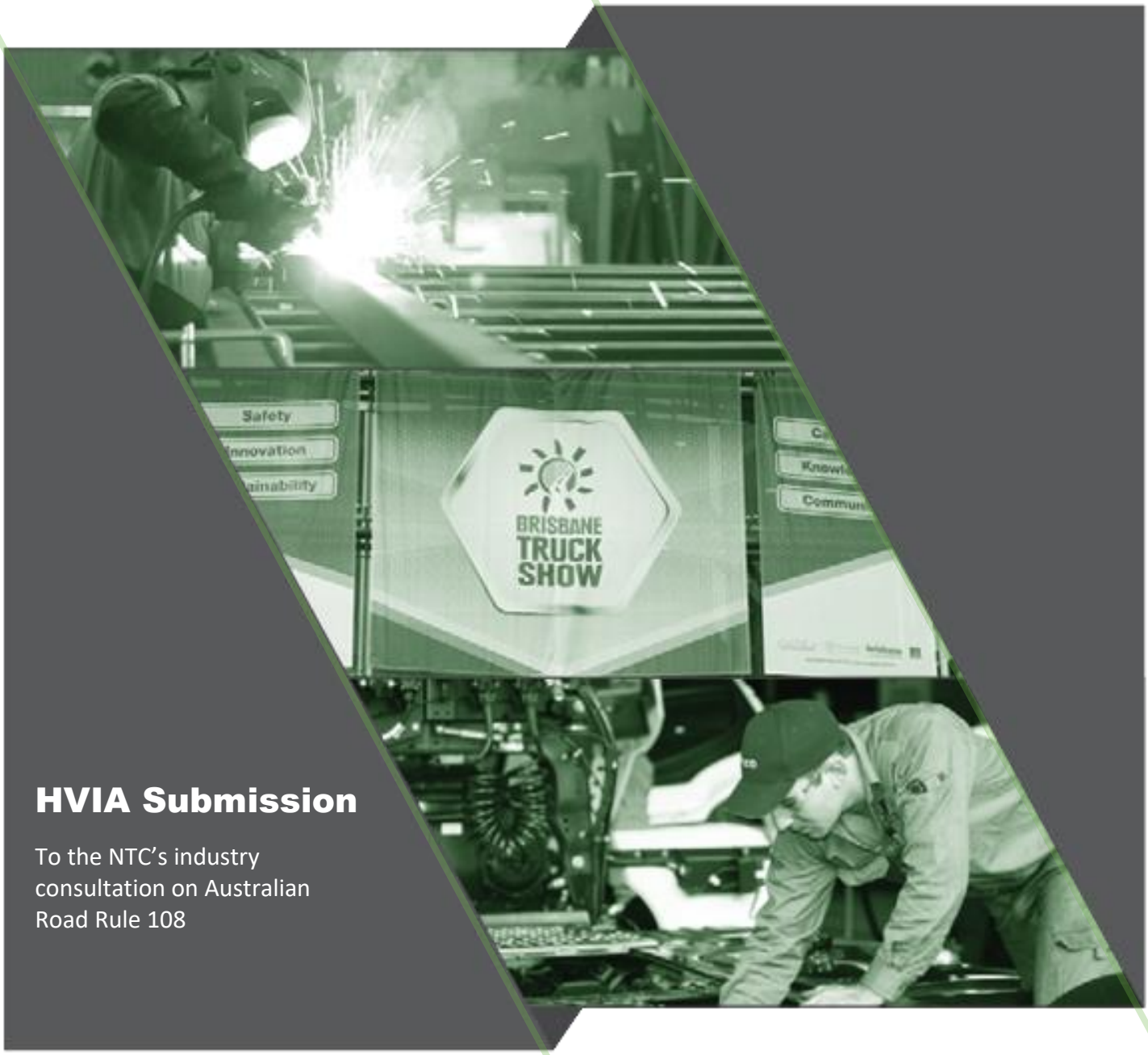
HEAVY VEHICLE INDUSTRY AUSTRALIA



HVIA Submission

To the NTC's industry consultation on Australian Road Rule 108

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Heavy Vehicle Industry Australia
Represents and advances the interests of manufacturers and suppliers of heavy vehicles and their components, equipment and technology.

