Transmitted by the chairs of the expert groups on regulatory fitness for Automated Driving Systems

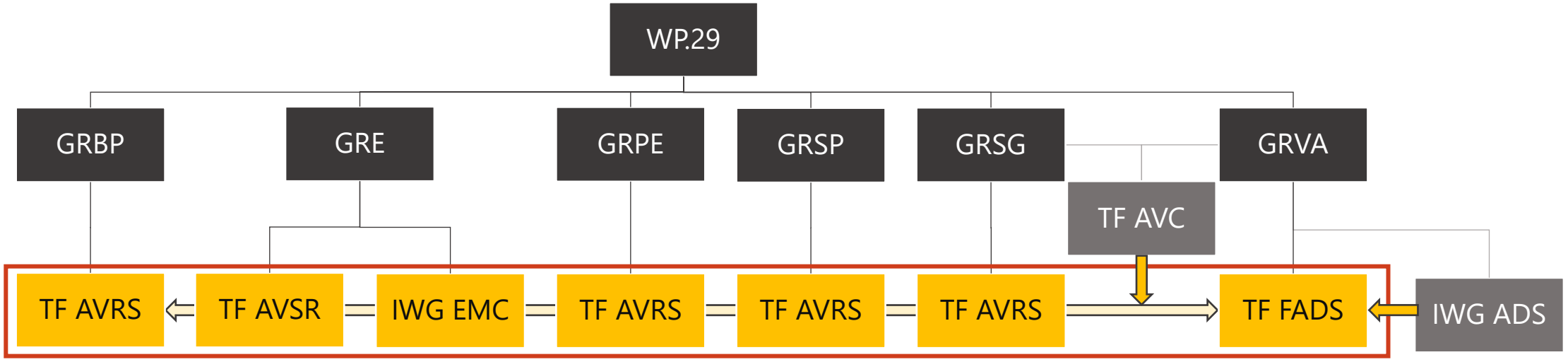
Informal document **WP.29-194-16**
194th WP.29, 12 to 15 November 2024
Agenda item 2.3

Regulatory fitness for Automated Driving Systems

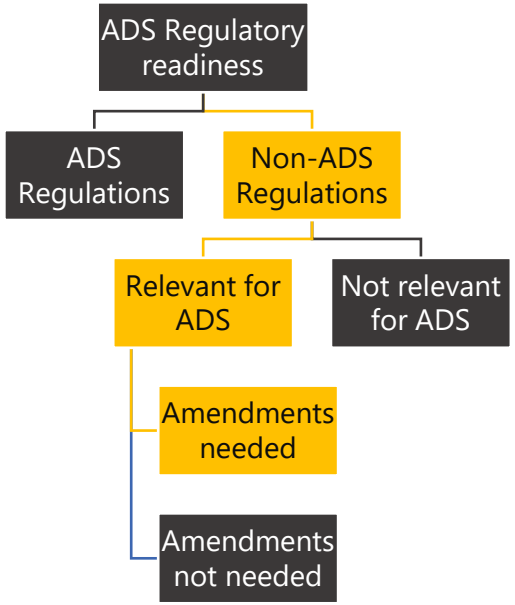
Status report

GRBP TF AVRS — GRE TF AVSR — GRE IWG EMC — GRPE TF AVRS — GRSG TF AVRS — GRSP TF AVRS — GRVA TF FADS

Context and purpose (1/2)



Expert groups on regulatory fitness for ADS



- Contracting Parties and the industry need a regulatory environment for automated vehicles, including non-ADS Regulations
- Which existing Regulations are relevant for automated vehicles? Which ones need to be amended before being applicable to ADS vehicles?
- The WP.29 expert groups on regulatory fitness for ADS are screening and amending these relevant UN Regulations and GTRs

Context and purpose (2/2)

Report to WP.29 (WP.29/2023/86)**:**

- Contains global results, summary sheets for each screened Regulations
- Endorsed by WP.29 (and resubmitted as GRVA/2023/18, endorsed by GRVA)
- Has been updated and submitted as an informal document to the 192nd session of WP.29 (WP.29-192-18)

Guidance received at the 192nd WP.29 session in March 2024

- WP.29 welcomed the timeline presented for amending relevant Regulations by 2026
- All groups may start **drafting amendments** to proposed "priority Regulations"
- **Coordination** between groups shall continue for common definitions, translations and solutions to cross-GR issues, and the work should be coordinated with the IWG ADS and the TF AVC

