

# Regulatory Report

## The Evolution of Lighting Regulations Worldwide

Published 25<sup>th</sup> June 2019



Published by Driving Vision News · 3 rue Daumier · 75016 Paris · France  
T: +33 (0)1 55 60 18 25 · F: +33 (0)1 55 60 18 39 · [DrivingVisionNews.com](http://DrivingVisionNews.com)

# Table of Contents

About the Author & Author's Foreword. ....	4
Executive Summary. ....	5
Introduction .....	6
<b>The United Nations Economic Commission for Europe. ....</b>	<b>7</b>
• UNECE Inland Transport Committee. ....	7
• UNECE Global Forum for Road Traffic Safety (WP.1). ....	7
• UNECE World Forum (WP.29) .....	8
• Working Party on Lighting and Light-Signalling (GRE). ....	9
• GRE—How it is transforming. ....	9
• Working Party on Autonomous Vehicles (GRVA). ....	10
• GRVA—Its Role in Relation to GRE .....	10
<b>The UNECE Agreements and who applies them .....</b>	<b>11</b>
• The 1958 Agreement (Reciprocal Recognition of Approvals).....	11
• The 1998 Agreement (Global Technical Requirements).....	12
• The UN Lighting and Light Signalling Regulations.....	12
• Database for the Exchange of Type Approval documentation.....	13
• Versions of a UN Regulation.....	14
• International Whole-Vehicle Type Approval.....	14
• List of applicable UN Lighting and Light Signalling Regulations. ....	15
<b>Evolution of the regulatory approach in the major economic regions</b>	<b>16</b>
• Canada .....	16
• China—The GB Standards .....	17
- The role of SAC/TC114/SC21 .....	17
- Current Development of the GB Standards .....	19
- GB Recommended Standards Planned for 2017-2020 .....	20
• The European Union .....	20
• India .....	21
• Japan. ....	22
• South Korea. ....	23
• The Korea Internationalization Centre for Automobile Regulations. ....	23
• The USA .....	25

## Table of Contents (Continued)

<b>Simplification of Regulatory Systems</b> .....	34
• The UN Lighting, Light-Signalling and light-Source Regulations. ....	34
• New UN Regulations set to take force in October 2019. ....	33
• Overview of the work of the GRE Simplification Working Group. ....	35
• Simplification of the UN Light Source Regulations.....	43
• Simplification of the Chinese GB Standards. ....	50
<b>Standardisation versus Regulation and how they coexist</b> .....	51
• The Need for Global Technical Regulations.....	52
• Special Regulatory Session at the DVN 2018 Japan Workshop.....	53
<b>Priorities for Traffic Safety—Innovation needs good Regulation</b> .....	62
<b>Major Issues under consideration</b> .....	63
• Glare and Visibility.....	64
• Issues identified for study in recent GTB and DVN Forums.....	65
<b>The role of the NGO in GRE</b> .....	66
• GTB's special role in GRE.....	69
• GTB—Mission, History and Organisation.....	69
• The GTB Strategy Working Group .....	73
<b>Thoughts on the whole process of regulation</b> .....	73
<b>Conclusion</b> .....	75
<b>Annexes</b> .....	76
• Annex 1 Articles by Daniel Stern, originally published by DVN in 2013 and 2016 .....	76
• Annex 2 An interview with KICAS Director Mr. Jae-Wan Lee .....	84
DVN Gold Members.....	88
DVN Reports.....	89

## About the Author

Geoffrey Draper retired in 2009 after a 47-year career in the vehicle lighting industry in product design, manufacturing, project management, marketing, and senior management. His working life started as an apprentice with Lucas, and after qualifying as a mechanical engineer he worked for Lucas Lighting UK, Carello UK, Magneti Marelli in Italy, and finally as Technical Director of Koito Europe, based in Belgium.

In addition to his mainstream roles, Geoff developed an interest in international regulatory harmonisation and in 1989 he was elected chairman of the GTB Harmonisation Working Group. Subsequently he led the GTB Front Lighting Group, CIE TC-4-45, and the SAE Pedestrian Visibility Task Force.

Now in his 11<sup>th</sup> year as GTB President, Geoff is also a member of the ISAL Steering Board (Germany), Honorary President of the ALE Forum (China), Member of the IFAL Advisory Board (China), and was named DVN Personality of the Year in 2017.



## Author's Foreword

I am honoured by the invitation from DVN to produce this report on a subject that, 10 years ago, was confined to the domain of specialists in the certification and approvals departments of vehicle manufacturers and their equipment suppliers. Now regulation is high on the list of priorities of the development engineers who understand the importance of removing barriers to innovation. This report is the latest in a series of DVN reports on the subject; previous ones have been published in [2016](#) and [2011](#). This new report provides an update on the changes in attitude to regulation, what differentiates it from standardisation, and how changes are underway around the world.

I have extensively referred to and included information on the UNECE website, which also offers the "[blue book](#)", an excellent backgrounder publication to quickly get up to speed on how the UN vehicle regulatory system works and how a country can join it. And I have received support from many friends in our global lighting community—I am particularly grateful for the friendly cooperation of our Chinese colleagues at CATARC and SMVIC, Indian colleagues at ARAI and ACMA, Japanese colleagues at JASIC, and Korean colleagues at KATRI and KICAS.

In the final section I have taken the opportunity to offer my personal thoughts on the whole process of regulation. Innovation needs good regulation to thrive commercially, and I hope my remarks stimulate further discussion.

Finally, I thank DVN President Hector Fratty for his advice and support, and DVN Chief Editor Daniel Stern for his usual thorough scrutiny and final editing of my draft.

## Executive Summary

The past 10 years have brought a major shift in attitude and approach to vehicle lighting regulation and this has been the result of intense pressure to facilitate innovation offering significant improvements in road safety. Regulation was long considered as something of a necessary evil, best left to specialists in the certification-and-approval departments of vehicle manufacturers and their equipment suppliers, but now it is high on the priority list of development engineers who understand that good innovation depends upon good regulation to succeed commercially.

There has also been a notable change in attitude toward the effects of regulatory approach and policy upon trade. National regulations were focused on development and protection of markets, with technical provisions justified as being necessary due to local conditions. But as international trade in motor vehicles increases, a patchwork of national technical requirements impedes the process of harmonisation necessary for the successful negotiation of international trade deals. This report aims to describe changes in attitude toward regulation, its differentiation from standardisation, and the changes underway around the world. There is a clear distinction between the development of global technical requirements and the politics of how they can be implemented into national regulation. It is important to understand the implications and the actions that industry needs to implement if we are to avoid barriers to beneficial innovations widely, practically, and affordably reaching the world's roads.

This report focuses on the main issues facing global harmonisation and synchronisation of the technical requirements. It also details the changes underway in the UNECE, the EU, China, Korea, and the USA and introduces new topics such as the lighting requirements of AVs (autonomous vehicles).

The final section of the report provides the author's thoughts on the whole process of regulation from the standpoint of innovation requiring good regulation in order to succeed, with the aim of prompting further discussion. The latest news from GRE concerning the question of lighting for autonomous vehicles is included.

## Introduction

Around the world, attitudes are changing toward regulation and standardisation, but the path between better regulatory ideas and better regulations in force is an uphill climb; there is a clear distinction between the development of global technical requirements and the politics of how they can be implemented into national regulation. It is important to understand the implications and the actions that industry needs to implement if we are to avoid barriers to beneficial innovation.

Previous DVN Reports published in [2016](#) and [2011](#) have provided details of the regulatory approaches of the world's major administrations. Most of that information remains valid, so it is not repeated here. However, Annex 1 contains a series of articles by Daniel Stern, originally published in 2013 and 2016. These provide good insight into the status of the discussion regarding regulatory harmonisation as it was six and then three years ago. It is interesting to note that considerable progress has been made with the exception of the United States of America; that country remains shackled to its outdated national regulation, Federal Motor Vehicle Safety Standard 108.

This report focuses on the current status of the main issues facing global harmonisation and synchronisation of the technical requirements. It also details the changes underway in the UNECE, the EU, China, Korea, and USA and introduces new topics such as the lighting requirements of autonomous vehicles. In building this report I visited with Indian colleagues in ARAI and ACMA, Korean colleagues of KATRI and KICAS, and Chinese colleagues of CATARC and SMVIC to understand how their national regulations are evolving.

Specific technical requirements and protocols of the various regulatory systems are outside the scope of this report; various DVN Reports and other sources of information cover that aspect of the topic.

Finally, as the International Automotive Lighting and Light-Signalling Expert Group (GTB) provide unique support to the whole process of global regulation as an NGO (non-governmental organisation) with Special Advisory Status at ECOSOC (the UN Economic and Social Council), information is provided to explain how GTB is evolving to meet the future challenges faced by regulators and industry.

Throughout this report, clickable hyperlinks are provided for more information about specific topics. As above on this page, they appear in blue boldface underlined type.

# The United Nations Economic Commission for Europe

## The forum for the development of global lighting and light-signalling technical requirements and their administration

The UNECE (United Nations Economic Commission for Europe) is one of the five United Nations regional commissions, administered by the ECOSOC (Economic and Social Council). It was established in 1947 with the mandate to help rebuild Europe after World War II, develop economic activity, and strengthen economic relations both amongst European countries and between Europe and the rest of the world. During the Cold War, UNECE served as a unique forum for economic dialogue and cooperation between East and West. Despite the complexity of this period significant achievements were made, with consensus reached on numerous harmonisation and standardisation agreements.

Today UNECE supports its 56 member states in Europe, Central Asia, and North America in the implementation of the 2030 Agenda for Sustainable Development with its SDGs (Sustainable Development Goals). UNECE provides a multilateral platform for policy dialogue, the development of international legal instruments, norms and standards, the exchange of best practices and economic and technical expertise, as well as technical cooperation for countries with economies in transition. Many of the norms, standards, and conventions developed in UNECE are used worldwide, and a number of countries from outside the region participate in UNECE's work.

### UNECE Inland Transport Committee

The [ITC](#) (Inland Transport Committee) is the highest policy-making body of the UNECE in the field of transport. Over the last 72 years, together with its subsidiary bodies, the ITC has provided an intergovernmental forum where UNECE and other United Nations member states come together to forge tools for economic cooperation and negotiate and adopt international legal instruments on inland transport. These legal instruments are considered indispensable for developing efficient, harmonised and integrated, safe and sustainable inland transport systems

### UNECE Global Forum for Road Traffic Safety ([WP.1](#))

The UNECE pioneered road safety activities in the United Nations system with the establishment of an Ad Hoc Working Group on the prevention of road accidents in 1950. In 1988, the Working Party on Road Traffic Safety (WP.1), an intergovernmental body, was established. In 2017 its name was changed to Global Forum for Road Traffic Safety (WP.1).

Today the Global Forum for Road Traffic Safety remains the only permanent body in the United Nations system that focuses on improving road safety. Its primary function is to serve as guardian of the United Nations [legal instruments](#) aimed at harmonising traffic rules. The Conventions on Road Traffic and on Roads Signs and Signals of 1968 and other UNECE legal instruments that address the main factors of road accidents (road user behaviour, vehicles, and infrastructure) are tangible contributors to improved road safety. Many countries across the world have become Contracting Parties to these legal instruments and benefit from their implementation. These Contracting Parties are also the key driving forces keeping these international road safety conventions up to date. The UNECE also supports the development and promotion of best road safety practices and the organisation of road safety weeks and other awareness-raising events.

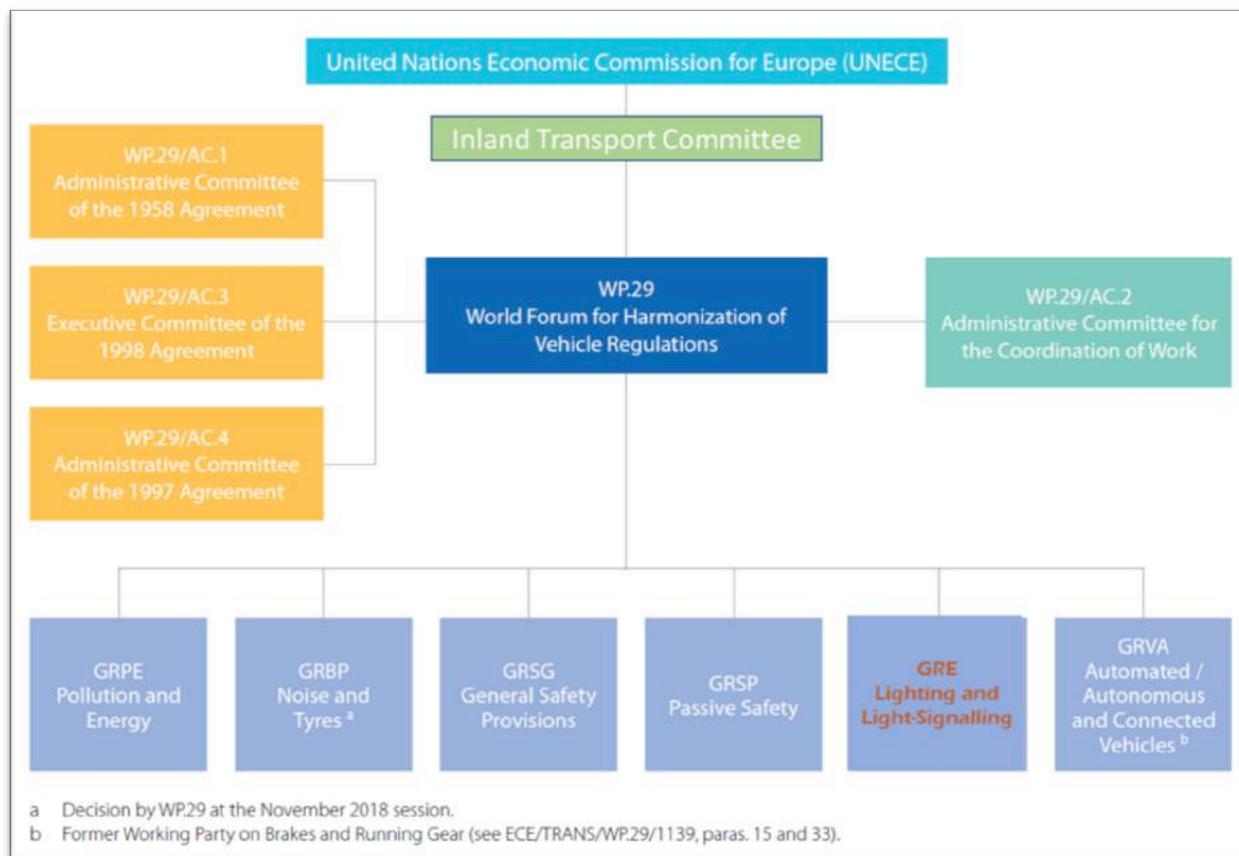
Participation in the Global Forum for Road Traffic Safety (WP.1) is open to all countries across the world. Typically WP.1 meets twice a year in Geneva, Switzerland.

In 2010, WP.1 celebrated 60 years of road safety initiatives in the United Nations system. This coincided with the Decade of Action for Road Safety proclaimed by the United Nations General Assembly Resolution 64/255. Since 2010, UNECE has contributed by participating in the development and implementation of the Decade's Action Plan.

In 2012, the Inland Transport Committee (WP.1's parent body) adopted the UNECE Action Plan for the UN Decade of Action for Road Safety 2011-2020 ([download PDF](#)). The UNECE Action Plan is directly aligned to the Decade's Action Plan and aims to achieve the UNECE's overall road safety goals by addressing priority areas of work as well as implementing continuous and future actions for each goal in its geographical area and beyond. It includes actions, initiatives, and measures for several UNECE Working Parties, with Global Forum for Road Traffic Safety being the main coordinating entity in the area of road safety.

### UNECE World Forum for Harmonization of Vehicle Regulations ([WP.29](#))

The UNECE World Forum for Harmonization of Vehicle Regulations (WP.29) is the only global forum in which relevant stakeholders from the lighting world are participating to harmonise vehicle regulations and rules on vehicle performance and on vehicle parts and equipment, vehicle safety, environmental pollution, energy efficiency, anti-theft and security. For a detailed presentation of the work of WP.29, please download the [blue book](#).



Three UN Agreements adopted in 1958, 1997, and 1998 provide a legal framework allowing Contracting Parties to establish internationally harmonised regulatory instruments concerning the approval of motor vehicles, their equipment and parts, and rules for technical inspections of vehicles in use. The regulatory framework developed by the World Forum allows broad, large-scale commercialisation of innovative vehicle technologies while continually improving global vehicle safety, energy efficiency and environmental performance.

Countries joining the World Forum benefit from a global platform wherein state-of-the-art technical regulations are regularly discussed and adopted, reducing the administrative burden for contracting parties, and offering harmonised technical specifications for faster deployment of vehicle technologies aiming at achieving sustainable mobility.

Under the aegis of WP.29 are six Working Parties (GRs, for "Groupe des Rapporteurs"), two of which are directly relevant to vehicle lighting.

### Working Party on Lighting and Light-Signalling ([GRE](#))

The GRE (Working Party on Lighting and Light-Signalling) is the subsidiary body of the World Forum for Harmonization of Vehicle Regulations (WP.29) that prepares regulatory proposals on active safety to WP.29, specifically regarding vehicle lights, signals, and reflectors. This group of experts conducts research and analysis to develop lighting requirements for vehicles.

GRE convenes officially twice a year and entrusts informal groups with specific problems that need to be solved urgently or that require special expertise. More than 80 experts participate at the sessions of GRE.

The Working Party is open to the governmental experts from any member country of the United Nations, and to any regional economic integration organisation set up by member countries of the United Nations, and to experts of governmental organisations. Experts of non-governmental organisations (NGOs) may participate in a consultative capacity. Final decisions are taken by government representatives by vote at the World Forum WP.29 level.

The work of GRE experts is transparent: All agendas, working documents and reports are openly [accessible](#) on the internet.

### GRE—How it is transforming

GRE held their first meeting in July 1977. By this time GTB had been operating as the expert group in Geneva since 1952 and had been responsible for drafting all of the lighting and light-signalling regulations adopted. With the creation of GRE, GTB continued to develop and draft the text of the regulations and the presence of GTB was considered to be a substitute for the "informal working groups" that operated in the other WP.29 GRs. This continued until 2014 when it was concluded that GRE should follow the convention of the other GRs and carry out the study of major topics through the establishment of GRE Informal Working Groups. It was recognised that GTB could not represent all of the stakeholders present in GRE. This approach was implemented with the launch of the GRE Informal Working Group on Simplification of the Lighting Regulations

(GRE IWG-SLR) with Belgium and the European Commission providing the chair and co-chair, and GTB providing the secretariat.

The GRE IWG-SLR has been a major success and, apart from providing the secretariat, GTB continues to provide the major part of the technical input supported by its internal global working group structure.

GRE is now focusing on the need to provide technical requirements for both type-approval systems (UNECE 1958 Agreement) and self-certification systems (UNECE 1998 Agreement) and are also studying the future lighting and signalling needs of automated driving.

## Working Party on Automated/Autonomous and Connected Vehicles ([GRVA](#))

At its February 2018 session, the ITC acknowledged the importance of WP.29's activities related to automated, autonomous, and connected vehicles and asked WP.29 to consider establishing a dedicated subsidiary Working Party (Groupe de Rapporteurs - GR).

Following this request, WP.29 at its June 2018 session decided to convert the Working Party on Brakes and Running Gear (GRRF) into a new Working Party on Automated/Autonomous and Connected Vehicles (GRVA). The current priorities of GRVA include:

- Safety and security of vehicle automation and connectivity:
- Framework
- Functional requirements
- New assessments and test methods
- Cybersecurity (and software updates)
- Data Storage System for Automated Driving
- Automated Driver Assistance Systems (ADAS):
  - Remote control manoeuvring
  - Automatically commanded steering systems
  - Dynamics (Steering, Braking etc.):
  - Advance Emergency Braking Systems
  - Anti-lock Braking System for motorcycles
  - Electronic Stability Control

## GRVA's role in relation to GRE

GRVA concentrates on developing principles and guidelines governing automated and autonomous vehicles, especially their safety. In the case of lighting and light-signalling, GRVA considers its interaction with the operation and safety of autonomous vehicles and will report to WP.29 with recommended actions. If WP.29 supports these proposals it will delegate the detailed work to GRE. As for all the WP.29 GRs, GRE has no direct accountability to GRVA; all GRs are directly accountable to WP.29.

# The UNECE Agreements and Who Applies Them

## The 1958 Agreement (Reciprocal Recognition of Approvals)

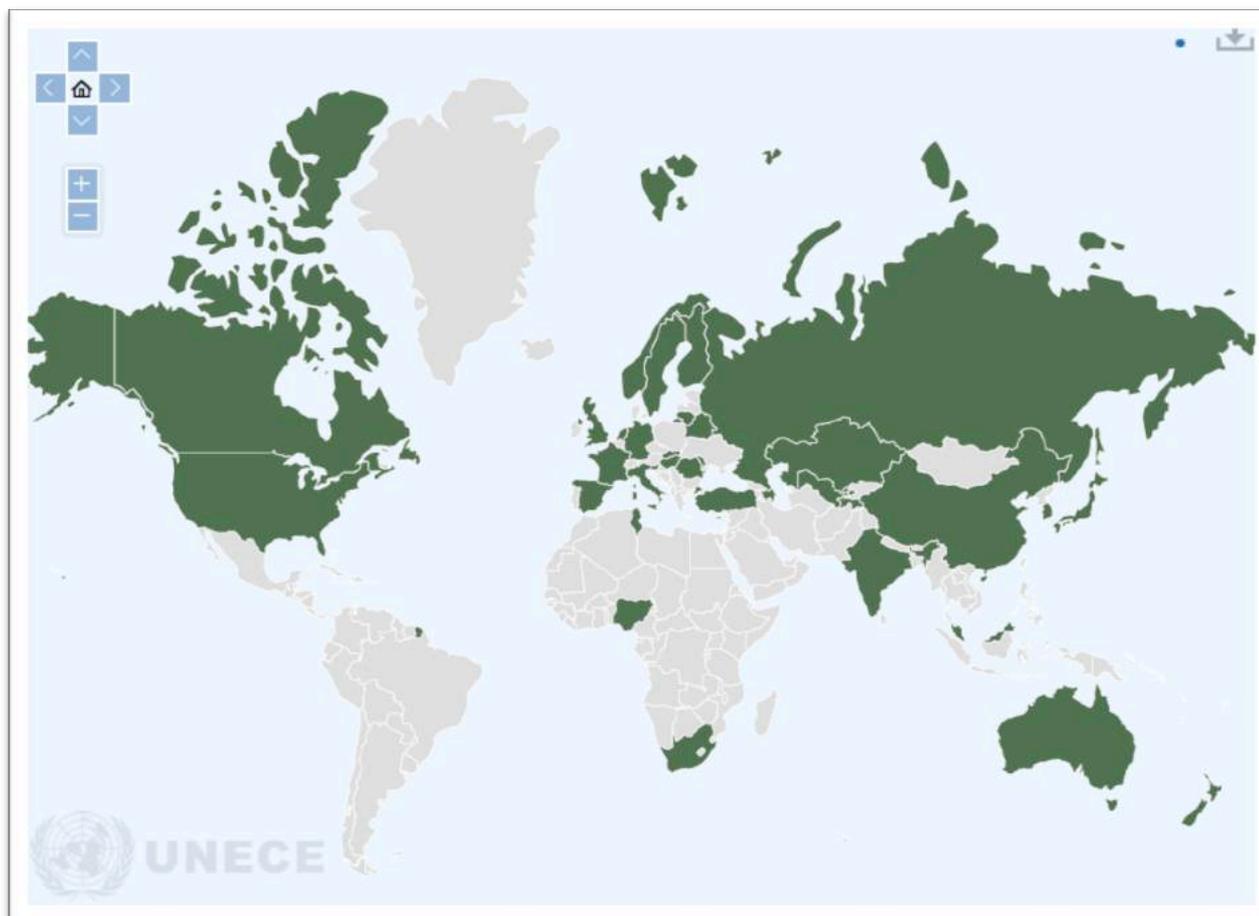


Agreement concerning the Adoption of Uniform Technical Prescriptions for Wheeled Vehicles, Equipment and Parts which can be fitted and /or be used on Wheeled Vehicles and the Conditions for Reciprocal Recognition of Approvals Granted on the Basis of these Prescriptions, of 20 March 1958

The 1958 Agreement currently has 53 Contracting Parties ([official map](#)):

Albania, Armenia, Australia, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czechia, Denmark, Egypt, Estonia, European Union, Finland, France, Georgia, Germany, Greece, Hungary, Italy, Japan, Kazakhstan, Latvia, Lithuania, Luxembourg, Malaysia, Montenegro, Netherlands, New Zealand, Nigeria, North Macedonia, Norway, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, South Africa, Spain, Sweden, Switzerland, Thailand, Tunisia, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland.

## The 1998 Agreement (Global Technical Requirements for adoption into national regulatory systems)



Agreement concerning the Establishment of Global Technical Regulations for Wheeled Vehicles, Equipment and Parts which can be fitted and / or be used on Wheeled Vehicles, of 25 June 1998

The 1998 Agreement currently has 38 Contracting Parties ([official map](#)):

Australia, Azerbaijan, Belarus, Canada, China, Cyprus, European Union, Finland, France, Germany, Hungary, India, Italy, Japan, Kazakhstan, Lithuania, Luxembourg, Malaysia, Netherlands, New Zealand, Nigeria, Norway, Republic of Korea, Republic of Moldova, Romania, Russian Federation, San Marino, Slovakia, Slovenia, South Africa, Spain, Sweden, Tajikistan, Tunisia, Turkey, United Kingdom of Great Britain and Northern Ireland, United States of America, Uzbekistan.

## The UN Lighting and Light Signalling Regulations (1958 agreement)

The 1958 Agreement operates on the principle of reciprocally-recognised type approval. Any country that ratifies the 1958 agreement has authority to test and type-approve any regulated vehicle or item of vehicle equipment, regardless of country of manufacture or destination. Each design from each manufacturer is considered to be a type. Every acceding country is obliged to honour each type approval granted by any other acceding country. Once a type approval is

granted, every acceding country applying the specific regulation applicable to that type approval shall honour it, i.e., regard the type-approved vehicle or component as legal for import, sale and use. Type-approved vehicles and equipment are marked with an "E" and a number, within a circle—this approval marking is specified in each regulation.

The number in the circle indicates which country's type approval authority issued the type approval, and nearby letters and digits indicate the precise version of the regulation that the device meets and the type approval number, respectively.

Revision 3 of the 1958 Agreement ([download](#)) entered into force on 14 September 2017. It introduced important changes to the requirements relating to type-approval numbers and markings. These changes were introduced to clearly identify the applicable number, amendment series, and supplement of the apposite UN Regulation, and any approval extension. There is a difference between the approval marking on the product and the approval number that is detailed on the type approval documents.

Revision 3 of the 1958 Agreement also introduced the possibility to share type-approval data using a secure database with strict access control. This database is currently hosted by Germany but it is planned to transfer it to be administered by the UNECE Secretariat in Geneva. Detailed information is [available online](#); here is an overview from that webpage:

*DETA is the Database for the Exchange of Type Approval documentation. It is currently hosted by Germany. Access to DETA is currently limited to Contracting Parties (CP) having signed the 1958 agreement (for the time being and until this decision is revised by WP.29) and to manufacturers as approval holder. Type approval authorities, having granted a type approval, upload the documents to DETA. Only CPs signatory of the respective Regulation and the respective manufacturer as approval holder get reading access to all document parts of the approval. Reading rights for the certificates will be granted by default to all Contracting Parties to the 1958 agreement.*

*Only registered users get access to DETA. The Contracting Parties of the 1958 Agreement can thereto nominate a single DETA Focal Point. This DETA Focal Point shall manage the access and users accounts of the said Contracting Party.*

The full implementation of DETA will be an important aspect of the simplification of the lighting and light-signalling regulations because it will allow the complicated markings associated with lighting products, currently required to be indelibly marked on the product, to be replaced by a Unique Identifier (UI). This UI is a unique number to give access to the DETA where all of the type-approval details will be stored. The UI is introduced by Revision 3 of the UN 1958 Agreement where more details can be found.

