Written evidence submitted by Highways England (RSM0114)

Highways England welcomes the Transport Select Committee's inquiry into the roll-out and safety of smart motorways. We are pleased to submit this written evidence, which we hope will be helpful to the Committee in its consideration of the issues set out in the terms of reference of the inquiry.

We enclose Highways England's *'*Smart motorways stocktake first year progress report 2021*'* (referred to as the progress report, as appropriate, hereafter), which sets out:

- The progress we have made in addressing the actions set out in the Government's March 2020 *'*Smart Motorway Safety Evidence Stocktake and Action Plan*'*.
- The latest evidence on the safety of smart motorways. and
- Highways England's commitments to accelerate measures to help drivers feel safe and be safer on smart motorways.

We would like the Committee to consider this progress report as part of Highways England's written evidence to this inquiry.

Introduction

1. Highways England was created under the Infrastructure Act in 2015. We are the government-owned company responsible for operating, maintaining and improving England's 4,517 miles of motorways and major A-roads, known as the Strategic Road Network (SRN). Prior to the formation of Highways England, the Secretary of State for Transport was the highway authority with responsibility for operating, maintaining and improving the strategic road network. Many of these functions were exercised by the Highways Agency, an executive agency of the Department for Transport.

2. Highways England employs nearly 6,000 people (FTE) and supports thousands of skilled jobs and apprenticeships in the supply chain. Sectors reliant on our roads employ 7.4 million people and contribute £314 billion to the UK economy.

2. Making up only 3% of the UK road network, but carrying one-third of all traffic and over 75% of freight, the SRN is essential for a modern, connected and prosperous economy.

3. There are three types of smart motorway currently in operation on the SRN. All have technology to support variable speed limits and manage traffic flow:

    - **Controlled motorways (CM)** apply technology to a conventional motorway with a permanent hard shoulder to control the speed of traffic. At the end of 2019, there were 141 miles of CM on our network.
    - **Dynamic hard shoulder (DHS) motorways** apply the controlled motorway technology, temporarily increase capacity by using the hard shoulder at peak times, and include emergency areas. At the end of 2019, there were 63 miles of DHS motorway on our network.
    - **All lane running (ALR) motorways** apply the controlled motorway technology, permanently convert the hard shoulder to a running lane, and feature emergency areas. At the end of 2019, there were 141 miles of ALR motorway on our network.

4. At the end of 2019 there were 1,564 miles of conventional motorway on our network, most of which includes a permanent hard shoulder.

5. Safety is our top priority, and it is our ambition that nobody should be harmed when working or travelling on any of our roads.

6. The UK has some of the safest roads in the world. The number of road deaths per million inhabitants is lower in the UK than in almost every country within Europe[1].

7. This safety record is not just down to good road design and operation, it is also testament to the millions of people who work and drive on our roads every day. We work in this spirit of partnership with road users to ensure that the UK continues to lead on road safety.

8. Even though our roads have a strong safety record, there were **1,489 fatal casualties on England's roads in 2019**. Every one of them is a tragedy. Of those fatalities, 210 (14%) occurred on the SRN, 85 (6%) occurred on motorways and 15 (1%) occurred on motorways without a permanent hard shoulder (DHS and ALR).

[1] the October 2020 Conference of European Directors of Roads report covers the Trans-European Network

9. Our motorways remain the safest roads in the country and by increasing their capacity to meet growing demand, we improve the overall safety performance of the SRN. Without creating more motorway capacity, the resulting congestion on the motorways would cause significant numbers of drivers to divert to far less safe roads, increasing the numbers of people killed and seriously injured on our nation's roads overall.

10. Since the inception of the smart motorway programme, and like other transport authorities across the UK, Highways England has used the Fatal and Weighted Injuries (FWI) measure to provide a consistent measure of safety performance over time and to enable meaningful comparison between different roads. The FWI measure gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. In effect, it takes all the non-fatal injuries and adds them up using a weighting factor to give a total number of 'fatality equivalents'.

11. The latest 2015-2019 data shows that:

- in terms of fatality rates, smart motorways are the safest roads in the country
- approximately per mile travelled:
    i. fatal casualty rates are a third higher on conventional motorways (0.16 per hundred million vehicle miles (hmvm)) compared to ALR (0.12 per hmvm). Fatal casualty rates on strategic road network A-roads (0.44 per hmvm) are three and a half times the rate on ALR.
    ii. serious casualty rates are a tenth lower on conventional motorways (1.12 per hmvm) compared to ALR (1.24 per hmvm). Serious casualty rates on strategic road network A-roads (3.04 per hmvm) are two and a half times the rate on ALR.
    iii. slight casualty rates on conventional motorways (9.63 per hmvm) are similar to ALR (9.73 per hmvm) and are double on strategic road network A-roads (19.27 per hmvm) compared to ALR.
- The hard shoulder is perceived to be a place of safety, but, in reality, they do not provide a completely safe place to stop. One in 12 motorway fatalities occur on the hard shoulder.

12. This latest data supports the findings of the 2020 Stocktake that smart motorways are as safe as, or safer than, the conventional ones. But not in every way.

13. These figures have been compiled on a five-year basis (2015-19 inclusive), because single-year figures are too low and variable to draw consistent conclusions from. For the year 2019, the total number of deaths on all motorways was 85, of which 15 were on ALR and DHS motorways. This was a rise of four since 2018, reflecting in part the increase in traffic on the motorway network generally and on these roads in particular. We will continue to monitor and evaluate safety on our network.

14. In response to concerns around smart motorway safety, the Secretary of State for Transport published the Smart Motorway Safety Evidence Stocktake and Action Plan in March 2020 (referred to as the 2020 Stocktake and 2020 Action Plan, as appropriate, hereafter).

15. Highways England fully supports the 2020 Action Plan to ensure smart motorways are as safe as possible and to build greater public confidence in them. We have already delivered a number of the actions in full, and we are taking the others forward, including the roll-out of radar technology that can identify a stopped vehicle and an update of The Highway Code.

16. We recently launched our biggest ever road safety campaign aimed at helping drivers know what to do in the event of a breakdown on a motorway. Reaching a prime-time audience on television, radio, in print and via digital advertising, this campaign is intended to help people feel more confident and better informed should they break down.

17. We are working closely with the Department for Transport and the Office of Rail and Road to report every month on our progress in delivering the 2020 Action Plan. We will ensure that the Committee is also regularly updated on our progress as we continue to take this important work forward.

18. We recognise that concerns have continued to be raised about smart motorways and, in particular, the impact that removing the hard shoulder has on driver safety. We are determined to do all we can to help drivers feel safer and be safer on our roads – all our roads. We are, therefore, **committing to accelerate several measures from the 2020 Action Plan** to

further raise the bar on safety. These additional commitments include the following.