Activities since March 2024

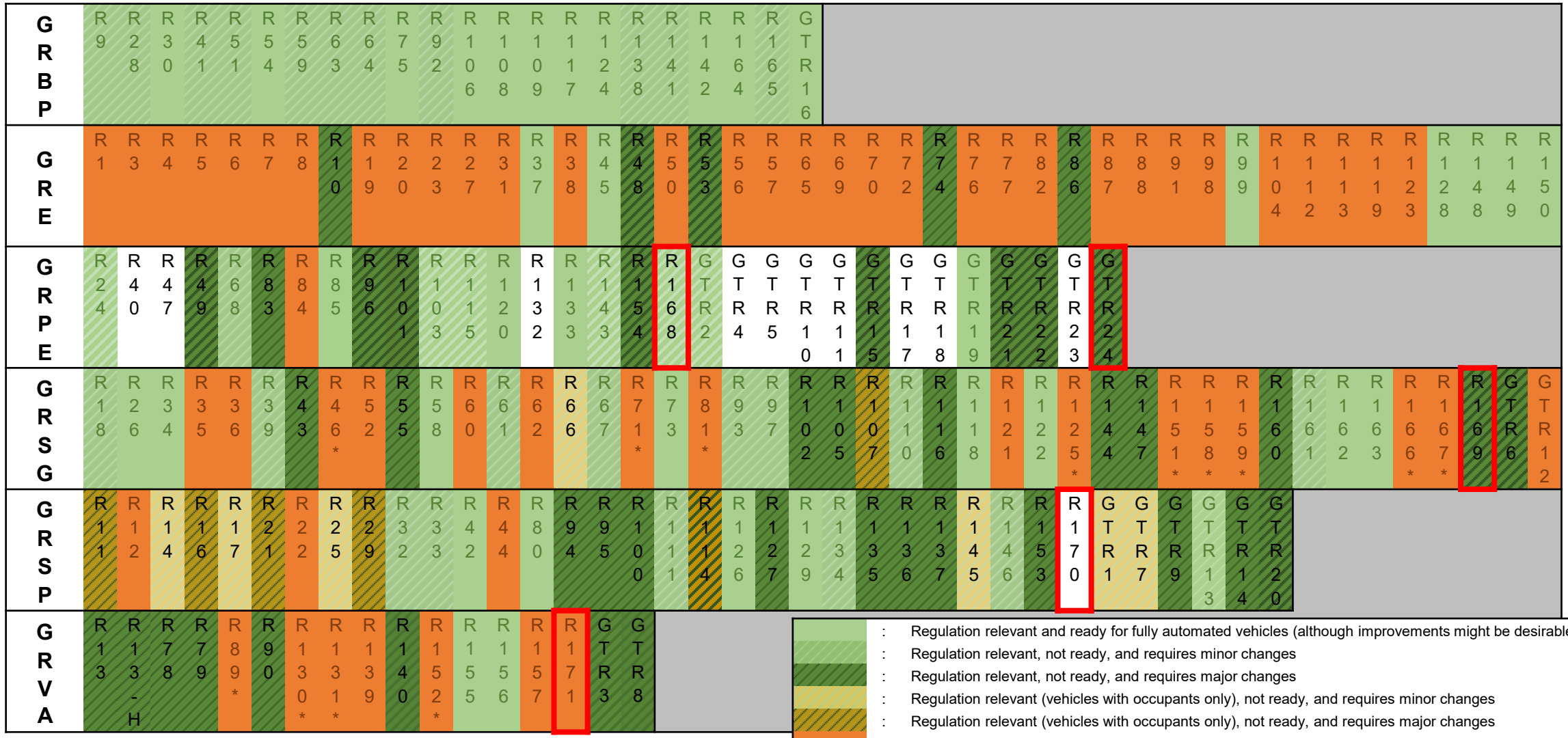
Individually

- GRBP TF AVRS proposed first informal documents for R28 and R138; now finalised for submission as working documents
- GRE IWG EMC is starting preliminary work on the 8th series of amendments to R10, which will further improve ADS fitness
- GRE TF AVSR submitted a working document for R48 to the 91st session of GRE
- GRPE TF AVRS completed the screening of most Regulations under its purview
- GRSG TF AVRS started amendments activities for R107 and R116
- GRSP TF AVRS started amendment activities for its priority Regulations
- GRVA TF FADS has prepared first full drafts of amendment proposals for R13 and R79

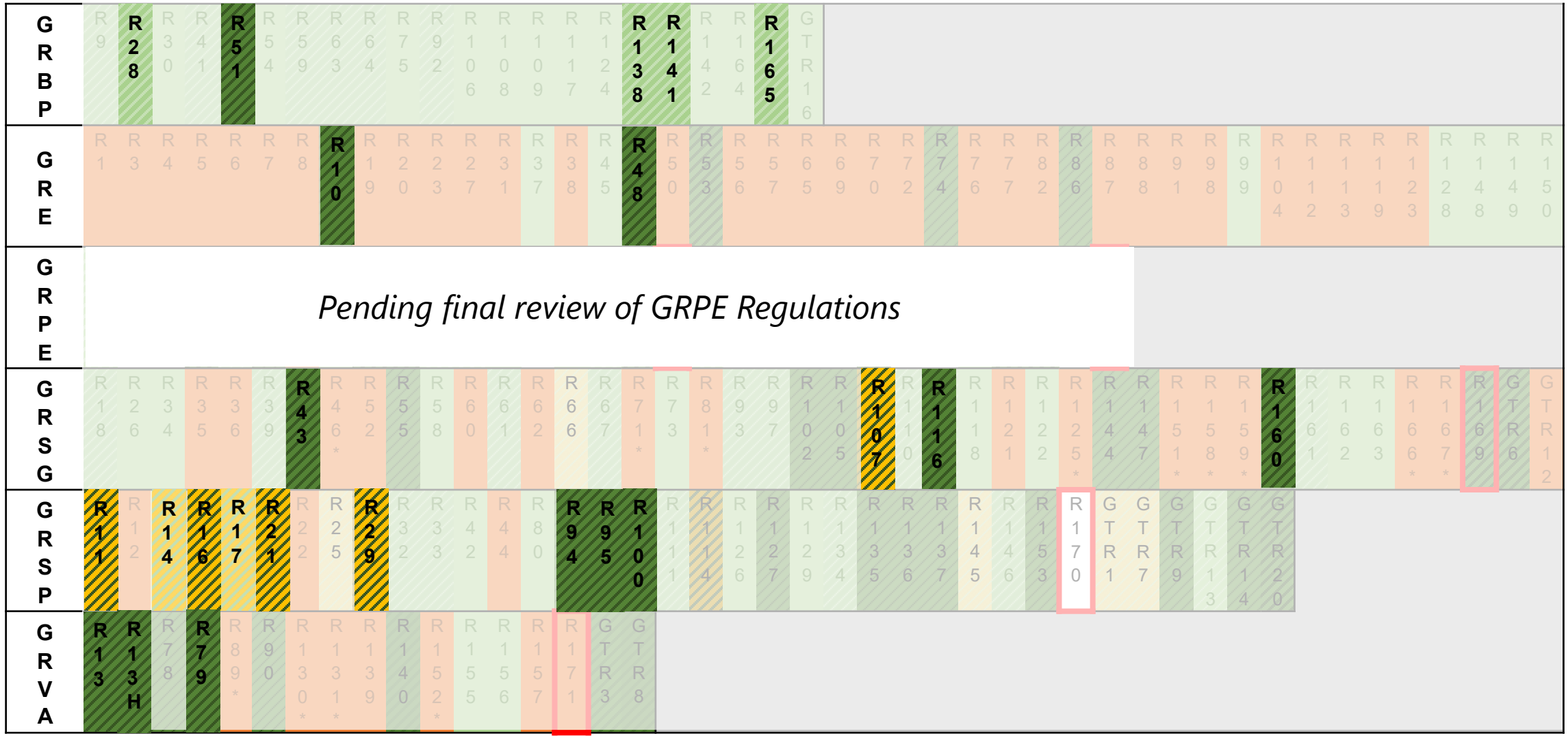
Collectively

- Multiple joint meetings between leaders of the expert groups (June, September and October 2024)
- Frequent cross-participation and reporting of the relevant expert groups to IWG ADS and TF AVC

Reminder on screened Regulations – Updated screening results



Reminder on screened Regulations – Priority Regulations



Excerpts from activities on individual Regulations

R13, R13-H, R79: GRVA TF FADS noted various kinds of warnings and information intended to the driver, and has prepared tables summarising this information for the IWG ADS, as additional material for Horizontal Topic No. 3 of this presentation.