The simplified lighting and light-signalling UN Regulations (See Page 32 of this report) introduce a Change Index to indicate the approval status of the individual devices that are subject to the provisions in the new regulations. These new UN Regulations group devices that were previously subject to individual UN Regulations, and special measures were necessary to be able to track the approval status in relation to the applicable series of amendment.

Revision 3 of the 1958 agreement has also introduced changes to encourage more countries to join. Two of the major changes are:

## Versions of a UN Regulation

While the granting and reciprocal recognition of type approvals is always based upon the latest version of the UN Regulation and its transitional provisions, Contracting Parties may apply previous versions of UN Regulations annexed to the 1958 Agreement in their national legislation. This means that these contracting parties can follow the development of the technical requirements but choose the level of stringency of their national legislation in terms of their technological development and national needs. However, countries applying and accepting type-approvals to an earlier version of a Regulation may not refuse to accept products type-approved to a more recent version of the Regulation.

## International Whole vehicle type Approval ([UN Regulation 0](#))

Any Contracting Party applying UN Regulation № 0 on the IWVTA (International Whole Vehicle Type Approval) system may issue approvals for whole vehicle types to either a limited level (L-IWVTA) or to a wider range of technical topics included in the universal level (U-IWVTA). Contracting Parties may apply the limited or universal IWVTA depending on the national situation. The Universal-IWVTA (U-IWVTA) provides a greater level of certainty for vehicle manufacturers and for Contracting Parties applying this Regulation, since the approval must be accepted without further assessment of the technical items covered by the U-IWVTA issued.

Contracting Parties applying UN Regulation № 0 are not obliged to accept approvals to the limited level (L-IWVTA) but may do so at their discretion. However, Contracting Parties are obliged to accept approvals issued pursuant to U-IWVTA, as stipulated in Revision 3 to the 1958 Agreement.

*"Article 1 ... The term "whole vehicle type approval" indicates that type approvals granted pursuant to applicable UN Regulations for wheeled vehicles, equipment and parts of a vehicle are integrated into an approval of the whole vehicle according to the provisions of the administrative IWVTA system.*

*...Notwithstanding other provisions of Article 1 and Article 12, a Contracting Party applying the UN Regulation on IWVTA shall only be obliged to accept those type approvals granted pursuant to the highest level of stringency of the latest version of the said UN Regulation...."*

The scope of UN Regulation № 0 on IWVTA is limited, in a first step, to passenger cars.

## List of UN Lighting and Light Signalling Regulations

Here is a list of UN Regulations that will be in force in October 2019, following the completion of Stage 1 simplification. For more details of the GRE Simplification activity please refer to page 32 of this Report.

UN Device Regulations – Under responsibility of GRE		
148	Light Signalling Devices	Replacing UN Regulations 4, 6, 7, 23, 38, 50, 77, 87, 91
149	Road Illumination Devices	Replacing UN Regulations 19, 20, 98, 112, 113, 119, 123
150	Retro-Reflective Devices	Replacing UN Regulations 3, 27, 69, 70, 104

UN Installation Regulations – Under responsibility of GRE		
48	Installation of lighting and light-signalling devices	Updated to align with the new simplified device regulations
53	Installation of lighting and light-signalling devices for L3 vehicles	
74	Installation of lighting and light-signalling devices (mopeds)	
86	Installation of lighting and light-signalling devices for agricultural tractors	

UN Light Source Regulations - Under responsibility of GRE		
37	Filament lamps	Updated to move provisions into the Resolution R.E.5
99	Gas-discharge light sources	
128	Light Emitting Diode (LED) light sources	
R.E.5	Consolidated Resolution on the common specification of light source categories	

Other UN Regulations - Under responsibility of GRE		
10	Electromagnetic compatibility	
45	Headlamp cleaners	
65	Special warning lamps	

## Evolution Regulatory Approaches in Major Economic Regions

### Canada

Canadian vehicle regulations are usually more or less in synchronised with U.S. standards, as automakers prefer to sell substantially the same vehicle on both sides of the border. However, there is a major deviation from this norm since AFS and ADB according to UN Regulations 48 and 123 have been permitted in Canada since 21 April 2018. That's when the newly-revised Canada Motor Vehicle Safety Standard № 108 (CMVSS 108) was [published](#) in the Canada Gazette, which makes it official as a final rule; an adoption of the regulatory amendment. The new CMVSS 108 also contains upgrades to Canada's DRL requirements and other improvements.

Having the ADB (adaptive driving beam) and, what is more critical, the AFS (adaptive front-lighting system) allowed in Canada goes beyond just having another country allowing these systems. Allowing just ADB would not have helped Canadians get access to better and safer road illumination, as ADB is a functional part of an AFS. What is very important is that Canada now allows full AFS system as described in UN Regulation 123 and as installed according to UN Regulation 48, including allowance for the aggregated maximum high beam output allowed by UN R48 (as long as the centre of the high beam is not more than 85 cm above the road surface).

Canada also permits ADB according to the North American SAE J3069 technical standard which, like all other SAE J-documents, is in itself not a regulation and does not carry force of law except to whatever degree it is adopted or referenced by a government. Canada has chosen to do so, but allowance for ADB according to SAE J3069 may be just that: an allowance without followers, as Canada is so far the only country to reference SAE J3069 as a permissible standard for ADB, and its provisions differ from those of the UN Regulations. Moreover, ADB can only be installed with AFS. Compliance with J3069 by itself, therefore, would not be viable option, but a manufacturer could consider providing AFS according to SAE J2838 with the J3069 ADB addition. But an AFS conforming just to SAE J2838 may not be the same as the AFS allowed by CMVSS 108, which is according to UN Regulation 123 installed per UN Regulation 48.

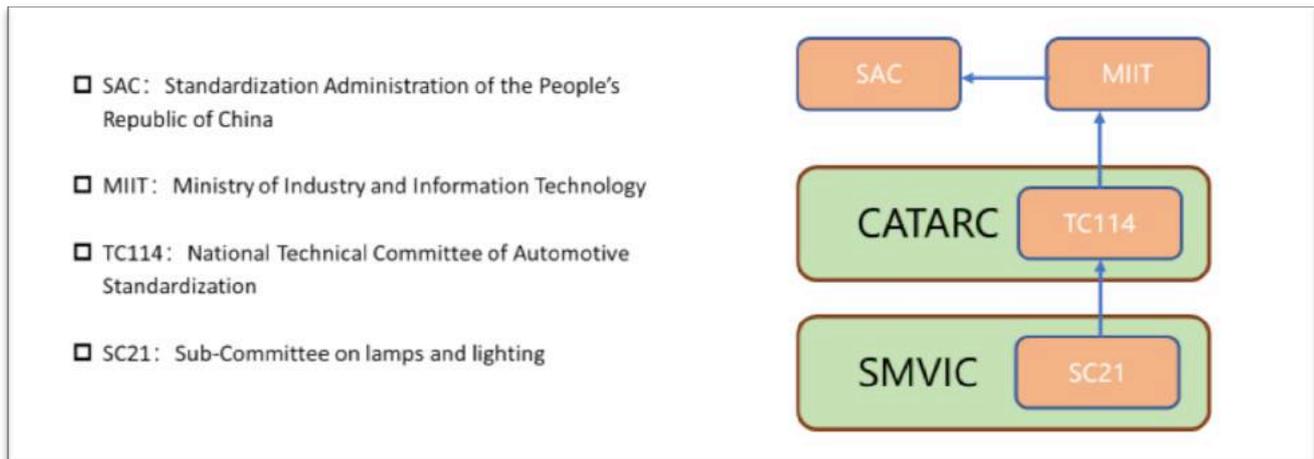
There are other changes in the new CMVSS 108. The standard now deals with "phantom cars"—the ones driving at night with only their daytime running lamps (DRL) illuminated. CMVSS 108 now requires vehicles with illuminated dashboards to have either their rear position lamps lit together with DRL, or the headlamps (with all ancillaries; the front/rear position lamps, side marker lights, etc) must come on automatically at dusk. Also, the new regulation will add more safety to three-wheeled vehicles and motor tricycles by requiring better marking systems. Finally, the new CMVSS 108 has several small adjustments making it more harmonised with the UN Regulations on lighting and light-signalling.

## China

### The GB Standards

China operates a regulatory system based on certification of compliance to mandatory and voluntary GB Standards. The standards are developed according to ISO procedures. The system is managed as follows—the information presented here is extracted from the presentation of Bu WeiLi (SMVIC) at the DVN Shanghai 2019 Workshop:

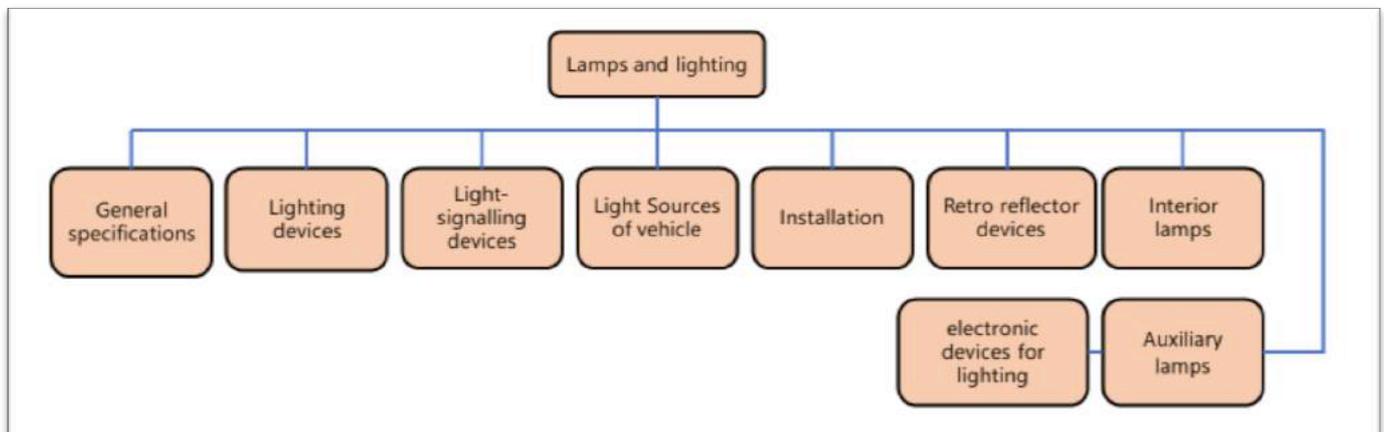
### The role of SAC/TC114/SC21 in the drafting of the GB lighting standards



The China Automotive Technology and Research Centre Co. LTD (**CATARC**) - Auto Standardisation Research Institute (ASRI) provides the secretariat of the National Technical Committee of Auto Standardisation (SAC/TC114) and is officially nominated by MIIT (Ministry of Industry and Information Technology) to act as secretariat and convenor of the Chinese delegation to WP.29 and GRE.

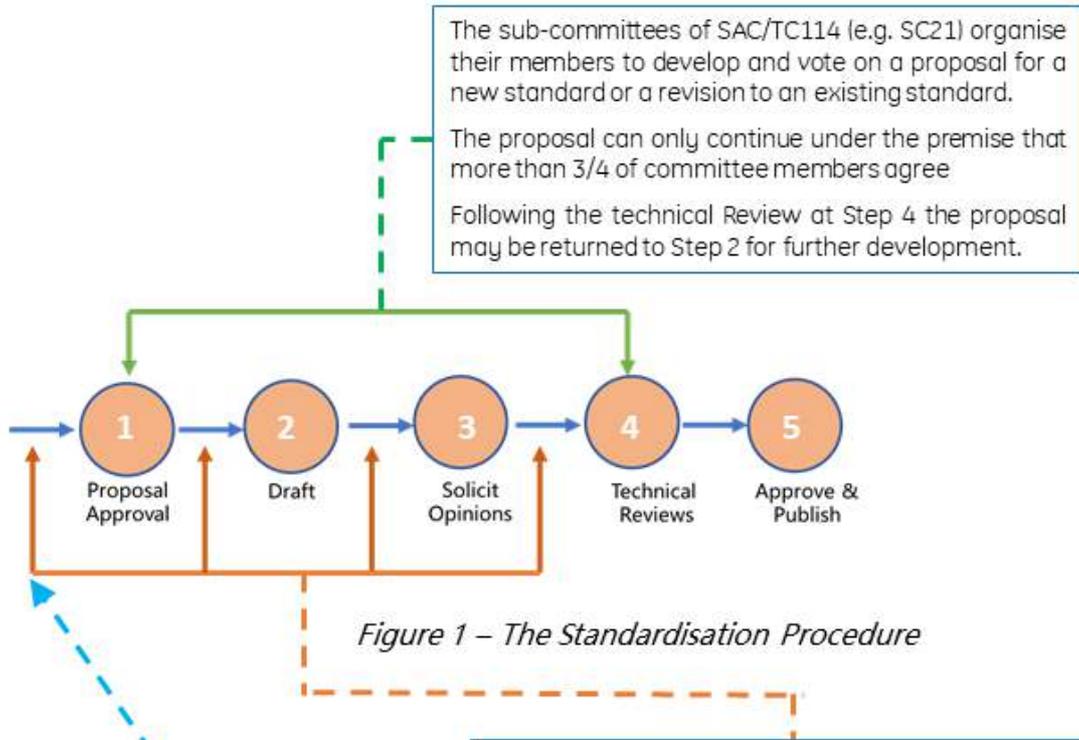
The Shanghai Motor Vehicle Inspection Certification & Tech Innovation Centre (**SMVIC**) - Shanghai Automotive Lighting Research Institute provides the secretariat of Sub-Committee 21 on Lamps and Lighting of National Technical Committee of Auto Standardization (SAC/TC114/SC21)

SAC/TC114/SC21 is responsible for the standardisation works of definitions, graphical symbols, size and performance for external & interior lighting & light-signalling lamps for vehicles. It is organised as follows:



# The Chinese GB Standardisation Process

## SAC/TC114 Procedure and the role of Sub Committee 21



For each of the procedural steps: 1, 2, 3 .... There is a sub-process to be followed by the SC21.

As an example, the steps to develop an initial proposal are as shown below in Figure 2.

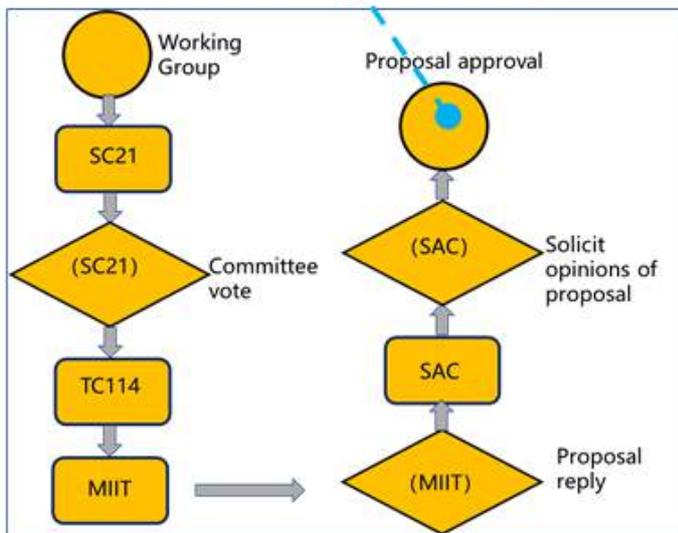


Figure 2 - The sub-process steps

The process of developing the GB standards was significantly changed in 2018. The four orange arrows in figure 1 mean that these processes are to be followed by SC21. The green arrows mean that these processes are very important because they are subject to voting by SC21.

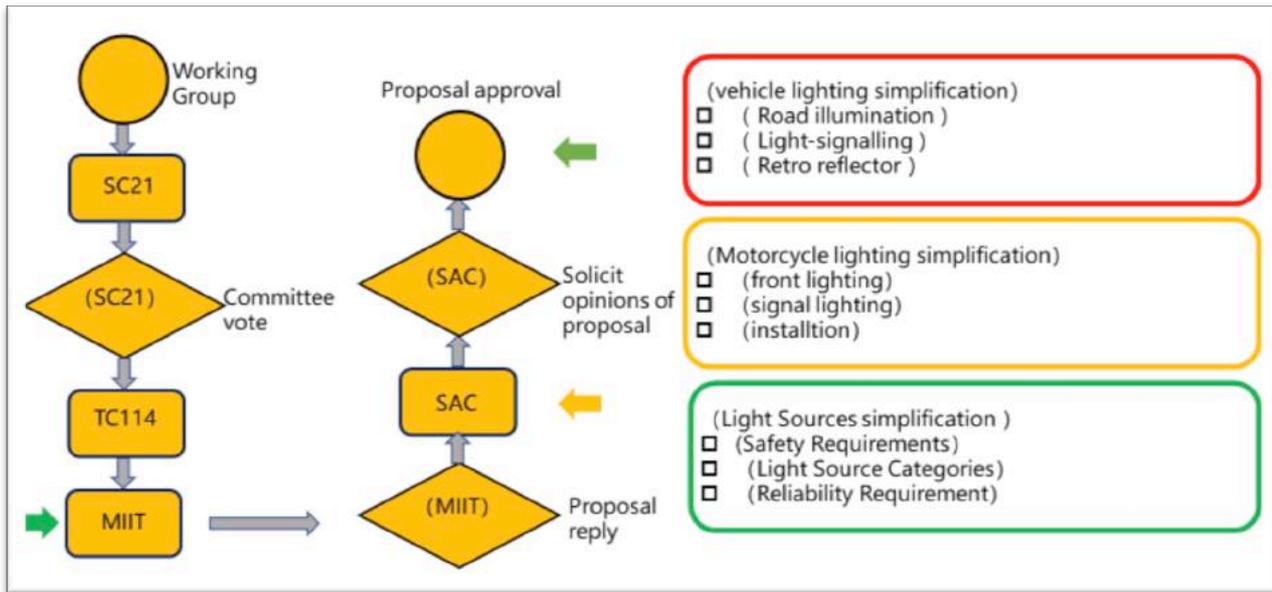
Figure 2 shows the detailed procedure to develop the proposal that is subject to voting by SC21 at the step1. There are also sub-processes between steps 2-3 and 3-4 but as this process is new and under development their details will only be confirmed after three simplified GB standards have been processed.

## Current Development of the GB Standards for Lighting of Power-Driven Vehicles

GB4599-2007	汽车用灯丝灯泡前照灯	GB5920-2019	汽车及挂车前位灯、后位灯、示廓灯和制动灯配光性能
GB 21259-2007	车用气体放电光源前照灯	GB15235-2007	汽车倒车灯配光性能
GB 25991-2010	汽车用LED前照灯	GB11554-2008	机动车和挂车用后雾灯配光性能
GB/T 30036-2013	汽车用自适应前照明系统	GB17509-2008	汽车及挂车转向信号灯配光性能
GB4660-2016	机动车用前雾灯配光性能	GB18408-2015	汽车及挂车后牌照板照明装置配光性能
GB/T 30511-2014	汽车用角灯配光性能	GB18409-2013	汽车驻车灯配光性能
GB5948-1998	摩托车白炽丝光源前照灯配光性能	GB18099-2013	机动车及挂车侧标志灯配光性能
GB19152-2016	发射对称近光和 或远光的机动车前照灯	GB 23255-2019	机动车昼间行驶灯配光性能
GB11564-2008	机动车回复反射器	GB17510-2008	摩托车光信号装置配光性能
GB 25990-2010	车辆尾部标志板	GB4785-2007	汽车及挂车外部照明和光信号装置的安装规定
GB 19151-2003	机动车用三角警告牌	GB18100.1-2010	摩托车照明和光信号装置的安装规定 第1部分 两轮摩托车
GB 23254-2009	货车及挂车 车身反光标识	GB18100.2-2010	摩托车照明和光信号装置的安装规定 第2部分 两轮轻便摩托车
GB 21260-2007	汽车用前照灯清洗器	GB18100.3-2010	摩托车照明和光信号装置的安装规定 第3部分 三轮摩托车
GB/T10485-2007	道路车辆外部照明和光信号装置环境耐久性		★ 共计：24项强制性国家标准，3项推荐性国家标准

The chart above should be read in conjunction with the interpretive chart below





## GB Recommended Standards Planned for 2017-2020

The projects of recommended standards in addition to mandatory national standards (2017~2020)					
1	QC-102-202-321-403-500-001	(Environmental endurance)	GB/T voluntary standards	2017	修订 revised
2	QC-102-202-321-403-500-003	(Measurement method of filament light source)	GB/T voluntary standards	2018	制定 developing
3	QC-101-101-321-402-507-001	(Exterior ambient lighting devices)	QC/T Industrial Standards	2018	制定 developing
4	QC-102-202-321-403-500-004	(Measurement method of OLED)	QC/T Industrial Standards	2019	制定 developing
5	QC-101-101-321-402-507-002	(Interior ambient lighting devices)	QC/T Industrial Standards	2019	制定 developing
6	QC-102-202-321-403-500-005	(Measurement method of ADB)	QC/T Industrial Standards	2020	制定 developing

## The European Union

On 17 May 2018, the European Commission adopted a proposal for a Regulation of the European Parliament and of the Council on type-approval requirements for motor vehicles and their trailers, and systems, components and separate technical units intended for such vehicles, as regards their general safety and the protection of vehicle occupants and vulnerable road users, amending Regulation (EU) 2018/... and repealing Regulations (EC) No 78/2009, (EC) No 79/2009 and (EC) No 661/2009. This can be [downloaded](#) from the eur-lex website.

On 25 March 2019, the European Parliament, Council and Commission reached a provisional political agreement on the revised General Safety Regulation. As of 2022 new safety technologies will become mandatory in European vehicles to protect passengers, pedestrians and cyclists. Details are [here](#) and [here](#).

This new EU Regulation includes an Annex 1 that lists the UN Regulations that it applies according to Article 4(2) that states: "Type-approval in accordance with the UN Regulations listed

in Annex I shall be considered as EU type-approval in accordance with the requirements of this Regulation and of the delegated acts adopted pursuant to it". This list will be regularly updated according to the progress of the UN Regulations and, in general it is the intention of the EU to always apply the latest versions of the UN Regulations. This is the same approach that the EU is adopting to the application of the UN Regulation 0 on International Whole Vehicle Type Approval.

The European Commission states:

It will continue to monitor technical progress developments in the automotive sector and, wherever appropriate, will propose to amend the relevant legislation in order to include new safety features. It will also continue to actively participate and lead the vehicle standard harmonisation process at international level (United Nations Economic Commission for Europe – UNECE).

In order to make the new Regulation future proof, it has been deemed more appropriate to address any review of these vehicle safety rules in a more dynamic fashion, namely linked to the overall technical progress and occurrences of new safety needs. In this context, the international regulatory developments through UNECE as well as the frequent need for the adaptation of those rules tend to prompt this reviewing process automatically.

The Commission is determined to promote and support the development as soon as possible of the detailed technical requirements for the advanced vehicle systems at the UNECE level. Nevertheless, The Commission is committed to establish those requirements under the EU type-approval framework should the preparation at UNECE not advance at the required speed. The Commission will also endeavour to ensure that the UN Regulations adopted with the support of the European Union are defined according to the highest standards of road safety technology available and are regularly updated.

## India

India operates a type-approval system based upon Automotive Industry Standards (AIS) and Central Motor Vehicle Rules (CMVR) Type Approval Certification.

Although India is not a signatory to the UN 1958 Agreement, it is active at WP.29 and sends a delegation of experts to GRE with a keen interest in the development of the technical requirements for lighting and light-Signalling. This participation in GRE is enabling India to align its local requirements to those in the UN Regulations, and they have been actively contributing to the GRE Informal Working Group on Simplification of the UN Regulations (GRE IWG-SLR).

In general, India takes the latest technical provisions of the UN Regulations and applies them in the Automotive Industry Standards (AIS). More information relating to the AIS and CMVR Type Approval Certification can be found on the website of the [ARAI](#) (Automotive Research Association of India), the research institute of the Indian automotive industry with the Indian Government's Ministry of Heavy Industries & Public Enterprises.

## Japan

Japan plays a major leading role in the UNECE World Forum for Harmonisation of Vehicle Regulations (WP.29) and has a strong record of promoting global harmonisation along with the European Union and the USA.

**JASIC** (the Japan Automobile Standards Internationalisation Centre) was founded in 1987 and has actively supported cooperation between the Japanese government and industry for the internationalisation of automobile regulations and certification systems by the government. As an ongoing member of WP.29, JASIC has been involved in the establishment and amendment of UN Regulations, the promotion of mutual recognition of approvals based on the UN Regulations, and the further internationalisation of Japanese vehicle regulations and type approval systems.

Japan became a signatory to the UNECE 1958 Agreement (Reciprocal Recognition of Type Approvals) in November 1998 and a signatory of the UNECE 1998 Agreement (Global Technical Regulations) in August 2000. At the United Nations, to support the activities of the Japanese government, JASIC regularly sends experts to meetings of WP.29 and its six "GR" working parties. In particular, Japan holds the following positions relating to lighting and light-signalling:

### WP.29 World Forum

Administrative Committee -1998 Agreement (AC.3)	Mr. H. Inomata	Chair
Intelligent Transport Systems (ITS)	Mr. H. Inomata	Chair
International Whole Vehicle Type Approval (IWVTA)	Mr. T. Onoda	Chair
IWVTA Subgroup on UN Regulation № 0	Mr. T. Onoda	Chair
GRE (Lighting and Light Signalling) Japan is normally represented by 10 experts		

In addition, JASIC is involved in the establishment of vehicle regulations and type approval systems in Asia and cooperation for internationalisation of these regulations and systems. In December 2015, for example, a project named MAJAICO, which stands for Malaysia-Japan Automotive Industry Cooperation, was implemented under the Japan-Malaysia Economic Partnership Agreement. In the area of automotive lamps, with the aim of improving the Malaysian government's capabilities relating to vehicle type approval, JASIC sent to Malaysia three experts—on four-wheeled vehicle lamps, on motorcycle lamps, and on lamp components. Through these experts, JASIC provided information regarding uniform standards on vehicle structures and equipment related to safety and environment, and also offered advice on certification testing and facilities.

Having become a contracting party of the UNECE 1958 Agreement (Reciprocal Recognition of Type Approvals) in November 1998, the Japanese MLIT (Ministry of Land, Infrastructure and Transport) gradually adopted the UN vehicle lighting and signalling regulations including the AFS Regulation 123. After long consideration and discussion, in January 2017 Japan finally adopted the Daytime Running Lamp Regulation 87. This means Japan reciprocally accepts UN type approvals granted by other administrations for all of the regulations it applies.

## South Korea

South Korea is a signatory of the UN 1958 Agreement but is not adopting the UN Regulations, with the exception of UN Regulation 0 (International Whole Vehicle Type Approval) because it operates a self-certification system in preference to reciprocal recognition of type approvals. One of the motivations for this is the US-Korean trade agreement initially signed in March 2012 and re-negotiated in March 2018.