19. On existing smart motorways:
    - **By the end of September 2022**, six months earlier than previously committed:
        i. On existing ALR motorways we will have **completed the installation of radar technology** which detects stopped vehicles (radar SVD technology)
        ii. We will have **installed around 1,000 additional signs** to better inform drivers of the distance to the next place to stop in an emergency
    - **By the end of September 2022**, 10 months earlier than previously committed:
        i. We will have **upgraded cameras that automatically detect** vehicles passing illegally under a Red X or entering the lane beyond a Red X, so the police can take enforcement action. We are doing this for the safety of those in the closed lanes and because it's illegal to enter the lane beyond a Red X, until such time that you pass a sign and signal cancelling the restriction
    - We will **continue to consider a national programme of retrofitting additional emergency areas** on existing smart motorways where places to stop in an emergency are more than one mile apart. This review will be complete by April 2022.

20. On smart motorways under construction:
    - We will ensure that every new smart motorway will have radar SVD technology in place when it opens.

21. For smart motorways in the design phase:
    - Stopped vehicle detection technology will be in place before any scheme opens.
    - Going forward, and as previously announced, drivers will encounter places to stop in an emergency[2] every three-quarters of a mile where feasible, with a maximum spacing of one mile[3].

[2] places to stop in an emergency include motorway services, emergency areas and remaining sections of hard shoulder, such as on slip roads

[3] with some exceptions where not feasible to construct additional emergency areas, such as where junctions intersect or on bridges

Section 1 - The benefits of smart motorways, for instance to reduce congestion on busy sections of motorway, and how necessary they are

22. Demand for journeys on the SRN has grown significantly in the last 20 years and is predicted to increase further in the next 30 years:

    - Since 2000 there has been a 23% increase in traffic on roads in England and a 26% increase in motorway journeys.
    - The Department for Transport forecasts that over the next thirty years traffic growth on the SRN is expected to grow between 32% to 66%, driven by increases in the number of car trips and trip distances, as well as increasing light goods vehicle traffic.
    - This means that, by 2050, between 1 and 2 additional vehicles are expected to use the SRN for every 3 cars currently using it.[4]
    - Although COVID-19 has seen a reduction in traffic on the SRN, we are beginning to see a return to normal levels. In the medium to long-term, we expect demand for journeys on the SRN to continue to grow.

23. The economic cost of congestion is already high and without meeting demand for the predicted growth in journey demand, will increase further:

    - According to research from INRIX (a specialist transport consultancy), drivers in the UK each lost an average of 178 hours in delays due to congestion in 2018, costing the economy £7.9 billion.[5]
    - The Department for Transport also estimates that, by 2040, unless action is taken, road traffic congestion will cost the economy £10 billion per year in lost time and the freight industry £2 billion.

24. Highways England is committed to working with the Government to ensure that road journeys of the future are decarbonised, as we transition towards a net zero economy.

25. As demand for road journeys continues to grow, we would expect demand for motorway journeys to also increase. Without increasing capacity on our motorway network, we would see greater levels of congestion, which would likely result in:

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[4] DfT '*Road Traffic Forecasts 2018*'

[5] See '*UK drivers spent 178 hours in traffic in 2018*'

- A **reduction in the overall safety of the SRN**, as more journeys divert from motorways, our safest roads onto less safe A-roads and local roads.
- **More collisions on motorways** associated with higher levels of congestion.
- Increased number of journeys on A-roads putting traffic closer to communities.
- Poorer air quality from congestion and greater **environmental impact**.
- **Lower productivity** and reduced economic return.
- A poorer driver experience, with **less reliable journeys**.

26. Smart motorways deliver much needed additional capacity and maintain safety, at the same time as realising significant benefits over conventional motorways. These benefits include:

- The **economic and customer advantage** of smoother, more predictable journey times due to traffic-flow technology. All lane running motorways built between 2015 and 2025 are expected to deliver an economic return of over £3 for every £1 invested.
- **Better environmental outcomes**, by protecting one football pitch of space per kilometre and reducing carbon emissions associated with construction by a factor of five compared to conventional widening.
- **Protection of properties and businesses adjacent to motorways**, by maintaining the existing physical footprint of the road. On the M6 J13-15 motorway upgrade, by avoiding widening we have protected up to 95 properties. Across the smart motorway portfolio between 2015 and 2025, we estimate that we will protect between 660 and 2,090 properties from compulsory purchase and demolition.
- **Reduced disruption for road users, businesses and local communities**, through quicker, less complex design and construction.
- A **better return for taxpayers** by delivering safe, reliable and predictable journeys at 50-60% of the cost of conventional widening. To deliver the same capacity benefits as our smart motorway upgrade on the M6 J21a to 26 through conventional widening, we would have needed to also widen or reconstruct over 20 bridges with the associated implications for the roads and railways they carry.
- **Better communication with drivers** using more electronic signage, including in the event of an emergency.

- **Future proofed technology** to unlock the economic and productivity benefits of greater vehicle and highway connectivity.

27. None of these benefits, individually or collectively, outweigh the importance of safety.

Section 2 - The safety of smart motorways, the adequacy of safety measures in place and how safety could be improved

28. Safety is and will always be our top priority. Any injury or fatality on one of our roads is one too many. We also want people to feel confident and safe, whatever road they are travelling or working on.

Safety on the strategic road network

29. Across all road classifications, the UK has some of the safest roads in the world. Taking into account the varying levels of car use across different countries, the European Transport Safety Council's Performance Index (PIN)[6] programme enables comparisons of road safety progress between European countries to be made. The latest PIN report was published by the European Transport Safety Council in June 2020.

30. Figure 1 below shows that the number of road deaths per million inhabitants is lower in the UK than the majority of countries within Europe, at 29 road deaths per million inhabitants. Only Norway, Sweden and Switzerland perform better (Ireland[7] performs the same as the UK).