R16: GRSP TF AVRS expressed its concern in ensuring that ADS vehicles will react appropriately to safety belt reminders.

R48: GRE TF AVSR identified some requirements where further consideration is needed for vehicles of categories X and Y (as defined in GRSG/GRVA TF AVC provisional drafts).

R51, R138: GRBP TF AVRS noted an interest by their participants to tackle bidirectional vehicles in Regulations that involve the measurement of sound levels, although bidirectional vehicles are currently scheduled to be part of the next phase of the activities of the expert groups.

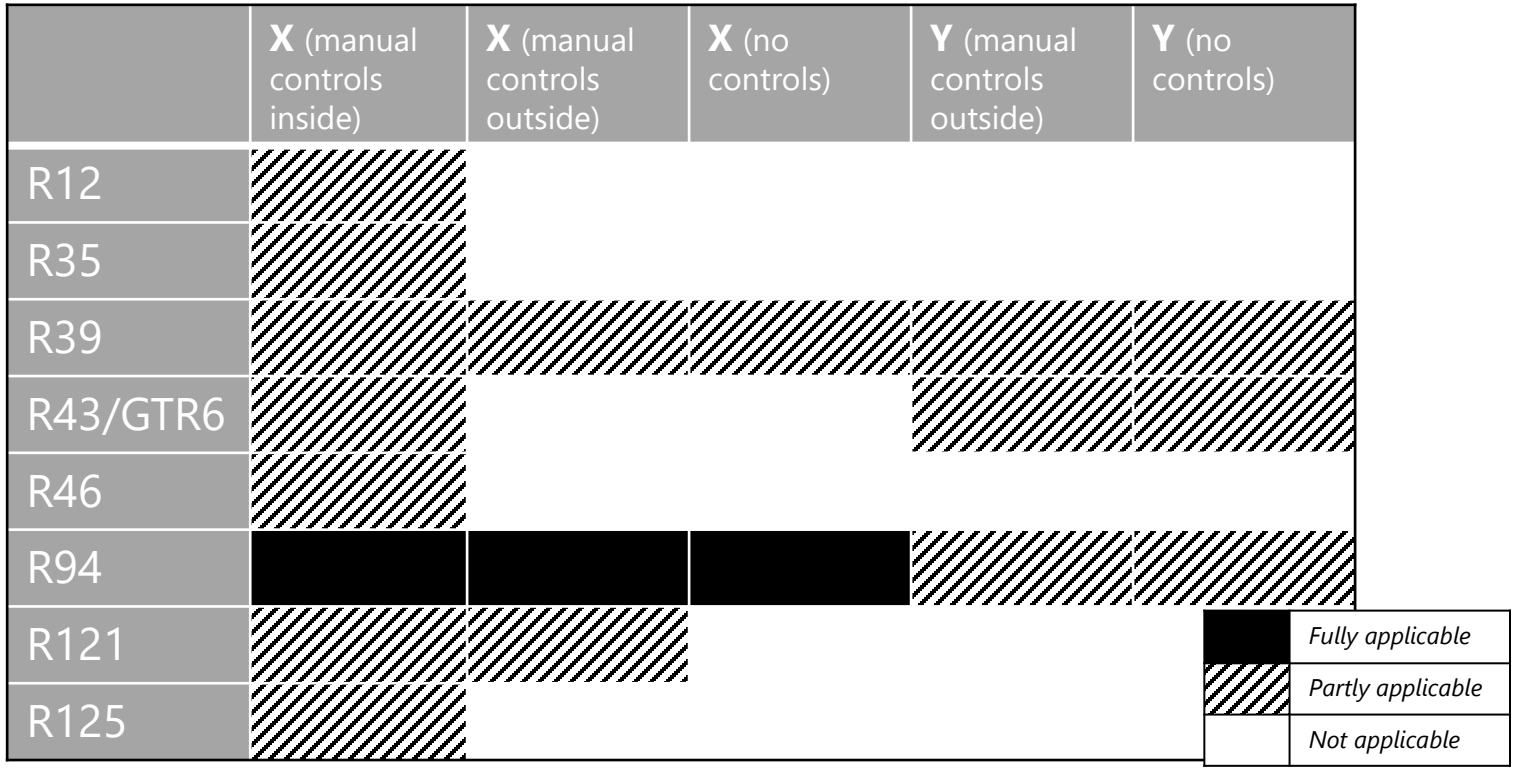
R107: GRSG TF AVRS noted a large amount of requirements that are related to non-DDT responsibilities of the driver (Horizontal Topic No. 2 of this presentation). AVRS also highlighted the need to easily define ADS features that issue / do not issue system-initiated deactivations to manual driving.

R154 and various GRPE Regulations: GRPE TF AVRS identified a large amount of keywords related to manual driving, and that were not previously identified by other GRs.

Horizontal topic 1 – Categories X/Y and scope of Regulations (1/6)

Categories X and Y are currently defined as follows by the GRSG–GRVA TF AVC:

Category X	**Category Y**
Equipped with an ADS	
Cannot be driven manually above 6 km/h	
Designed to transport occupants	**Not designed** to transport occupants
Compatible with L, M, N and T	Compatible with L, N and T



Categories X and Y have been defined to allow for innovative, yet safe designs of automated vehicles.

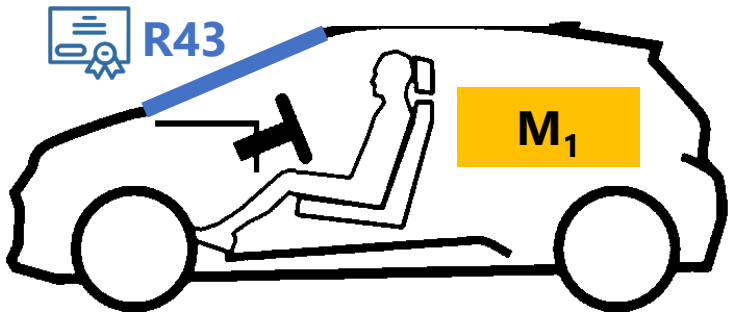
ADS vehicles may offer a wide range of designs for limited manual controls compatible with these new categories: concealed or disabled traditional controls, joysticks, controllers, remote (within line of sight) control, etc.