Since 2003 Korea has applied their self-certification system, under which the government provides the safety standards for manufactured vehicles and manufacturers self-certify that their vehicles meet the safety standards. The government conducts compliance tests and orders a recall if there is an item that does not meet the safety standards.

Although Korea is operating a self-certification system it is fully incorporating the technical requirements of the UN Regulations into its KMVSS (Korea Motor Vehicle Safety Standards). However, it requires at least 12 months following the publication of the latest version of the UN Regulation to include the technical requirements in the KMVSS.

At the beginning of each year, MoLIT (Korea's Ministry of Land, Infrastructure and Transport) decides on priorities to reflect the amendments to the UN regulations to be harmonised. Then experts on lighting regulations at KATRI (Korea Automobile Testing & Research Institute) draft amendments to the KMVSS. The drafting committee which consists of domestic vehicle manufactures and lamp suppliers works with the KATRI experts and submits the draft amendment to MoLIT where it is reviewed and corrected to ensure that the KMVSS reflects the original intent of the UN amendment. Following this review of the draft amendments of KMVSS, MoLIT issues a pre-announcement of legislation for a two-month public consultation. Subsequently the results of the consultation are incorporated into a modified draft amendment of the KMVSS that is submitted for formal legal adoption and subsequent publication.

The technical requirements of the KMVSS Lighting Regulations consist of a separate section detailing the requirements and a performance table for each device. Test procedures to be applied in the self-certification system are stipulated in detailed enforcement regulations.

In summary, the lighting regulations of KMVSS are fully aligned with the UN regulations but there is always a delay of up to 12 months for this to be realised. MoLIT is aware that this is an inconvenience for manufacturers, and actively seeks to reduce the delay to the minimum.

For more information concerning the Korean Regulatory system please refer to Section 5 of the UNECE [blue book](#).

## [KICAS](#) – The Korea Internationalization Centre for Automotive vehicle safety Standards

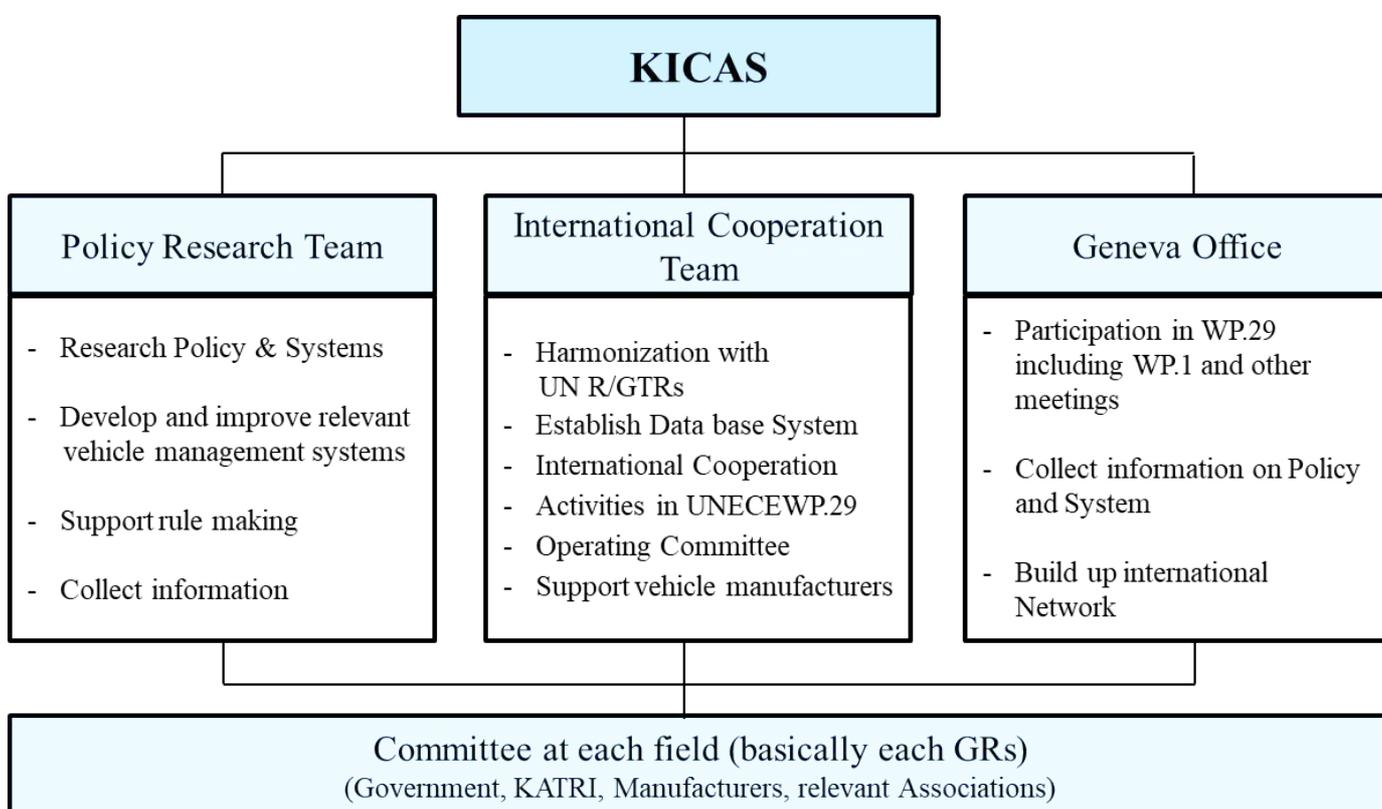
In accord with the Korean Automobile Act, Article 68-4, MoLIT designated a specialised organisation for harmonisation, international cooperation, and development of relevant systems and polices for automobiles on 6 December 2017.

On 1 January 2018, KATRI (Korea Automobile Testing & Research Institute) launched a new department, KICAS: The Korea Internationalization Centre for Automotive vehicle safety Standards.

The main duties of KICAS are:

- To support MoLIT to improve and/or develop relevant systems and policies
- The expansion of activities in UNECE WP.29 including harmonisation and R&D related to vehicle regulation
- Support and cooperate with vehicle manufacturers
- Strengthen international cooperation with other countries

The organisation of KICAS consists of two teams and an office in Geneva, with a total of 15 experts:



The Director of KICAS is Mr. Jae-Wan Lee from KATRI and the Chair of the KICAS Lighting Committee is Mr. Ju Don Choi of SL Corporation.

KICAS is the supervisor of all harmonisation activities and research, and it produces an annual plan for these including its participation in WP.29's six GRs and its informal Working Group in Korea. To support this, KICAS has six committees to mirror the WP.29 GR organisation. One of these committees is responsible for lighting, and experts from all manufacturers and suppliers work together in all KICAS activities. MoLIT supports the KICAS budget, which for 2019 is almost USD \$700,000.

Annex 2 of this report includes a copy of an interview with KICAS Director Mr. Jae-Wan Lee by the European Chamber of Commerce in Korea. This is related to all activities of Korea in W.P.29, and it proves interesting background of how Korea is working with the UN Regulations.

Importantly, KATRI is the Korean member of GTB and leads a large delegation of experts who contribute at each GTB meeting.

## The USA

The lighting and light-signalling regulatory process in the USA is currently static and locked in the outdated provisions of FMVSS 108 (Federal Motor Vehicle Safety Standard № 108: Lamps and Reflective Devices). The US administration is a regulatory island out of step with the rest of the world because aside from having its own self-certification and enforcement system, it does not recognise or accept the technical requirements of the UN Regulations. One reason for this is because some of the test procedures in UN Regulations do not satisfy the objective-test requirements called for by the US laws applicable to regulation of motor vehicles and are the basis of a self-certification approach. Four articles by Daniel Stern from 2013 and 2016 are included in Annex 1; these provide a good insight into the status of the discussion regarding Regulatory Harmonisation as it was six years ago.

Currently the main lighting-related activity of NHTSA is to address the pressure from industry to allow ADB (adaptive driving beam). At NHTSA's request SAE developed the J3069 technical standard that defines an objective test procedure for ADB, but NHTSA then chose to substantially depart from J3069 in the ADB rules the agency [proposed](#) in late 2018.

Here is an article produced by Daniel Stern for the DVN newsletter of 17 December 2018, providing an excellent overview of the American ADB situation. It summarises the main comments submitted in response to the NHTSA proposal:

### [USA ADB: Will NHTSA Grant the Choir's Prayers? \(by Daniel Stern, 17 December 2018\)](#)

Time's up! Last Tuesday, 11 December, was the official end of the public comment period for NHTSA's NPRM (Notice of Proposed Rulemaking) regarding ADB. In weeks past, we've scrutinised and analysed the proposal as well as some of the general public's replies while we waited for automakers, suppliers, industry associations, and safety outfits to weigh in. The timeframe has been very compressed given the scope and magnitude of the contemplated changes; substantive responses from stakeholders had to be crafted and drafted with great deliberation in a very big hurry, and even so, most of them were submitted and posted to the [docket](#) on the last possible day.

In perusing major players' comments, straight away we notice something very encouraging: the high level of consensus among them. Consensus, we say, and not unanimity; each of the respondents gave their own unique voice to their own particular perspectives and concerns. That's probably to the good; it shows that this feedback to NHTSA is the product of thought and effort, not merely a flurry of reflexive me-toing—which is also available in the docket,

serving as an effective backdrop against which the substantive consensus looks even better, thanks to alarmed owners of movie theatres. Drive-in cinemas, specifically, which are reportedly increasing in popularity lately in accord with retro-trends. The owner of such a drive-in got word of the proposal to allow ADB, thoroughly misunderstood it as a proposal to take away any driver control and have all the car's lights permanently lit, wrote in begging NHTSA not to ruin his business, and set about very effectively instigating a letter-writing campaign amongst his fellows, as it seems. Perhaps it goes to emphasise the need for effective consumer education about what ADB is (and what it is not).

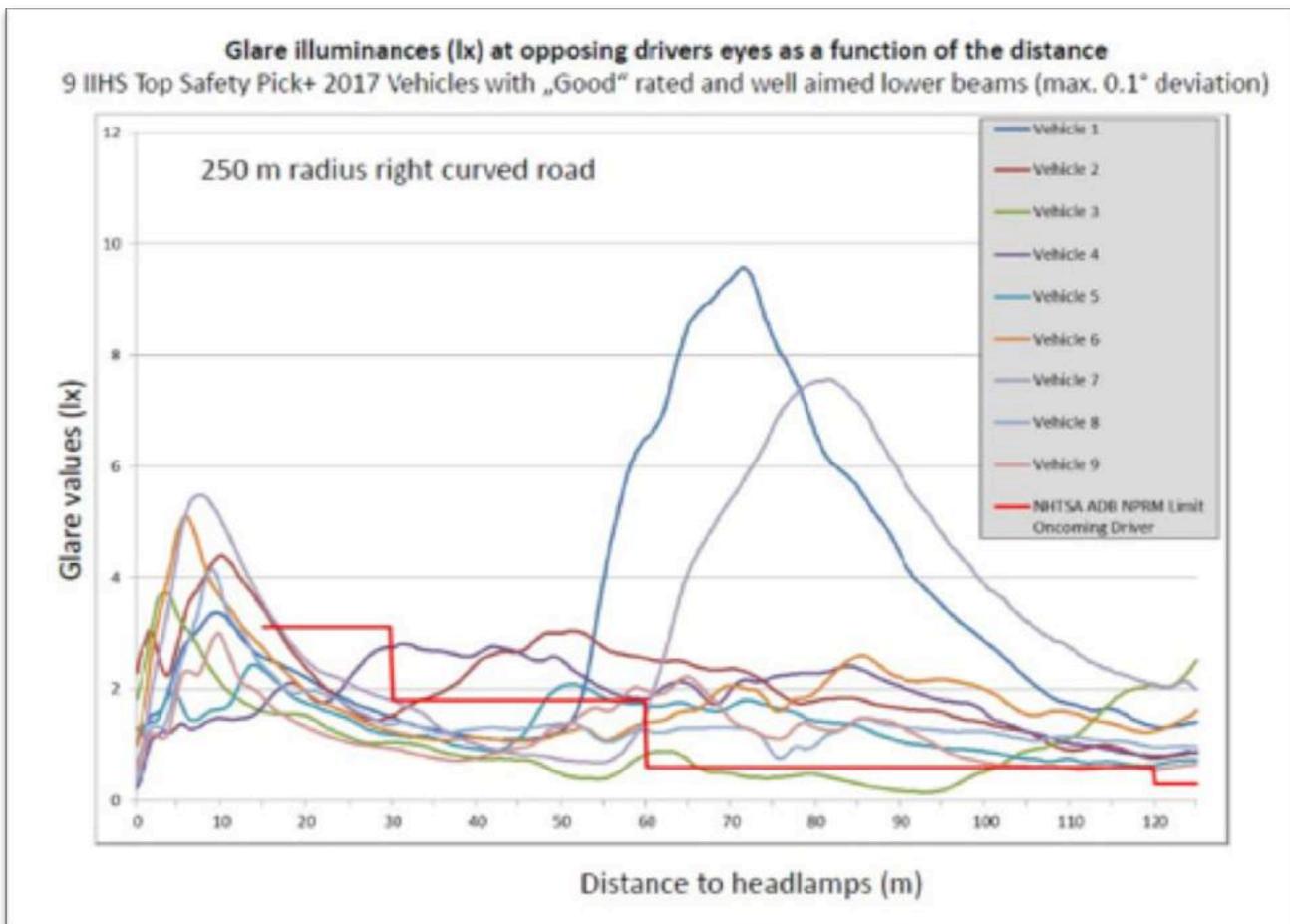
Getting back to the substantive responses and their consensus: at the 2015 DVN US Workshop, NHTSA's lighting regulators fairly begged the lighting community to please speak to them in a united, cooperative voice: develop consensus among ourselves to the maximum practicable degree, then talk to NHTSA. That was a reasonable request: don't make them do extra work trying to reconcile competing visions of what should be allowed and prohibited, how it should work, what it should be called, and otherwise like that. NHTSA must carefully decide how to allocate their finite resources of time, money, effort, and (especially in the chaotic present environment) political capital. The appearance of discord in the regulated industry can naturally make regulators reluctant to listen.

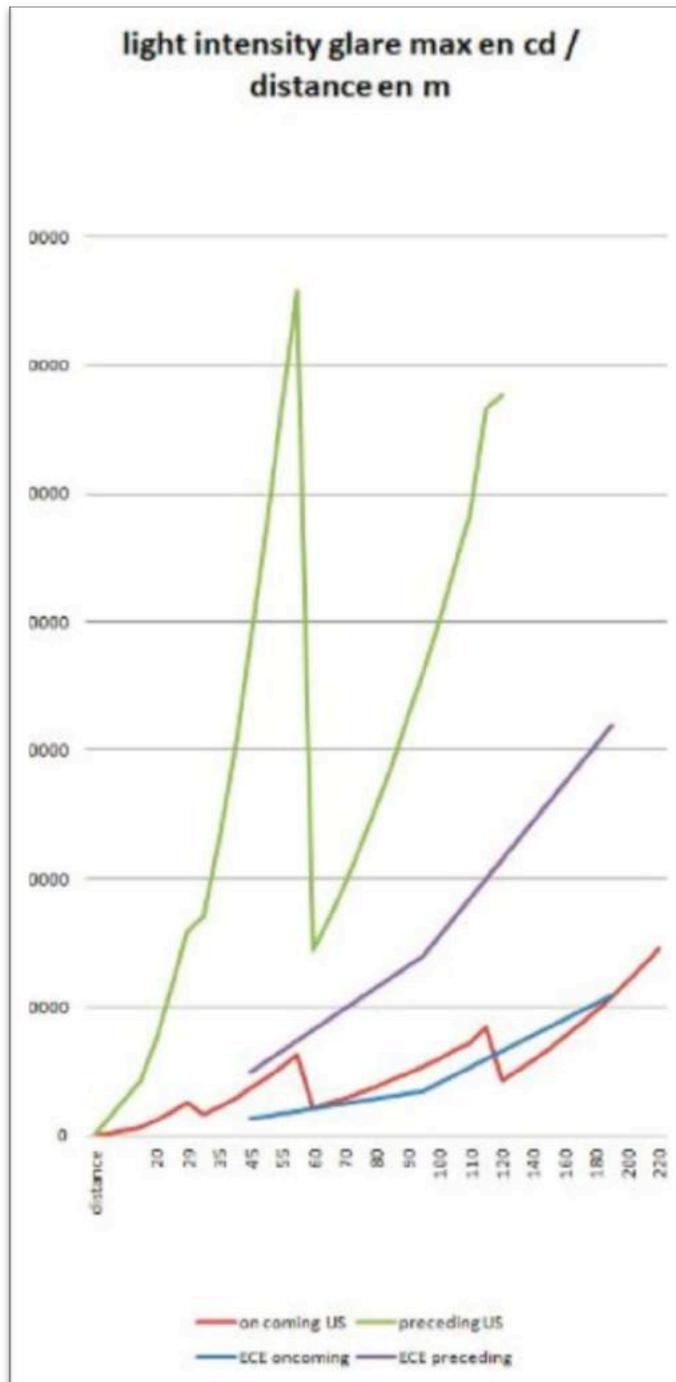
But we seem to be doing a creditable job of all rowing the boat in the same direction, as evidenced by the large amount of agreement among substantial stakeholders. Of 34 major players' responses we evaluated, over 65% explicitly supported adopting or heavily drawing from SAE J3069, aligned themselves with the SAE Regulatory Cooperation Task Force's docket comment, or both. About half objected in specific detail to NHTSA's proposed test protocol as unrealistic and/or impracticable. Over a third expressed dismay that the NHTSA proposal would create enormous disharmony, require not just market-specific calibration but US-specific hardware. A solid proportion of respondents noted with alarm that although ADB headlamps must be horizontally aimable, FMVSS № 108 does not permit horizontal aimability unless the headlamp is equipped with a thoroughly obsolete kind of aiming attachment—a VHAD—which rapidly fell out of favour two decades ago when visual/optical lamp aim came to US headlamp regulations. A fair number of comments mentioned the UN ADB Regulations recognised in virtually every other country (including Canada!), but rather than taking a petulant, America-should-get-over-itself-and-just-do-like-the-rest-of-the-world tone unlikely to gain traction with NHTSA, these comments tend to advocate for thoughtful consideration of certain specific ECE points and provisions. Which doesn't guarantee NHTSA will listen but would surely seem to stand a better chance.

Other discussion points that came up in multiple replies: there must and will be a transition area between the shadow and the bright light; NHTSA's proposal to require the shadow area to meet static low beam minimum intensities is both impracticable and counter to the point of ADB in that it would prevent effective de-glaring; the proposal to require the unshaded area to meet high beam maximum intensities sacrifices a large part of the safety performance benefit potential; the high beam intensity limit should be raised much higher than the present 75 kcd

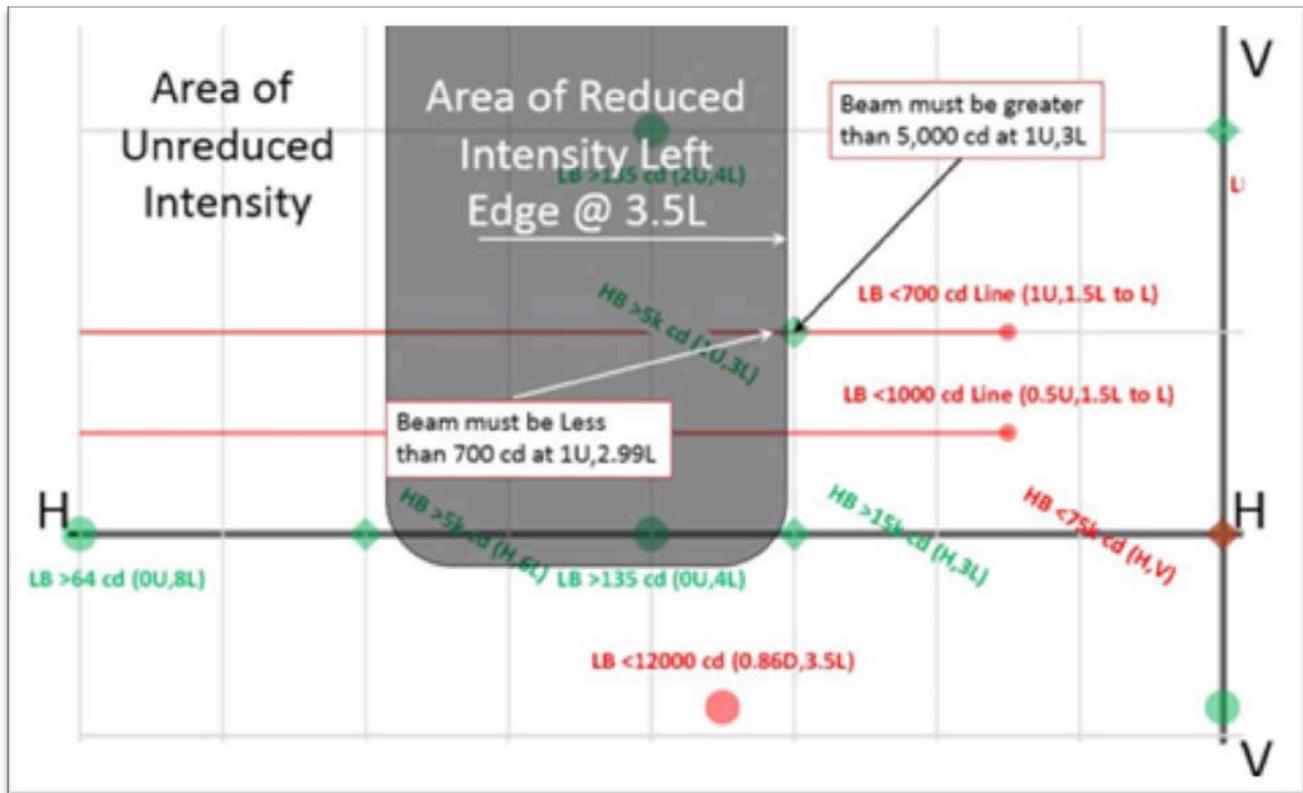
limit; the proposed 40 km/h minimum road speed for ADB operation is an unnecessary and unbeneficial restriction that would cut into the safety performance benefit particularly with regard to pedestrians, and proposed tests and disharmonious requirements without a demonstrable safety basis or link will serve only to increase the cost of offering ADB, reducing and slowing its proliferation and thereby denying and delaying its life-saving effects.

Of course, there's another aspect to the fact that consensus does not require or imply unanimity: there are some dissenters. Three of the commenters stated their support for the proposal largely or entirely as issued. One of these is from a tier-1 lighting supplier experienced in building ADB systems for Europe and Japan; it was a bit of a surprise to see. Another is from a major ADAS outfit no longer involved in the lighting business—their response focused on issues around sensors and cameras, without weighing in on the lighting technical aspects. And a third is from Consumer Reports, whose comment evinces an apparent belief that ADB is an entirely new idea without any real-world experience or data, whatever the industry says is dubitable and suspect, and the most stringent regulation is the best one.





And then there's the SAE RCTF's comment, which goes into thoughtfully-phrased, carefully-explained detail on the issues and implications of NHTSA's proposal, offering analysis and providing alternative ideas. An image from the SAE comment, for example, plots the glare illuminance at an oncoming driver's eyes at various distances for nine vehicles with properly-aimed low beams that received a "Good" grade in the IIHS headlamp tests...most of which greatly exceed NHTSA's proposed ADB glare limits, indicated on the plot with a bright red stairstep-shaped line. Another image graphically explains the problem created by



NHTSA's proposal requiring ADB to meet static low and high beam minima and maxima while not accounting for a light/dark transition between shadowed and un-shadowed areas: at an example point (1U-3L), the intensity must simultaneously be less than 700 candela to meet a low beam maximum and greater than 5,000 candela to meet a high beam minimum.

SAE weren't the only ones to use graphics to make their point. Valeo Lighting Systems' response included an interesting plot of the glare intensities permitted by the NHTSA proposal (green line for leading vehicles, orange for oncoming) versus those permitted by the UN Regulations (violet line for leading vehicles, blue for oncoming). They noted the much lower variance in the UN allowance, and advocated for NHTSA to follow suit.

All of the substantive responses are well worth reading in their entirety. Here are some excerpts we found particularly salient:

**The VW Group:** "VWGoA would also like to take this opportunity to encourage NHTSA to approve the pending petitions from BMW and from VWGoA to temporarily permit Adaptive Driving Beam technology. Doing so will aid the companies and NHTSA in gathering valuable field evaluation data to support a final rule and further reinforce the benefits of ADB technology. (...) Under SAE J3069, any aspects not harmonised with UN Regulations could be implemented in headlamp aim or software calibration differences rather than requiring hardware differences between regions. (...) This could require unique ADB system hardware for the United States as compared to the rest of the world, including Canada - which in the

past has only required minimal differences to the U.S. In addition to the complex testing (...) this non-harmonization of requirements will increase the cost burden for OEMs to develop U.S. specific systems, making it less feasible to implement ADB technology as a cost-effective option for consumers. This will, in turn, cause the market penetration of ADB systems to be relatively small and the realization of the safety benefits of ADB systems to be significantly diminished. The testing proposed in the NPRM is overly complicated, not practicable, and does not sufficiently address the abilities of ADB systems."

**Toyota:** "The challenges the proposed requirements create (...) would decrease the penetration rate of this system into the US market, and thereby decrease the potential number of lives saved. As SAE explains, the photometric requirements proposed in this NPRM are unreasonable to meet, and in fact, can create a safety hazard. Specifically, test point 1U-3L requires an illuminance performance of a low-beam MAX (700cd) and a high-beam MIN (5,000cd) at the same point. Even if NHTSA were to correct this and create two adjacent test points (one to meet the low-beam MAX and the other to meet the high-beam MIN), this requirement would create a distinctive vertical line between the area of reduced intensity and the area of unreduced intensity. It has been our experience with low beams in the US and ADB in other markets that the distinctive and visible line creates a distraction to drivers and has created customer complaints."

**Texas Instruments:** "Extra light in the part of the beam directed toward unoccupied roadway is important. However, the blanket requirement that all of these areas outside of the areas of reduced light intensity directed toward oncoming and preceding vehicles must meet the high beam minimum will negatively impact many of the potential safety improvements enabled by high resolution ADB. With high resolution, we can do more to improve safety than just flood this part of the beam with fixed high beam minimum light. (...) This requirement will effectively prohibit many useful features, such as luminous intensity optimization on retroreflective street signs (high beam minimums will create glare levels from such street signs). High resolution ADB systems can, can, in addition to masking oncoming and preceding vehicles, classify objects and place optimized levels of light on all of the objects in the driver's view, not just low beam light on preceding and oncoming vehicles and high beam intensity light on everything else. TI proposes that the regulation be structured to allow carmakers to innovate using the part of the adaptive beam directed towards unoccupied roadway by allowing variable light levels between low beam minimum and high beam maximum levels, with the stated goal being to provide the best lighting possible for the circumstances (meaning placing the maximum amount of light on the road without glaring roadway occupants). The current proposed regulation is sufficient for reducing glare for preceding and opposing traffic. But for all other road users, this 'high beam minimum' requirement for all light not falling on preceding and opposing traffic will actually maximize glare, including self-glare of the driver due to excessive illumination of retroreflective surfaces. Changing the regulation to allow light levels between low beam minimum and high beam maximum outside preceding and opposing vehicle mask areas would also make the regulation forward compatible with ever increasing ADAS high resolution ADB system capabilities, and allow for safety improvements

beyond the basic ADB function enabled by mechanical shutter and LED matrix systems."