[6] The ETSC Road Safety Performance Index (PIN) is a policy tool to help EU Member States improve road safety

[7] the European Transport Safety Council's Performance Index defines Ireland as Republic of Ireland

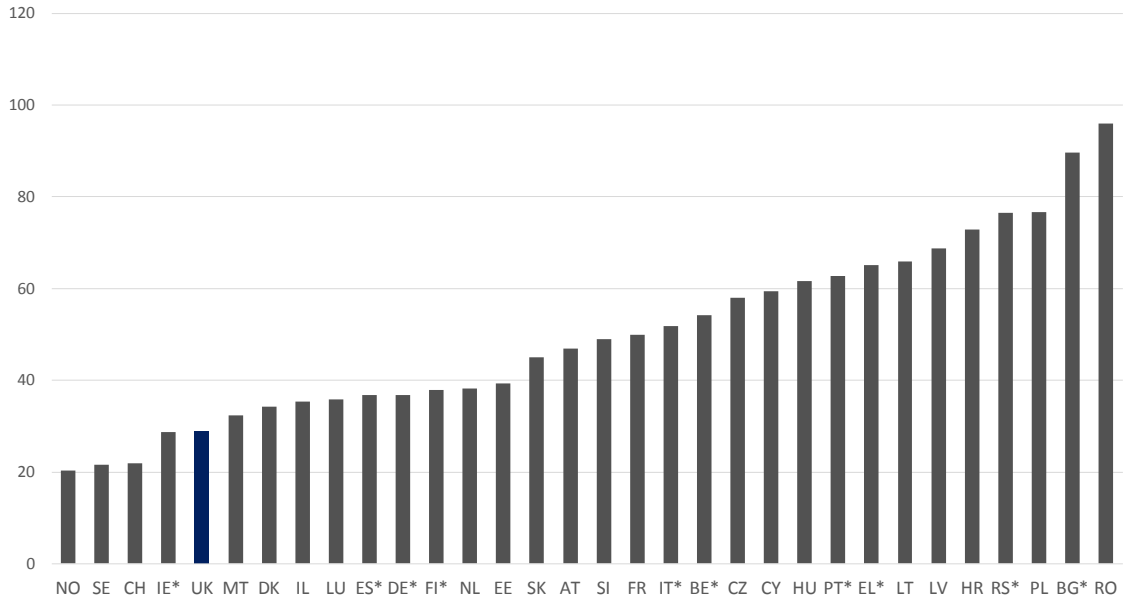


Figure 1 - Number of road deaths per million inhabitants in 2019[8]

Source: Visualisation from Highways England. Data based on ETSC

Country	Code
Austria	AT
Belgium	BE
Bulgaria	BG
Croatia	HR
Cyprus	CY
The Czech Republic	CZ
Denmark	DK
Estonia	EE
Finland	FI
France	FR
Germany	DE
Greece	EL
Hungary	HU
Ireland	IE
Italy	IT
Latvia	LV

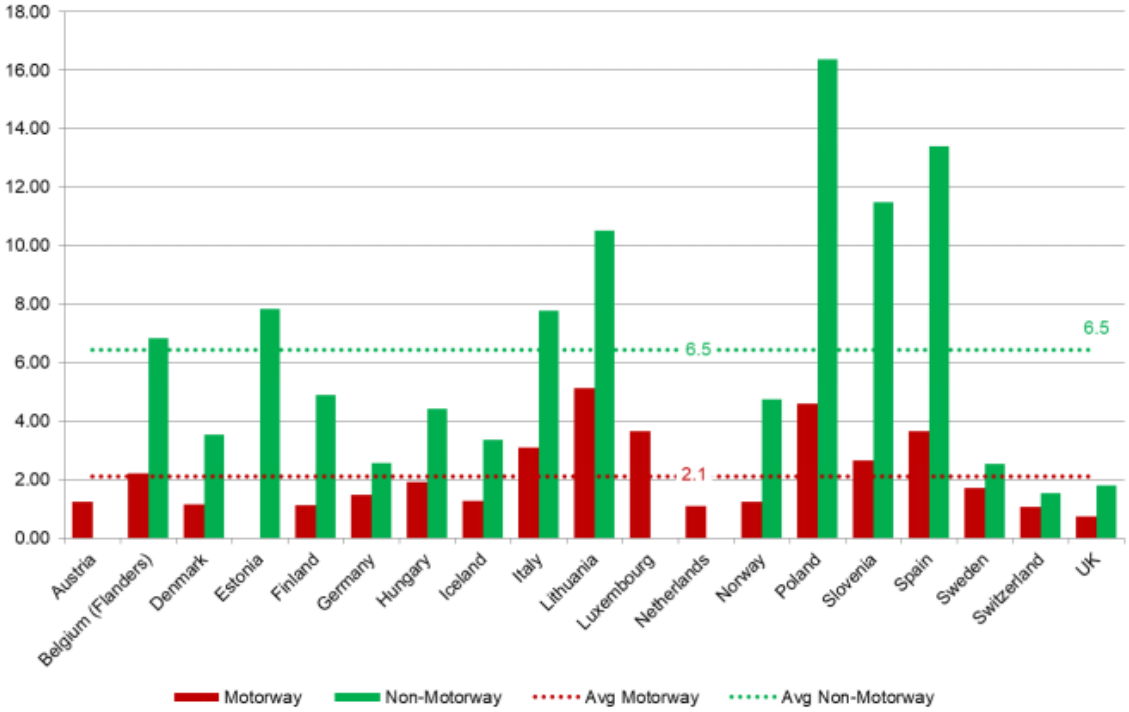
Country	Code
Lithuania	LT
Luxembourg	LU
Malta	MT
The Netherlands	NL
Poland	PL
Portugal	PT
Romania	RO
Slovakia	SK
Slovenia	SI
Spain	ES
Sweden	SE
United Kingdom	UK
Israel	IL
Norway	NO
Serbia	RS
Switzerland	CH

31. In its latest report published in October 2020, the Conference of European Directors of Roads found that the UK's roads have fatal accident rates well below the average across Europe (see Figure 2 below). The UK has a lower average annual fatal accident rate on motorways than any other participating country, and is second only to Switzerland for non-motorway strategic roads.

32. There is always scope for further improvement. We take road safety very seriously and have a strategic ambition that nobody should be harmed when using or working on our roads[9].

[8] Countries with an asterisk (*) indicate provisional fatality figures.
https://etsc.eu/14th-annual-road-safety-performance-index-pin-report/

Figure 2 - Average Annual Fatal Casualty Rate per billion vehicle kilometres by country 2019[10]



Source: Visualisation and data based on CEDR Report 2020

33. Compared to other roads in Great Britain, motorways are comparatively the safest roads to travel on. Figure 3 also shows that in 2019, the majority of fatalities (57%) occurred on rural roads, whereas the majority of casualties (63%) occurred on urban roads. Although motorways carry around 20% of traffic, they only account for 6% of fatalities.

34. Any move towards increasing capacity on our most safe roads, provides safer overall capacity for drivers on the road. That is because the extra capacity draws traffic from less safe roads where there are tragically more deaths and injuries.