Some UN Regulations and GTRs may exempt all vehicles of Category X and/or Y from their scope, while other Regulations may be partly applicable to X/Y vehicles depending on the kind of manual controls that can be used to control them at low speeds.

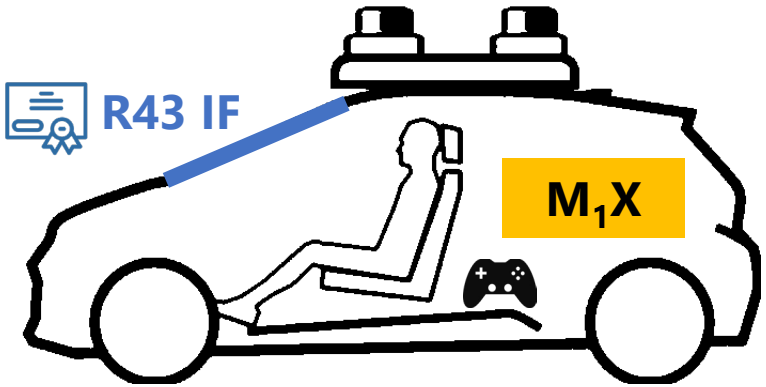
Horizontal topic 1 – Categories X/Y and scope of Regulations (2/6)

Option 1: X and Y vehicles may apply for approvals to partly applicable Regulations, but are only subject to their relevant requirements.

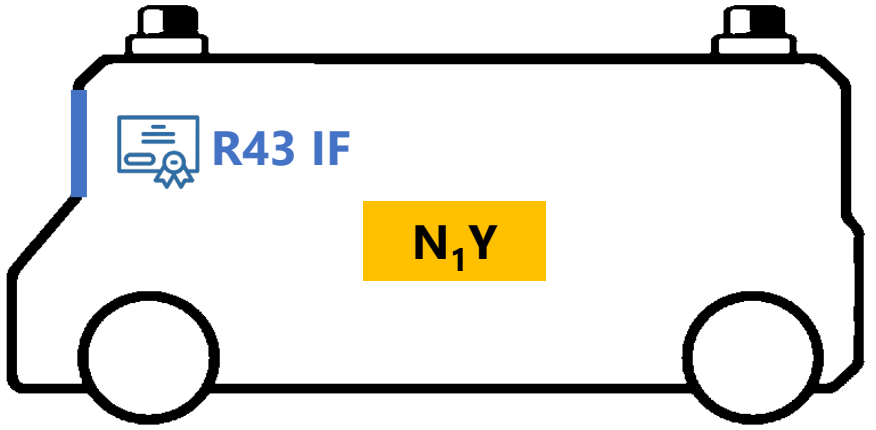
Partial list for illustration purposes



- R13-H
- R43
- R46
- R94
- R137



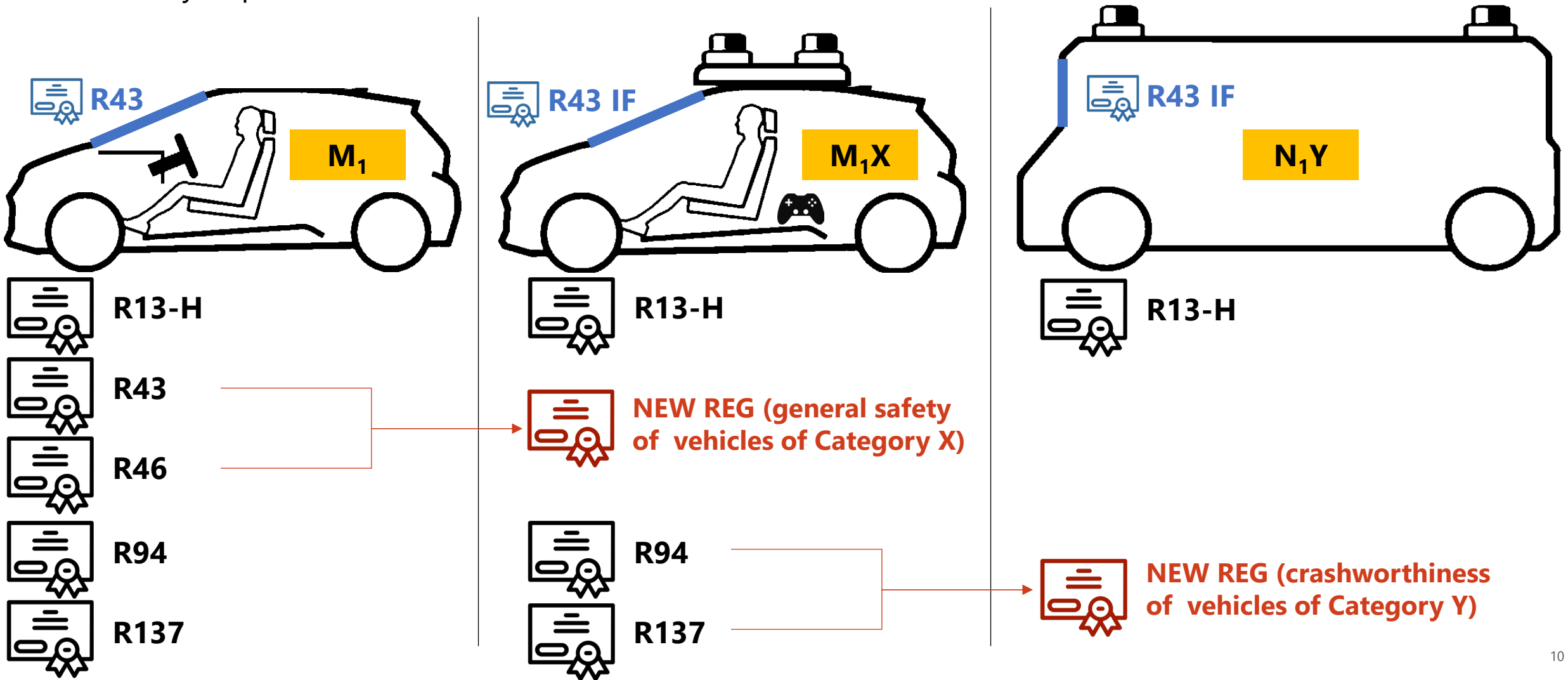
- R13-H
- R43 (simplified)
- R46 (simplified)
- R94
- R137



- R13-H
- R94 (leakage/spillage only)
- R137 (leakage/spillage only)

Horizontal topic 1 – Categories X/Y and scope of Regulations (3/6)

Option 2: A specific General Safety Regulation and Passive Safety Regulation are created to gather basic safety requirements for X and Y vehicles.