**SAE:** "The forward camera vision on today's vehicles only extends to approximately 25 degrees left and right, ten degrees more than that required by UN R48. Upper beams at greater than 15 degrees left or right are not as bright as lower beams straight ahead, and at an angle of 40 degrees the light toward a stimulus vehicle driver is low. This is also demonstrated by the millions of AHB systems in the field today using the same or similar forward vision cameras and detection algorithms as ADB would use, resulting in the same reaction performance, yet absent of discomfort glare complaints. This suggests that wide angle visibility, i.e. anything beyond 25 degrees, is unnecessary, precluding any need to test throughout a 320 ft to 380 ft radius curve in a Final Rule. Should this curve range be retained, the forward vision cameras would be required to extend their visibility out to 40+ degrees left and right, increasing their costs at the expense of potentially diminished performance in the much more critical central portion of the visibility zone. The increased costs, diminished performance, and dis-harmonization with the rest of the world would limit the availability of ADB systems in the USA."

**Honda:** "The NPRM proposes that the stimulus vehicle may be of any of the major vehicle types (...) Passenger Cars, Light Trucks, Heavy Trucks, Buses, Multi-passenger Vehicles, and Motorcycles. Additionally, the stimulus vehicle may be of any of the 5 model years prior to the model year of the test vehicle. NHTSA estimates that in Model Year 2017, there are approximately 420 makes/models of passenger cars, trucks, vans, and SUVs offered for sale. If we account for a range of vehicles spanning 5 model years with multiple headlight/taillight variations possible for each vehicle, the number of potential stimulus test vehicles cannot reasonably be managed. We believe that this approach is not in line with the approach used in other FMVSS or NHTSA Test Procedures. For example, FMVSS crashworthiness requirements utilize a specific test barrier, test speed, and test configuration to represent a broader set of real-world crash conditions and partner vehicles. Additionally, NHTSA's New Car Assessment Program (NCAP) has established Crash Avoidance test procedures for Frontal Collision Warning (FCW), Collision Imminent Braking (CIB), and Dynamic Brake Support (DBS). In each of these NCAP tests, the partner vehicle is represented using a narrowly defined partner vehicle or surrogate dummy target vehicle. In all of the above tests, a common approach of using a representative test barrier or target vehicle in combination with a relatively narrow set of test configurations allows the tests to be objective, practicable, and meet the needs of safety. Finally, it is not practically possible to ensure compliance with any stimulus vehicle from any of the 5 model years prior to the ADB test vehicle. As part of the vehicle development process, the design and performance of ADB systems would need to be established well before its availability for sale. For example, a 2020 model year ADB vehicle cannot be developed in advance while also being certified against a 2019 model year stimulus vehicle."

**Mobileye:** "In our experience, if any system is obligated to react very quickly, it is likely to react less precisely. If the ADB system is obligated to adhere to a very small (0.1s) reaction

time, this will lead to many more false positives. These false alarms could be avoided if the system is given a reasonable reaction time to accumulate data for classification and detection. This would also provide the system with a better trade-off between glaring and visibility. We are worried that if the definition for glaring is too stringent, OEMs will tune ADB systems to over-sensitive states to comply with this definition. The result will be overall erratic and sub-optimal behaviour, where the system overreacts instantaneously to any new, suspicious light source in order to prevent glaring, thereby reducing driver visibility, and thus safety. We believe the way the NPRM tries to achieve the second goal can only be satisfied by the OEMs repeating the test (under all scenarios) for all required vehicle makes and models. This may well prove impractical and may drive OEMs to tune the ADB system to over-sensitivity to ensure passing the test even for vehicles they have not tested."

**MEMA:** "The Canadian regulations accept either UN ECE R123 or the SAE J3069™. NHTSA's proposal is counter to a Memorandum of Understanding between the U.S. and Canada that strives to enhance—not diminish—regulatory coöperation between the U.S. and Canada. In fact, the U.S. Office of Management and Budget's Office of Information and Regulatory Affairs is soliciting public comments on how to reduce and eliminate unnecessary regulatory differences between the U.S. and Canada. we urge the agency to reconsider the NPRM's test procedure and align more with the SAE J3069™ recommended practice, which provides an objective and repeatable test procedure and acceptance criteria for ADB features. Doing so will reduce regulatory burden of having multiple test procedures and standards. Now, more than ever, governments and industry alike could benefit greatly from more alignment and less overall regulatory burden."

**Competitive Enterprise Institute:** "Departing from SAE J3069, as NHTSA proposes in the NPRM, would harm consumers by increasing the cost of ADB system equipage, thereby reducing the consumer appeal of ADB lamps and forgoing the safety benefits of ADB adoption that could otherwise be realized. This reduced consumer demand for ADB systems could also reduce manufacturer investment in lighting system research and development. (...) A 2016 Centre for Automotive Research report estimated that divergence in safety regulations between NHTSA and its European Union counterpart increased costs by \$3.3bn to \$4.2bn, 2 to 2.6 times the total automotive tariff costs in 2014. In the case of the NPRM, NHTSA is needlessly deviating not only from SAE J3069, but from U.N. Regulations Nos. 48 and 123 upon which much of the rest of the world relies. Short of mutual recognition—as top U.S. automotive trading partner Canada has done with respect to its ADB regulation's incorporation of both SAE J3069 and U.N. Regulation № 123—NHTSA should eschew a government-unique standard in this rulemaking in favour of SAE J3069."

**IIHS:** "The proposal would require ADB photometry inside any area shadowed for another vehicle to meet existing FMVSS 108 low beam minima, while the intensity outside of the shadowed area (or when no other vehicles were present) would be subject to the existing high beam maxima. By attempting to shoehorn ADB into the standards written for static headlights in this fashion, the proposal will prevent ADB systems from realizing both their full

visibility-enhancing and glare-reducing potential. In terms of visibility, while European standards allow high beams that are almost twice as bright as those allowed in the US, NHTSA has rejected the opportunity to allow brighter high beams when coupled with the glare-prevention technology of ADB. As justification for this decision, the agency stated, 'we believe it is important to maintain the upper beam maxima because they too play a role in glare prevention.' While this statement could help explain why a specific high beam maximum is needed when the driver is responsible for preventing glare by switching to low beams, it is inappropriate for a properly functioning ADB system. If NHTSA is concerned that there are scenarios where ADB systems may not properly detect and shadow other vehicles, it would be preferable to include these in the set of dynamic tests it is proposing rather than limit ADB output to the same level as manually-controlled high beams. Regarding glare reduction, the proposed requirement for the shadowed areas created by ADB headlamps to still meet low beam minima means that drivers of other vehicles below the horizontal axis of the ADB headlamp could still experience excessive glare. In other words, the photometry requirements would effectively create a low-beam 'cutoff' within the shadowed areas of the beam pattern. Common real-world scenarios that currently produce high levels of glare from low beams include cresting hills, driving on bumpy roads, or the higher headlamp mounting height of pickups and many SUVs. ADB has the potential to reduce glare in all of these scenarios, but only if NHTSA removes the requirement that the shadowed areas are as bright as existing low beams."

**American Trucking Associations:** "ATA has long supported ADB technology for all vehicles as an optional feature. In DOT's 2017 regulatory review notice, ATA included FMVSS № 108 as one of the regulations in need of reform, suggesting that it be modified to allow ADB headlamps as optional safety equipment, and require SAE and TMC practices for lens coating durability and maintenance to improve vehicle lighting systems performance over their lifetimes.<sup>6</sup> The ATA also suggested this modification to FMVSS № 108 in comments filed with NHTSA regarding regulatory barriers to automated driving systems (ADS). Granting the subject petition for rulemaking not only accelerates conventional transportation safety, but also provides an opportunity to utilize ADB headlighting in a wide-range of real-world conditions that allows collecting data to further substantiate the benefits of ADS."

**AAA:** AAA supports testing on undulating roadways and hills as a part of the overall dynamic roadway test for ADB systems that perform to a higher standard (e.g., glare control demonstrated out to a distance of 400 metres and acceptable control of glare on undulating roadways and hills). For ADB systems that successfully meet enhanced testing criteria, the per-headlamp candela limit should be raised from 75,000 cd to 215,000 cd (430,000 per vehicle). AAA contends that by not including performance on hills and dips in the evaluation, the ADB systems will not be maximized for glare reduction, and technology improvements may be impacted. AAA recommends an additional requirement for proven ability to respond to undulating roadways and hills as an additional safeguard against glare before allowing the higher beam intensity.

So that's an overview of things as they now stand; industry and safety groups are substantially in agreement that for a bunch of sturdy reasons, NHTSA ought to reconsider some of their philosophical and technical assumptions about what ADB is and how it should work, and issue a regulation based on SAE J3069. Will they, though? That's anybody's guess. As it was NHTSA who approached SAE in the first place to ask for what would quickly and efficiently become J3069, why did the agency diverge so sharply from it? That, too, is a mystery. A long-time expert who for many years has been well positioned to observe the agency's lighting regulatory activities, called the divergence baffling. Is it a political gambit that will play out with NHTSA eventually agreeing to go along with J3069, thus keeping up appearances for a US Presidential administration avowedly pro-industry and anti-regulation? Maybe. We will just have to wait and see. We've done as NHTSA asked and sung to them harmoniously; now we must hope they will respond in kind with a harmonised regulation.

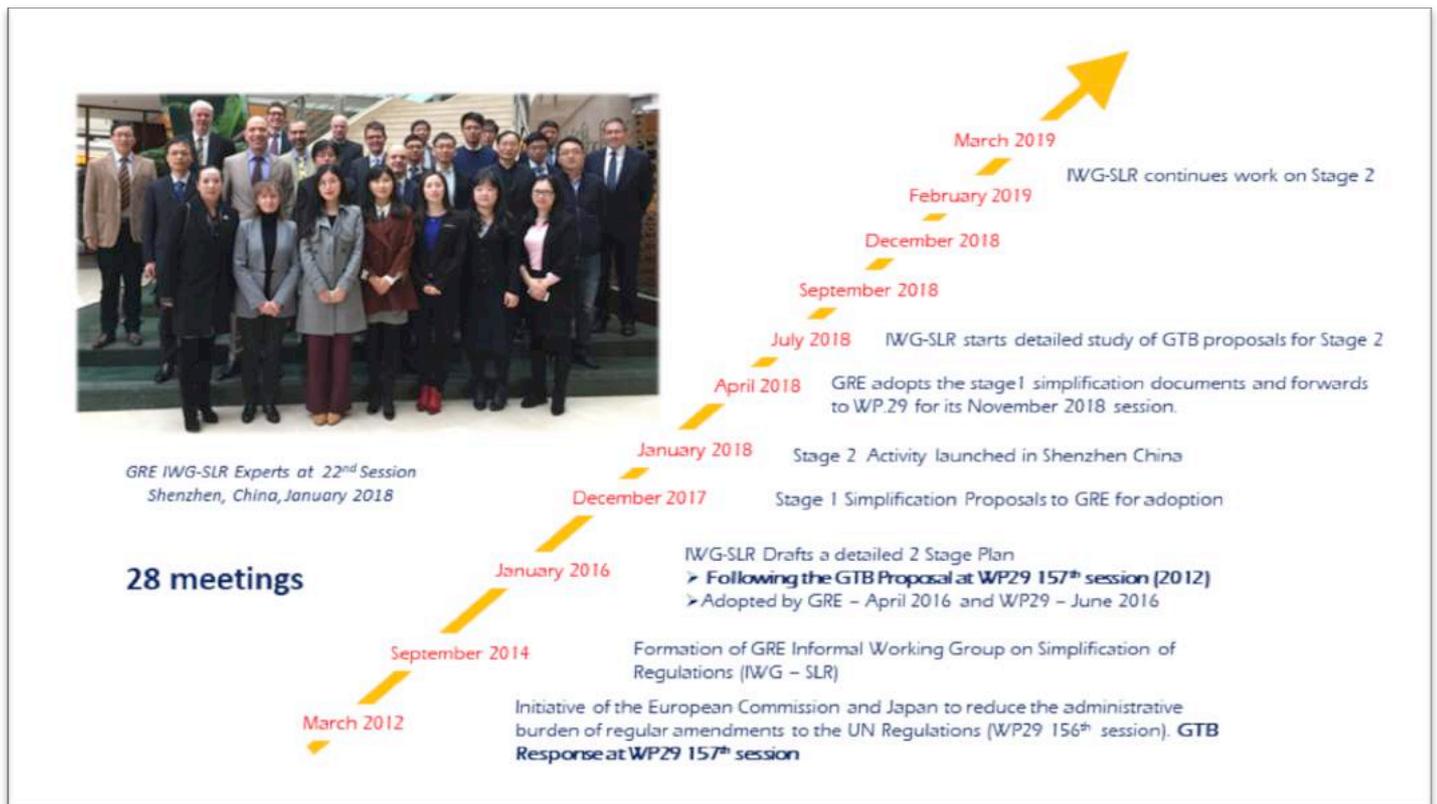
## Simplification of Regulatory Systems

### Simplification of the UN Lighting, Light-Signalling and light-Source Regulations

In 2012, GTB responded to the initiative of the European Commission and Japan at the WP.29 156<sup>th</sup> session to reduce the administrative burden of regular amendments to the UN Regulations. At the WP.29 157<sup>th</sup> session, GTB introduced a proposal for simplification of the UN lighting and light-signalling regulations. This proposal was eventually adopted and the GRE Informal Working Group on Simplification of Regulations (IWG–SLR) was launched in 2014. The GTB proposal is the basis of the subsequent work of GRE IWG-SLR.

All the working documents of GRE IWG-SLR may be [accessed](#) online.

The following diagram summarises the main steps completed up to March 2019



## New UN Lighting and Light-Signalling Regulations Set to Take Force in October 2019

At its March 2019 session, the United Nations World Forum for Harmonization of Vehicle Regulations (WP.29) adopted the complete Stage 1 Simplification package developed by GRE. This package consists of:

- Three new UN Regulations, intended to replace the existing regulations that will be phased out over a 24-month transitional period
- Associated amendments to the existing UN device Regulations to allow them to be frozen after the transitional period
- Updated versions of the installation regulations to refer to the new Regulations and to manage the movement of the common definitions into a single point of reference (UN Regulation № 48)

Although the numbers of the new regulations will be finally confirmed when they enter into force in October 2019 it is expected that they will be as follows:

UN Regulation № [148] - Light Signalling Devices (LSD)

UN Regulation № [149] - Road Illumination Devices (RID)

UN Regulation № [150] - Retro-Reflective Devices (RRD)

This is a significant milestone resulting from the intense work of the GRE Informal Working Group on Simplification of the Lighting Regulations (SLR). It also provides the necessary base for the Stage 2 Simplification that will transform the three new regulations into technology-neutral,

performance-based technical requirements than can be applied globally under the UN 1958 and 1998 Agreements.

The following is an extract of the presentation GTB Secretary General and Secretary of the GRE IWG-SLR to the DVN 2019 US Workshop. It provides a detailed overview of the GRE simplification activity.

## Why simplification ??

Too many UN Regulations amended too frequently  
because not technology neutral



### **Excessive administrative burden**

(cost for translations, difficult handling of many proposals, collective amendments, high risk of introducing errors, etc.)

### **Lack of legal certainty**

### **Need to remove barriers to innovation**

## Option chosen by the GRE-IWG SLR

### **Develop 3 new UN Regulations:**

- Light Signalling Devices (LSD)
- Road Illumination Devices (RID)
- Retro-Reflective Devices (RRD)

Containing classes of devices (e.g. Direction Indicators, position lamps, reversing lamps, Rear foglamps, etc.)

Quickest route to deliver a solution for the administrative problem of collective amendments.

Continue to grant new type approvals to the existing Regulations during development of the new Regulations.



## Simplification to be delivered in two stages

### STAGE 1

“Editorial simplification”

**REDUCE 41 UN REGULATIONS TO  
14 REGULATIONS + 1 RESOLUTION**



Provide a structure that limits to a minimum the number of parallel amendments necessary to achieve a regulatory change

Reduce the number of active/non-frozen regulations

Reduce the administrative burden (caused by maintenance of Regulations) on the Contracting Parties, the UNECE secretariat (and associated UN services) and the affected industrial sector

### STAGE 2

“Performance based / Technology neutral”

**REWRITE THE NEW REGULATIONS WITH UPDATED  
PERFORMANCE BASED TECHNICAL REQUIREMENTS  
SUITABLE FOR THE FUTURE**



Reduce ambiguity in the provisions to provide consistent interpretation

Define the essential requirements in performance (technology neutral) terms to provide opportunities for innovation

Determine whether the current regulatory text presents barriers to innovation and whether safety considerations are addressed

Develop, as far as possible, performance-based and technology-neutral requirements to ensure freedom for technical innovation within a framework of safety principles

UN Regs

## Structure of UN lighting Regulations after Stage 1

1  
2  
3  
4  
5  
6  
7  
8  
19  
20  
23  
27  
31  
38  
50  
56  
57  
69  
70  
72  
76  
77  
80  
87  
91  
98  
104  
112  
113  
119  
123



### NEW REGULATIONS

New 1 “Light Signalling Devices”  
New 2 “Road Illumination Devices”  
New 3 “Retro-Reflective Devices”

### INSTALLATION

R-48, R-53, R-74, R-86

### LIGHT SOURCES

R-37, R-99, R-128  
(Simplified structure with reference to a Resolution, R.E.5)

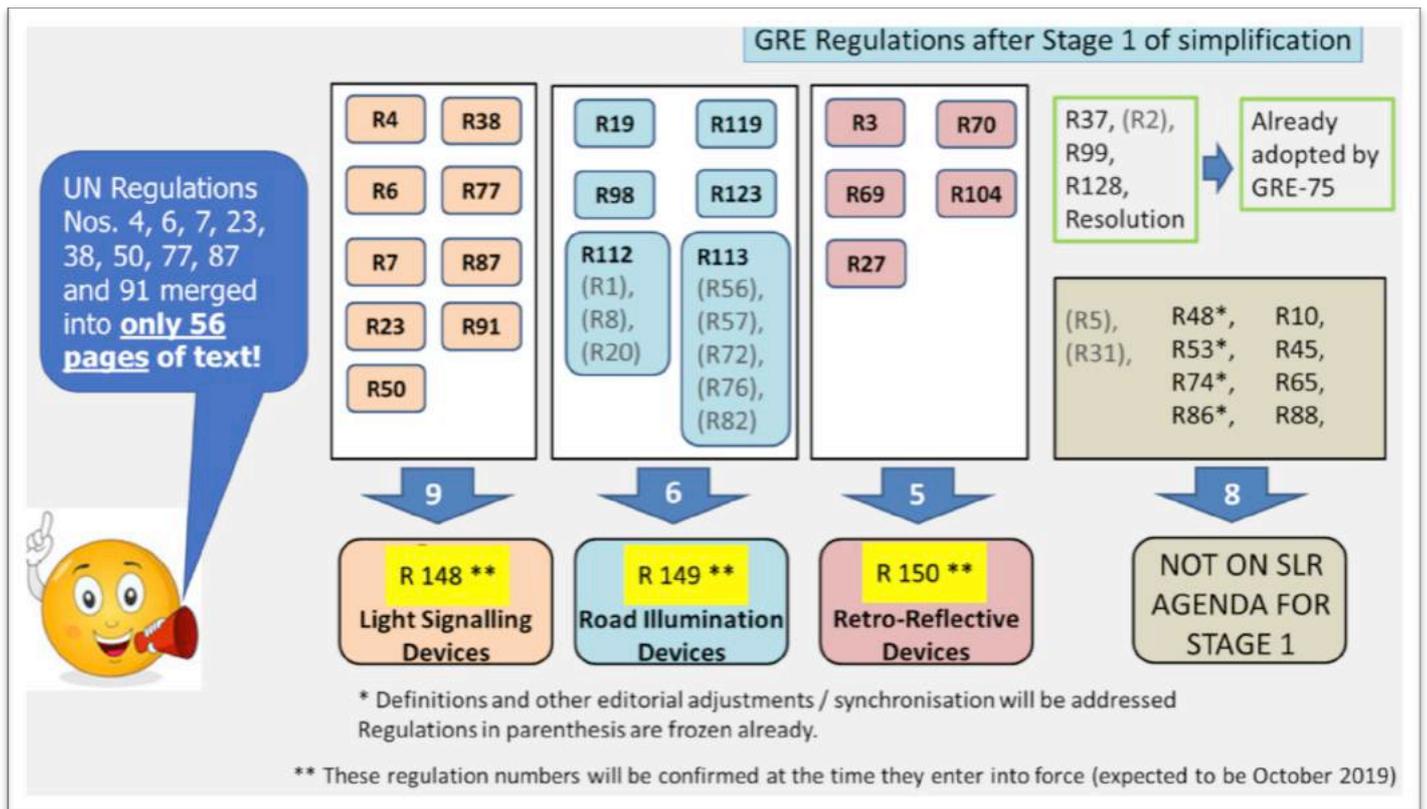
### VARIOUS

R-10, R-45, R-65, R-88



**ONLY  
14 Live  
Regulations**





## SLR "Stage 1"

### The complete package adopted by WP.29 - March 2019

**NEW SIMPLIFIED UN REGULATIONS**

- Light Signalling Devices [148] → WP.29/2018/157 (GRE/2018/36 to Nov 2019)
- Road Illumination Devices [149] → WP.29/2018/158/Rev.1 (part of GRE/2018/37 to Nov 2019)
- Retro-Reflective Devices [150] → WP.29/2018/159/Rev.1 (part of GRE/2018/38 to Nov 2019)

*The numbers of the new regulations will be finally confirmed when they enter into force in October 2019  
It is expected that they will be as shown above*

**Transitional Provisions**  
Collective Amendments for Regs Nos. 3, 4, 6, 7, 19, 23, 27, 38, 50, 69, 70, 77, 87, 91, 98, 104, 112, 113, 119 and 123  
WP.29/2018/091/Rev.1 to .../098/Rev.1, .../103/Rev.1, .../106/Rev.1, .../107/Rev.1, .../109/Rev.1, .../112/Rev.1 to .../119/Rev.1

**Updated References** to device Regs. + Reorganized and grouped definitions + Use of "Change Index" and its definition

- R48, series 03, 04, 05 and 06 of amendments  
(WP.29/2018/102, .../101, .../100, .../099/Rev.1)
- R53, series 01 and 02 of amendments  
(WP.29/2018/105, .../104/Rev.1 + GRE/2018/35 as corrected by GRE-80-05)
- R74, series 01 of amendments  
(WP.29/2018/108/Rev.1)
- R86, series 00 and 01 of amendments  
(WP.29/2018/111, .../110/Rev.1)

## Work plan and time schedule for “Stage 2”

STAGE 2 = SIMPLIFIED REGULATIONS with technology neutral and performance based requirements

STAGE 2	The overarching objective is to update and harmonise the technical requirements for lighting and light signalling to be <u>suitable for global implementation under the UN 1958 and 1998 agreements</u> .	
STAGE 2 STEP 1	<b>Revise the technical requirements of the new LSD, RID and RRD Regulations, to become technology neutral with performance-based and objective test requirements. Minor amendments will be required to the installation Regulations</b>	
	Informal submission to GRE-82	<b>October 2019</b>
	Final consideration at GRE-83	<b>April 2020</b>
	Adoption by WP.29	<b>November 2020</b>
STAGE 2 STEP 2	<b>Simplify and update the technical requirements of the UN installation Regulations (48, 53, 74, 86), to become technology neutral with performance-based and objective test requirements</b>	
	Informal submission to GRE-86	<b>October 2021</b>
	Final consideration at GRE-87	<b>April 2022</b>
	Adoption by WP.29	<b>November 2022</b>

## STAGE 2 = SIMPLIFIED REGULATIONS with technology neutral and performance based requirements

### STEP 1

What realistically  
can be achieved by the end of 2019



Improve the simplified UN **device Regulations** resulting from Stage 1 (i.e. LSD, RID and RRD) with regards to:

- technology neutral
- performance based requirements
- objectively testable provisions

Align all changes with the progress of the corresponding simplified Chinese GB Standards

Minor amendments to installation will be necessary

### STEP 2

What will be delivered afterwards (not because less important but because requiring more time!)



Simplify UN **installation Regulations** (48, 53, 74, 86) and harmonise with corresponding Chinese GB Standards.