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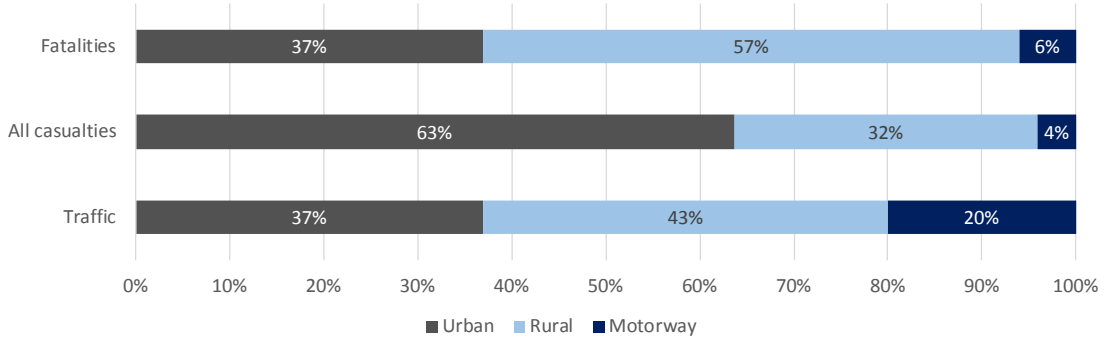
[9] we have a stretching target to reduce the number of people killed or seriously injured on our roads by 50% by 2025

[10]Average Annual Fatal Accident Rate per billion vehicle kilometres https://www.cedr.eu/download/Publications/2020/CEDR-Technical-Report-2020-01-TEN-T-2019-Performance-Report.pdf

Figure 3 - Casualties by severity and road type in Great Britain 2019[11]



Source: Visualisation from Highways England. Data based on STATS19

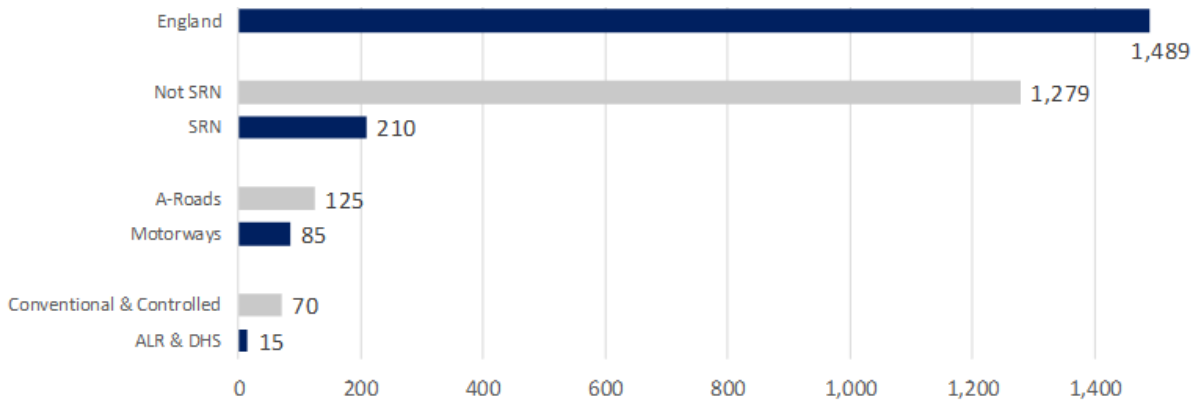
35. In England there were 1,489 fatal casualties in 2019 with 1,279 (86%) of them taking place outside of the strategic road network. Out of the 210 (14%) fatalities on the strategic road network, 125 (8%) took place on A-roads and 85 (6%) on motorways.

36. Out of the total fatalities in England in 2019, 15 (1%) took place on motorways without a permanent hard shoulder (ALR and DHS), in comparison to 70 (5%) on motorways with a permanent hard shoulder (conventional and controlled). Figure 4 also shows that within England, before accounting for road length or traffic flows, the strategic road network and motorways are comparatively the safest roads to travel on.

Figure 4 - Fatalities by country and road type in England 2019[12]

[11] Please note this excludes Northern Ireland. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/922717/reported-road-casualties-annual-report-2019.pdf

[12] The data has been derived and visualised by Highways England based on the 2019 STATS19 data (https://www.gov.uk/government/collections/road-accidents-and-safety-statistics)



Source: Visualisation from Highways England. Data based on STATS19

37. Our motorways are the safest type of road in the country - of the 7,515 deaths on England's roads between 2015-2019, 431 were on motorways, and of those 24 on ALR motorways.

Safety update on smart motorways[13]

38. The 2020 Stocktake provided a comprehensive summary of the safety of smart motorways, considering all available data sources. The 2020 Stocktake found that for the first nine ALR schemes, the overall casualty rate improved significantly, following the conversion to ALR, by 18% compared to what might have been expected without the conversion. The report concluded that, overall, smart motorways are in most ways as safe as, or safer than, the conventional ones. But not in every way. It set out an action plan to further improve safety on the smart motorway network.

39. Now, 12 months after the publication of the 2020 Stocktake, we are building on the evidence base it provides using the latest safety evidence. This evidence includes 2019 safety data and measures, such as casualty rates (i.e. casualties per hundred million vehicle miles - hmvm), fatal and weighted injury rates (i.e. FWI per hmvm) and casualty trends. By considering these safety measures, there is a consistent comparison across schemes with different traffic levels. All measures and underpinning calculations have followed the methodology adopted for the 2020 Stocktake.

[13] The 2020 Stocktake considered smart motorways to include ALR, DHS and controlled motorways.

40. Since the 2020 Stocktake there has been understandable interest in incidents where vehicles have stopped in a live-lane, so we have considered additional data on live-lane fatalities (both moving and stopped).

41. The progress report aims to confirm whether, after considering the 2019 safety data, the safety conclusions outlined in the 2020 Stocktake remain valid[14]. It does not aim to fully replicate the 2020 Stocktake[15] or report on the effectiveness of the interventions outlined in the 2020 Stocktake. These interventions are currently being delivered and will be monitored and evaluated at appropriate intervals.

42. Data on road traffic casualties on the roads in Great Britain are collected via the STATS19 process[16]. These statistics are collected by police forces, either through officers attending the scene of incidents, from members of the public reporting the incident in police stations after the incident, or more recently online and then validated and published annually by the Department for Transport. The analysis presented here is developed by Highways England using STATS19 data (unless stated otherwise).

43. Like other transport authorities across the UK the key measure we use to assess the safety of roads, is Fatal and Weighted Injuries (FWI). This gives a fatality 10 times the weight of a serious casualty, and a serious casualty 10 times the weight of a slight casualty. In effect, it takes all the non-fatal injuries and adds them up using a weighting factor to give a total number of 'fatality equivalents'. This FWI figure is used to compare one year with another. The actual fatalities are also listed as it is possible for the FWI to go down even if

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[14] Providing an update to section 4b 'High Level Casualty Statistics on Smart Motorways and the Wider Strategic Road Network' in the 2020 Stocktake.

[15] The 2020 Stocktake also considered other measures which are replaced by current or future analytical activities. For example, hazard assessments and evidence from the 'Smart Motorway All Lane Running Overarching Safety Report' were referenced in the 2020 Stocktake to demonstrate that the ALR concept was delivering its safety objective (to maintain or improve safety by the FWI measure). As their intended objective for the ALR concept was met, this will not be updated further. Instead, Post Opening Project Evaluation (POPE) reports will aim to compare the safety impact before and after an intervention or a project is delivered. At the time of drafting the progress report, no new POPE reports have been published. Scheme-specific POPE reports will follow later in 2021.