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What is Heavy Vehicle Industry Australia?

Heavy Vehicle Industry Australia (HVIA) is the peak industry association for Australian manufacturers of trucks and trailers (collectively referred to as heavy vehicles), as well as the dealerships, repairers, suppliers, and service providers that support the entire industry. We represent almost every major truck manufacturer/importer, all of Australia's major trailer manufacturers, and an ever-growing list of their component, equipment and technology providers.

HVIA's 300-plus corporate members collectively employ a local workforce of over 70,000 staff. Our member's interests cover an extensive range of vehicles, starting with 3.5-tonne light commercial trucks, and extending all the way up to Australia's unique 50-metre long, 100-tonne road trains.

The industry provides some of the world's most efficient, safe, innovative, and technologically advanced vehicles. HVIA seeks to work with government and industry stakeholders to promote an innovative and prosperous industry that supports a safe and productive heavy vehicle fleet operating for the benefit of all Australians.

HVIA member feedback to the NTC's consultation paper

HVIA has consulted individual members and provides the following collective responses to the questions posed, based on the submissions received. HVIA understands that individual members may have submitted their own detailed responses to the NTC.

For brevity, the acronym LZEHV (Low and Zero Emission Heavy Vehicle) will be used and refers to battery electric heavy vehicles, hydrogen fuel cell heavy vehicles, and battery-ICE hybrid heavy vehicles. The term 'primary brake' is used and refers to the conventional, friction-based wheel-end brakes.

HVIA's responses should not be taken as being completely representative of the entire fleet of LZEHV models available in Australia.

What technical and operational factors should be considered to ensure ARR 108 continues to achieve its safety intent for vehicles without driver-selectable forward gears (including electric and hybrid trucks and buses) on long or steep descents?

LZEHVs may not feature driver-selectable forward gears, with the exception of some hybrid driveline vehicles. To safely manage speed on descents, most LZEHVs typically rely on driver-selectable multi-stage regenerative braking systems featuring brake blending control, and drive motor torque management.

Those systems allow the driver to select a level of regenerative braking, and the system applies its regenerative system, controls motor torque, and may also apply the primary brake (i.e. brake blending) to manage the vehicle's speed during the descent. Hence, the regenerative braking system performs the functional role that conventional 'low gear engine braking' performs in other vehicles, meeting the safety intent of ARR 108.

The regenerative systems are controlled by vehicle software that can offer greater consistency in the resultant speed profile than driver-selected forward gears.

If the driver applies the primary brake, the system will automatically adjust the level of regenerative braking. The regenerative systems are also integrated with the vehicle's Electronic Brake System ((EBS), incorporating Anti-lock Braking Systems (ABS), and Electronic Stability Control (ESC).

Some regenerative systems may reduce their braking capacity in situations where the vehicle's battery is in a high State of Charge (SoC), or is at a high temperature. In those instances, application of the primary brake to reduce speed must be allowed. Operation at high gross vehicle mass, or on long, continuous descents can increase battery SoC. Driver training provides awareness of those characteristics, and

operations are planned to accommodate gradient length, battery SoC, and long, steep descents present on the route.

Which braking systems (e.g. regenerative, engine, or endurance braking) are capable of maintaining controlled speeds on long or steep descents for vehicles without driver selectable forward gears?

Regenerative braking systems, drivetrain-based braking systems featuring motor torque control, brake blending systems, and auxiliary 'endurance' braking systems (if fitted) featuring hydraulic or electric mechanisms are all capable of maintaining controlled speed on long and steep descents. None rely on the selection of a forward gear by the driver. Hence, the systems meet the safety intent of ARR 108 by limiting speed without the continuous use of the primary brake.

Under what circumstances is the use of the primary (friction) brake necessary for these vehicles?

Use of the primary brake may be required in the following circumstances:

- where the vehicle's battery is at a high SoC or temperature
- on low friction road surfaces, where stability systems may automatically reduce the brake torque that can be provided by the drivetrain
- to bring the vehicle to a complete stop, following operation of a regenerative or other brake system
- when manoeuvring at low speeds (regeneration may not operate below a speed threshold)
- in emergency braking events.