Horizontal topic 1 – Categories X/Y and scope of Regulations (4/6)

Recapitulative partial table of Option 2: General Safety Regulations

	X	Y	Details
R35	New Regulation	Exempted	R35 may partly apply to Category X vehicles if standard foot controls are fitted.
R43		Exempted	If fitted on Category X or Y vehicles, glazings should comply with R43. Some basic installation requirements may apply to Category X vehicles with controls inside the vehicle.
R46		Exempted	Vehicles of Category X with controls inside the vehicle should provide basic capabilities for indirect vision, although with a lower level of stringency than R46.
R121		Exempted	Basic control / tell-tale requirements may apply to Category X when manually controlled at low speeds. Tell-tale requirements for other purposes (e.g. communication with passengers) are explored in *Horizontal topic 3* of this presentation.
R125 R167		Exempted	Vehicles of Category X with controls inside the vehicle should provide basic capabilities for direct vision, although with a lower level of stringency than R125 and R167.
R39	Simplified	Simplified	Requirements on speedometer do not apply to X nor Y; requirements on odometer may apply to both X and Y.
R107	Applies	Exempted	R107, as a Regulation on the general construction of buses and coaches, is not relevant for vehicles of Category Y.
R144	Applies	Simplified	Some requirements are irrelevant or inapplicable to vehicles of Category Y (manual activation, references to airbags)
GTR6	Simplified	Simplified?	Only two GTRs are currently under GRSG, so a new GTR may not be appropriate for GTR No. 6.

Horizontal topic 1 – Categories X/Y and scope of Regulations (5/6)

Recapitulative partial table of Option 2: Passive Safety Regulations

	X	Y	Details
R11 GTR1	Applies	Exempted	The current scope of R11 only considers doors of compartments with occupants.
R12	Simplified	Exempted	R12 only applies to some Category X vehicles (presence of a steering column).
R14 R16 R17 R25 R44 R80 R129 R145 GTR7	Applies	Exempted	Regulations on seats, safety belts and their anchorages can only apply to vehicles with occupants.
R21	Applies	Exempted	Interior fittings are only relevant for vehicles with occupants,
R29 R94 R95 R135 R137 R153 etc.	Applies	New Regulation	Only spillage and leakage requirements are relevant for Category Y. Basic compatibility requirements might also be desirable to ensure the protection of other vehicles and vulnerable road users.
R100 R134 GTR13 GTR14 GTR20	Applies	Simplified	Requirements on the protection of occupants may not apply to Category Y.

Horizontal topic 1 – Categories X/Y and scope of Regulations (6/6)

Benefits of Option 1	Benefits of Option 2
- May be managed through supplements, without the need to formally mandate an IWG - May reduce the administrative burden for Contracting Parties (no need to change mandatory Regulations in national / regional frameworks)	- Reduced administrative burden for OEMs (fewer approvals to manage, clearer Regulations for both conventional and X/Y vehicles) - Reduced procedural burden for WP.29 (one Regulation each for GRSG and GRSP) - Opportunity to take a bottom-up approach to decide appropriate requirements for X/Y vehicles - No misrepresentation of the meaning of approvals (e.g., a R94 approval is only possible when there are occupants to protect)

Based on their previous screening work and current amendment activities, the expert groups recommend the choice of **Option 2**.

- If Option 2 is chosen, the new Regulations may contain requirements originally from UN Regulations that are not necessarily applied by all Contracting Parties. Therefore, the list of requirements in these new Regulations should be carefully considered.
- If Option 2 is chosen, the integration of the new Regulations in UN R0 (IWVTA) should be considered.

Horizontal topic 2 – Non-DDT tasks of the driver (1/7)

Regulations contain many provisions where the role of the driver extends beyond the simple operation of the vehicle:

Regulation	Examples of non-DDT tasks of the driver
R11	*2.9. "Door closure warning system" is a system that will activate a **visual signal located where it can be clearly seen by the driver when a door latch system is not in its fully latched position** and while the vehicle ignition is activated.* *6.3.2. Each rear side door shall be equipped with at least one **locking device which, when engaged, prevents operation of the interior door handle** or other interior latch release control […]*
R13	*5.2.1.11.2.1. "It shall be possible to **easily assess this wear on service brake linings from the outside or underside of the vehicle**, without the removal of the wheels, by the provision of appropriate inspection holes or by some other means. This may be achieved by utilizing simple standard workshop tools or common inspection equipment for vehicles.* *Alternatively, a sensing device per wheel. […], which will warn the driver at his driving position when lining replacement is necessary, is acceptable […]"*
R16	*2.41. "Safety-belt reminder", means a system dedicated to **alert the driver when any of the occupants do not use the safety-belt**. The system is constituted by a detection of an unfastened safety-belt and by two levels of driver's alert: a first level warning and a second level warning.*
R21	*5.8.4.2. All rear-window, roof-panel and partition **switches intended for use by occupants in the rear of the vehicle shall be capable of being switched off by a driver-controlled switch** which is located forward of a vertical transverse plane passing through the R points of the front seats.*
R100	*6.14. Warning in the case of a thermal event within the REESS. The REESS or vehicle system shall provide a signal to activate the **warning specified in paragraph 5.2.3. in the case of a thermal event in the REESS***

These requirements mainly focus on informing the driver, or on making easier a task that is performed or initiated by the driver.