## CHINESE SIMPLIFICATION OF GB STANDARDS

> GB 4599-2007 汽车用灯丝灯泡前照灯  
Headlamp with filament lamps  
> GB 21259-2007 汽车用气体放电光源前照灯  
Headlamp with gas-discharge light sources  
> GB 25991-2010 汽车用LED前照灯  
Headlamp with LED/LED module(s)  
> GB 4660-2016 机动车用前雾灯配光性能  
Front fog lamps



> GB/T 30036-2013 汽车用自适应前照明系统  
Adaptive Front-Lighting System for Motor Vehicle  
> GB/T 30511-2014 汽车用角灯配光性能  
Cornering lamps

FRONT LIGHTING

SIGNAL LIGHTING

标准号NO.	标准名称Name	UN ECE
GB 5920-XXXX	汽车及挂车前位灯、后位灯、示廓灯和前雾灯配光性能	R7
GB 15235-2007	汽车及挂车倒车灯配光性能	R23
GB 11554-2008	机动车和挂车用后雾灯配光性能	R38
GB 17509-2008	汽车及挂车转向信号灯配光性能	R6
GB 18408-2015	汽车及挂车后牌照板照明装置配光性能	R4
GB 18409-2013	汽车驻车灯配光性能	R77
GB 18099-2013	机动车及挂车侧标志灯配光性能	R91
GB 23255-XXXX	汽车侧滑门灯配光性能	R87
GB 13594-2009	特种车辆标志灯	----

GB 11564-2008 机动车回光反射器 (对应于 ECE R3)

"Retro reflector device for motor vehicles"

GB 19151-2003 机动车用三角警告牌 (对应于 ECE R27)

"Warning triangles for motor vehicle"

GB 23254-2009 货车及挂车 车身反光标识 (技术内容类似 ECE R104)

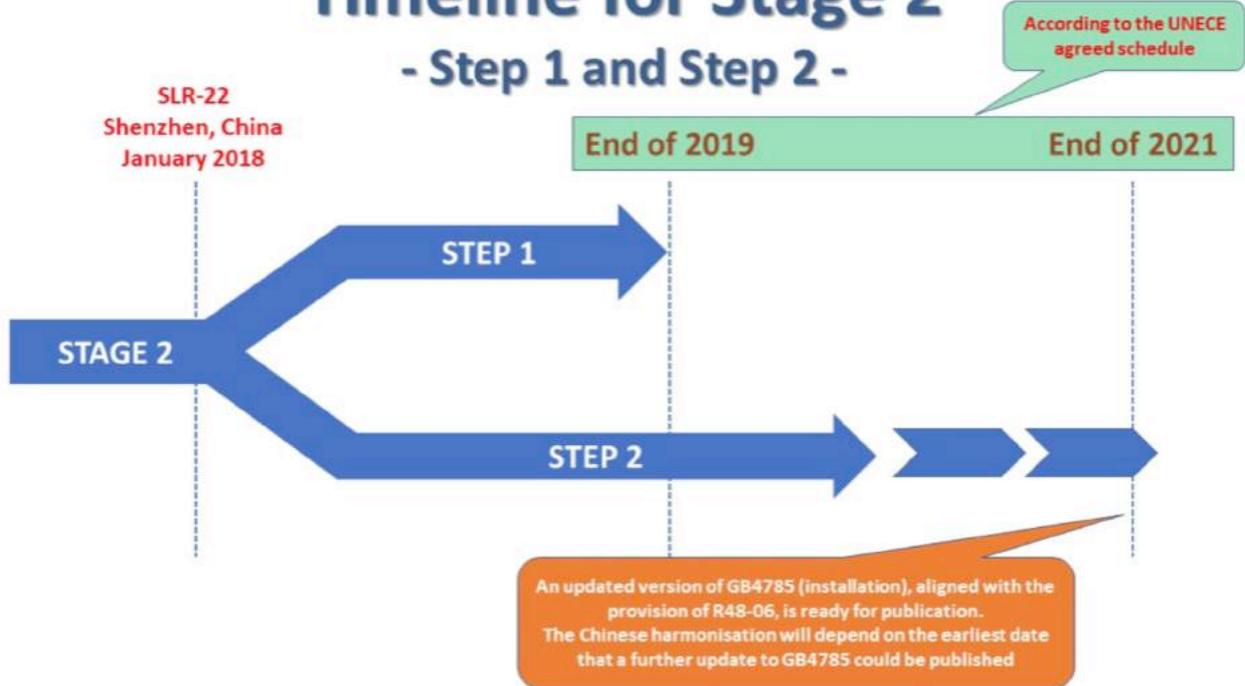
"Retro-reflective markings for trucks and trailers"

GB 25990-2010 车辆尾部标志板 (对应于 ECE R69和ECE R70)

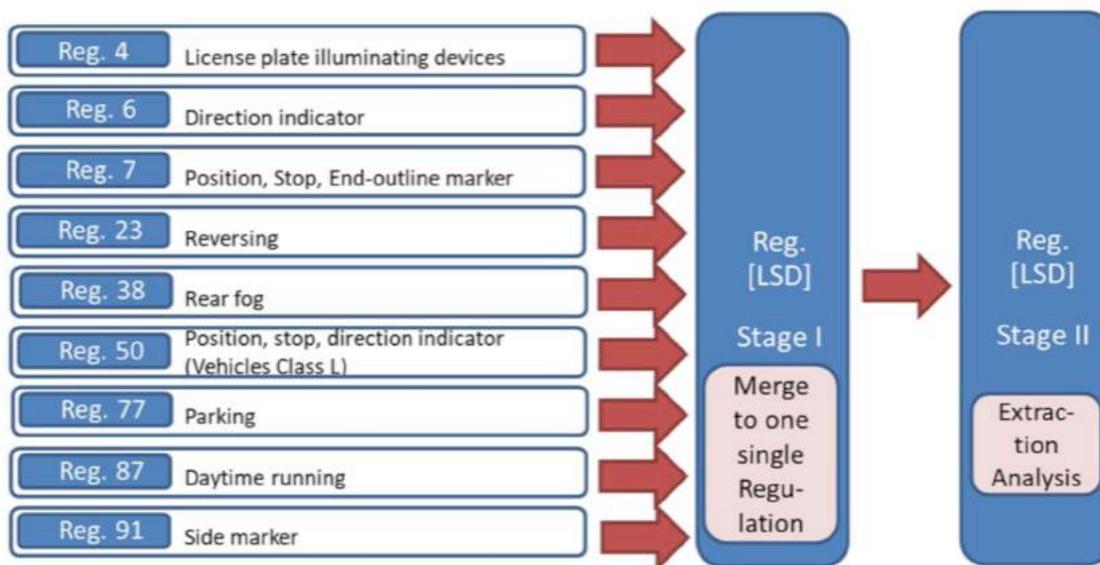
"Rear-marking plates for vehicles and their trailers"

RETRO-REFLECTIVE DEVICES

## Timeline for Stage 2 - Step 1 and Step 2 -



## Stage II – LSD Regulation No. [148]



## Stage II – LSD Regulation No. [148] Main topics of work

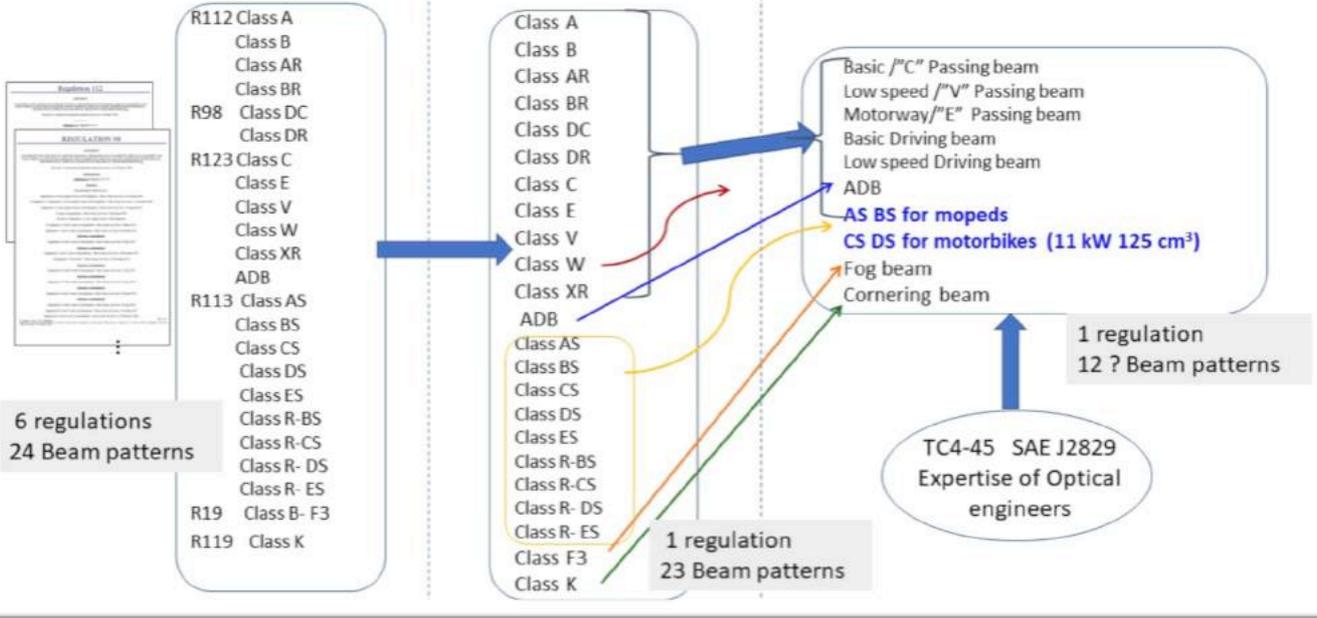
- Rearrangement of the requirements -> §5.x.x
- Align "D" and "Y" lamp provisions -> §4.4
- Light source module definition -> §4.3.2.ff
- Harmonise failure provisions -> §4.6. (see also §5.4.4.ff)
- Rear registration plate lamp – harmonisation -> §5.11.
- Reversing lamp – improvement -> §5.8.
- Rear fog lamp – improvement -> §5.9.
- Additional functions -> New §x.y.
- Move requirements to main text -> Annex 2, 3

# ROAD ILLUMINATION DEVICES (RID) Reg. No. [149]

TODAY

TOMORROW (RID "Stage 1")

IN FUTURE (RID "Stage 2")



## Installation requirements after SLR step 1 RRD Regulation [149]

**R48**

- Class B, BR
- Class DC, DR
- Class C
- Class E
- Class V
- Class W
- Class XR
- ADB
- Class F3
- Class K

**R86**

- Class A, AR
- Class B, BR
- Class DC, DR
- Class AS
- Class BS, R-BS
- Class CS, R-CS
- Class DS, R-DS
- Class ES, R-ES
- Class F3
- Class K

**R74** AS  
BS, R-BS  
CS, R-CS  
DS, R-DS  
ES, R-ES  
A, AR  
B, BR

< 50 Km / h

**R53** CS, R-CS  
DS, R-DS  
ES, R-ES  
Class B, BR  
Class DC, DR  
F3

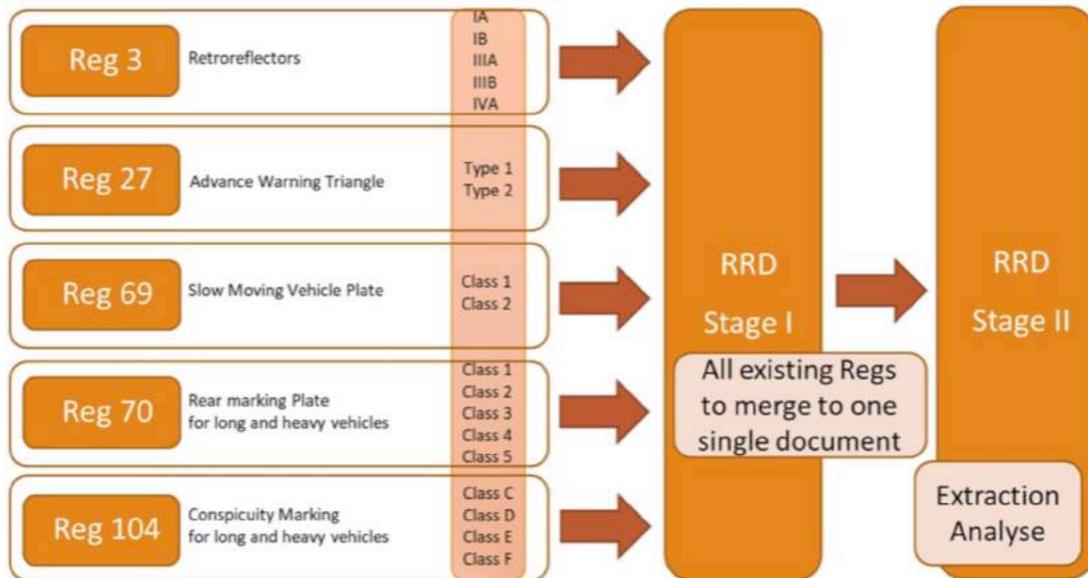
< 125 cm<sup>3</sup>

> 125 cm<sup>3</sup> 2 x CS, 2 x R-CS  
DS, R-DS  
ES, R-ES  
A, AR  
B, BR  
DC, DR  
F3

GREEN colour means «optional»  
BLACK colour means «mandatory»

Should the beam requirements be based on the category of the vehicle?

## Stage II – RRD Regulation No. [150]



## Stage II – RRD Regulation No. [150] Main topics of work

- Requirements for CIL for retroreflective devices – classes
- Requirements for  $R' (R_A)$  for retroreflective devices/markings – classes
- Colorimetric requirements – daytime and nighttime visibility enhanced visibility
- Photometric measurement conditions – to define independent from device
- Water-penetration test and corrosion test independent from the device
- Weathering test (colour fastness) to adapt to state of the art testing
- Mechanical requirements to define testing independent from device
- Chemical and environmental requirements - testing independent from device
- Specific requirements and testing, which is depending from the device

## Conclusions

This approach is complicated but will overcome the problem of collective amendments and provide GRE and WP29 with an **excellent basis for introduction of new technologies** into the UN Regulations with a **minimum of administrative burden**



### Simplification of the UN Light Source Regulations

At the DVN 2019 US Workshop, GTB Vice President and Light Source Working Group Chairman Bart Terburg provided a detailed overview of the simplification of the UN Light Source Regulations. This work is the result of the collective efforts of industry partners actively working on vehicle lighting in GTB, ELMAPS, IEC Committees, their task forces and corresponding national committees. It has revolutionised the format of the light source regulations by removing the detailed datasheets from the text of the regulations to a Resolution Document listed under "R.E.5" in the Resolutions section of the UN website. This approach dramatically reduces the administrative burden for the governments and UN secretariat, and reduces the time-to-market for new light sources from 26 to 17 months.

An extract of Bart Terburg's overview is shown here:

## Simplification of UN Light Source Regulations

### Timeline

- Analysis and feasibility study
  - Mr. Ad de Visser (IEC\* Head delegate in GRE & WG LS Chair 2001-2015)  
\*IEC = International Electrotechnical Commission
- Project endorsed by WP.29 in 164<sup>th</sup> session (November 2014)
  - Work carried out in GRE IWG SLR, by IEC delegation
- Formal proposal adopted in April 2016 GRE session
- Adopted by WP.29 in November 2016
- Entered into force **22 June 2017**
- Published **1 March 2018**

## Structure UN Light Source Regulations

Similar structure of R37 (Filament), R99 (HID) and R128 (LED):

Scope

Administrative provisions

Technical requirements

Conformity of production

Names and addresses of Technical Services

Transitional provisions

### Annexes

Sheets for light source categories



Light Source  
Technical Specifications

Communication

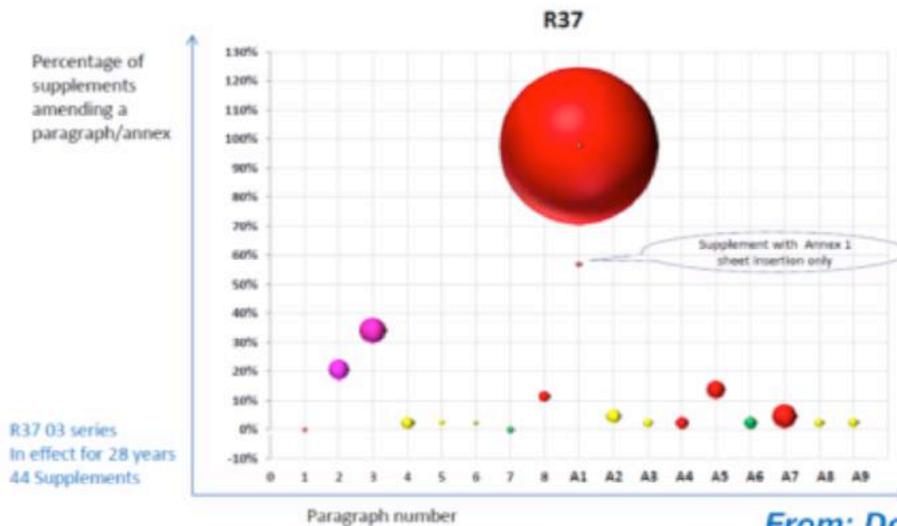
Example of the arrangement of the approval mark Prescriptions for technical testing

Prescriptions for conformity of production

# Analysis and Feasibility Study

## Analysis amendments Statistics

Bubbles	
Size	Colour
Reflects number of pages per paragraph/annex	Green Common text shared between light source regulations
	Yellow Common text with minor technology related lines
	Purple Common text with frequent technology related lines
	Red Totally different paragraphs



From: Document WP.29-164-18

## Concept for Simplification

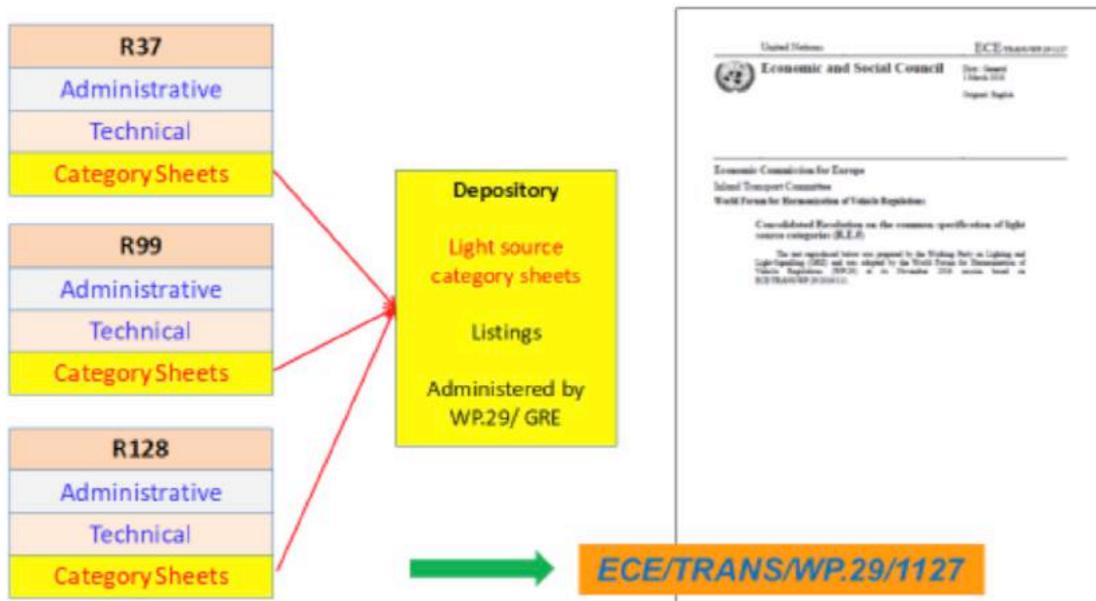
- Create a depository ("Consolidated Resolution") containing all light source category sheets from [Annex 1](#) of each of the light source regulations:
  - » Regulation 37 (filament lamps)
  - » Regulation 99 (HID)
  - » Regulation 128 (LED light sources)
- Depository contains an index with the date of introduction phase out, amendment/correction, use restrictions, etc.
- A reference to the depository is added in each of the light source regulations
- The regulations are not amended when only light source categories are inserted

# Consequences

- Significantly less amendments of the light source regulations
- The processing of light source category sheets is complete after GRE and WP.29 adoption and posting in the depository
- Submission to UN Office of Legal Affairs (OLA), NY not necessary
  - Elimination of 6 month period for category sheets (only)
- After extraction of data sheets remaining regulatory texts of R37, R99, and R128 are significantly condensed
  - E.g: Regulation 37 condensed from ~200 to ~ 40 pages

# Simplification of UN Light Source Regulations

- Simplification of Light Source Regulations – New structure as of **22 JUN 2017**

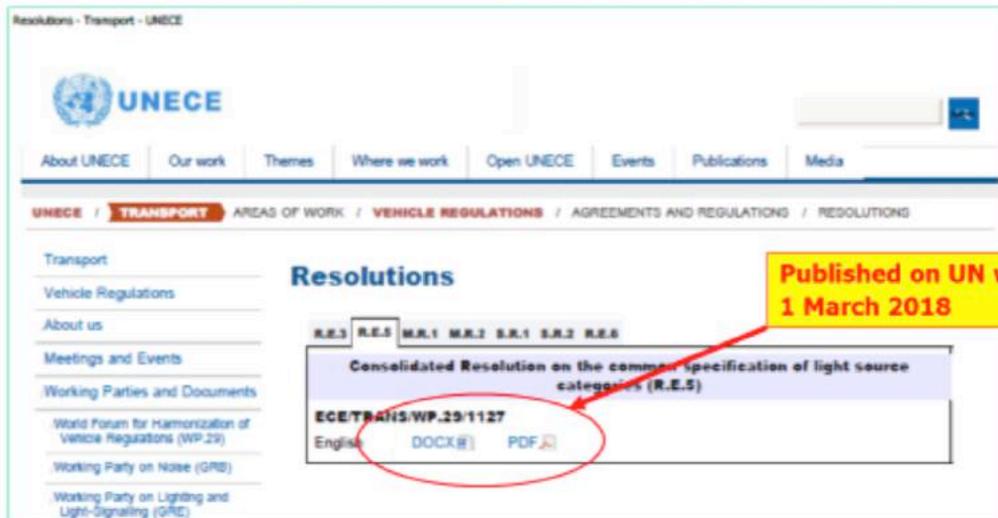




# Consolidated Resolution R.E.5

- Resolution Document is listed under “R.E.5” in the **Resolutions** Section on the UN web site:

<http://www.unece.org/trans/main/wp29/wp29wgs/wp29gen/wp29resolutions.html>



## Development and Approval Process New & Amended **Light Source Data Sheets**



# Summary

## Reduced the administrative burden

- Fewer pages of regulation text
- One Consolidated Resolution to maintain

## Reduced burden on governments

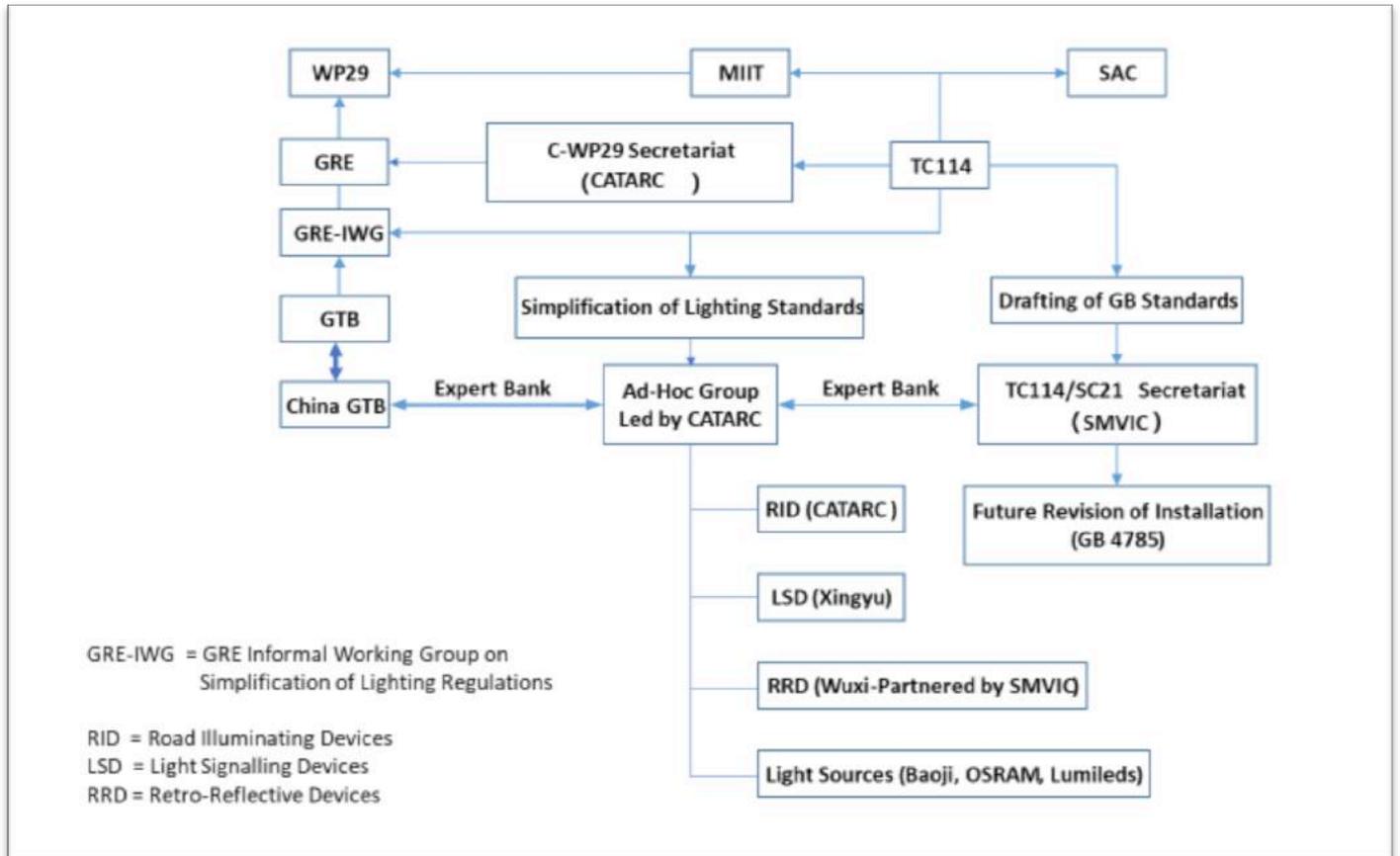
- Number of supplements reduction
- Process completed after WP.29 and posting in R.E.5

## ▪ Reduced regulatory burden for industry

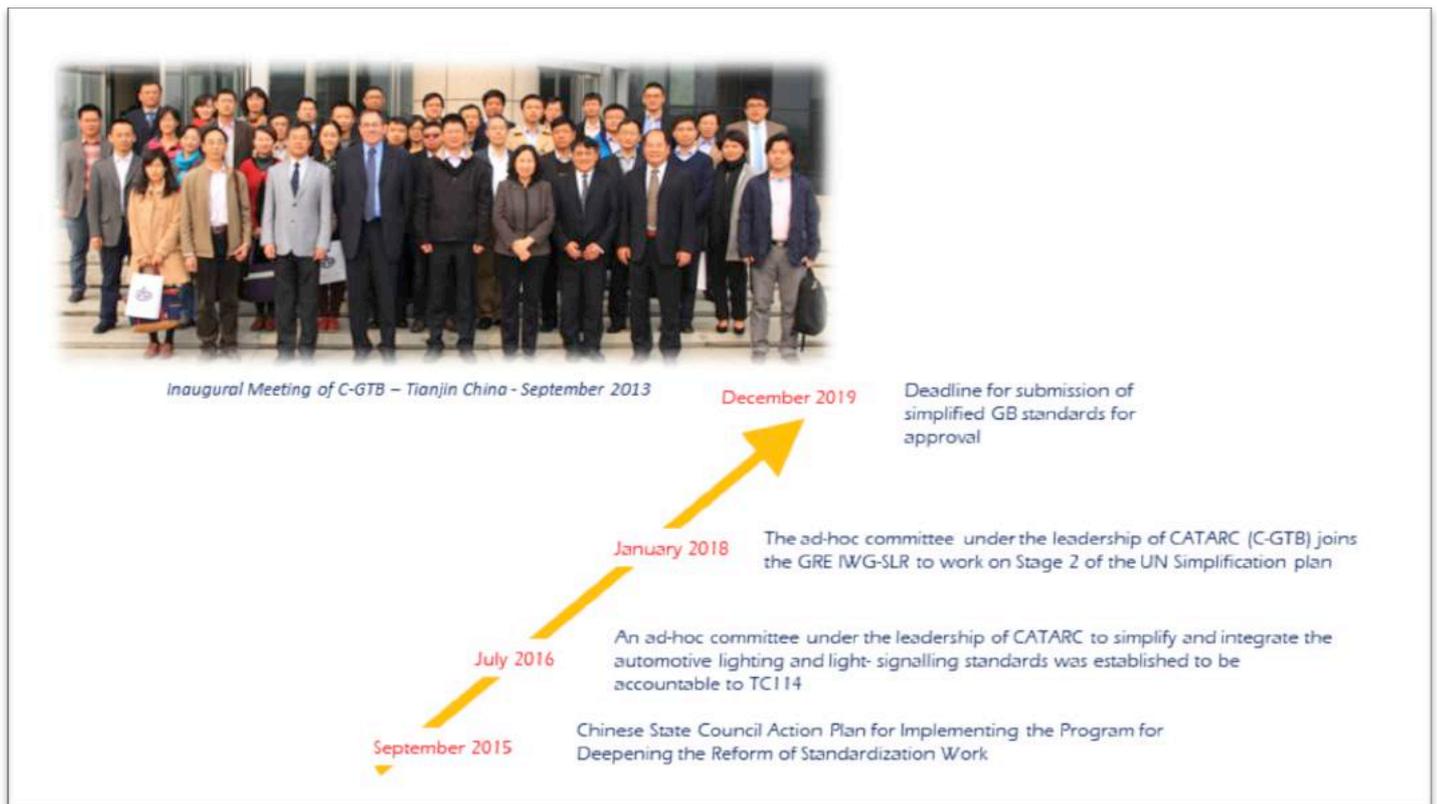
Approvals earlier due to elimination of 6 month period

## Simplification of the Chinese GB Standards

The following information is extracted from the presentation of Professor He Yuntang to the 2019 DVN Shanghai Workshop. The diagram shows the interactions between China's MIIT (Ministry of Industry and Information Technology), SAC, SMVIC, and CATARC in relation to the development of the Chinese GB Standards and the current project to simplify the GB Standards. It also shows the relations between the Chinese MIIT and WP.29–GRE and the links between GTB, C-GTB, and SAC/TC114/SC21.