[16] The STATS19 database is a collection of all road traffic accidents that resulted in a personal injury and were reported to the police within 30 days of the accident. More information can be found at: https://data.gov.uk/dataset/cb7ae6f0-4be6-4935-9277-47e5ce24a11f/road-safety-data

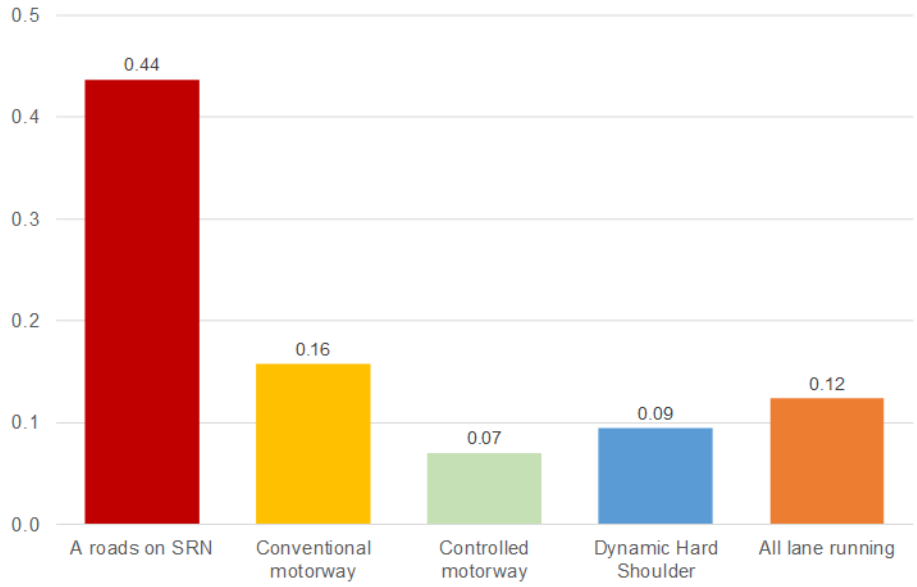
the actual number of fatalities has gone up, due to a reduction in the number of less- severe accidents.

44. Casualty data can change significantly from year to year, depending on circumstances in any given year, and casualty rates can be sensitive to small changes in the absolute number of casualties. Volatility is an issue as it can obscure more meaningful conclusions that can be drawn from the data. When considering casualty statistics, looking at the average over a recent set of years reduces the impact of volatility and helps identify trends. The progress report uses the last five years of available data (2015-2019).

45. Overall, the data shows that fatality rates i.e. the rate of fatalities per hundred million vehicle miles (hmvm) travelled, averaged across all years between 2015 and 2019 are lower on smart motorways at 0.09 per hmvm versus conventional motorways at 0.16 per hmvm. Furthermore, each type of smart motorway has a (slightly) lower rate of fatalities than conventional motorways: controlled is 0.07 per hmvm, DHS is 0.09 per hmvm and ALR is 0.12 per hmvm. This is illustrated in Figure 5.

46. Figure 5 highlights that ALR has a slightly higher fatal casualty rate in comparison to DHS. DHS is an existing type of smart motorway where the hard shoulder is used as a live traffic lane to increase capacity temporarily only when it is needed most. The 2020 Action Plan highlighted that this type of smart motorway has the potential to cause confusion for drivers because the hard shoulder is sometimes in use for traffic, and sometimes not. Also, as time goes on and the motorway becomes busier, the hard shoulder is in use as a live traffic lane for longer periods of time and the motorway essentially acts as ALR. We acknowledge that there is a risk of confusion of operating a relatively intermittent hard shoulder on a DHS motorway and therefore, and as set out in the 2020 Stocktake and in the progress report, DHS motorways are being converted to ALR to reduce confusion.

Figure 5 - Annual average fatal casualties per hundred million vehicle miles travelled, by SRN road type (2015-19 weighted average)



Source: Data from Highways England based on STATS19.f

47. A similar analysis using the FWI measure over the same 2015 to 2019 period shows that smart motorways have a FWI rate of 0.33 per hmvm, slightly lower than conventional motorways at 0.37 per hmvm. The FWI for smart motorways are 0.32, 0.34 and 0.35 per hmvm for controlled, DHS and ALR respectively.

48. While the rate of fatalities and the FWI measure demonstrate that all types of smart motorways are safer than conventional motorways, it remains the case that they are not safer in every way.

49. In more detail:
    - Casualty rates on all motorway types are lower than A-Roads on the strategic road network, for each type of severity and the Fatal and Weighted Injuries measure
    - Fatal casualty rates on controlled (0.07 per hmvm), DHS (0.09 per hmvm) are lower than on conventional motorways (0.16 per hmvm), while ALR are slightly lower (0.12 per hmvm)
    - Fatal and Weighted Injury rates on controlled (0.32 per hmvm), DHS (0.34 per hmvm) and ALR (0.35 per hmvm) schemes are slightly lower than on conventional motorways (0.37 per hmvm)
    - Serious casualty rates on controlled (1.14 per hmvm) and ALR (1.24 per hmvm) schemes are slightly higher to conventional motorways (1.12 per hmvm), while DHS are slightly lower (1.10 per hmvm)

- Slight casualty rates are higher on controlled (13.59 per hmvm) and DHS (13.83 per hmvm) compared to conventional motorways (9.63 per hmvm), while ALR roads are slightly higher (9.73 per hmvm).

50. This means that based on the updated casualty data alone, the latest safety analysis is consistent with the conclusions of the Government 2020 Stocktake. Overall, what the evidence shows us is that in most ways, smart motorways are as safe as, or safer than, the conventional ones, but not in every way.

51. Through the actions we have already taken, and those accelerated commitments made in the progress report, we are determined to do all we can to make drivers both feel safe and be safer on our roads. Through monitoring and evaluation activities, we will continue to assess the overall safety of smart motorways and the effectiveness of the interventions outlined in the 2020 Stocktake. Additionally, Post Opening Project Evaluation (POPE) reports for specific schemes will be published to compare the safety impact before and after a project is delivered.

Fatalities on motorways without a permanent hard shoulder

52. The risk of a live lane collision between a moving vehicle and a stopped vehicle is greater on ALR and DHS motorways. But the risk of a collision between two or more moving vehicles is lower. This is because ALR and DHS motorways have variable mandatory speed limits to smooth traffic flow, and electronic signs and signals to warn drivers of incidents ahead. This means less speeding, tailgating and fewer rapid changes of speed, which gives drivers more time to react if something happens.