Horizontal topic 2 – Non-DDT tasks of the driver (2/7)

Regulations contain many provisions where the role of the driver extends beyond the simple operation of the vehicle:

Regulation	Examples of non-DDT tasks of the driver
R107 Annex 3	*7.5.7.1. […] in the event of activation of an alarm system: […]* *B) **After a single positive action of the driver** on any of the door controls in the driver's compartment, all power-operated doors […] shall open and shall remain in the opened position. […]*
	*7.6.5.5. Where controls are provided for the driver to open and close a power-operated service door, they shall be such that **the driver is able to reverse the movement of the door at any time** during the closing or opening process.*
	*7.6.6.4.1. The driver shall be able to **inhibit the automatic closing process** by actuation of a special control. A **passenger shall also be able to inhibit** the automatic closing process directly by pressing a special push-button.*
	*7.6.10.6. When a **passenger is standing on a power-operated retractable step**, the corresponding door shall be incapable of being closed. […] This requirement shall not apply to any door within the driver's direct field of view.**
	*7.2.3.1. Space shall be provided in the driver's area, in a position clearly visible to the driver in his seating position, for the markings provided for in paragraph 3.3. of Annex 11***.

In other words, the driver is responsible for **checking for the presence of passengers on retractable steps.*
***Such as the maximum number of seated or standing passengers. In other words, the driver or crew member is responsible for **checking the number of passengers inside the vehicle**.*

These requirements mainly focus on informing the driver, or on making easier a task that is performed or initiated by the driver.

Horizontal topic 2 – Non-DDT tasks of the driver (3/7)

*"**Automated Driving System (ADS)**" means the vehicle hardware and software that are collectively capable of performing the entire Dynamic Driving Task (DDT) on a sustained basis.*

*"**Dynamic Driving Task (DDT)**" means the real-time operational and tactical functions required to operate the vehicle.*

*"**Tactical function**" means a capability to perceive the vehicle environment and control real-time planning, decision, and execution of manoeuvres, including conspicuity of the vehicle and its motion.*

*"**Operational function**" means a capability to control the real-time motion of the vehicle.*

Definitions taken from GRVA-18-50r1

- Currently, an ADS is only defined as a system capable of performing the dynamic driving task of the vehicle.
- GRVA IWG ADS documents only require the ADS to "*comply with traffic rules in accordance with application of relevant law within the area of operation*"
- concrete requirements explicitly mention an interaction with passengers:
  1. "*Pursuant to a **passenger request**, the ADS shall bring the vehicle to a safe stop.**"*
  2. "*The ADS shall not initiate motion unless the **safety risks to the passenger(s) have been mitigated**"*
  3. "*An ADS that controls the operation of **doors** shall provide an **emergency override** to the user***"*
  4. (another requirement in p. 37 will be developed as a separate horizontal topic)

**R107 may need to be amended to introduce the presence of a button or other user interface to make this stop request.*
***This requirement is similar to R107 §7.6.6.4.1.*

Horizontal topic 2 – Non-DDT tasks of the driver (4/7)

Option 1: the ADS* is in charge of **both DDT tasks and non-DDT, safety-relevant tasks**. The **ADS Regulation** should contain requirements on how the ADS is evaluated on non-DDT tasks to ensure the safety of relevant vehicle users.
In non-ADS Regulations (e.g., R107), an ADS is assimilated to a human driver and may override non-DDT automatic actions (like the operation of doors) if they are part of its safety concept.

Benefits of option 1: corresponds to existing requirements of the ADS Regulation (see examples 1 and 3 in the previous slide). Considers the ADS to be a full replacement of the driver in all aspects. Additional requirements that are not present in existing non-ADS Regulations can be created.

Option 2: the ADS* is in charge of **both DDT tasks and non-DDT, safety-relevant tasks**. Each Regulation shall ensure that the ADS reacts appropriately to the information transmitted through requirements of that Regulation.

Benefits of option 2: a high level of safety is ensured in each Regulation. Each GR may define what is considered to be an "appropriate reaction" depending on the information transmitted to the ADS.

Option 3: the ADS is in charge of **only the DDT**. Non-DDT tasks are to be **handled through each Regulation** as "automatic" functions, the safety of which must be demonstrated as part of the compliance with each Regulation.
In non-ADS Regulations (e.g., R107), an ADS is assimilated to automatic functions, independent from one another.

Benefits of option 3: non-DDT aspects of automated vehicles are tackled from the perspective of existing Regulations (a non-compliance in performing the DDT is separated from a non-compliance in operating doors).

Option 4: These tasks shall be covered under regional or national law.

*Including a vehicle user or remote operator designated as responsible in the safety concept of the ADS

Horizontal topic 2 – Non-DDT tasks of the driver (5/7)

Illustration with the following requirement of UN R107:

7.5.7.1. […] in the event of activation of an alarm system: […]
*B) **After a single positive action of the driver** on any of the door controls in the driver's compartment, all power-operated doors […] shall open and shall remain in the opened position. […]*

Option 1

R107	R ADS
*Unchanged**	***New section: Non-DDT safety tasks*** ***"The ADS shall respond appropriately to signals received from other vehicle systems"***

Option 2

R107	R ADS
"For vehicles equipped with an ADS, the manufacturer shall demonstrate that the ADS responds appropriately when the conditions for paragraph 7.5.7.1. are met."	*Unchanged*

*In all four options, R107 should still be amended for ADS fitness purposes

Horizontal topic 2 – Non-DDT tasks of the driver (6/7)

Option 3

R107	R ADS
Existing text of 7.5.7.1. B) **+** **"For vehicles equipped with an ADS, in the absence of a designated person responsible for the opening of doors, doors shall open automatically in accordance with NEW ANNEX"** NEW ANNEX based on existing annexes for electronic control systems (R79 Annex 6, R13-H Annex 8…)	*Unchanged*

Option 4

R107	R ADS	National laws
Unchanged	*Unchanged*	**CP A: "In case of fire, all doors of an ADS vehicle shall open automatically "** **CP B: "In case of fire, *the ADS shall open all power-operated doors […]* "**

Horizontal topic 2 – Non-DDT tasks of the driver (7/7)

Based on their previous screening work, current amendment activities and consultations with GRVA IWG ADS, the expert groups recommend the choice of **Option 1 or Option 2**