The Ad-Hoc Group, led by CATARC with input from C-GTB, are working in cooperation with the GTB Working Groups to synchronise the simplification of the UN Regulations with the simplification of the Chinese GB Standards. The output of the Chinese Ad-Hoc group is submitted to the TC-14/SC21 secretariat and subsequently follows the normal procedure to develop the GB standards (explained on Pages 17 -20).



The Ad-Hoc Group are finalising their proposals for simplification of the GB standards that will be submitted for public comments in the spring of 2020, following the normal SC-21 procedure.

The result of the simplification project will be an alignment with the UN Simplification including:

- Forward Lighting Device standard to include Headlamps, Front Foglamp, AFS and Cornering Lamps
- Signal Lighting Devices standard including all signalling lamps, except warning lamp for special purpose vehicles
- Retro-Reflective Devices standard including advanced warning triangle, retro-reflectors, conspicuity markings, and retro-reflective plates
- Light Sources. This standard has been drafted in a similar way to the UN Regulations with three sections:
  - Mandatory part for the safety requirements
  - Types List
  - Reliability Test Requirements

## Standardisation versus Regulation and how they coexist

It is clear that the major part of the world is following the work of the UN World Forum (WP.29) in terms of incorporating the technical requirements of lighting and light-signalling into their national standards and legislation. This is a great success and the result of hard work of the contracting parties and NGOs coming together at GRE in Geneva. There are 53 contracting parties to the 1958 Agreement, and most of these operate the mutual recognition of type approvals. Other

countries incorporate the technical requirements of the UN regulations into their local requirements and this does not present particular difficulties to importing manufacturers because there is a good level of synchronisation with the changes being developed in Geneva.

The difficulty for manufacturers comes from countries operating their own system of mandatory Standards such as USA, China, and—to a lesser degree—India and Korea. The operation of a standardisation system such as that of ISO is democratic and bureaucratic and this takes time, so even if there is a declared intention to follow the work in Geneva the result is an inconvenient delay following the entry into force of the amendments to the UN Regulations and the entry into force of the corresponding mandatory standards.

The choice between standardisation and regulation is largely political, and concerns countries that wish to operate their own certification/approval systems or operate a self-certification approach backed up by enforcement procedures. The USA regulates vehicle lights by dint of FMVSS № 108 and defines test requirements based on its own independent research. Opportunities to introduce amendments are tightly constrained by its strict laws, notably the statutory requirement for positive demonstration of cost-benefit to any mandatory aspect of a vehicle regulation. This makes it very difficult to regulate crash-avoidance equipment (such as lights, signals, and reflectors) at more than a minimal, basic level, as the cost of an avoided crash can only be estimated, not ascertained, and the law does not allow for estimation or risk-assessment in calculating cost-benefit.

China operates its own system of mandatory standards alongside a certification system with regular surveillance of the manufacturing processes to ensure compliance. There is a readiness on the part of the Chinese administration to amend its GB standards, but the process is lengthy, with delays of at least five years from the start of the amendment process being common.

Korea has taken a political decision to follow a self-certification and enforcement system as a result of its free-trade Agreement with the USA but is actively working to maintain close alignment of the KMVSS with the Technical requirements of the UN Regulations. India is also making intensified efforts to keep its AIS standards in line with UN Regulations.

## The Need for Global Technical Regulations

The situation just described means that despite the high level of global harmonisation of technical requirements there are still major barriers to innovation to be overcome. WP.29 and GRE are now focused on developing technical requirements that are suitable for application in both type-approval and self-certification systems. This means that all future development of technical requirements in GRE will demand that objective testing and technology-neutral, performance-based requirements shall be incorporated. The terms of reference for the Stage 2 activity of the GRE Informal Working Group on Simplification include this important requirement.

Successful implementation of these harmonised technical requirements into national legislation, such that there is global synchronisation to avoid barriers to innovation, cannot be achieved without the development of Global Technical Regulations under the 1998 agreement. This is

particularly important with regard to the US situation where there is great reluctance to attempt any significant update or upgrade of FMVSS № 108.

Currently there is only limited enthusiasm on the part of administrations and industry stakeholders to devote resources to develop GTRs. Administrations recall previous failed attempts to develop lighting GTRs because at a certain point industry withdrew support, and the US did not get onside with the greatest-common-stringency principle of a single lighting regulation. This time, there is a consensus in industry that it is time to start developing GTRs but there is nervousness that, having dedicated expensive resources, the administrations will not adopt the GTR into national law.

For the present this impasse can be tolerated because industry is finding ways to work with existing regulations and mandatory standards, with the exception of AFS and ADB where the US regulation is an impassable obstacle. And with vehicle lighting innovation coming faster and faster it is clear that the status quo cannot continue. The new adaptive lighting systems offer well researched improvements in traffic safety, but they will be blocked unless a regulatory solution is found. The current debate about the need for signals on autonomous vehicles will demand a unique global solution if it is decided that these vehicles need to signal their status and intentions for the benefit of other vulnerable road users.

Since 2012 the DVN Workshops have included a regulatory session where the issues associated with removing barriers to innovation and trade through regulatory change have been debated on many panels. The following is a report of the Special Regulatory Session at the DVN 2018 Japan Workshop on 6 June of that year:

A high level, two-hour, Regulatory session with contributions from eleven experts in the field of Vehicle lighting and light-signalling was led by GTB President, Geoff Draper. He launched the session with reference to the introduction, published in the DVN Newsletter of 15 May 2018, which explained his motivation to work on building an industry consensus to seek the support of governments to develop GTRs under the UN 1998 Agreement.

Since 2011 Geoff Draper has been leading the debate relating to the need to remove barriers to innovation by simplifying and harmonising the current regulations and over the past six years much has already been achieved. This debate has now reached a stage where a step change is required to develop global technical requirements. These requirements must be suitable for global implementation of innovations instead of perpetuating the current system of parallel UN regulations and other national mandatory standards that are almost impossible to synchronise and which present major barriers for manufacturers.

As this 17<sup>th</sup> workshop was held in Tokyo, the opportunity was taken to organise a regulatory session that was focused on the opinions of our Asian colleagues from Japan, China, India and South Korea and their willingness to participate was truly impressive. The two-hour session consisted of:

An opening speech by **Mr. Hiroyuki Inomata** - Director of Technical Planning Office - Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT). Mr. Inomata also holds very important positions at the UN Global Forum in Geneva as Chair of WP29- AC3 (Administrative Committee for the UN 1998 Agreement) and Chair of the WP.29 Informal Group on



## "ITS / Automated Driving"

A keynote presentation by **Dr. Peter Bodrogi**, Senior Research Fellow, Laboratory of Lighting Technology, Technical University of Darmstadt, Germany. Dr Bodrogi shocked and inspired the audience with a presentation of his work on *"The worldwide demographic development and consequences for the development of global automotive lighting technical regulations"*.



A keynote presentation on *"The UN 1998 Agreement and the procedures to develop GTRs: Experience of developing GTRs and lessons learnt"* by **Mr. Michel Loccufier**, Director and Head of Unit, Regulation, Licence & Enforcement at the Belgian Ministry of Transport and Mobility. Mr Loccufier also has the key role at the UN in Geneva as Chair of the WP.29 Working Party on Lighting and Light-Signalling (GRE)



The opening speech and the keynote presentations were followed by a panel session that addressed the questions: a) *"Are GTRs the Future of Global Vehicle lighting Regulation?"* and b) *"What are the pros and cons?"*

In conclusion, the panel unanimously agreed:

- ✓ GTRs shall be the future basis for lighting and light-signalling regulation and the priority should be placed upon developing GTRs for the new technologies such as signalling for Automatic Driving Systems (ADS).
- ✓ There is some nervousness to commit resources to this major task because of the previous attempts to develop GTRs that failed, due to opposition from some parts of industry and reluctance of some contracting parties of the UN 1998 agreement to incorporate the Global Technical Requirements into their national laws.
- ✓ Notwithstanding the nervousness, it is time to start working on GTRs because the new technologies need to have globally harmonised technical requirements and be available for application in all markets.

## Background to the Session

Traditionally, Lighting and Light-Signalling Regulations have been based upon a classic standardisation approach and in many cases are focused on specific technologies. This has resulted in regular amendments of the regulations to accommodate technical progress. In 2012 the European Union and Japan introduced an initiative in the UN World Forum on Harmonisation (WP.29) calling for a new simplified approach based upon the principle of technology neutral requirements, meeting minimum performance levels based upon safety criteria. In 2015 the Chinese Government launched a similar initiative to simplify the GB Mandatory Standards. In both cases the motivation was to produce regulations that are not subject to frequent amendment.

In response to the initiative of the EU and Japan, the GRE SLR Informal Working Group was launched in September 2014 and developed its two-stage plan to produce technology neutral, performance based technical requirements. The Stage 2 was launched in January 2018, with the

opportunity to work with the Chinese simplification group to harmonise the device requirements by the end of 2020. The harmonisation of the installation requirements requires more time with expected completion in 2024.

Ground-breaking work on development of the SAE J3069 Adaptive Driving Beam and NHTSA'S approach to adaptive head lighting systems is now the subject of a Notice of Proposed Rulemaking. This provides a foundation for developing objective, performance-based requirements compatible with the self-certification approach to regulation.

These important initiatives by the UN, China, and USA are all aimed at technology-neutral, simplified technical requirements focused on assuring road safety and regulatory certainty and reducing barriers to innovation. There are also initiatives to introduce NCAPs (New Car Assessment Programmes) to encourage the development of features to further enhance the minimum requirements laid out in the Regulations. This is a means of simplifying the regulations to make them more stable by reducing the need for frequent amendment without unnecessary restrictions to the implementation of new technologies.

Looking to the future there are new challenges and opportunities associated with the possibilities of adapting lighting to suit special needs such as:

- Mega cities
- The ageing population
- The complexities of mixed traffic consisting of more cycles, more trucks, more pedestrians and the presence of vehicles equipped with Automated Driving Systems (ADS)
- Special signals to indicate the operational status and intended manoeuvres of ADS vehicles

Emerging technologies will increasingly have the capability to adapt lighting and light-signalling to satisfy these important special needs and, clearly, there will be a requirement to develop stable technology neutral requirements for systems that can be intuitively operated, or their signals can be understood, by all users. This implies the need for technical regulations that are globally harmonised and synchronised. The platform for the development of these requirements is the UNECE World Forum for Harmonisation of Vehicle Regulations and its 1958 and 1998 Agreements.

The regulatory aspects of lighting and signalling for ADS Vehicles are under discussion at the UNECE and it is clear that the technical requirements will be developed as GTRs under the UNECE 1998 agreement and in conjunction with WP.1 (1968 agreement – "Vienna Convention") because a unique global solution will be necessary.

The opening speech and the keynote presentations provided a logical introduction to the panel session that posed the questions:

- *Are GTRs the Future of Global Vehicle lighting Regulation?*
- *What are the pros and cons?*

The panel consisted of the following experts who had already become acquainted around a large table at the welcome dinner on the previous evening:

<b>China</b>	Independent Tier 1 Equipment Manufacturer	<b>Mrs. Xiaoping Zhou</b> CEO and Chair of the Board of XingYu Lighting
<b>India</b>	Automotive Research Association of India (ARAI)	<b>Mr. Venkataramaiah Belavadi Shamsundara</b> General Manager
<b>JAMA</b>	Japan Automobile Manufacturers Association	<b>Mr. Teruyoshi Fujita</b> Body Function Planning Dept. Toyota Motor Co. Chair of the JAMA Lighting Committee
<b>Japan</b>	Ministry of Land, Infrastructure, Transport and Tourism (MLIT)	<b>Mr. Hiroyuki Inomata</b> Director of Technical Planning Office - Japanese Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Chair of WP29- AC3 (Administrative Committee for the UN 1998 Agreement) Chair of the WP.29 Informal Group on "ITS / Automated Driving"
<b>JAPIA</b>	Japan Auto Parts Industries Association	<b>Mr. Takayuki Amma</b> Deputy General Manager, Regulation and Homologation, Koito Manufacturing Co. Chair of the JAPIA Lighting Committee
<b>South Korea</b>	Vehicle Manufacturer	<b>Mr. Sung uk Choi</b> Leader - exterior lamp system engineering design team, Hyundai Motor Group
<b>UNECE</b>	GRE Chairman	<b>Mr. Michel Loccufier</b> Director and Head of Unit, Belgian Ministry of Transport and Mobility Chair of WP.29 Working Party - Lighting and Light-Signalling (GRE)



The panel (left to right):  
**Sung Uk Choi** (South Korea)  
**Takayuki Amma** (Japan),  
**V. B. Shamsundara** (India)  
**Xiaoping Zhou** and **Zhiming Yu** (China),  
**Teruyoshi Fujita** (Japan),  
**Hiroyuki Inomata** (Japan)  
**Michel Loccufier** (Belgium).

To conclude the panel session, written contributions submitted by experts who were unable to be present but wanted to explain their positions were read to the audience. These experts were:

<b>EU</b>	Mr. Aleksander Lazarevic Policy Officer, DG GROW, The European Commission	
-----------	--	---

USA	<p>Mr. Charles Uthus  Vice President AAPC  (American Automotive Policy Council representing Fiat Chrysler Automobile, Ford Motor Company and General Motors Company)</p>	
China	<p>Professor Yuntang He  Auto Standardization Research Institute (ASRI)  China Automotive Technology &amp; Research Centre (CATARC)  Representing China in the UN ECE World Forum - WP29 / GRE</p>	

### The Contributions of the Panel

#### Mrs. Xiaoping Zhou

Xingyu lighting is among the largest vehicle lighting companies in China and serves OEM brands all over the world, I am very glad to address the DVN workshop to share our opinions.

For the first question, I think that GTRs should be the future of global vehicle lighting regulation and the trend of its development because the ultimate goals of national and regional regulations are the same; they mainly focus on safety, environmental protection and economy. GTRs can promote the technical consistency and innovative technology development for different markets, and therefore benefits for international trade. However, the consolidation for the different regulations shall be big challenge for the coordinator, due to the different traffic situations and different regulation bases among different regions. For example, in Asia there are many mega cities and the road traffic situations are very complicated. Perhaps the field of Automated Driving System (ADS) lamps and Road projection will be the good breakthrough points.

#### Mr. Venkataramaiah Belavadi Shamsundara

India in 2020 is looking forward to smart, safe and sustainable mobility like other developed countries. At this juncture;

- India is crossing 30 million vehicles production annually
- India is 2<sup>nd</sup> largest two-wheeler manufacturer
- India is 5<sup>th</sup> largest heavy truck manufacturer
- India is 6<sup>th</sup> largest car manufacturer

Considering the environmental challenges of pollution and fossil energy depletion, technological innovations would be required to meet the rising need of urban and rural mobility in India. Also the development of automotive regulations harmonised with Europe and the technological advancements would be critical to ensure the safety and environmental performance of future vehicles in India. The Indian Automobile Industry in the last decade has made significant progress on the environmental and safety front by adopting stringent standards and is progressively aligning technically with international standards.

While formulating the national standard in India considerable assistance is drawn from existing UN Regulations. Additionally being a signatory to 1998 agreement, India actively participates in the

formulation of GTR and their subsequent transposition into national standards. While formulating its standards, India has drawn references from 116 out of the 143+ UN regulations and has completed the task of formulating the India Lighting standards with the reference to the UN regulations, with the exception of UN R88 related to retro reflective tyres for 2-wheeled vehicles. Similarly India has formulated standards which are technically aligned to 7 GTRs out of 19.

As a matter of fact, India has tabled several informal documents while formulation of Lighting GTR long back. As a 1998 signatory, we have strongly supported the formulation of GTRs in lighting. India is ready to take any assignment, if WP-29/GRE provides an opportunity to work in this regard.

India has all the global automobile players and, having equal share of Asian and European countries as well as US base a GTR will really help us to make life easier. India has always been in agreement for the technology neutral simplified technical requirements and less frequent amendments. It assures more road safety, regulatory certainty and reduces barriers to innovation.

We feel there is no negative concern for the development of GTRs in the lighting areas. However before taking this task, we need to understand the following because GRE has worked / discussed more than two years in the past, but the outcome was zero.

Effective use and implementation of existing GTRs across the globe by the 1998 signatories

1. What are the problems faced by 1998 signatories while implementing these GTRs / it may be feedback from respective countries?
2. Make an agreement from 1998 contacting parties and clearance from WP29 before start of formulation of lighting GTR.

### **Mr. Teruyoshi Fujita**

To the question "Are GTRs the Future of Global Vehicle lighting Regulation", of course I hope so but it's difficult. I'm not familiar with GTRs. There are 20 GTRs now but there is no lighting GTR.

When I started my regulatory work in JAMA, the trial making GTR for lighting installation had just ended in failure. Most of OICA members are negative to GTR because of this bad experience and when the OICA GEE chairman saw the GTB document for GTR, he said, "It's a dream!"

I think lamps are like languages; they are communication tools and they are like cultures. It is difficult to harmonize cultures. People in US are accustomed to red direction indicators whereas, in Japan, people would be surprised at red direction indicators. However, there may be a possibility of GTR for new lamp systems, like ADS lamps.

To the question "*What are the pros and cons?*" the pros are that we can sell the same lamps to all over the world but the cons are that innovations may be delayed. I hope that regulations will be made at the same speed as innovations.

## **Mr. Takayuki Amma**

The view of JAPIA is that GTRs are a very good idea for future and new lighting technologies, especially for signalling and marking lamps of autonomous vehicles in the near future, The GTR is important and necessary for the pedestrian and other road users to understand the signals and markings easily and to communicate between them correctly all over the world.

For the global harmonization, the important point is to involve not only the 1958 agreement countries but also other countries including China, India, and the US in this activity and rulemaking, and the question is how to make the GTR in line with other countries rules such as China GB standard and USA FMVSS.

Regarding ADB we will see a good example soon, because we can expect NHTSA will issue a NPRM for allowing ADB in the near future. The question is whether NHTSA could accept UN/R123 or not. I'm afraid the GTR for ADB might be difficult. But, for the future lighting technology, we really need the GTR, and in order to do so, at the beginning of the development of GTR, we should discuss with many countries including China, India and US, and consider how to resolve this question.

Anyway, basically JAPIA would like to support the development of GTR for the future and new lighting technology.

## **Mr. Sung uk Choi**

The Korean industry supports the development of GTRs but as mentioned by the Japanese members Korea has a different culture and environment so harmonisation is difficult. However the car manufacturers have a need to harmonise. Korea already has a close harmonisation with the UN Regulations but other countries outside the UNECE have different requirements so a GTR becomes an important approach.

Concerning new technology we heard in this morning's presentation that there are already so many different signals and signs proposed for the ADS vehicle but we should not be concerned about only one ADS vehicle on the road but, for example, one vehicle projects a pedestrian crossing on the road and another does the same thing, the result is confusion for the other road users.

Of course innovation is very fast and regulation is relatively slow but we need to be very careful because this is the time to find the correct solution for the future.

## **Mr. Michel Loccufier**

As I said in my earlier speech, we will only deliver good GTR solutions if we work together; everyone has to contribute.

First of all I think GTRs are a good idea but we also have a need to develop technology-neutral and performance-oriented requirements that can also be a good step and perhaps an easier step to finally have a GTR. It could be the principle that everything would be specified in the GTR so that we have uniform harmonised provisions that could be used on a national level according to national needs but not refused if installed according to those specified provisions. This could be useful because it is not like in the 1958 agreement where the provisions are obligatory.

Of course as a GRE Chair I will give support to all initiatives where needed and particularly to

ensure safer and cleaner vehicles. I am also a "Belgian guy" and Belgian guys are familiar with working on compromises so take care when asking my opinion on some things!

### **Mr. Aleksander Lazarevic**

The European Commission has been actively involved in the process of simplification of requirements for vehicle lighting and light-signalling. The process, the objective of which is transition towards performance-based requirements will lead to technological neutrality and reduction of regulatory burden for the industry and administrations. Eventually, in the framework of UN 1998 Agreement, the simplification could lead to a universal recognition of this novel regulatory approach as early as 2025 and the European Commission would truly appreciate timely and earnest engagement of other key Contracting Parties in developing a new proposal for global technical regulations on lighting.

### **Mr. Charles Uthus**

We sincerely appreciate the opportunity, which has been provided by GTB, for AAPC to issue this statement in support of the important and timely event covering a central auto regulatory subject matter – lighting regulations for road transportation.

Lighting equipment and their manufacturers have been at the forefront of vehicle safety and safety standards and regulations for a long time. In fact:

One of the first technical lighting regulations was established in October 1915 in the United States (in the state of Massachusetts). It was what we would call today a "technology-neutral, performance-oriented standard." The regulation required:

- Headlamps to make all substantial objects visible to a distance of 150 feet (48 metres); and
- That no dazzling rays of light be more than 3.5 feet (1.1 meters) above the ground for a distance of 50 feet (15 metres) ahead of the vehicle.
- During the 1960s, the first harmonised regulations adopted by the group that is known as the UN World Forum for the Harmonization of Vehicle Regulations (WP.29) were all lighting regulations.

Initial lighting regulations often focused on particular technologies. But through trial and error we have come to understand that performance, not technology, provides the optimal basis for setting lighting standards and regulations. Keeping lighting regulations aligned with technological innovation is especially critical during this period of rapid technological progress through electrification and automation.

Furthermore, the global nature of these trends and the rapid and accelerating evolution of the automotive industry, demands that we take this opportunity to establish uniform regulations applicable worldwide without regard to the compliance and enforcement systems of individual countries or regions.

With this in mind, the American Automotive Policy Council wishes to take this opportunity to affirm its strong support for technology-neutral, performance-oriented, and globally applicable regulations. AAPC appreciates the efforts of the GTB, the EU, Japan, China, and WP.29 as well as those of SAE, the US Department of Transportation and the National Highway Traffic Safety Administration to establish a new 21<sup>st</sup>-century global framework for lighting equipment. Through

the use of advanced lighting solutions, we believe that these efforts, especially if pursued under the WP.29 1998 Global Agreement, have the capacity to improve safety on roadways around the world.

## **Prof. Yuntang He**

GTRs should be a right choice for the future.

- ❖ Globalisation of auto industry needs worldwide harmonised rules.
- ❖ Introduction of GTRs could simplify the job of GRE IWG-SLR.
- ❖ Avoiding the complex UN Regulation system developed under the UN1958 Agreement.
- ❖ There is a need for GTRs to have a bigger influence

Pros: International wide

China joined 98 agreement, sharing the chance to develop a GTR

Without certificate provisions, GTR could be easily accepted by different parties.

Cons: UN Regs have been playing an important role.

On the platform of GTB, China could carry out the jobs of UN Regs although not being a 1958 Agreement Contracting Party.

The existing Chinese standard system is nearly the same as UN Regs.

Development process of GTR is too long.

## **Conclusion**

In summary, the panel unanimously agreed that:

- ✓ GTRs shall be future basis for lighting and light-signalling regulation and the priority should be placed upon developing GTRs for the new technologies such as signalling for Automatic Driving Systems (ADS).
- ✓ There is some nervousness to commit resources to this major task because of the previous attempts to develop GTRs that failed, due to opposition from some parts of industry and reluctance of some contracting parties of the UN 1998 agreement to incorporate the Global Technical Requirements into their national laws.
- ✓ Notwithstanding the nervousness, it is time to start working on GTRs because the new technologies need to have globally harmonised technical requirements and be available for application in all markets.

## **Closing Comments**

Geoff Draper referred to an important discussion that took place at the GRE 79<sup>th</sup> Session in April 2018 where the official report (ECE/TRANS/WP.29/GRE/79) states (emphasis added):

*The expert from GTB pointed out the growing interest in global harmonization of lighting and light-signalling norms, in particular in China and the United States of America. According to him, stage 2 of the ongoing process for Simplification of the Lighting and Light-signalling Regulations (SLR), which focused on technology-neutral requirements, could pave the way to development of a new Global Technical Regulation (GTR). He also identified light-signalling functions of autonomous vehicles as a possible topic for a new GTR. The experts from the Netherlands, UK, EC, OICA and SAE supported this idea. **The expert from the United States of America encouraged all stakeholders to start a dialogue on this issue.***

## **Priorities for Traffic Safety—Innovation Needs Good Regulation**

It may be appropriate to question how lighting and light-signalling may evolve. The UN regulations were launched as a joint activity set up in 1952 by ISO, CIE, and IEC that was formalised as the Groupe de Travail Bruxelles-1952 (GTB). The group followed the ISO procedures and produced the detailed technical requirements and test procedures that were ultimately transformed into the UNECE Regulations. The approach was to produce a standalone regulation for each device, and these were focused on specific technologies. As a result there were 41 UN Regulations dedicated to lighting and light-signalling until in 2012 WP29 decreed that it was time to simplify the system and reduce the huge regulatory burden for the administrations and industry alike.

Following the stage 1 of the GRE Simplification activity the situation after October 2019, when it enters into force, the 41 UN Regulations will be reduced to 14 Regulations and one Resolution. Stage 2 of the GRE work will further simplify these UN Regulations by introducing Technology neutral performance-based requirements based upon objective testing methods. This will result in technical requirements that can be applied to both the 1958 and 1998 UN agreements.

There remains a requirement for a deep debate concerning the concept of "performance-based" regulation; that can be interpreted in several ways. The terms of reference for Stage 2 of the GRE Simplification state:

- ❖ Rewrite the new regulations with updated performance based technical requirements suitable for the future
- ❖ Reduce ambiguity in the provisions to provide consistent interpretation
- ❖ Define the essential requirements in performance-based (technology-neutral) terms to provide opportunities for innovation
- ❖ Determine whether the current regulatory text presents barriers to innovation and whether safety considerations are addressed
- ❖ Develop, as far as possible, performance-based and technology-neutral requirements to ensure freedom for technical innovation within a framework of safety principles.

The expression "framework of safety principles" raises many questions to be answered:

What are the safety principles?

- Ensuring sufficient forward visibility for driving at night, in urban and rural areas, on motorways etc.?

- Protecting drivers from disabling glare of Road illuminating devices and Light Signalling Devices?
- Protecting following drivers from glare?
- Providing adequate light signalling to indicate the presence and dimensions of vehicle, to indicate the manoeuvring intentions of the vehicle etc.?
- Should Regulations be confined to assuring minimum levels of road safety?
- What devices or systems should be mandatory and what can be optional?
- Should innovation be encouraged through NCAP procedures?
- How should we treat adaptive lighting systems that consist of sensors, image processors, control systems and lighting devices that have to perform in "real-world" traffic conditions and road geometries?
- How should we test adaptive systems?
- How to address the introduction of technologies that are associated with marketing and product differentiation that appeals to consumers?
- What are the lighting and signalling requirements of autonomous vehicles?

If the ultimate objective is to have a regulatory system that is stable, based upon safety principles and is not a burden for the administrations or industry, it is likely that the solution will be a combination of regulation to assure safety and NCAP procedures to encourage improved performance and product innovation.

This whole constellation of questions will require a robust debate involving all stakeholders, and it must take place under the auspices of the UN World Forum (WP.29), as it is a global debate if we want to avoid creating barriers to innovation and trade whilst reducing fatalities of vulnerable road users according to the UN objectives.

## Major Issues Under Consideration

### Glare and Visibility

The debate concerning glare and visibility continues and is blocking progress on the development of performance-based technical requirements at GRE. With conventional lighting devices the compromise between the need to see and the need to avoid disabling glare to other drivers remains a compromise.

It is clear that there is a requirement to have adequate forward visibility to suit the road geometry and driving speed and the conclusion of most researchers is that this should take priority over glare considerations. However, all administrations receive many complaints about glare that, politically, cannot be ignored. Complaints concerning glare are very subjective and no reliable correlation with accident data is forthcoming.

