Highways England – Written evidence (AUV0090)

Introduction
1. Highways England is the Government-owned Company responsible for operating, maintaining and improving England’s motorways and major A-roads (the Strategic Road Network – SRN). Safety is our number one priority.

2. Our road network totals around 4300 miles and forms the economic arteries of the country – connecting regions, business and people 24 hours a day, 7 days a week. We carry a third of all traffic by mileage and two thirds of all freight.

3. Innovation, technology and research play critical roles in helping Highways England make our roads safer, cleaner, more efficient and easier to use – at the same time as increasing capacity to meet rising demand and delivering greater economic returns.

4. Within the transport innovation field, autonomous vehicle (AV) technology is developing rapidly. Highways England continues to work with government, industry and other partners to ensure that the benefits of AV are harnessed for our road users and the SRN, and that the technology is deployed in a safe and sustainable way across our network.

5. It is in that context that Highways England responds to this inquiry.

Q1. What are the potential applications for autonomous vehicles?

Highways England has an interest in the potential applications of both connected and autonomous vehicles.

By connected vehicles, we mean those that can communicate with other vehicles or infrastructure on the road network. A good example is freight platoons - where a lead vehicle, within which the driver has full control, is electronically coupled to other vehicles in the platoon allowing drivers of the following vehicles to cede elements of control to the lead vehicle.

Connected highways are also a developing area of interest, whereby vehicles and the network can communicate with each other. This technology has a number of potential applications for Highways England that could give us a better understanding of network conditions, such as traffic flow and speed.

In terms of autonomous vehicles, it is important to recognise there are several different levels of autonomy, ranging from Level 0 (full driver control) to Level 5 (no driver – all control is in the vehicle).
Across this automation spectrum we see two main applications for autonomous vehicles on the SRN:

- **Road users**: AV has the potential to be applied in support of the use of the SRN by the public and by industry and business.

- **Maintenance/Construction**: using AV to undertake some aspects of highways maintenance and construction activities.

**Q2. What are the potential user benefits and disadvantages of the deployment of autonomous vehicles?**

There are broad potential benefits for the SRN in a number of areas:

**Safety**: Drivers can already benefit from levels of automation in their vehicles including adaptive cruise control (setting the vehicle to maintain a certain speed), lane keep assist (helping the vehicle to stay in lane) and autonomous emergency braking (AEB). Given that up to 94% of all recorded road injury collisions in Great Britain include human error as a contributory factor, we believe there is scope to do more in this area. Causes of accidents including driver fatigue (thought to be attributable to up to 20% of accidents on all roads)\(^1\) and distraction could be reduced by Level 4 and 5 autonomous vehicles.

We believe that autonomous and connected technology can play an important role in the work Highways England is doing to deliver its objectives on safer roads, safer vehicles and safer people.

**Productivity**: Safe AV technology could enable road users to use their travel time more productively. At level 5 autonomy, where the vehicle is fully automated, passengers in the vehicle would be able to hold meetings whilst on the move, without being distracted or responsible for driving.

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\(^1\) “Fatigue and Road Safety: A Critical Analysis of Recent Evidence”, Road Safety Web Publication No. 21, Department for Transport, 2011
Utilisation: if AV technology could be developed to a position where it enabled vehicles to become part of a more integrated road transport system there is potential to make the SRN even more efficient by better utilising available road space. For example, if vehicles could interact with traffic signals, road works operators and other transport modes then there is scope for a reduction in delays to journeys.

If autonomous vehicles could be programmed to safely travel closer to the vehicle in front at motorway speeds it would provide potential to enhance the capacity of the network.

Access: The SRN is a critical component of our national and regional economies. The network also connects people and communities and therefore has an important social function.

AV technology could evolve in a way that enables those people currently unable to drive to access our network and realise the social and economic benefits of doing so.

Of course, there are also a number of challenges that AV technology poses for the SRN:

Safety: the safe deployment of any form of AV technology on the SRN is clearly of paramount importance to Highways England and our road users. In particular, there are challenges around autonomous vehicles taking emergency action on the SRN and we will work with industry to ensure that these challenges are addressed and take into account the design and operation of the network.

The biggest challenge is the interaction between autonomous vehicles and human driven vehicles and ensuring each vehicle can predict the actions of the other. Some of the incidents reported with self-driving vehicles occur because the human driven vehicle is not able to predict self-driving behaviour. Human factors research will be a key activity to understand this.