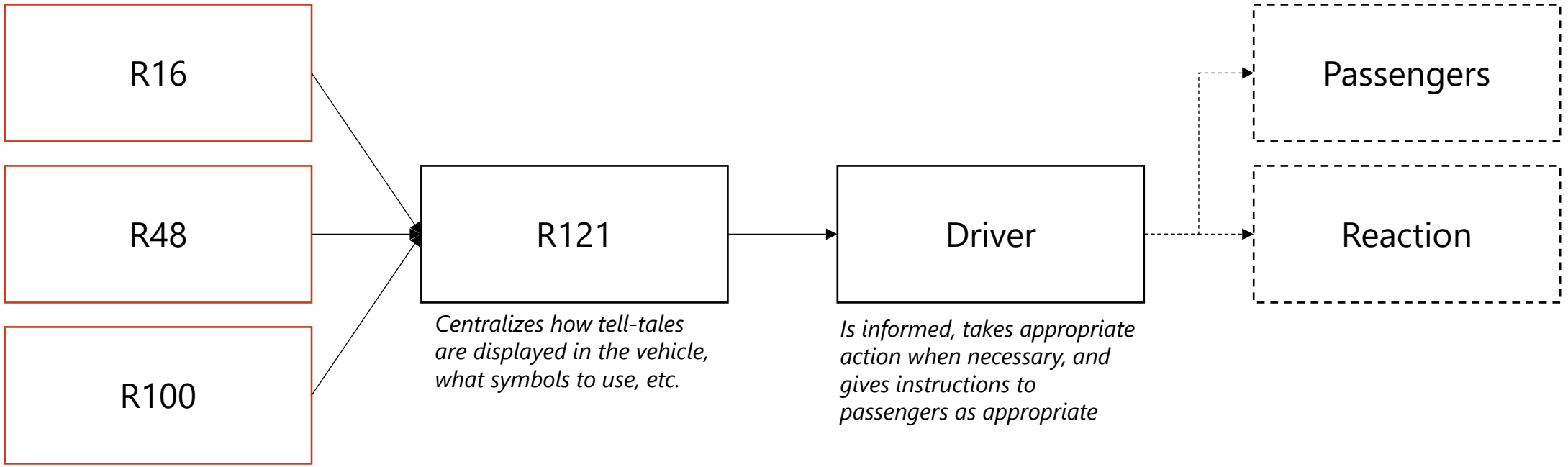
- Option 1 could shift part of the workload from the fitness expert groups to the IWG ADS. Coordination would thus be required, especially regarding requirements related to R107, to ensure the safety of ADS in public transportation vehicles.
- Option 1 remains the only option that avoids at the same time:
  - Fragmented national ADS requirements, and
  - The inclusion of ADS requirements in non-ADS Regulations
- Option 1 is also the only option that elaborates on the existing non-DDT requirements in ADS draft documents.

- Options 2 and 3 would create a regulatory vacuum for automated vehicles that are not in the scope of R107, as no existing Regulation could be used as a reasonable basis to include some of the expected non-DDT requirements for vehicles of Categories not covered by R107. Furthermore, these options could inelegantly divide the ADS from its non-DDT tasks, even though the industry plans are to create ADS that may operate various vehicle systems beyond the DDT.

Horizontal topic 3 – Communication with ADS users (1/4)

In a conventional (non-ADS) vehicle, nearly all information goes to the driver, who has full responsibility to react to regulatory vehicle or safety information (DDT-related or not), but also to communicate to passengers and to give instructions.

Each Regulation *defines what information should be communicated with a warning / tell-tale, when warnings should be triggered, etc.*

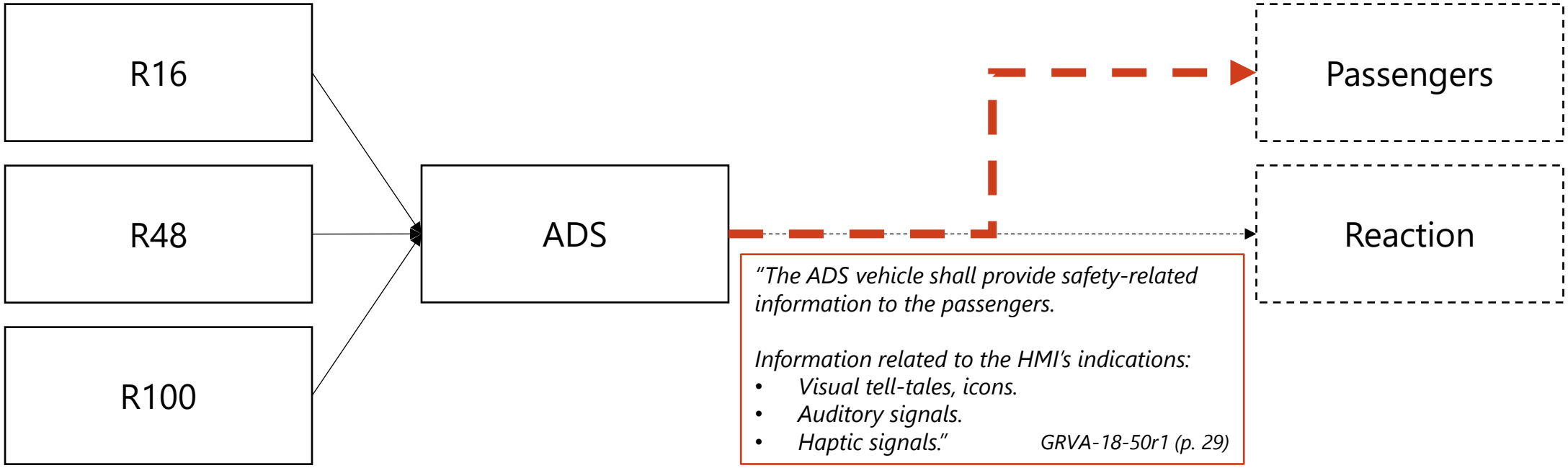


Centralizes how tell-tales are displayed in the vehicle, what symbols to use, etc.

Is informed, takes appropriate action when necessary, and gives instructions to passengers as appropriate

Horizontal topic 3 – Communication with ADS users (2/4)

In an automated vehicle, information is transmitted directly to the ADS.
The ADS Regulation requires the ADS to provide safety-related information to passengers, **but does not specify what information is relevant, when to provide it, how, and to whom.**



Communication from the ADS to users depends on the criticality of the information and on user roles.
There is currently **no requirement for the ADS to transmit any specific safety-relevant information defined in an existing Regulation**.

Horizontal topic 3 – Communication with ADS users (3/4)

Option 1: do not define any specific requirements for the transmission of information to users; this should be decided by the ADS, and communication strategies may be different from one ADS to another.

Option 2: each Regulation may introduce requirements for information directly to passengers when no driver is present in the vehicle.

