MOTOR VEHICLE LIGHTING COUNCIL

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Participating Companies
Automotive Lighting Corporation
Guide Corporation
Hella Lighting Corporation
II Stanley Co., Inc.
North American Lighting, Inc.
Valeo Sylvania
Visteon Corporation

The Honorable Dr. Jeffrey Runge
Administrator
National Highway Traffic Safety Administration
400 Seventh Street, S.W.
Washington, D.C. 20590

Re: Motor Vehicle Lighting Council Comments on NHTSA Request for Comments; Notice Docket No. NHTSA-02-13957, Notice 1; Glare from Headlamps and Other Front-Mounted Lamps: Adaptive Frontal-lighting Systems Federal Motor Vehicle Safety Standard No. 108; Lamps, Reflective Devices, and Associated Equipment

Dear Dr. Runge:

The Motor Vehicle Lighting Council (manufacturers of automotive lighting products for the motoring industry: Valeo Sylvania, Hella, Automotive Lighting, North American Lighting, Guide Corporation, I.I. Stanley, and Visteon) hereby submits comments on the above-identified Notice; Request for Comments. We are aware of the introduction of AFS systems into the U.S. market and of NHTSA's concern with the introduction of such systems. The Motor Vehicle Lighting Council supports NHTSA's efforts to address the concerns of the public and protect their safety. We are willing to cooperate in tangible ways to find equitable solutions that will meet the needs of the motorists, government, and industry.

In this response, we are commenting on only those questions that relate to vehicle lamp manufacturers. Responses are not provided to questions that are more specific to vehicle manufacturers or actual vehicle drivers. Wherever possible we have referenced known studies from industry or research organizations. The accumulation of road miles on AFS is limited and involved a variety of equipment and driving situations. Because no members have production experience to date, our responses are based primarily on experience with development systems and our own knowledge and observations made by a limited number of persons who participated in night-drives. As this technology matures, actual road data is accumulated and additional research studies are conducted, it is expected that preferred systems will emerge and improvements will be made in the systems and the supporting regulations.

The Motor Vehicle Lighting Council believes adaptive forward lighting systems have many benefits with the potential to significantly improve the safety and comfort of nighttime driving. A key aspect to achieving these potential benefits is the proper application and implementation of this or any new technology. To ensure the proper use of AFS the Motor Vehicle Lighting Council recognizes, supports and participates in the work of SAE and other industry organizations such as GTB and IEC, in addition to the work of research organizations such as UMTRI and TLA.

Summary of Recommendations: By way of summary, the Motor Vehicle Lighting Council believes that the following are important points to be considered when weighing the regulatory impact of AFS:

1. The glare requirements specified in the various photometric tables of FMVSS108 are effective and suitable to regulate AFS performance.
2. There need not be a limit to total luminous flux for AFS.
3. Revisions to FMVSS 108 to remove potential barriers to AFS systems should be enacted.

RESPONSE TO NHTSA's QUESTIONS

Question #8: Have manufacturers evaluated prototype AFS-equipped vehicles at night to determine whether changes in the intensity and direction of illumination may cause misdirection of any driver's gaze toward the newly lighted or intensified areas, or away from objects that are still important for driving safety? Please describe the evaluations and provide copies if available.

Response: There have been extensive evaluations over the past three years. All of the member companies have had vehicles with various systems installed. Many thousands of miles have been accumulated. The overwhelming response of drivers has been that there has been a significant visibility improvement over non-AFS equipped vehicles. The reason for the improvement is due to the beam pattern being maintained on the road surface. This keeps the driver's eye directed in the appropriate areas. Moreover, the movement of the beam pattern may permit the driver to avoid objects on the road that could not be detected otherwise.

Question #9: Do moving beams (from bending light or the increase or decrease in intensity) either increase or decrease the level of driver fatigue compared to non-AFS lighting? Please provide all available research information about the issue.

Response: There are no specific studies that were conducted addressing driver fatigue. However, evaluations revealed that drivers, in general, reported greater comfort while driving an AFS system over conventional lighting systems. The reduced mental fatigue was attributed to better road illumination where it was required. These findings are supported by multiple industry papers including: SAE paper 2001-01-0299 presented by Automotive Lighting and the UMTRI research report number 2002-3 (Driving Performance with and Preference for HID Headlamps).

It is, thus, conjectured that AFS with its bending light would provide similar or greater benefits due to its intended function of providing illumination in the direction of the vehicle trajectory rather than in the direction of the axis of the vehicle.

Question #10: Have vehicle manufacturers evaluated prototype AFS-equipped vehicles at night as occupants of other vehicles to evaluate the potential glare from AFS? If so, please describe the evaluation and the results. Are there other assessment methods used to assess the glare from the AFS before vehicle manufacturers commit to a particular AFS design? Please provide the results of all alternative assessments conducted for AFS.

