



Department
for Transport

From the Minister of State
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Sir Edward Leigh and Adrian Bailey
The Automated and Electric Vehicles Bill
Committee
House of Commons
London
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Dear Edward and Adrian,

I thought I would drop you a note regarding the levels of automation, and our definition of an automated vehicle, in response to the committee session on Thursday 2 November.

SAE International's standard provides and defines the six levels of driving automation, from no automation to full automation. Consistent with industry practices, the standard is frequently cited and referred to by industry and media. In general, SAE J3016™ levels and definitions include:

- **Level 0 – No Automation:** The full-time performance by the human driver of all aspects of the dynamic driving task, even when enhanced by warning or intervention systems.
- **Level 1 – Driver Assistance:** The driving mode-specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task.
- **Level 2 – Partial Automation:** The driving mode-specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the human driver performs all remaining aspects of the dynamic driving task.

- **Level 3 – Conditional Automation:** The driving mode-specific performance by an Automated Driving System of all aspects of the dynamic driving task with the expectation that the human driver will respond appropriately to a request to intervene.
- **Level 4 – High Automation:** The driving mode-specific performance by an Automated Driving System of all aspects of the dynamic driving task, even if a human driver does not respond appropriately to a request to intervene. The self-driving aspect is determined under specified conditions (geo-fencing to define motorways etc).
- **Level 5 – Full Automation:** The full-time performance by an Automated Driving System of all aspects of the dynamic driving task under all roadway and environmental conditions that can be managed by a human driver.

Scope of the Bill's application

Our definition of a vehicle 'driving itself' incorporates within it the point that the vehicle 'does not need to be monitored' by an individual.

'Level 3' vehicles, according to the generally accepted definition¹, perform "*conditional driving automation*", but with the expectation that the human driver (what they call "the dynamic driving task (DDT) fallback-ready user") "*continues to be receptive to Automated Driving System requests to intervene, as well as to DDT performance-relevant system failures.*"

These two conditions have to be fulfilled for these systems to be 'safely driving themselves'. The condition we set for a vehicle to be deemed by the Secretary of State to be worthy of inclusion on this list was that it is able to both:

- a. Safely drive itself.
- b. Without needing to be monitored by an individual.

There is never a 'circumstance or situation' in which a 'level 3' vehicle can 'safely' drive itself without the 'monitoring' of the driver. 'Level 3' is defined by the fact that the driving tasks are shared conditionally; the vehicle controls the DDT, but on conditions which by our Bill definition exclude them from ever being on the clause 1(1) list.

¹ https://www.sae.org/misc/pdfs/automated_driving.pdf

Ignoring the key condition that the SAE definition sets for 'level 3' – that the driver should continuously monitor and be ready to take over controls – takes the 'driving' of this vehicle outside the bounds where it is being driven 'safely'. If the vehicle is not being monitored by a fallback-ready user, then this vehicle's operation would cease to be safe.

When using an advanced driver assistance system (ADAS) and 'level 3', the driver still will retain overall responsibility for the safe execution of the driving task. This is regardless of the complexity of assistance the vehicle is providing.

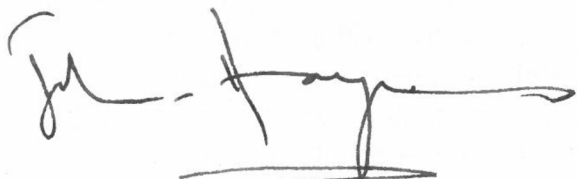
This is reflected in Rule 150 of the Highway Code, '*You MUST exercise proper control of your vehicle at all times. Do not rely on driver assistance systems*'.

A 'level 4' system, on the other hand, can manage without the driver's monitoring and is designed to do a 'minimal risk manoeuvre' if it asks the driver to take back control and gets no response. This minimal risk manoeuvre means the car will take itself to a safe place and stop if the driver is unresponsive, unlike a 'level 3' system.

You will have gathered that there is nervousness in some quarters about the safety of 'level 3' technology, and UK experts are actively shaping the international debate to ensure manufacturers are able to demonstrate these vehicles are safe before they are approved for sale.