53. In 2019, 50,995 live lane breakdowns (LLB) incidents were reported on the strategic road network. Half of these took place on conventional motorways, whereas approximately a quarter took place on motorways without a permanent hard shoulder (ALR and DHS). While these figures indicate the total number of breakdown incidents, most LLBs do not lead to fatal or serious casualties.

54. Since the publication of the 2020 Stocktake-there has been significant interest in the number of LLBs on motorways without a permanent hard shoulder (i.e. ALR and DHS motorways). Breaking down in a live lane is the main concern drivers have about smart motorways. Here we look at how many fatal

casualties have occurred in a live lane. By using STATS19 data, we have focused on all live-lane fatalities for the period 2015- 2019.

Table 1 – Live lane fatalities on motorways

Live Lane Fatalities (moving and stopped vehicles)	2015	2016	2017	2018	2019	Total (2015-19)
Fatalities on live lanes of **conventional motorways**	76	65	78	62	60	**341**
Fatalities on live lanes of **controlled motorways**	5	1	3	8	5	**22**
Fatalities on live lanes of **DHS motorways**	2	2	1	1	6	**12**
Fatalities on live lanes of **ALR motorways**	0	1	4	10	9	**24**

Source: STATS19, Highways England Statistics on live lane casualties in England, and DfT Road Traffic Statistics on the strategic road network in England from 2015-19

Table 2 – Live lane fatality rates on motorways

Live Lane Fatality Rates (moving and stopped vehicles)	2015	2016	2017	2018	2019	Total (2015-19)
Fatality rates (per hundred million vehicle miles) on live lanes of **conventional motorways**	0.16	0.14	0.17	0.14	0.13	**0.15**
Fatality rates (per hundred million vehicle miles) on live lanes of **controlled**	0.08	0.02	0.05	0.11	0.07	**0.06**

motorways						
Fatality rates (per hundred million vehicle miles) on live lanes of **DHS motorways**	0.07	0.06	0.03	0.03	0.18	**0.08**
Fatality rates (per hundred million vehicle miles) on live lanes of **ALR motorways**	0.00	0.04	0.10	0.19	0.14	**0.12**

Source: STATS19, Highways England Statistics on live lane casualties in England, and DfT Road Traffic Statistics on the strategic road network in England from 2015-19

55. Taking traffic flow into account from tables 1 and 2 above, ALR motorways are overall slightly safer than conventional motorways. Over the period 2015-2019, conventional motorways had an average of 0.15 live lane fatalities per hundred million vehicle miles compared to 0.12 for ALR motorways.

56. Based on data and measures between 2015- 2019, this evidence shows fatality rates in live lanes are slightly lower on ALR motorways compared to those on conventional motorways.

Making smart motorways even safer and building public confidence

<u>Giving clarity to drivers</u>

57. We know from feedback that many drivers do not know exactly what a smart motorway is and are not aware of whether they are on one or not. We also know drivers are not always clear what to do if they need to seek refuge and get help. And we know from feedback that Dynamic Hard Shoulder Running motorways have the potential to cause confusion for drivers because the hard shoulder is sometimes in use for traffic, and sometimes not.

58. A number of commitments were made in the 2020 Action Plan to give clarity to drivers. These were:

- **Communicating with drivers:** an additional £5 million for national and targeted communications campaigns to further increase awareness and understanding of smart motorways, how they work and how to use them confidently.
- **Reducing confusion:** ending the use of DHS as they have potential to cause confusion for drivers because the hard shoulder is sometimes in use for traffic and sometimes not. The 2020 Action Plan committed to end the use of DHS and to convert all existing DHS smart motorways into ALR by the end of March 2025 so there is only one type without a permanent hard shoulder. This will provide a more consistent experience for drivers.
- **Improving guidance:** improving The Highway Code so drivers can more easily find information on how to drive on high-speed roads, including smart motorways. Having listened to feedback we plan to publish The Highway Code update in Autumn 2021, which is ahead of the original commitment of March 2022.
- **Working with partners:** working more closely with the recovery industry to strengthen our relationship, which means we have a common and agreed set of safe operating procedures across the industry to help drivers who get into difficulty on smart motorways.
- **Increasing visibility:** reviewing the use of red flashing lamps for recovery vehicles, in response to calls from the recovery industry.

59. These commitments will help drivers know what a smart motorway is and what to do if they need to seek refuge and get help on their journey. By providing better information to drivers, we will reduce confusion, increase driver confidence and make everyone's journey safer.

Action	**What we have delivered since March 2020**	**What will happen next**
Communicating with drivers: additional £5 million for national and targeted communications campaigns	Having worked closely with drivers and motoring organisations, in March 2021 we launched our latest national public information campaign, 'Go left', to give drivers clear information about what to do in a breakdown. We worked with	We will listen to public concerns and tailor our public information campaigns to focus on specific elements of motorway driving, to continue to raise awareness and

	campaigners, recovery operators, the freight industry and others to ensure the messages address their concerns. The campaign includes high profile television, radio, print and digital advertising. Ahead of this campaign we ran public information campaigns focusing on specific elements of motorway driving. In 2020 these included activity urging drivers not to drive in lanes closed by Red X signs and to adhere to variable speed limits (February/March). We are planning a summer campaign encouraging drivers going on holiday or day trips to check their vehicles before setting out, to reduce the risk of breakdowns (July/August); and, a campaign discouraging tailgating, a factor in around one in eight casualties on England's motorways and major A-roads (September/October).	provide clarity to drivers.
Reducing Confusion: ending the use of Dynamic Hard Shoulders	We are currently progressing five locations through the preliminary design and survey stages, with all due to complete this stage by June	All DHS motorways will be converted to ALR motorways by March 2025**.**

	2021. These locations are: • M42 Junctions 4 to 7, • M1 Junctions 10 to 13, • M4 Junctions 19 to 20/M5 Junctions 15 to 17, • M6 Junctions 4 to 10a; and • M62 Junctions 25 to 30. These will meet the new design standard; 'GD302 – Smart Motorways: Upgrading hard shoulder running to all lane running operation' published in October 2020. It means that sections of smart motorway designed from that point will have concrete central reservation barriers, SVD technology, improved emergency signage, full CCTV coverage and places to stop in an emergency three-quarters of a mile apart, where feasible, with a maximum of one mile[17].	We have a complex programme of work to make this happen, which is on track.
Improving guidance: an update of The Highway Code	The updates to The Highway Code will provide more guidance for motorists driving on high-speed roads, including	Following public consultation, we will present a final package of updates