Response: Not applicable.

Question #11: What assessment is made of potential glare from AFS at points in the beam pattern that are currently unregulated?

Response: An assessment of current beam pattern regulations from FMVSS 108 show that there are test points which address the area of concern for on-coming driver's eyes (glare). This is

confirmed by the study conducted by Damasky (Hella) in 1995. The relevant test points in the U.S. beam pattern are: ½ U-1 ½ L to L and 1 U-1 ½ L to L.

Question #12: Are there any current lamp or vehicle manufacturer corporate design guidelines for AFS that deal with unregulated points in the beam pattern? If so, please indicate what those guidelines are and explain why the manufacturer believes they are appropriate.

Response: From a safety perspective, it is felt that there are no missing points in the beam pattern. As lamp manufacturers we design to exceed FMVSS regulations and SAE recommended practices.

Question #13: To what extent do lamp and vehicle manufacturers consider the reports and work by the Society of Automotive Engineers and other non-governmental bodies on the subject of glare in designing the performance of AFS on their vehicles? In answering this question, manufacturers are asked to provide a list of the reports, papers and data that they found useful in establishing design guidelines. Please provide specific examples of internal glare limits that have been adopted as a result of those references.

Response: Member companies actively participate in SAE, GTB, IEC, UMTRI, TLA and other relevant industry organizations. Continuing work in this area includes:

- Mounting Height Study by SAE
- SAE Coated Bulb Taskforce
- SAE J2591AFS Recommended Practice
- Various glare studies by UMTRI & TLA

Question #14: While we are aware of many studies to demonstrate and promote the efficacy of AFS, we are not aware of a single study that has been done on the effects on other drivers facing AFS-equipped vehicles or on drivers using AFS-equipped vehicles. Please identify any such studies.

Response: UMTRI research report 2002-2 (The Appearance of Bending Light from Other Vehicles), February 2002, addresses this concern. In addition to this, there have been numerous studies conducted by the AFS Working Group in Europe. These studies conclude that there are no adverse effects to on-coming drivers. Observers demonstrated a limited ability to distinguish bending light from fixed light.

Question #15: Has glare been studied specifically for younger and older drivers facing or preceding the various modes of AFS operation on vehicles? If so, please list the studies.

Response: Age related effects in automotive lighting are documented, particularly in NHTSA research document, DOTHS808 452. We have seen no unusual effects with AFS systems in

regards to age. However, we would anticipate that older drivers would benefit the most from an AFS system due to the feeling of safety and confidence gained from having illumination directed in the line of the vehicle trajectory.

Question #16: Has diminished recognition of presence, or the perception of distance or closure rate to an oncoming AFS vehicle ever been studied? If so, please list the studies and findings.

Response: Per the previously cited UMTRI study on "The Appearance of Bending Light from Other Vehicles" observers noted no significant difference from conventional lighting systems. In addition, other signal and marking lights are maintained which also provide a consistent visual reference of the vehicle.

Question #17: What fail-safe features for each possible mode of AFS operation have been developed and studied that will prevent glare to oncoming and preceding drivers? Please describe them.

Response: It is felt that fail-safe features for AFS modes, while possible, are not necessary. The nature of the beam pattern would not generate disability glare even if fixed in its maximum actuated positions. We support the recommendation identified in SAE J2591 that the driver should receive some indication in case of a system malfunction. In addition, automatic leveling systems, when present, could mitigate potentially glaring situations by lowering the aim of a failed module.

Question #18: What fail-safe features for each possible mode of AFS operation have been developed and studied that will prevent no greater risk to the driver using it than when non-AFS headlighting fails?

Response: See response to Question #17. Note that failure modes for AFS systems are no more disabling than for non-AFS systems and provide at least minimal visual performance that is necessary to see and to be seen until repairs can be performed.

Question #19: What studies have been done to demonstrate whether AFS adds safety value? What value is that and how was it measured? Please identify and provide the findings of such studies.

Response: Multiple studies have been done regarding the safety benefits of AFS systems. These studies identify improvements in visibility of roadside objects and pedestrians, reduced driver fatigue, improved roadway discrimination, and a feeling of safety. These studies include: SAE 2001-01-0299, SAE 2001-01-0526, UMTRI 99-21.

Question #20: What are the anticipated incremental costs of adding the various designs of AFS

features to halogen headlighting systems?

Response: The extra costs can vary considerably depending on what features are realized and how.

Question #21: What are the anticipated incremental costs of adding the various designs of AFS features to high intensity discharge headlighting systems?

Response: The extra costs can vary considerably depending on what features are realized and how.

Question #22: What are the anticipated incremental costs of adding the various designs of AFS features to light emitting diode headlighting systems?