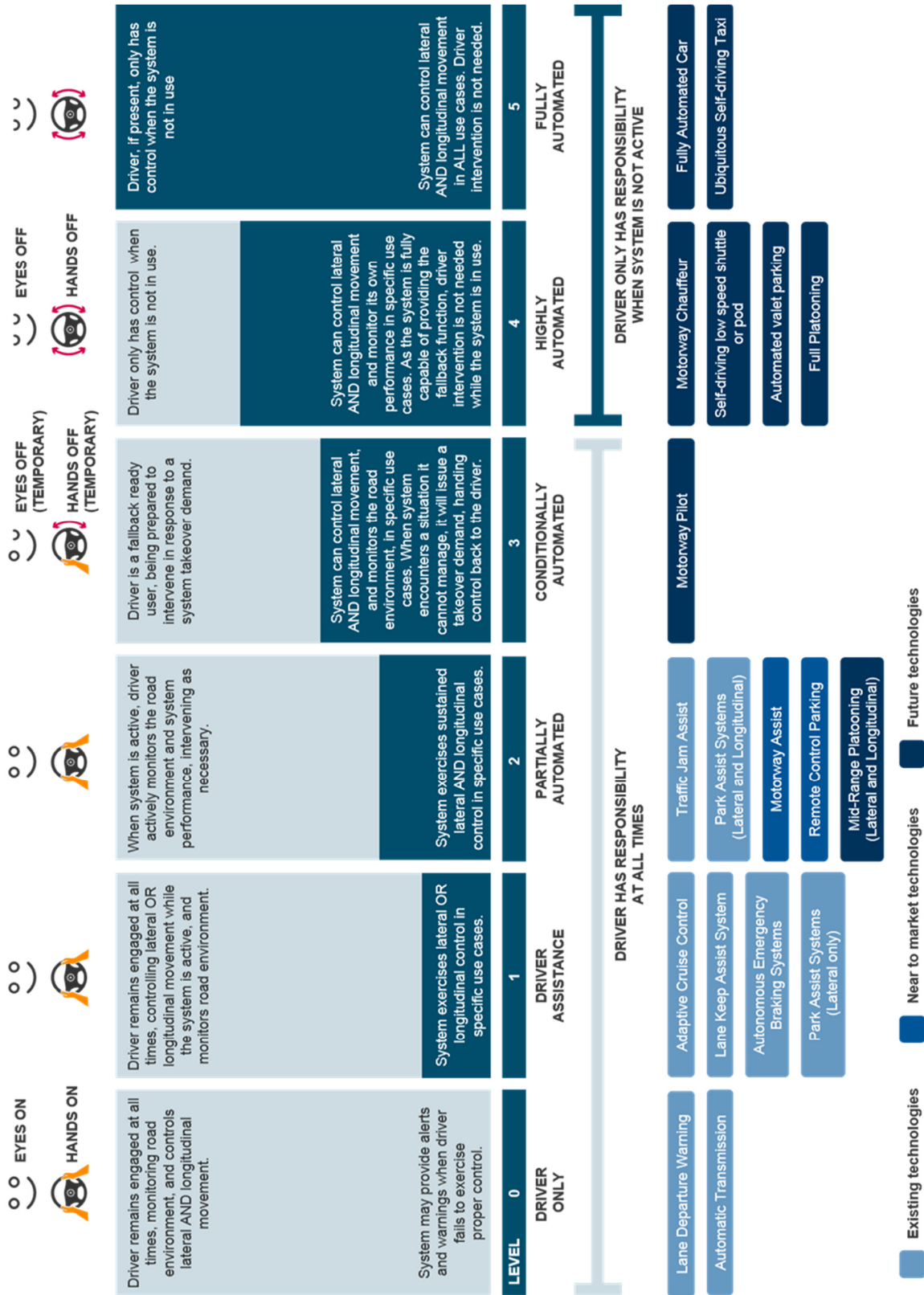
I will be following the progress of the international discussions on the approval for sale of 'level 3' technology with interest, but I hope this note gives you some reassurance that this issue is separate to the matters being put before the Committee for consideration.

I hope you find this helpful.

A handwritten signature in black ink, appearing to read 'John Hayes', with a horizontal line underneath.

THE RT HON JOHN HAYES CBE MP

Annex A - Levels of automation diagram²



² This infographic is adapted from the Society of Automotive Engineers J3016 Standard “Taxonomy and Definitions for Terms Related to On-Road Motor Vehicle Automated Driving Systems” (http://standards.sae.org/j3016_201609/)