[17] with some exceptions where not feasible to construct additional emergency areas, such as where junctions intersect or on bridges

	smart motorways. We shared our proposals with 37 stakeholder organisations in a pre-consultation exercise. Working collaboratively with the Department for Transport and Driver and Vehicle Standards Agency we have been able to secure a timeline which will ensure the updates to The Highway Code are published later this year. The four-week public consultation on our proposed changes closed on 29 March 2021.	to The Highway Code and seek Parliamentary approval. Subject to this we plan to publish The Highway Code update in Autumn 2021, which is **ahead of the original commitment of March 2022**.
Working with partners: closer working with the recovery industry	We signed a strategic partnership agreement with the independent recovery industry in March 2020 to strengthen our relationship. This provides a structured approach to regular engagement with industry leads, a means to develop best practice training and to enhance safe operating procedures across the industry. The agreement encourages recovery operators to work safely on our network in a standardised	We will continue to work collaboratively with the recovery industry and drive forward the commitments made in the strategic partnership agreement.

	way.	
Increasing visibility: review use of red flashing lamps	The Department for Transport has completed its review of existing evidence relating to the use of red flashing lamps. Ministers have agreed to implement off-road trials to understand the likely impact of allowing the use of red flashing lamps for road recovery operators, and to work with the recovery industry to promote best working practices and develop specific industry guidance on vehicle lighting.	The trials will be led by the Department for Transport.

Finding a safe place to stop

60. We know that drivers are concerned about not being able to find a safe place to stop in an emergency. The hard shoulder is perceived to be a place of safety but, in reality, it does not provide a completely safe place to stop; one in 12 motorway fatalities happen there. On smart motorways, as well as the introduction of technology (such as signs and signals that we can vary to display variable speed limits, Red X and driver information messages and the rollout of radar SVD technology), the hard shoulder is replaced by emergency areas which are wider than a hard shoulder and set back from live traffic lanes. The 2020 Action Plan committed to providing more emergency areas in new schemes, making them easier for drivers to see and adding better signage.

61. Actions were set out to make it easier for drivers to find a safe place to stop. These included:
    - **Frequent places to stop:** a new design standard which means emergency areas will be more closely spaced.

- **More places to stop:** installing 10 additional emergency areas on the M25 so there are more places to stop in an emergency and considering a national programme to install more emergency areas on existing smart motorways where places to stop in an emergency are more than one mile apart.
- **Easier to see:** upgrading all existing emergency areas so they are clearer and more visible to drivers.
- **Better signage:** installing clearer, easier to understand and more frequent approach signs showing the distance to an emergency area.
- **Easier to find:** showing places to stop in an emergency on sat navs.

62. Having listened to drivers and motoring organisations, we want to build on the 2020 Action Plan and go further to improve the safety of smart motorways and improve public confidence, so we are accelerating two commitments from the 2020 Action Plan:
    - **Better signage**: by September 2022, six months earlier than planned, we will have installed around 1,000 additional approach signs which were committed to in the 2020 Action Plan. These signs are blue featuring an orange SOS telephone symbol and show how far it is to the next place to stop in an emergency, to help drivers reach one and avoid stopping in a live traffic lane.
    - **More places to stop**: we committed to complete the monitoring of the impact of additional emergency areas on the M25. We are accelerating this commitment to complete the monitoring and present a report to the Department for Transport by end of August 2021, four months earlier than planned.

63. The original actions from the 2020 Action Plan and our commitment to install extra signage sooner will increase the likelihood that a driver will be able to find refuge in an emergency and get help.

Action	**What we have delivered since March 2020**	**What will happen next**
Frequent places to stop:	We have published a new standard for smart motorways which means	The new standard will be adopted to schemes entering the design phase.

committing to a new standard for spacing of places to stop in an emergency	there will be more places to stop in an emergency. GD 301 – Smart Motorways was published ahead of target in October 2020. This standard requires places to stop in an emergency to be three-quarter miles apart where feasible, with a maximum of one mile[18].	
More places to stop: delivering 10 additional emergency areas on the M25	We have installed 10 additional emergency areas on the M25 and all were open to traffic by early December 2020. This means that an additional 14 miles of ALR now have emergency areas at a maximum of one mile apart – nine additional miles between Junctions 23 and 27, and five additional miles between Junctions 5 and 7.	Now that the 10 emergency areas are open for traffic, we are monitoring their impact to understand if they have reduced the level of live lane stops. The monitoring period began on 1 January 2021. In the 2020 Action Plan we committed to complete the monitoring period by 31 December 2021. We are **accelerating this commitment** to complete the monitoring and present a report to the Department for Transport by the end of August 2021.
More places to stop: considering a national programme to install	The 2020 Action Plan said we should consider a national programme to install more places to stop in an emergency on existing smart motorways, where places to	We have listened to the concerns raised by the public about spacing of places to take refuge in an emergency, so we will report our findings to the Department for Transport by

[18] with some exceptions where not feasible to construct additional emergency areas, such as where junctions intersect or on bridges

more emergency areas on existing smart motorways	stop in an emergency are more than one mile apart. This review is to be completed by April 2022.	August 2021. We will continue our work to consider a national rollout programme by April 2022. We will consider a variety of impacts including disruption during construction and damage to the environment. We will also look at opportunities to reduce the impact of construction, such as coordinating the work with other planned activity. We will also take account of the experience gained constructing the new emergency areas on the M25.
Easier to see: making emergency areas more visible	We completed the work to make over 300 emergency areas more visible in May 2020. All existing emergency areas now have clearly visible orange surfacing and marked stopping areas with clearer, easier to understand and more frequent signage.	In addition to the work already completed to make emergency areas more visible on existing smart motorways, these emergency area enhancements are now standard on all new smart motorways designed and constructed.
Better signage: more traffic signs giving the distance to the next place to stop in an emergency	We have completed initial surveys and we will be installing around 1,000 new approach signs showing the distance to the next place to stop in an emergency. These additional signs mean you should almost always be able to see a	We will **accelerate the completion** of our sign installation programme so that by September 2022 we will have installed around 1,000 additional signs in between places to stop in an emergency. This is six months earlier than planned.

	sign wherever you are on the motorway.	
Easier to find: showing places to stop in an emergency on sat navs	We have made location information for all smart motorway emergency areas available to sat nav providers.	Over the next year we will work with the Department for Transport to review whether the data is being shared with drivers.
Places to stop: reviewing existing emergency areas where the width is less than the current standard	We have completed an independent review of the widths of 249 emergency areas. The review found 13 are less than 4.4 metres wide, but that all 13 are considerably wider than the standard 3.3 metre width of a conventional hard shoulder.	We are now working on completing safety risk assessments to help guide our next steps for widening any narrow emergency areas.

<u>Being safer in moving traffic</u>

64. Needing to stop, or being forced to stop, in an emergency on a live traffic lane is very rare. It can of course happen on any road but on high-speed roads it is more frightening, and help needs to be at hand quickly.