Response: The extra costs can vary considerably depending on what features are realized and how.

Question #23: Presumably, the added illumination in curves is intended to reduce the risk of a crash. However, because most crashes are on straight roads (because of the predominance of straight roads), how does the presumed incremental benefit compare to the added cost of AFS? Does the incremental benefit outweigh the potential for additional glare to oncoming or preceding drivers in a curve or intersections or during an AFS failure? Why?

Response: While crash avoidance is a significant aspect of AFS, the real benefits are realized from improved visibility and reduced driver fatigue. While the majority of roads are straight, any driving trip includes many turns. The potential benefit of AFS is not limited to curving roads but provides benefits in any situation in which the vehicle turns (e.g., at intersections, on / off ramps, parking lots, subdivisions, etc.). While a full study of the safety aspects of AFS would not be possible until there are a large number of AFS systems on the road, the preliminary indications suggest that there would be a net benefit to the consumer. The glare aspect does not result in a significant negative consequence since there is no potentially disabling glare (refer to response to Question #11).

Question #24: Should AFS designs be incorporated as separate, regulated lighting systems that operate independently of the primary headlighting system?

Response: We support a removal of current barriers in FMVSS108 that prevent some of the features of a full AFS. While we understand that current regulations would permit the basic forms of AFS, minor revisions to FMVSS108 would provide clarity for the industry and potentially with State authorities. This should be an extension of current lighting regulations to add AFS as an optional feature. See response to Question #28.

Question #25: Given that known AFS prototype designs are intended to use more headlamp replaceable light sources than currently permitted, should AFS headlamps be limited in total luminous flux?

Response: There should not be a limit to total luminous flux. Regardless of the number of light sources, current regulations limit glare, maximum intensity at specific points, and an overall maximum intensity. It is known that additional luminous flux in the beam pattern is desirable. Reference UMTRI 99-36, "Subjective and Objective Aspects of Headlamp Glare: Effects of Size and Spectral Power Distribution."

Question #26: Should AFS headlamps have unlimited luminous flux if automatic headlamp leveling and cleaning are incorporated, as currently mandated in Europe for headlamps that have light sources that are rated at 2000 lumen or more?

Response: Regarding luminous flux, please refer to previous response to Question #25. Also note that while automatic headlamp cleaning reduces glare, automatic headlamp leveling has significantly greater effect in controlling glare regardless of lamp or light source type.

Question #27: What is the feasibility of reducing the intensity of AFS lamps during low speed, dense traffic, or high ambient illumination conditions? Please describe how this might be accomplished.

Response: It is feasible to reduce the intensity of the AFS system during the conditions described. Member companies are investigating many approaches, including modulation of light sources and movement of lighting elements tied to vehicle sensors and electronic controls. In the case of systems using high-intensity discharge light sources, intensity reduction would be difficult but leveling down could be an alternative. Additional study is required to develop preferred methods.

Question #28: Are there requirements in Standard No. 108 that are barriers to the implementation of AFS? If there are barriers, in accordance with the published lighting policy of the agency (see NHTSA docket 98-481), what data exist showing safety benefits to justify amending the Standard to permit AFS?

Response: It is possible within the current Standard No. 108 to implement an AFS system. There are limitations, however, in 108 that prevent certain solutions:

- Under replaceable bulb headlamps there is a restriction on the number of light sources within a single unit.
- Under the integral beam specifications there is a limitation on the way the light sources can be used.
- There are aiming restrictions that prevent low beam and high beam from being independently aimed.

- Paragraph S7.6.1 requires symmetrical illuminated lens area, which restricts the use of beam contributing elements.

Question #29: Should AFS be mandatory? What data exists showing safety benefits to justify amending the Standard to require AFS? If not mandatory, why not?

Response: While we feel there are significant benefits for AFS systems, it is premature to make it mandatory.

Question #30: Should AFS be permitted as a replacement for non-AFS headlighting systems? If so, why, and what safeguards are necessary beyond that necessary for new OEM installations? If not, why not?

Response: An AFS system offers many positive benefits; however, since there is typically a high level of vehicle integration required for implementing an AFS, optimal performance is based on proper vehicle installation. There may be challenges to an after-market installation.

The member companies of the Motor Vehicle Lighting Council appreciate this opportunity to share our knowledge of and experience with AFS. These systems potentially offer significant benefits to both drivers and pedestrians. Nonetheless, the Motor Vehicle Lighting Council believes that the following are important points to be considered when weighing the regulatory impact of AFS:

1. The glare requirements specified in the various photometric tables of FMVSS108 are effective and suitable to regulate AFS performance.
2. There need not be a limit to total luminous flux for AFS.
3. Revisions to FMVSS 108 to remove potential barriers to AFS systems should be enacted.

Thank you for your thoughtful consideration of these comments.