Utilisation: If autonomous vehicles initially need to be programmed to require larger distances between vehicles (to ensure safe operation) than currently achieved by standard vehicles this could reduce the capacity on our network.

Insurance: The uptake of AV technology brings real challenges to Highways England in terms of legal responsibility for damage caused to our network by vehicles. At present, in some circumstances drivers can be held responsible in the event that their vehicle damages SRN infrastructure – however, in an automated vehicle it is less clear where the responsibility lies and this presents challenges around insurance claims.

Q4. How much is known about public attitudes to autonomous vehicles?
Transport Focus recently (November 2016) published their “Road to the Future” report, which focusses on how Highways England can improve the road user experience during the next Roads Investment period. The largest area for improvement was around increasing road space and capacity. Although none of the users interviewed mentioned either connected or autonomous vehicles specifically, AV has the potential to address some of their primary
concerns. Our experience is that road users are most interested in their experience of using the network, rather than the technology explicitly.

It is worth recognising that whilst fully automated vehicle technology might seem futuristic, road users have already benefitted from a number of semi-automated technologies that are now considered as standard – for example traction control, breaking systems and impact protection.

The three year social and behavioural research programme that DfT is leading will help to build a much fuller and more robust evidence base to understand the attitudes and behaviours of road users with respect to AV.

**Q6. Is the scale of current and planned demonstration facilities for autonomous vehicles sufficiently broad and ambitious?**

We work closely with the Centre for Connected and Autonomous Vehicles and in particular on the UK testing for connected and autonomous vehicles.

In our view the proposal for a flagship test facility is a good one, though we think a range of test environments is required in order to progress the technology safely and with public support.

Sections of the SRN could provide a good environment to safely test lower levels of AV technology as they are relatively controlled road environments with clearly defined carriageways, CCTV technology to monitor driver behaviour and few physical hazards such as pedestrians, cyclists and road furniture. Indeed lower level autonomous vehicles are already in use on the network.

We are already supporting a number of AV trials:

- The UK Connected Intelligent Transport Environment (CITE) connected vehicle trial by April 2018, where we are working with Jaguar Land Rover, Coventry City Council, Visteon, Vodafone and others – a project sponsored by Innovate UK.
- The A2/M2 Connected Corridor, working with Transport for London and Kent County Council and supported by the Automotive Electronic Systems Innovation Network.
- The HGV platooning trial working with DfT.

In addition, we are in discussions with a number of vehicle manufacturers about future trials, including on the M4. We also support the ongoing work of the Four Cities Driverless Vehicle Trials as members of the advisory boards, funded by Innovate UK.

**Q10. Will successful deployment of autonomous vehicles require changes to digital or physical infrastructure?**

It is too early to determine exactly what changes to physical infrastructure might be required to accommodate AV in the future, but our active involvement in trialling both connected and autonomous vehicles will shape our thinking in this area. We would expect connected vehicles to require changes to both digital (better connectivity) and physical infrastructure (reducing traditional roadside communications infrastructure).
A good example of the uncertainty around the development of this technology and its potential impact on the SRN is that of white lining. Depending on how in car technology develops, the requirement for white lines to support Lane Keep Assist Systems may increase or become obsolete from an AV perspective.

Safety will be a key driver in determining what changes to physical infrastructure, if any, will be required in the future and our leadership and support of real world environment continues to be an important part of the evidence base.

Q11. How might a move from current levels of highly automated vehicles to their extensive deployment best be managed? What do you see as the key milestones?
A number of key milestones have already been met, including the Government’s publication of a regulatory review of what will be necessary to enable the testing and development of AV technology. For us, the development of the safety case for autonomous vehicles to safely operate on public roads is a key milestone.

As part of that safety agenda, there are a number of associated issues, including insurance provision and vehicle licensing that will require further consultation and examination.

Q13. Are further revisions needed to insurance, regulation and legislation in the UK to create an enabling environment for autonomous vehicles?
As AV technology develops and is deployed in real world environments, we think that inevitably there will be a requirement for insurance, regulation and legislation to keep pace.

Any changes will need to, in part, be driven by experience from real-world testing and guided by the projected path and speed of technology development and deployment. The uncertainty around whether AV technology will develop incrementally or as a breakthrough straight to high-levels of automation will require an adaptable approach to these issues.

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