49,430	38,355	38,355
Increased pollution	-12,619	-13,250	-10,252	-10,276	-6,371
<b>Total benefit</b>	<b>34,458</b>	<b>36,181</b>	<b>39,178</b>	<b>28,059</b>	<b>31,964</b>
<b>Costs (million Euro, present values)</b>					
Installation of DRL	0	2,728	6,829	2,728	6,829
Fuel consumption	9,014	9,465	7,324	8,630	5,350
Light bulb consumption	8,562	8,990	8,562	8,436	8,436
<b>Total costs</b>	<b>17,576</b>	<b>21,183</b>	<b>22,715</b>	<b>19,794</b>	<b>20,615</b>
<b>Ratio of benefits to costs</b>					
<b>Benefits/cost ratio</b>	<b>1.96</b>	<b>1.71</b>	<b>1.72</b>	<b>1.42</b>	<b>1.55</b>

**For all five options, the benefits are greater than the costs.**

The highest B/C-rate is that of option 1 (1.96), followed by options 2 and 3 (1.71 and 1.72, respectively). The B/C-rates for options 4 and 5 are substantially lower (1.42 and 1.55,

respectively) because both measures apply to new vehicles only and it would take time (up to twelve years) for the entire car park to comply.

With regard to accident reduction, options 2 and 3 score better than option 1: an accident-related cost reduction of €49,430 million for options 2 and 3, versus a reduction of €47,076 million for option 1. This is because the new cars will comply as opposed to a behavioural measure where full compliance is difficult to achieve at all times.

An important issue is the increase of pollution. Option 3 is superior to options 1 and 2 in that its safety benefit is at the highest level and its energy/pollution disadvantage is the lowest for a scheme that requires full fleet compliance (behavioural plus technical solution).

### 3. BASIS AND CONTENT OF POSSIBLE EU LEGISLATION

On the basis of the analysis above, **Option 3 would seem likely to result in the highest acceptance levels and could be the preferable strategy for implementing DRL in the EU:**

*Automatic low-energy consumption dedicated DRL would be requested for new vehicles, accompanied by a measure requesting to turn the dipped headlights on at any time on existing vehicles not equipped with dedicated DRL.*

The introduction of DRL would need to be preceded and accompanied by a large-scale publicity campaign on television, radio, and in the newspapers, emphasizing the importance of contrast in aiding visual perception and the resulting road safety benefits. The campaign should also address the concerns of specific road user groups (e.g. powered two-wheelers).

#### 3.1. TECHNICAL MEASURE: AUTOMATIC DEDICATED DRL

From an environmental point of view, dedicated daytime running lights are the solution to improve visibility and conspicuity of vehicles during daytime that give least cause for concern. Their energy consumption is only 10% of the energy consumption for using existing lighting devices. In the case of using LED (Light Emitting Diode) technology for dedicated DRL, the energy consumption is even less. In order to avoid adverse effects of dedicated DRL, e.g. drivers forget to switch on their normal lights when it becomes dark. it is recommended to build sensors to automatically switch on the appropriate lights. Therefore, a legislative proposal could also advocate automatic dedicated daytime running light to be installed in new vehicles.

UN/ECE regulation 87 provides a standard, which outlines the technical requirements for automatic dedicated daytime running light. This standard could be referred to in a European directive. In particular, this regulation provides for technical requirements against glaring by limiting the maximum light density.

#### 3.2. BEHAVIOURAL MEASURE: DIPPED-BEAM HEADLIGHTS AS DRL

There are two arguments to make mandatory the use of dipped-beam headlights during daytime:

(1) The positive effects of DRL are immediately available without waiting for the renewal of the complete vehicle fleet, which could easily take another 12 to 14 years;

(2) The positive effect in terms of identification<sup>9</sup> of a vehicle becomes fully active when all vehicles are using DRL. As soon as road users see DRL they would identify it as a motor vehicle and adapt their behaviour in consequence. Put another way: the overall effect of DRL maybe diminished if not all vehicles are using some kind of DRL.

All available studies clearly show that the overall benefits of the use of dipped-beam headlights outweigh the costs for this measure.<sup>10</sup> In terms of results, the use of dipped-beam headlights is as good as dedicated daytime running lights. Both solutions do not glare other road users during daylight and both solutions show similar performances with regard to detection and recognition.

### 3.3. ADVERSE EFFECTS ON OTHER ROAD USERS

As already stated above, the Commission's services have found **no significant evidence for adverse effects of DRL on other road users**. Moreover, in the EC, study experiments under laboratory conditions confirmed the findings that there is no evidence that conspicuity of road users in the vicinity of a vehicle with its DRL on would be diminished by such lights. In fact, the evidence pointed in the opposite direction - other road users actually benefiting from the lights being on -, with a small, but measurable effect.

However, some fear that the general use of DRL on all vehicles would **deprive motorcyclists of their current distinctive feature**, as they are already using DRL now. This would worsen the perception of motorcyclists by drivers of other vehicles and thus have negative effects on their safety. **In this generality, the claim cannot be upheld**. It is not borne out by statistics of the countries having introduced general daytime running lights. On the contrary, DRL will help motorcyclists recognising other vehicles and thus contribute to preventing accidents with motorcycle involvement.

In order to further reduce motorcycles accidents, work needs to be done to improve their conspicuity, and there are national and EU research projects studying the issue.

## 4. CONCLUSION

Research indicates that DRL could help saving between 1,200 and 2,000 lives per year on EU roads. From an environmental and technical as well as from a road safety point of view, there is a strong case for moving forward with a technical requirement to equip all vehicles with automatic dedicated daytime running lights.

In order to deploy the positive effects of DRL as quickly and thoroughly as possible, consideration should also be given to a user requirement to use dipped-beam headlights or retrofitted dedicated DRL even without an automatic switch and light sensors.

In order to provide for necessary flexibility, a legislative initiative on DRL could foresee a fixed date for the transposition of the technical requirement to install automatic dedicated

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<sup>9</sup> There are several steps to process information in road traffic. The first step is to detect an object. Detection in visual terms depends among other parameters on the contrast of an object. DRL increases the contrast of vehicles. If all vehicles are using DRL, it becomes not only a means of better detecting an object but also of better identifying this object as a vehicle.

<sup>10</sup> See footnote 1.

DRL on new vehicles and an appropriate period of time to transpose the user requirement for existing vehicles.

## 5. EXEMPTIONS

Since historic vehicles form only a very small part of the vehicle population and they do not primarily serve transport purposes, they might be exempted from any eventual DRL requirement. For reasons of subsidiarity, it might be convenient to leave the definition of an "historic vehicle" to the Member States, who generally have one for tax purposes (vehicles around 25 years old). From a purely technical point of view, in any case vehicles built before 1970 should be excluded from a possible directive.

## 6. CALL FOR COMMENTS

Interested parties are asked to comment on the approach outlined above. The Commission's services would especially welcome answers to the following question:

1. Is the approach of a technical requirement to equip all vehicles with automatic dedicated daytime running lights, coupled with a user requirement to use dipped beam headlights or retrofitted dedicated DRL the correct one, or should other alternatives be considered?
2. Should there be specific rules concerning motorcycles, e.g. a different colour of light for them?
3. Do you have any other comments or questions?

Comments should be sent to **not later than Friday, 17 November 2006** to the following address:

European Commission  
Directorate General for Energy and Transport  
Road Safety Unit  
"DRL"  
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Fax: (322)2965196

The Commission will publish the comments received.

The Commission also intends to hold a meeting with all stakeholders in Brussels after the end of the consultation period.

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