The glare limits established in the early days of creation of the UN Regulations remain valid and the conclusion at a human factors level is that if a person perceives to be glared this is glare but it is difficult to quantify objective photometric limits.

New adaptive technologies such as ADB offer a solution to resolve the glare/visibility compromise and the benefits of improving visibility without increasing glare to other drivers are confirmed by

recent research. In the USA, NHTSA's proposed ADB rule acknowledges the clear safety benefits of adaptive lighting systems.

In October 2018, GTB organised a one-day glare-and-visibility forum in conjunction with 80<sup>th</sup> session of GRE at the UN in Geneva. The forum was created with the objective of providing contracting parties and GRE experts with an opportunity to hear the topical conclusions of the research institutes, of Asia, Europe, and the USA.

This forum focused on the scientific issues and did not include presentations from representatives of industry. It was organized by Dr Rainer Neumann and Mr Gert Langhammer, chair and secretary of the GTB Safety & Visual Performance (SVP) Working Group (respectively), and was moderated by Dr. Bart Terburg, GTB Vice-President.

The agenda is shown below and copies of all the presentations can be [downloaded](#).

<b>GTB Glare and Visibility Forum, 22 October 2018</b>		
<b>Monday, 22 October 2018 (Prior to GRE-80th session)</b>		
<b>Palais des Nations, Geneva - Room IX</b>		
09:30	Introduction to the Forum	<b>Dr Bart Terburg</b>
09:40	Elderly People, General Visibility Versus Glare and Headlamp Cleaning in Automotive lighting	<b>Jonas Kobbert, M.Sc</b> , Doctoral Student <i>TU Darmstadt, Germany</i>
10:10	Recent study on benefits of ADB	<b>Prof. Dr. Dirk Meyer</b> <i>THM Gießen, Germany</i>
10:40	Visibility under adverse weather condition in automotive lighting	<b>Prof. Chan-Su Lee</b> <i>Yeungnam University, Republic of Korea</i>
11:45	Importance of visibility improvements for safety in automotive lighting	<b>Dr. Michael Flannagan</b> <i>UMTRI, Ann Arbor, MI, USA</i>
12:15	Questions and Discussion	
14:30	Headlamp Light Performance evaluation	<b>Dr. John Bullough</b> <i>Renselaer institute, Troy NY, USA</i>
15:00	Glare and visibility by headlight for pedestrian and elderly driver	<b>Dr. Yoshiro Aoki</b> <i>National Traffic Safety and Environment Laboratory, (NTSEL), Japan</i>
16:00	Glare and visibility by headlamps with different control strategy	<b>Prof. Yandan Lin - Fudan University, China</b> <i>Chinese Technical Committee of CIE</i>
16:30	Summary & Final Questions and	

	Discussion	
17:30	End of Forum	

An active Q&A session followed and the main takeaway points are:

- a) Although governments receive many complaints, glare is a very complex subject; discomfort glare is difficult to quantify and includes psychological factors.
- b) There are no accident data to indicate that glare is a major cause of accidents
- c) Headlamp misaim and road geometry are the overwhelming factors that provoke complaints about glare.
- d) The new adaptive technologies such as ADB offer the potential to overcome the compromise between glare and visibility.

## Issues identified for study in recent GTB and DVN Forums

The following issues are being considered by GTB as part of its activity to create its vision and work programme up to 2025

- Lighting for megacities
- Lighting for the ageing driving population
- Influence of dirt on the light distribution and camera / sensor performance
- Headlamp aiming is crucial for detection distance and glare prevention
- The role of headlamp levelling in the reduction of glare (Initial aim and dynamic aim correction) Use of new technologies such as LIDAR
- Adaptive signal lighting to reduce glare / improve conspicuity
- Need study to prove safety benefits of ADB
- Visual Light Communication (data transfer by light)
- Signature lighting, contour light, interior lighting

## The role of the NGOs in GRE

The following NGOs normally participate in the work of GRE

- CEMA European Committee of Associations of Manufacturers of Agricultural Machinery
- CLCCR International Association of the Body and Trailer Building Industry
- CLEPA European Association of Automotive Suppliers
- GTB The International Automotive Lighting and Light-Signalling Expert Group
- IEC International Electrotechnical Commission

IMMA International Motorcycle Manufacturers Association

JAPIA Japan Auto Parts Industries Association

OICA International Organization of Motor Vehicle Manufacturers

SAE Society of Automotive Engineers

## GTB's special role in GRE

GTB, the International Automotive Lighting and Light-Signalling Expert Group, contributes a special role in GRE.



*Experts at the 126<sup>th</sup> Session of GTB in Lisbon, Portugal, November 2018*

### GTB is:

- A non-governmental organisation in special consultative status with ECOSOC, the UN Economic and Social Council, since 2014. It is a unique global group of vehicle lighting experts supporting the international regulatory process through the combination of their experience and skills as vehicle manufacturers, lighting systems manufacturers, light source manufacturers, test laboratories, regulators and academia. This provides a unique opportunity for members to be involved in the UN regulatory process.
- A truly global group, sharing local knowledge and experience and providing an opportunity for all members to keep up to date with regulatory progress, research, type approval issues, interpretational issues, etc.
- A non-profit association, legally established and based in Italy, funded and managed by its members. The operating costs are shared and this provides a unique service at low cost for the benefit of all members.
- Not in competition with the standardisation bodies and through cooperation with them provides up-to-date information concerning development of regulations and standards in different regions of the world such as Europe, USA, Canada, Japan, China, India etc.
- A technical group without a prime lobbying role and has mutually beneficial cooperation with the major automotive trade associations, whose members frequently contribute in their own right as lighting experts of the various GTB working groups.

## The GTB Mission Statement

The mission of the International Automotive Lighting and Light-Signalling Expert Group (GTB) is to:

- bring together the expertise of its global membership to promote safety, avoidance of regulatory barriers and the removal of unnecessary administrative burden to innovation and international trade.
- take account of national operational and cultural aspects, based upon the experience of its members.
- continually strive to be the partner of choice of governmental regulatory bodies and to work with them to develop and maintain high quality, performance based, technology neutral, globally harmonised technical requirements.

## GTB's History

- 1951 Launch of GTB at Lucerne, Switzerland as a Joint Working Party of International Organization for Standardisation (ISO), International Commission on Illumination (CIE) and International Electro technical Commission (IEC)
- 1952 1st formal session in Brussels, attended by delegates from 9 European countries (Belgium, France, Germany, UK, Italy, Norway, Netherlands, Portugal, Switzerland)
- 1953 The UN/ECE Working Party on the Construction of Vehicles (WP.29) began its activities. GTB was among the international organizations who participated in this work from the start.
- 1958 UN 1958 Agreement established. GTB prepared the first set of 8 regulations covering lighting devices and has been subsequently been involved in the development of all 141 lighting and signalling regulations.
- 1977 1<sup>st</sup> session of the Group of Rapporteurs on Lighting and Light Signalling (GRE). GTB submitted the 1st proposal for consideration.
- 2011 GTB restructured and legally established, with the signing of the constitutive act, as an association with headquarters in Torino, Italy.
- 2014 Awarded Special Consultative Status with ECOSOC, the UN Economic and Social Council

### GTB Presidents Past and Future



**Pierre  
Devaux**  
France  
1951-1983  
32 years



**Jean-Pierre  
Thiry**  
France  
1983-1993  
10 years



**Jack  
Hoppenbrouwers**  
Belgium  
1993-1997  
4 years



**Dieter  
Matthes**  
Germany  
1997-2008  
11 years



**Geoffrey  
Draper**  
UK  
2008 –

### The GTB Administrative Committee



Vice President:  
Dr. Bart Terburg



Secretary General  
*(New permanent post  
launched January  
2019)*

Davide Puglisi



President:  
Geoffrey Draper

## GTB members

### National Members

Austria	FFÖ
Belgium	AGORIA
China	CATARC
Czech Republic	ČNK CIE
France	SFEPA
Germany	VDA
Hungary	MSZT
Italy	CUNA
Japan	JAPIA
Korea	KATRI
Netherlands	NSVV
Poland	ITS
Slovenia	SDR
Spain	UNE
Sweden	SIS
Taiwan	VLA
UK	SMMT
USA	SAE International

### International members

IMMA	IMMA
------	------

The International Automotive Lighting and Light-signalling Expert Group (GTB) has two categories of members:

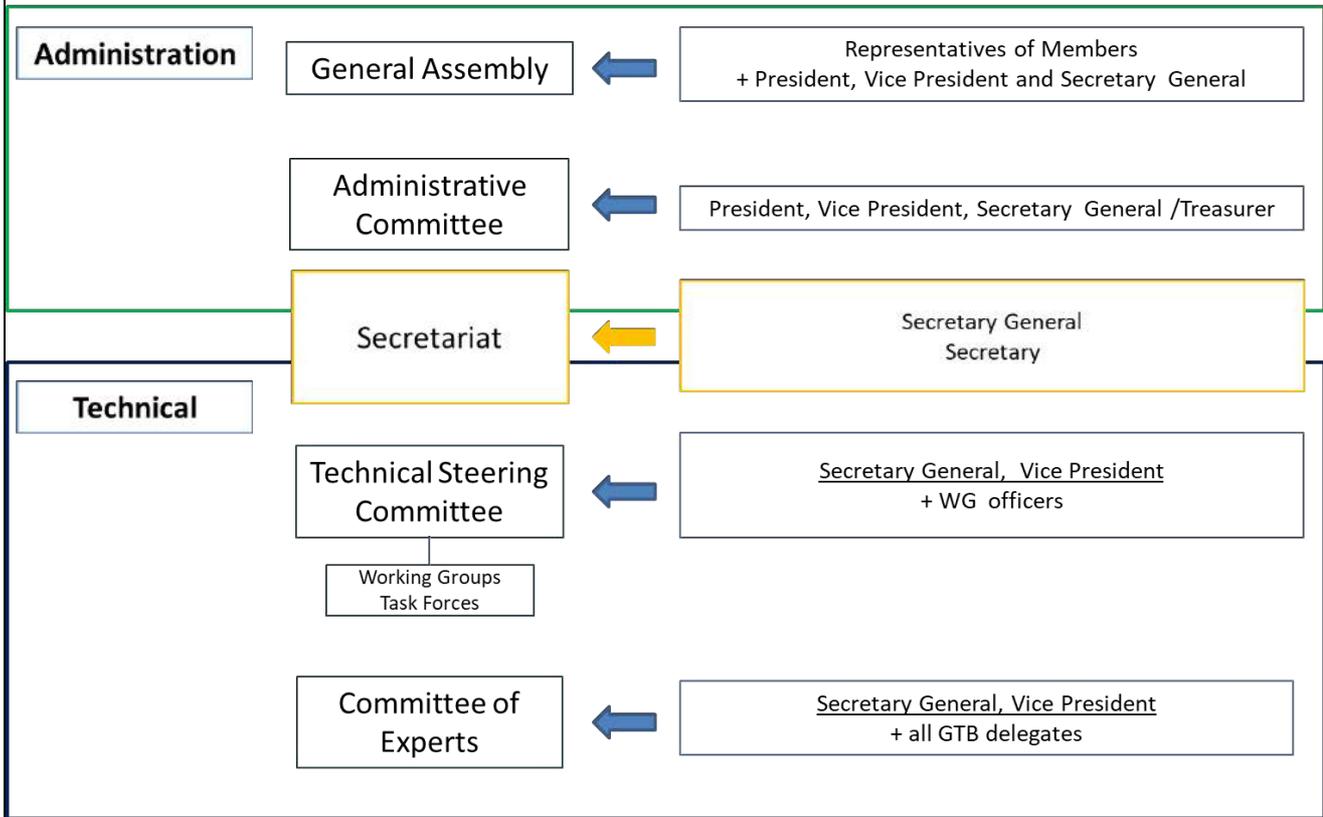
**National members:** National institutions or bodies involved in automotive lighting that, in the relevant statute, are open to applications for membership from all interested parties in the relevant country;

**International members:** International organisations or associations representing interests in automotive lighting.

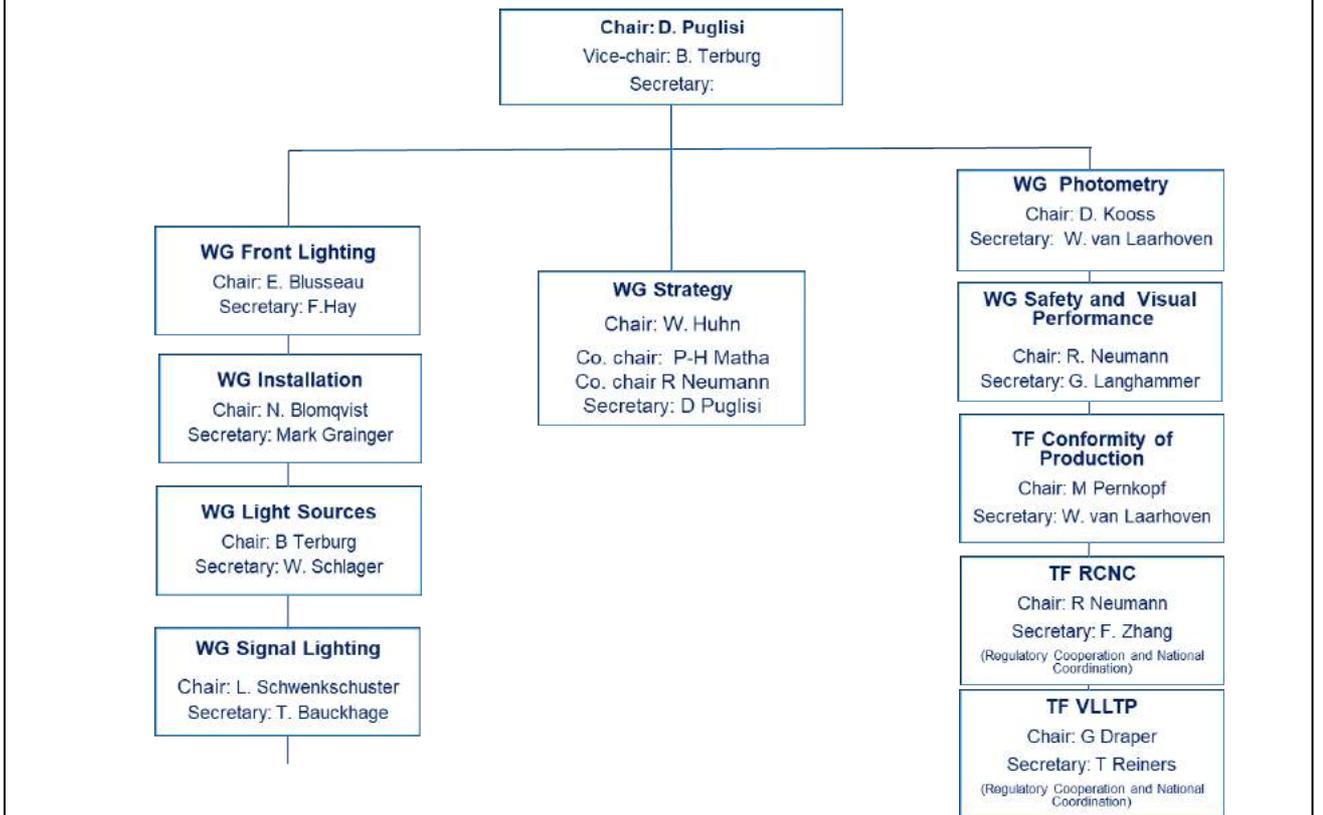
Consisting of Experts from:

Vehicle Manufacturers  
Lighting System Manufacturers  
Light Source Manufacturers  
Test Laboratories  
Representatives of governmental regulatory organisations  
Academia

## GTB STRUCTURE AND ORGANISATION



## GTB TECHNICAL STEERING COMMITTEE AND WORKING GROUP STRUCTURE



## The GTB Strategy Working Group

The Strategy Working Group was established in March 2017 to provide a forum for a group of interested executives with responsibility for technical development strategy and research and its associated budget in the field of vehicle lighting and light signalling. As members of the Strategy Group, these executives are prepared to actively support GTB, to develop strategies to meet the changing demands from the GTB global membership and to strengthen its structure and resources to be the global expert partner of choice by the regulatory administrations.

Currently the Strategy Working Group has 26 OEM and Tier-1 executives from the GTB Austrian, Chinese, French, German, Korean, Japanese, Swedish, and USA delegations.

The scope of the GTB Strategy Working Groups includes supporting GTB in its mission to promote safety worldwide backed by the results of funded neutral research undertaken by third party independent institutes, recognized and competent in the relevant area of research.

Currently research is underway to support the GRE Task Force on Autonomous Vehicle Signalling Requirements (AVSR) and to study New Functionalities in Vehicle lighting. More information can be found [online](#). Results will be available in July 2019 and will be published by the end of the year.

## Geoff Draper's Thoughts on the Whole Process of Regulation

### **The Regulators Are Not the Bad Guys—Maybe Industry is Too Impatient**

Concerning the issue of signals for autonomous vehicles and the perceived lack of progress to develop worldwide specifications for identification lamps to mark AVs as such, and intention lights to communicate with pedestrians, here are the challenges that both regulators and industry face:

- Industry must determine whether there is a need to amend the regulations to allow the benefits of the innovation to be realised.
- If an amendment is required, then it is the responsibility of industry to provide evidence of the safety impact based upon independent research from globally respected research institutes.
- To achieve this, the researchers may require prototypes and will certainly need funding.
- Once presented with the evidence of the research, the regulators have to consider whether to adopt the innovation and whether it should be mandatory or merely permitted.

We frequently hear the complaint that the regulation process is problematically long and slow, whether it's GRE and WP.29 or national administrations outside the UN Regulation sphere. However, this is too simplistic and the reality is another matter.

- Regulators agree and understand that innovation is important in the context of improving traffic safety.

- Intense work is underway under the World Forum for Harmonisation of Vehicle Regulations (WP.29) to change the approach to regulation by encouraging performance-based, technology-neutral requirements.
- The work underway in the GRE Informal Group on Simplification of the Lighting Regulations is leading to a regulatory system that will present more opportunities and less barriers for innovation.
- GTB is a major contributor to this work and is working closely with the regulators by providing the expert input from its global membership.

In the case of the question of lighting for **autonomous vehicles** the situation is far from clear and it is not a given that the regulators will agree that identification lamps to mark AVs, and intention lights to communicate with pedestrians, will be allowed. For this reason GTB took the initiative at WP29 in June 2018 to highlight the need for a global approach. This is necessary to avoid a situation where many solutions could be introduced into localised markets and there would be no harmonisation of safety-critical lighting signals. GTB also introduced this issue in the launch meeting of the new UNECE GRVA working party in September 2018.

At the GRE 80<sup>th</sup> session in October 2018, a proposal from GTB to set up a GRE taskforce to study the issue was adopted and the GRE Taskforce on Autonomous Vehicle Signalling Requirements (AVSR) was launched on 08 November 2018. This taskforce is led by Germany (Dr Karl Manz) and GTB (Lukas Schwenkschuster - Odelo) provides the secretariat. All of the working documents and reports of the GRE ASVR taskforce are publicly [available](#) .

The GRE AVSR Taskforce has brought together many of the global stakeholders and between 08 November 2018 and 13 March 2019 they have held five meetings. A [paper](#) has been drafted presenting a summary of the work underway by various groups around the world and tries to present an answer to the fundamental questions:

- Is there a safety requirement for AVs to provide signals to indicate their status and to communicate their next intended actions?
- If so, shall such signals be visual, audible, or a combination of both?

All of this means that in the space of a few months, regulators and industry have worked together to gather the known work from around the world on this complex issue of lighting for AVs. A summary will be presented to GRE in April 2019 and hopefully this will trigger the discussion in Geneva to result in a decision on how to proceed.

It should be remembered that the legal situation is unclear because both the UNECE WP.29 (World Forum for Harmonisation of Vehicle Regulations) and UNECE WP.1 (Global Forum for Road Traffic Safety, concerning the 1968 Vienna Convention on the movement of vehicles across borders), are involved. WP.1 and WP.29 are working together to try to reach a conclusion and the input from GRE will assist this process.

The GTB Strategy Working Group have commissioned independent research into the safety implications of various light signals that could be applied to AVs. The results of this research will

be submitted to GRE and WP29 to assist the process of finding a global approach to the technical requirements and regulation of such signals if it is concluded that they are necessary.

In summary, I believe that it is not justified to complain that the regulation process is always problematically long and slow. We are working in a world where the lighting products are a small part of the bigger question of how lighting systems installed on vehicles will impact on traffic safety issues. WP.29 and GRE are fully aware of these difficulties and through the GRE informal groups and taskforces all stakeholders, including GTB, are being brought together with the objective of developing global solutions. By fully engaging in this process we will have the best chance of avoiding barriers to innovation in the interest of all stakeholders. We must proactively support the process and GTB can play a major role.

## Conclusion

It is clear from the DVN Workshops and other conferences that there is great interest in innovation of vehicle lighting, both for reasons of improved traffic safety and for appealing and functional vehicle design. This interest is global, as we have learned from the DVN Workshops in North America, Europe, and Asia and it is also being powered by research studies identifying the needs of the demographic issues of mega-cities and ageing population combined with the enormous efforts to develop environmentally friendly vehicles, and automated and autonomous vehicles.

As vehicle lighting innovation is a matter of traffic safety, it can only be achieved on the basis of good regulation. Here, we have a major problem because the legal and technical requirements forming the basis of our global regulatory systems were founded in the 1950s and are now are unable to provide the innovation-friendly basis that industry and regulators are seeking to achieve.

WP.29, the UN World Forum for Harmonisation of Vehicle Regulations, is very aware of this situation and much has been done to update the 1958 and 1998 agreements to simplify and harmonise the technical requirements, as I have tried to outline in this report. However, we need to develop the will of the contracting parties and industry stakeholders to reach a global solution and this can only be achieved by working under the umbrella of the UN 1998 agreement. We must construct revolutionary technical requirements that will provide a basis for the foreseen innovations. We should not attempt to take the existing requirements and incorporate them into GTRs (Global Technical Regulations) because the leading contracting parties have no appetite to devote their stretched resources on such an activity. I believe that the industry stakeholders share this view and also prefer to devote their resources to the future.

The challenge, therefore, is to start to build a government and industry consensus to develop the new regulatory framework of truly performance-based, technology-neutral requirements. This is a task that will require an NGO to work with WP.29—specifically GRE, to act as the catalyst for change. GTB can do this, with the backing of DVN and the whole lighting community, and now is the time to start!

## Annex 1

# Articles by Daniel Stern, originally published by DVN in 2013 and 2016

## Global Regs...Meaning What?

*First in a series by Daniel Stern, DVN Chief Editor (2013)*

Automotive News reports Ford—at least their European executive—want US and European regulators to regard each other's safety and emissions standards as functionally equivalent.

Ford, the second-largest American-based automaker, have enjoyed steadily increasing profit and three and a half unbroken years of net income under the "One Ford" strategy implemented by CEO Alan Mulally, which aims to develop global rather than market-specific vehicles. But Wolfgang Schneider, Ford's European Vice President for Governmental Affairs, says different safety and emissions regulations add cost burdens and get in the way of automakers developing uniform models for global markets. He says common regulations would afford the automaker "far more flexibility to produce in the best place". Schneider clarified that the greatest benefit would come from lower-volume models in any given market, and "Do we need this when we sell 500,000 units of a particular model in a country? No. But you are talking about 20,000 or 30,000, yes, because it enables you to bring in niche products."

The benefits of a potential US-EU trade treaty presently under discussion may include ending tariffs as a first step, but Schneider looks at ending regulatory barriers as the "golden nugget." He is directly involved in the US-EU talks alongside representatives from other makers including GM and Daimler. From his European automaker executive perspective, Schneider says all automakers are in favor of the idea. Nevertheless, he says Americans and Europeans would probably not be able to agree on common regulations. So instead, Ford are advocating a more general philosophy of reciprocal regulatory recognition rather than focusing on regulatory details.

This, of course, is an idea much discussed in the lighting realm. While there are harmonised windows of overlap between the US and UN specifications for most lighting devices and their installation, there remain sticking points that have not been even partially resolved despite several decades of at least putative bilateral interest in doing so. Just as these disjunctions between US and UN practice often have philosophical roots, so does the disjunction between how Europe and the greater world at large views harmonisation (countries such as the US with national regs out of line with international-consensus practice should adjust their regs to accommodate UN-spec cars and parts) and how those on the North American regulatory island view harmonisation (the rest of the world should accept US standards). The last time there was an effort at a single worldwide car lighting standard, that's what killed it. The idea was not to cancel or supersede any national regulations; a maker who wanted to build a car acceptable only in a particular market could continue to do so, but there would be a global standard combining all the world's best practices and recognised by everyone, for a lighting system acceptable everywhere if a maker chose to build to it. The specified color for rear turn signals was amber. The US delegation to the talks,

headed by an American Ford representative (now retired), refused it on that basis: "No, it's the only light on the back of the car that flashes, so it doesn't need its own colour; the rest of the world will have to accept the US red turn signal." Non-US parties weren't interested in what they perceived as not a best practice and a rollback to 1950s turn signals, but the US would not budge and so the global standard didn't happen.

Too, the pragmatic aspects of harmonisation are something of a moving target. Here again, the European and international view tends to regard adoption—or at least recognition or accommodation—of the UN standards as self-justifying by dint of their reflecting at least a rough international consensus. The US regulatory view is rather narrower: if it is at all possible to create a component, design feature, or system that simultaneously complies with the US and the UN regulations, without regard to practicality, practicability, cost, design, or any other factor, then harmonisation is considered to have been achieved and the discussion is closed.

Very often, discussions about harmonisation or regulatory comparison tend to focus on the particular requirements of specific regulations: the UN regulation permits rear turn signals emitting just 50cd, which can plausibly be called inadequate. On the other hand, the US regulation permits rear turn signals emitting 1050 candela, which can plausibly be called excessive. Or the UN headlamp reg is said not to provide sufficient lighting of overhead road signs on low beam while the US headlamp reg is said to allow too much glare towards oncoming drivers. Or the UN reg fails to require side marker lights and reflectors but the US reg fails to require side turn signal repeaters. Examples like this abound, and for years have stymied and stalled efforts towards global regulations. In fact, while there are many aspects of each regulation that can be compared in terms of relative merits and drawbacks, scanty data (if any) supports the notion that US regulations result in safer cars than UN regulations or vice versa. In ranked lists of traffic safety, there are first-world countries using UN-spec vehicles with better and with worse traffic safety than the US and Canada. That suggests factors like how many candela the turn signal emits or how much light the low beam puts on an overhead sign are relatively inconsequential to real safety performance, and other factors—drivers, for example—are much more crucial. Other data show the US lagging behind progress made in countries where UN vehicle regs are used, further suggesting that national regulations out of line with international practice probably are not very defensible on a real-world traffic safety basis.

Why continue to have them, then?

## **Crouching Tariff, Hidden Trade Barrier?**

*Second in a series by Daniel Stern, DVN Chief Editor (2013)*

At DVN workshops and in other forums, there is broad agreement from most of us involved in specifying, designing, engineering, manufacturing, and testing vehicle lighting devices that the main impediment to regulatory commonisation—or at least enlarged windows of harmonisation—is not technical but political. Ford's European Vice President for Governmental Affairs Wolfgang Schneider is right that market-specific technical regulations act as a non-tariff trade barrier. His confidence that the general industry regards this as a hindrance, however, may not be warranted;

there are two sides to the sword. High-level company policy within at least some North American automakers has been very firmly and actively against any move toward internationalisation of the North American regulations, which are effectively used by automakers to control what vehicles do, don't, can, and can't be brought onto the North American regulatory island—and by whom. So while it is encouraging to see an automaker with US roots advocating for sensible reconciliation in technical standards, it is difficult to imagine the idea gaining much practical traction in the real world without high-level US executives signing on.