For vehicles featuring brake blending capabilities, the intermitted use of the vehicle's primary brake is part of the programmed brake blending strategy and should not be considered to be against the safety intent of ARR 108.

Are there scenarios in which vehicles without driver-selectable forward gears cannot safely comply with the current intent of ARR 108? Please describe the conditions.

When operated within rated limits and appropriate driver selection of regenerative levels, LZEHVs will maintain safe speeds on descents, which is understood to be the current intent of ARR 108.

Notwithstanding, high battery SoC, battery temperature, or low friction surfaces may limit regenerative braking capacity and may require the driver to intermittently use the primary brake to control speed.

In those cases, LZEHVs can meet the safety intent but may not meet the literal requirement to "*drive in a gear low enough to limit speed without the use of a primary brake*" that ARR specifies.

What operational or safety risks may arise from excluding the use of the primary brake for these vehicles (i.e. relying solely on regenerative or drivetrain-based braking systems)?

Prohibiting primary brake usage for LZEHVs negotiating long and steep descents may introduce the following risks:

- removal of brake blending as a brake system option, possibly leading to reduced overall braking capacity
- increased demands placed on other regenerative brake systems, potentially leading to higher battery SoCs, and possibly, reduced brake performance
- reduced braking redundancy (i.e. fewer options for drivers)

These risks are considered sufficient to undermine the current safety intent of the rule.

Are there specific routes, gradients or operating conditions where these issues are more pronounced?

Use of the primary brake by the driver to manage descent speed can be necessary in the following circumstances:

- long, steep descents such as Mt Ousley (NSW), the Toowoomba Ranges (QLD), and the South Eastern Freeway into Adelaide (SA).
- descents in urban areas with stop-start traffic (which can interrupt regenerative braking)
- high ambient temperatures (leading to higher battery temperatures)
- descents commenced at high battery SoC (possibly arising in 'first leg', or 'start of day' operations)
- high gross vehicle mass operations.

Most of these circumstances are not dissimilar to those that impact braking performance on conventional vehicles.

Do you have any data, operational experience, or supporting material that would inform how the ARRs should apply to these vehicles?

HVIA members have conducted operational trials in Australia across a range of freight duty cycles, including varied gross masses and mixed-gradient routes. Those trials have provided meaningful insight into the interaction between regenerative braking, blended braking strategies, driver operation, and real-world descent management. Those trials have indicated that:

- regenerative braking provides effective speed control on descents, as demonstrated via LZEHV manufacturer driver trainers
- drivers generally rely on regenerative braking rather than primary braking when operating LZEHVS on descents
- regeneration is significantly reduced at high battery SoCs (i.e. above 90%), requiring primary brake supplementation.

While specific performance data remains commercially sensitive and therefore confidential, members have indicated that they are willing to work with the NTC to develop practical, technology agnostic outcomes for ARR 108. Options for further work include:

- contributing qualitative operational insights to inform the safety intent of the rule
- participating in technical discussions to clarify EV braking behaviour
- provide contextualised information under appropriate confidentiality arrangements if required for regulatory clarification.

HVIA's recommendation

ARR 108 must be revised to be technology agnostic. In its present form, it effectively dictates the fitment of a 'low gear' to all trucks and buses. Regulations on vehicle equipment and specifications is not the domain of the Australian Road Rules, it is the domain of the Australian Design Rules, and should remain so.

Pending the above change, changes to the road safety warning signs that are deployed at long and steep descents would also be necessary. HVIA recommends national harmonisation in the language and graphics chosen for those road signs.

One possible option is to amend the sign to indicate the presence of a descent and the requirement to control speed, and amend the Rule to require vehicles to predominantly use non-primary brake speed control system, which therefore allows regenerative, endurance, or drivetrain-based braking, brake blending, and intermittent use of the primary brake, if necessary.

Finally, an amendment to enforcement approaches may also be necessary, to ensure that vehicles with stop lamps activating during descents are not issued infringements. Regenerative brake systems may trigger the illumination of stop lamps, which is a requirement of Australian Design Rule 13/00.