Option 3: a master table defines expected transmission from the ADS to vehicle users. This table could be integrated in the ADS Regulation or a separate Regulation.

Regulation	Paragraph	Description of the information	Type of signal (visual / auditory / haptic)	Relevant users

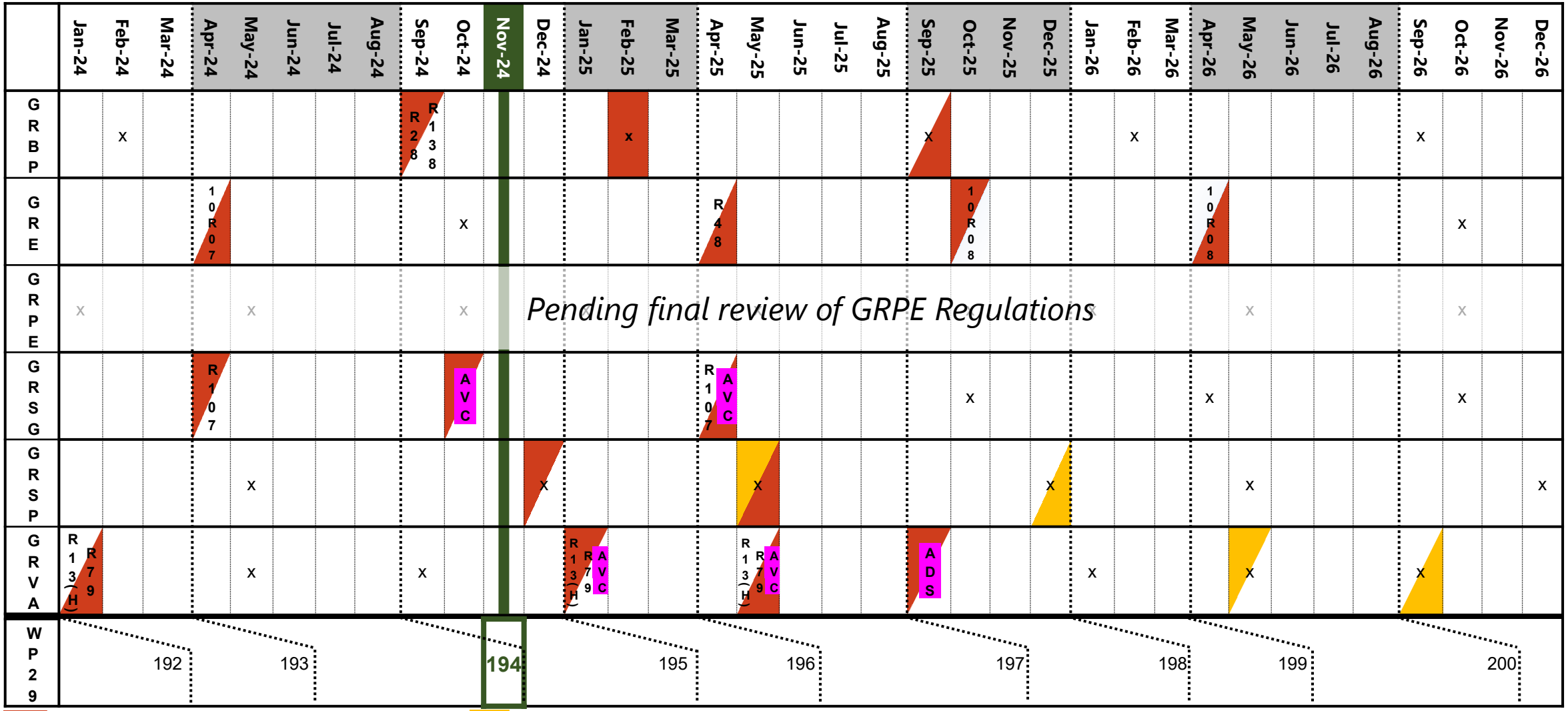
Horizontal topic 3 – Communication with ADS users (4/4)

Benefits of Option 1	Benefits of Option 2	Benefits of Option 3
- No need to amend existing Regulations or the ADS Regulation.	- No need to amend a master table each time a new warning or information is added to any Regulation.	- Clear, harmonised guidance in one location for when and how the ADS should transmit information.
- OEMs are free to define any strategy for communicating with vehicle users.	- Requirements for each kind of information can be precisely drafted in each Regulation, rather than in a master table.	- Information comes from the ADS and not from the vehicle. New methods of information delivery could thus be considered (vocal messages, etc.)
- Allows for more innovation in ADS operation.	- Direct communication from the vehicle to the users, without transiting through the ADS.	- A master table may also include information specific to the ADS performance of the DDT.

Based on their previous screening work, current amendment activities and consultations with GRVA IWG ADS, the expert groups provisionally recommend the choice of **Option 1**, although further research on this topic is desirable. The choice of an option may also depend on the type of ADS feature considered.

Furthermore, it remains possible to integrate guidance for communication with users in the future ADS interpretation document.

Updated provisional planning of ADS-related submissions (Nov-24)



Informal document(s)
Priority Regulation(s)

Working document(s)
Priority Regulation(s)

Informal document(s)
Non-priority Regulation(s)

Working document(s)
Non-priority Regulation(s)

- *X symbols mark the usual schedule of GR sessions*
- *Numbers such as 192 indicate WP.29 sessions*
- *Dotted lines indicate usual deadlines for the submission of documents to WP.29*

Summary of guidance requested to WP.29

- **Guidance or input for the three horizontal topics**

  1. Categories X/Y and scope of Regulations
  2. Non-DDT tasks of the driver
  3. Communication with ADS users

- **Future interactions between the expert groups and IWG ADS** (where should horizontal topics 2 and 3 be discussed? Are they part of the ADS mandate?)

- Date of **next update to WP.29: 195th session in March 2025** or **196th session in June 2025?**

Contact information

Group	Chairperson(s) to contact	Secretary
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GRPE TF AVRS	Netherlands (Niels DEN OUDEN)	AVERE (Banita FIDYOVA)
GRSG TF AVRS	Netherlands (Hans LAMMERS)	OICA (Olivier FONTAINE)
GRSP TF AVRS	Germany (Rudolf GERLACH)	OICA (Ansgar POTT)
GRVA TF FADS (and coordination with other expert groups)	China (Jiajie WU) France (Romain PESSIA)	CLEPA (Sébastien PATERNOTTE)