A cynical or sceptical analysis of this might lead to the conclusion that certain automakers are perfectly happy with the trade obstacles created by (and neatly hidden in and defended in terms of) technical regulations. That might be a realistic analysis. But there are real, practical reasons—having little to do with the intensity of a turn signal or the requirement for a side turn signal repeater—why a US automaker or regulator might strive to reject internationalisation of the American regulations. It is vital for the technical sector of the community to understand why even the most thoughtfully balanced technical specification containing best practices supported by up-to-date science and knowledge might make no headway in replacing numerous older regionally specific standards.

In today's world, those tariffs, local-content requirements, and other market-protective measures that still exist—far fewer than twenty or thirty or fifty years ago—are frequent targets for elimination in the name of "free trade". Whether there is ever really anything such as free trade is beyond the scope of this present essay, but it suffices to say the national and regional self-interests that spurred yesterday's protectionism still remain. With tariffs and local-content laws held in dim regard, trade restrictions and other market control measures must be effected elsewhere, and preferably hidden. Safety regulations offer highly effective, tailor-made camouflage for such measures: no matter how much data shows drivers' needs (for headlighting, turn signals, stop lamps, etc.) are within a common range all over the world, it's all quickly silenced and quashed by an appeal to emotion: *a bunch of big corporations and foreign governments are conspiring to weaken our safety standards so they can make more money!*

As an addendum to the long running trope, unsupported by data, that "US-spec vehicles are the safest in the world" or "US safety standards are the world's most stringent", this kind of political shout-down is very clever and especially effective in the very polarised United States; it gets those on the right who regard non-US governments with suspicion and scorn as well as those on the left who see callous profiteering by every corporation. Such a torch is reliably hoisted by US groups putatively devoted to traffic safety, every time closer cooperation in international regulation is proposed. For example, the US group Advocates for Highway and Auto Safety recently squawked that U.S. regulations would be "subject to significant weakening" if they were adjusted to accommodate or align with international practice.

So this is the steep, treacherous uphill political slog on the way towards standards that are truly global rather than "rest-of-world except US/Canada". Perhaps the shrinking volume of the American market relative to the volume in the rest-of-world markets with UN (or close-to-UN) regulations will exert some push in that direction...or perhaps it will make North American industry and government dig in their heels even more resolutely. Dim though the odds might appear of a

new direction from within North America, there is actually a glimmer of hope: recent talks suggest American automakers might be reconsidering their stance. We in the technical trenches can support them in that effort by speaking up in a clear, unified, well-informed manner to dispel myths and promote executive understanding that the technical aspects of global technical regulations really aren't terribly difficult, and there are lots of advantages to moving in that direction—big advantages that can outweigh the lesser advantages of market control through divergent technical requirements for vehicles and components.

## **Legal Hurdles to Regulatory Harmony**

*Third in a series by Daniel Stern, DVN Chief Editor (2013)*

As far as the science is concerned, a vehicle with a UN lighting configuration is about as safe as a vehicle with a US lighting configuration, with a few plus/minus points in both directions: side marker lights and reflectors required on US but not UN vehicles, side turn signal repeaters and yellow rear turn signals required on UN but not US vehicles, etc. It's a reasonably agreeable proposition that the safety performance differences aren't big enough to justify the regulatory differences between US and UN regulations. The same may well be true of differences between UN regulations and those of various other countries not party to the 1958 Agreement—India, China, Brazil, and more.

Given the very wide adoption or acceptance of UN Regulations round the world, it is easy and tempting for the vehicle lighting practitioner to see countries with their own UN-divergent regulations as stubborn outliers: Why won't they just acknowledge the global consensus and sign the damn treaty? Such thinking is erroneous because in fact there's often much more to the matter than just technical factors of safety performance and political factors of trade and market control. There are substantial matters of national law that can stand in the way of a country acceding to the 1958 Agreement.

Consider perhaps the most notable non-participant, the United States. If the US were to sign the 1958 Agreement, there would surely be benefits. The US and the considerable collective smarts of its research community and experience of its industry would have a seat at the table for developing the technical standards and regulations. However, this benefit would simultaneously be a drawback: the US—the world's second-largest auto market, with a big, important auto industry—would have a seat at the table. One seat. Only one seat, for the 1958 Agreement is set up on a one-country, one-vote basis. That would effectively nullify the US voice on most questions and neuter its contributions. Where US proposals and positions differ from European and Asian practice, the relatively enormous US auto industry, auto safety research community, and vehicle market would in all likelihood be overruled by a plurality of votes from a list of countries whose collective industry, research body, and market are comparatively tiny. A consensus-based system such as that used to decide on the UN regulatory provisions is—necessarily to some degree—a popularity contest for ideas: the most popular ideas get voted into the regulations. And with respect to the original intent of the 1958 Agreement, paving over technical barriers to international vehicle trade in Europe, a one-vote-per-country structure was probably the right design. But a one country/one vote system is blind to the differences in impact a regulation has on a country with a large auto industry and/or market versus a small one.

Then...what instead? How about giving each US state a vote, so the US would have 50 votes? That's no solution at all, for the bias of the vote would simply reverse and the US could use its 50-weight vote to enforce its wishes on the rest of the community. And for that matter, what of the rest of the community, still with one vote each? That would hardly be fair. Moreover, it would take the US back to the awful mess of before the 1968 advent of the Federal Motor Vehicle Safety Standards with their power of pre-emption over state standards. Back then, each and every item of vehicle lighting equipment had to be approved by each and every state—a slow, cumbersome and expensive process to say the least.

So no, treating the US as though it were 50 countries isn't a good way forward, but it does plant the seed for a possible improvement on that idea: perhaps, now the 1958 Agreement is open to the world's every country, it could be made more attractive to nonparticipants by weighting signatory countries' votes in accord with the size of their automotive industry and/or market.

There are other factors that prevent countries like the US signing treaties like the 1958 Agreement, the structure of which creates a severe safety enforcement problem that is also, for many countries, an insurmountable national-sovereignty problem: Every country that signs the 1958 Agreement and adopts the UN regulations is obligated to accept (for the regulations the country applies) the type approvals of every other signatory country. This was a key structural provision of the 1958 Agreement to enable one car configuration to be sold throughout Europe without expensive and time-consuming multiple tests and approvals.

But this also means a signatory USA would be obligated to accept (for example) a type approval granted by the Russian government. If a safety defect were to become evident in the US, the American government would not be able to go to the manufacturer and order the problem fixed; the manufacturer would correctly say "This what you're objecting to isn't our problem. The item was duly type approved; if you think there's a problem with it, go talk to the Russian government." Then the US would have to convince the Russian government to look into the matter, and if the Russian government were to decide the safety problem didn't exist (or decline even to investigate), there would be nothing the US government could do. This would create a situation in major contravention of numerous basic principles and requirements of US law.

Certainly there are flaws in the self-certification systems used in countries like the US and Australia and Korea, just as there are also comparable flaws in the type-approval system. In both systems, it is possible to sneak through the cracks and loopholes and go to market with a device or vehicle that doesn't merit its certification or type-approval. But with self-certification, there is a direct line of legal responsibility—i.e., liability—between the maker or importer of a regulated item and the government. If a safety issue arises, the government can go directly to the maker or importer and order the problem fixed. That's a very important thing for the national sovereignty of a country with a legal system such as America's.

Attempts have been made—such as the 1997 and 1998 Agreements—to figure out how to bring more countries to the table without their being forced to abandon or wrench their legal systems. For the most part, these efforts have not borne fruit, and the 1958 Agreement finds itself in the awkward position of being the global consensus on the technical side, but unacceptable to a growing list of important countries on the administrative side.

There are ways around this problem, but none of them is fully satisfactory. For example, the US could adopt the technical requirements of the UN regulations, either as replacements or options for the existing US regulations, while still keeping the existing US administrative requirements (self-certification). This could even go so far as for the US to accept type-approval documents as support for a maker or importer's certification of compliance, while still retaining the direct line of liability. But this would be possible only if the US remains outside of the 1958 Agreement's requirement for mutual recognition, so the US would still be frozen out of contributing to the development of the standards. That being the case, there'd be little apparent benefit to the US, so it's difficult to imagine the US being interested in pursuing such a course.

There are other potential workarounds for the 1958 Agreement's lack of adaptivity: when a country signs the 1958 Agreement, it can adopt any, all, or none of the regulations. Some countries mostly choose not to formally adopt the UN Regulations. They keep their national standards, which may closely mirror the technical requirements of the UN Regulations. Because they have not formally signed onto the UN Regulations themselves, such countries keep their national regulatory structure intact, including (for example) self-certification and its attendant direct chain of liability. But such a solution would likely be more difficult for a country like the US or Canada where the technical requirements of the national regulations in force differ substantially from those of the UN Regulations, and—unlike in Japan—there is negative interest in altering the existing technical requirements to align with the UN Regulations.

The administrative provisions of the 1958 Agreement have long been taken for granted by contracting parties, largely because in the past most all the contracting parties' perspectives and legal systems were broadly similar. That's no longer the case, as South Korea illustrates. Perhaps, now the Agreement is open to a bigger list of countries with a range of legal systems much broader than originally contemplated, it might be well to consider adjusting the strength of the link between the technical provisions and the administrative provisions of the Agreement, so as to give it greater adaptability. Perhaps, for example, there is a way to build recognition of self-certification into the 1958 Agreement. As concern grows about developing nations and regions driving a proliferation of divergent vehicle safety regulations and homologation or certification protocols, perhaps some thoughtful structural updates to the 1958 Agreement will make it more adaptive, palatable, and applicable to a wider array of legal systems.

It's not likely to happen quickly or soon, though, so maybe a reasonable short-term priority goal is increased separation between the technical provisions of UN Regulations and the administrative provisions of the 1958 Agreement. That way the world's politicians and diplomats can hash out the legal vagaries while our community's fine minds, freed of the dead weight of legalistic administrivia, can put their expertise to work optimising the technical regulations and making them as versatile and as broadly acceptable as possible.

## **On Mutual Recognition: What's Free Trade Mean for Car Lights?**

*By Daniel Stern—DVN Chief Editor (2016)*

TTIP, TPP, CETA...there are enough new and pending international-trade treaties these days to make a big cauldron of alphabet soup from their titles. The details of automotive provisions of trade pacts like this don't tend to get much attention in the popular press. Nevertheless, there's a

bustling and important conversation ongoing, as well there should be. What might a treaty like TTIP—the Transatlantic Trade and Investment Partnership—mean for vehicle lighting? More specifically: despite decades of effort and progress toward harmonisation, there still remain substantial differences between the UN vehicle lighting regulations in Europe and the US regulations used in North America. There probably will remain such differences for the foreseeable future. So given that, how might these differences be productively wrangled in context of TTIP? What does the vehicle lighting community need to be thinking and talking about with regard to trade pacts presently being negotiated?

A central principle being aimed for, at least nominally, is "mutual recognition": the idea that although US and European vehicle safety standards are different, they achieve functionally comparable levels of safety performance. There's some merit to that idea; while each set of standards has its relative strengths and weaknesses in terms of what's required (and therefore performed) by a set of headlamps, a turn signal, a seat belt, a mirror or whatever other component or system, overall there is no pattern suggesting that EU-spec cars are generally safer than US-spec cars or vice versa. But there is data showing that some of those relative strengths and weaknesses might be big enough to matter.

A major and intricate study, [Comparing Motor-Vehicle Crash Risk of EU and US Vehicles](#), done by the highly reputable and experienced researchers at UMTRI (the University of Michigan Transportation Research Institute), concluded that "when controlling for differences in environment and exposure, vehicles meeting EU standards offer reduced risk of serious injury in frontal/side crashes and have driver-side mirrors that reduce risk in lane-change crashes better, while vehicles meeting US standards provide a lower risk of injury in rollovers and have headlamps that make pedestrians more conspicuous."

Well, now that sounds dispositive, doesn't it? US headlamps do a better job than European headlamps of lighting up (and sparing the lives of) pedestrians. Except no, that's actually not quite what it says. It says, "Vehicles meeting US standards have headlamps that make pedestrians more conspicuous". The difference is between looking at headlamps and looking at vehicles equipped with headlamps. That difference matters because headlamps installed on a vehicle are aimed. They might be misaimed or they might be properly aimed, but they're aimed somehow. And in Europe, headlamps are aimed quite a lot lower than they are in the United States.

That seemingly simple statement about which cars in what region have headlamps that do a better job showing pedestrians, then, begins to get a little complicated. Consider it, for example, in light of an earlier UMTRI study, which concluded that vertical aim is "overwhelmingly the most important factor influencing the performance of low beam headlamps"—more important than whether the headlamp in question is a UN or a US item. Here again, the study must be read carefully to glean what's actually being stated. "US vs. UN beam pattern" includes not only the two photometric specifications but also the two local definitions and understandings of "correct" aim. The difference in aim angle has a much greater effect than which regulation the lamps comply with on the seeing distance range they provide. In short, a driver is usually better off with a relatively weak but well-aimed headlamp than with a relatively strong but poorly aimed headlamp.

So how might that finding weigh on the finding of the new EU-vs-US car safety study? Consider: Late-1990s changes to US headlamp specifications greatly reduced the degree of inherent

photometric difference between US and European low beams; the main consistent difference is now aim. Official and de facto European and UK practice tends toward much lower aim settings than are prescribed in North America. All of this taken together as a body of knowledge suggests a UN headlamp aimed higher to US practice for use in the US, or a US headlamp aimed lower to European practice for use in Europe, is very likely to be within the normal range of safety performance provided by a local-spec lamp aimed to the local aim practice.

The difficulty is, a quick reading of the abstract of that latest UMTRI study sounds a lot like "US headlamps are superior and European headlamps are inferior", which is not really what the study concluded. But that's how it very well might get summarised to negotiators who don't know a headlamp from a hedgehog or photometry from a phonebook. And if so, then that's how it'll get presented in the popular press, if it hasn't been already. What effect will that have on the negotiations to attempt to reach mutual recognition of standards? It doesn't seem it would pave the way. One can readily imagine a great deal of time and effort wasted—or even negotiations stalled—when all that's needed to resolve the question is a quick twist of the aiming adjustor: a little bit upward for the US, a little bit downward for Europe. Lamp set-makers already know this, now how might we convey that knowledge via the experts and consultants to the trade pact negotiators?

And the complicated discussion isn't confined just to headlamps. We could iterate the thought exercise with rear turn signals: size and minimum intensity requirements are greater in the US, but they're allowed to be red or amber; in Europe amber is required but they're allowed to be smaller and dimmer. What is the appropriate granularity for mutual recognition, then? Does the US insist Europe must undo a safety decision they made in the early 1960s and start accepting red rear turn signals again, thus stalling the negotiations or killing them completely? Exactly that has happened on precisely this point at least once before (1998 Agreement). Or does Europe insist that the US must tread into the murky, difficult waters of how to grapple with the EPLLA (minimum lit area) requirements that have existed in American standards for decades, without a demonstrated safety basis?

Maybe we have to take a more nuanced, compromise approach and arrange for the Europeans to say "We'll accept American rear turn signals as long as they're amber", and Americans to say "We'll accept European rear turn signals as long as they're big and bright enough", and call that good (if not perfect) progress towards the goal of eliminating duplicative testing and certification/approval without degrading safety or requiring enormous and costly regulatory effort on either side.

However things eventually do or don't shake out in TTIP and other pending trade treaties, they are one of many new realities exerting push for our whole community to figure out how to get onside with appropriate, safety-centred consolidation of best practices in vehicle lighting, with mindful avoidance of chauvinistic or reflexive defence of local practices and traditions. Most importantly, we must step up and speak up to effectively, clearly, and promptly explain the intricacies and simplicities of vehicle lighting to those in a position to discuss them in context of trade pact negotiations.

## Annex 2

### Interview with Mr. Jae-Wan Lee, Director of KICAS (The Korea Internationalization Centre for Automotive vehicle safety Standards)



The following is a copy of an interview with Mr. Jae-Wan Lee, Director of KICAS by the European Chamber of Commerce in Korea (reproduced with the kind permission of Mr. Lee).

Automobiles have made our life much more convenient than the past and these are now considered as something that people cannot live without. As the demand for automobiles increased, attention towards its safety increased too. The motor vehicle safety regulations in various countries are regulated by each country considering their country-specific environment or culture. However, these country-specific regulations can work as trade barrier between the countries. In the case of Korea-EU FTA, it clearly indicates to promote compatibility of regulations

based on international regulations in order to prevent technical barriers to trade agreement. In this light, internationalisation of domestic safety regulations is an important item to consider for European automobile manufacturers in Korea. In order to get deeper understanding of the harmonisation activities, ECCK Automotive Committee has interviewed the Chief of Korea Internationalisation Centre for Automotive vehicle safety Standards at the Korea Automobile Testing & Research Institute (KATRI):

#### **1. Why do automobile safety regulations need to be internationalised, and what is the aim?**

Automobiles were and still are the number-one trading items that take up the most of trading volume. The internationalisation of automobile safety regulations helps solving the trading difficulties that occur from the different safety regulations of each country.

Secondly, there are myriad things to consider when it comes to automobile safety. As technology develops to produce advanced vehicles, it came to the stage where only one country cannot make their own regulations. To make safer automobile use, the efforts and contribution of all countries were essential in making the regulations.

Lastly, the countries that do not have the safety regulations often experience difficulties in determining the regulations. Thus, the internalisation activity can help these countries by providing reference point and advices.

#### **2. Please briefly explain what the 1958 and 1998 Agreements are.**

1958 Agreement is the agreement concerning the adoption of technical regulation for the automobile parts and devices that are installed and used in vehicles. The countries that adopt the

UN Regulations in 1958 Agreement shall bilaterally recognise and approve the safety regulations of the devices and parts. At this stage, Korea is only reflecting the technical regulations under this agreement.

1998 Agreement is the agreement concerning the establishment of new regulations. Through the cooperation of member countries, new regulations are determined and reflected. As the member countries increase, Korea is participating beyond just reflecting the UN GTRs (Global Technical Regulations) that were set in the agreement, but actively proposing and participating in the activity.

### **3. Can you please explain the activities of WP.29 and what does KATRI do in cooperation with WP.29?**

The World Forum for Harmonization of Vehicle Regulations (WP.29) is a unique worldwide regulatory forum within the institutional framework of the UNECE Inland Transport Committee. WP.29 constitutes six permanent Working Parties (GRs), the subsidiary bodies that consider specialized tasks, consisting of people with a specific expertise:

- Lighting and Light-Signalling (GRE)
- Autonomous Vehicle (GRVA)
- Passive Safety (GRSP)
- General Safety Provisions (GRSG)
- Pollution and Energy (GRPE)
- Noise & Tire (GRBP)

KATRI participates in all 12 expert working group meetings organised by WP.29, and MOLIT also participates in the three meetings for Administrative Committee. KATRI actively engages in the discussions of making and studying safety regulations. Korea has been taking the vice-chairmanship of Passive Safety (GRSP) and chairmanship of two informal working groups on panoramic sunroof and deployable pedestrian protection system.

### **4. What are the developments and main achievements of the automobile safety regulation internationalisation?**

The automobile manufacturers' cost for research and development has decreased. Also, past trade barriers have decreased as the regulations became harmonised. The nation can now drive vehicles with high safety regulation (e.g. installation of AEB), which leads to less road fatalities.

### **5. Even when the domestic safety regulations are harmonised with the international regulations, the introduction date can be different. The manufacturers of Europe may experience difficulties in satisfying the domestic safety regulation when the introduction time in Korea is earlier than EU. How do you think about this issue?**

The goal is focused on introducing the harmonised regulation around the similar date. However, there are some unexpected cases that the legislative procedure is being delayed in one country due to the late confirmation from parliament, etc. Thus, there could be some differences in the introduction date when one country completes the legislative proceedings faster than the other.

Furthermore, in case of the UN Regulations under 1958 Agreement, it is not mandatory to adopt the UN Regulations. Thus, each contracting party can apply each UN regulations and determine the date of entry into force according to its situation. Therefore, certain regulations could be legislated faster than expected depending on the domestic situation. For example, when environmental problem like fine dust aggravates in Korea, it may be necessary to hurry the legislative procedure for emission-related regulation.

**6. A certain quota of US manufactured vehicles is deemed to satisfy KMVSS through Korea-US FTA whereas Korea-EU FTA states compatibility or harmonisation of each safety regulations. Although the safety regulations are harmonised, they are not applied as the harmonised contents under some situations (test regulations or procedure). In this case, European manufacturers should check all the domestic safety regulations, and sometimes European manufacturers have to take another test based on Korean regulations. From the FTA perspective, European manufacturers may have additional procedure to satisfy Korean safety regulation compared to US manufacturers. Do you think harmonising the safety regulations in every detail is possible?**

The principle is harmonising the regulations to get rid of trade barrier. However, there are some country-specific factors to consider. Thus, when certain regulations are difficult to apply in Korea, they need to be excluded or amended to fit the country-specific transportation environment. Thus, 100% of synchronisation is difficult under these kinds of situations.

**7. For European manufacturers to comply with domestic safety regulations, the specific contents of internationalised regulation (e.g. amended number of the UN Regulation) and the domestic regulation should be notified and shared. Could you please tell me how this is being done now?**

KATRI is planning on constructing a database for the updates on harmonised regulations. This web database will allow manufacturers as well as nations to check which safety regulation was harmonised with which content. The system will be refined after hearing the opinions of manufacturers and the trial service is planned to be at the end of next year.

**8. What is the meaning of IWVTA (International Whole Vehicle Type Approval) and what are the types of vehicles that are being applied?**

IWVTA means an approval whereby a Contracting Party certifies that a type of whole vehicle (only M1 category vehicles) satisfies the relevant administrative provisions and technical requirements as stipulated by the UN Regulation № 0. It is expected that the applied vehicle types will expand to other vehicle categories including medium- and large-size commercial vehicles in the near future. On the other hand, Korea has the self-certification system, so the international whole vehicle type approval is not practically being applied in Korean market.

**9. For the future safety regulation internationalisation, what are the sectors that Korea is focusing on?**

The sector of advanced vehicle technology, such as autonomous vehicles, is now on the trend. Korea is trying to participate more actively and for this, fundamental research is essential.

Therefore, KATRI has expanded the workforce and research facilities to enhance the research, which will lead to more contribution in internationalisation of the safety regulations.

## List of DVN Gold Members

### Car Makers

Aston Martin, UK  
 Audi, Germany  
 Bentley, UK  
 BMW, Germany  
 Changan Design Center, Italy  
 FCA, USA  
 Daimler, Germany  
 Ford, Germany  
 GM, USA  
 Great Wall, China  
 Harley-Davidson, USA  
 Honda, Japan, USA  
 Hyundai Motor, Korea, Europe  
 Jaguar-Land Rover, UK  
 Mahindra Mahindra, India  
 Nio, China  
 Nissan, Japan, Europe, USA  
 Opel, Germany  
 Porsche, Germany  
 PSA, France  
 Renault, France  
 SAIC TC, UK  
 Shanghai-Volkswagen, China  
 Seat, Spain  
 Skoda, Czech Republic  
 Toyota, Japan, Europe, USA  
 Volkswagen, Germany  
 Volvo Cars, Sweden

### Univ., labs, Consultants

Darmstadt university, Germany  
 DEKRA laboratory, Nederland  
 FEP, Franhauser, Germany  
 Fudan university, China  
 GranStudio, Italy  
 Hannover Leibniz Univ.(HOT), Germ.  
 Institut d'Optique, Fr.  
 Karlsruhe Lighting Institute, Germany  
 LAB, France  
 Light Sight Safety, Belgium  
 Nuremberg university, Germany  
 Pacific Insight, USA  
 Parma university, Italy  
 Rensselaer university, USA  
 SLD Laser—formerly  
 SoraaLaser  
 UMTRI, USA  
 University of California, Santa Barbara  
 YoungNam University, South Korea  
 Mr Shunxing Wang, China

### Set Makers and Tier 1s

AL, Germany, USA  
 Denso, Japan  
 Elba, Romania  
 Farba, Turkey  
 FIEM Industries, India  
 Flex'N'gate, USA  
 Grakon, USA,  
 Grote, USA  
 Harbin Good Time, China  
 Hascovision, China  
 Hella, Germany  
 Hyundai IHL, Korea  
 Ichikoh, Japan  
 J.W. Speaker, USA  
 Koito, Japan, Europe  
 Lear, USA, Europe  
 Lite-On, Taiwan  
 Lumax, India  
 Magna, USA, Austria  
 Microlight Auto Parts, Taiwan  
 Mind Optoelectronics, China  
 Mobis, Korea  
 NAL, USA  
 Neolite ZKW, India  
 Nordic Lights, Finland  
 Odelo, Germany  
 Olsa, Italy  
 Plastic Omnium, France  
 Peterson, USA  
 Rebo Lighting, China, Germany  
 SL Corporation, Korea  
 Stanley, Japan  
 Tianchong, China  
 Truck-Lite, USA  
 Valeo, France, Spain, China  
 Varroc, Germany, Czech R.  
 Wipac, UK  
 Xingyu, China  
 ZF-TRW  
 ZKW, Austria  
 Zodiac, France

### Light Source Suppliers

Anrui Opto, China  
 Diodes Dynamics, USA  
 Dominant Opto Tech., Malaysia  
 Everlight Electronic, Taiwan, Germ.  
 Excellence Opto Inc., USA, Taiwan  
 LG Innotek, South Korea  
 Lumileds, Nederlands  
 Nichia, Japan  
 Osram, Germany  
 Samsung Electronics, Korea  
 Seoul Semiconductor, Korea  
 Soraa Laser Diode, USA  
 Tungsram, Hungary  
 Vosla, Germany

### Lighting Suppliers

3M, USA  
 A2Mac1, France  
 AKKA, France, Germany  
 AML Systems, France  
 Aspöck Systems, Germany  
 ASYST Technologies, USA  
 Auer-Lighting, Germany  
 Bicomoptics, China  
 Bühler Alzenau, Germany  
 Covestro, US, China, Europe  
 Dajac, USA  
 DBM Reflex, Canada  
 Delvis, Germany  
 Docter Optics, Germany  
 EBW Electronics, USA  
 EcoGlass, Czech Republic  
 Elmos, Germany  
 Enmech-Mektec, Germany  
 GXC Coatings, Germany  
 Holophane, France  
 IAV, Germany, USA  
 IMS, Netherland  
 Infineon, Germany  
 Instrument Systems, Germany  
 Jenoptik, Germany  
 Keboda, China  
 LG Electronics, South Korea  
 LMT, Germany, China  
 Luminix, USA  
 Lumitex, USA  
 Maxell Joeli Tech, Japan  
 Merck, Germany  
 Mentor Graphics, Europe, USA  
 Mitsubishi Electric, Germany, Jap.  
 Myotek Industries, USA  
 Nalux, Japan  
 NXP, UK  
 ON Semiconductor, Europe, Asia, US  
 Optis, France  
 Optoflux, Germany  
 Oxyphen, Switzerland  
 Panasonic, Japan  
 Proper Group, USA  
 Red Spot, USA  
 Sabic, USA  
 Sapphire, USA  
 Sea Link International, USA  
 Synopsis, USA, Germany  
 Texas Instruments, USA  
 TQ Technology, Taiwan  
 Weidplas CH, Switzerland  
 WL Gore, USA  
 Zollner, Germany

## Previous DVN Reports

All previous DVN Reports may be perused and DVN Gold members may freely download them from the [DVN Library](#).