65. The 2020 Stocktake identified that because all lanes on motorways without hard shoulders are 'live' traffic lanes, the chance of vehicles stopping in a live traffic lane would increase. But it also identified that overall the risks a driver would face would be less than on a conventional motorway. This is because of the additional technology installed when the hard shoulder is removed, including variable speed limits enforced by cameras, more signs and signals, and electronic message signs giving information to drivers.

66. The 2020 Action Plan committed to implementing a range of measures to help drivers be safer in moving traffic. This included commitments to speed up the rollout of radar SVD technology to identify stopped drivers, improve

the use of electronic overhead signs and signals to warn oncoming drivers and reduce the time it takes for help to arrive. It also included a commitment to investigate the safety performance of specific sections of the M6 and M1 smart motorways where clusters of incidents have occurred previously.

67. Radar SVD technology identifies a stopped vehicle, typically within 20 seconds, and provides an alert to our control room. At the same time, it can also automatically display a 'report of obstruction' message to drivers to warn oncoming drivers of a stopped vehicle ahead. Our operators then set a Red X sign to close one or more lanes, adjust speed limits and deploy traffic officers. This technology was trialled on the M25, where it remains in place, is being commissioned on stretches of the M3 and M20 and is currently being installed on the M1.

68. We are making additional commitments to accelerate delivery of the 2020 Action Plan and have identified new actions too.
    - **Identifying stopped drivers quicker:** radar SVD technology will be in place on all existing ALR schemes by September 2022 and no new schemes will open without it
    - **Improving compliance:** upgrade enforcement cameras by September 2022 to support improved compliance with Red X signs
    - **Working with fleet operators:** using the 'Driving for Better Business'19 programme to communicate with fleet operators the need for compliance with current legislation and guidance in relation to Advanced Driver Assistance Systems. This includes the use of Automatic Emergency Braking systems. And we will work with the Department for Transport to explore making it illegal to switch off Automatic Emergency Braking

69. These commitments will allow us to get help quicker to drivers stopped in a live traffic lane to help drivers be safer in moving traffic and to reduce the likelihood of a collision.

Action	**What we've delivered since March 2020**	**What will happen next**
Identifying	The 2020 Action Plan set a	Based on our experience of

[19] www.drivingforbetterbusiness.com

stopped drivers quicker: faster rollout of radar stopped vehicle detection technology	challenging target for us to install radar SVD technology on 21 schemes by March 2023. Radar SVD technology is currently being commissioned on the M3 Junctions 2 to 4a and M20 Junctions 3 to 5. Work on the M1 Junctions 32 to 35a started in February 2021. We have completed the design stages on three further schemes.	installing the technology we will be **accelerating the completion** of this programme. We will install radar SVD technology on every existing ALR scheme by end of September 2022. Current DHS motorway sections will have SVD technology installed as part of being converted to ALR by March 2025. We are also **making a new commitment** that all new schemes will have radar SVD technology installed before they open, including the six schemes currently in construction: • M4 Junction 3 to 12, • M1 Junction 13 to 16, • M27 Junction 4 to 11, • M6 Junction 13 to 15, • M56 Junction 6 to 8 and • M6 Junction 21a to 26.
Identifying stopped drivers quicker: large-scale trial of CCTV analytics	As a result of the 2020 Stocktake, we committed to launch a large-scale trial of other technologies for detecting stopped vehicles. This action allowed us to look into making greater use	Results of the trial showed positive results that, subject to further work, could lead to future use elsewhere on the network. We remain committed to

	of the full CCTV coverage on smart motorways, providing another option alongside current radar technology. We have now completed this work, on the M4 near Bristol, to trial an alternative system that analyses CCTV images to identify stopped vehicles. Video analytics, using 32 of our CCTV cameras, was used to detect stopped vehicles, with alerts being relayed to operators.	installing radar SVD technology as our primary approach for stopped vehicle detection on existing ALR schemes by end of September 2022. Current DHS motorway sections will have SVD technology installed as part of being converted to ALR by March 2025.
Warning oncoming drivers: displaying 'report of obstruction' messages	The stopped vehicle detection system sends an alert to our control rooms which they respond to. At the same time, it can also automatically display a message on an electronic overhead sign on the motorway. This automatically displays a 'report of obstruction' message to drivers to warn oncoming drivers of a stopped vehicle ahead. We do this instead of automatically setting a Red X to reflect that the 'report of obstruction' is ‘unverified’, i.e. we’ve been told there is	We are on target, by March 2023, to deliver automated display of ‘report of obstruction’ messages on signs and signals when radar SVD technology identifies a potential incident.

	potentially an obstruction somewhere in the carriageway, but we need to investigate to confirm. This means we can warn oncoming drivers of a potential stopped vehicle ahead, and then in parallel, our control room will investigate and validate if it is a stopped vehicle, and when confirmed, they will set a Red X to close the appropriate lane. 'Report of obstruction' messages were enabled on the M3 Junctions 2 to 4a in December 2020.	
Getting help to drivers faster: faster attendance by more Highways England traffic officer patrols	We are on target to deliver the roll-out of changes to our traffic officer patrols on certain smart motorway sections. We are doing this to support the aim, that by July 2021, we will reduce the average time it takes traffic officers to attend incidents from 17 to 10 minutes. This average response time compares favourably with the 15-minute target for police response time. To do this we have adjusted	We will continue our work to support the aim, that by July 2021, we will reduce the average time it takes traffic officers to attend incidents from 17 to 10 minutes.

	patrol route strategies across regions, giving greater focus to those sections of smart motorway where the average distance between places to stop in an emergency is more than one mile, and so where drivers may need extra help from our patrols, and introducing park up points either within, or closer, to those sections.	
Getting help to drivers faster: making it easier to call for help if you are forced to stop	Increasing numbers of newer cars come with an eCall or 'SOS' button which can be used to call for help. We have completed work with the Society of Motor Manufacturers and Traders (SMMT) to jointly understand the range of eCall and bCall functions in newer cars, and to communicate the benefits to drivers.	We are working with stakeholders to agree the key messages for a public information campaign which will run later in 2021. For those whose cars do not have this feature, there is guidance on our website[20] on what to do if your vehicle has a problem or you get into trouble on a motorway.
Improving compliance: we have changed the law to enable automatic detection of Red X violations	Following the change in the law, we are on target to deliver upgrades to enforcement cameras across the whole smart motorway network to enable automatic detection of Red X violations which can then be enforced	We will **accelerate the completion of our upgrade programme** so that by September 2022 we will have upgraded all cameras to provide automated detection. This is 10 months earlier than planned.

[20] https://highwaysengland.co.uk/road-safety/breakdowns

and enforcement (three points, £100 fine) using cameras	by the police. To date we have upgraded 33 of the 85 cameras. We are doing this for the safety of those in the closed lanes and because it is illegal to enter the lane beyond a Red X, until such time that you pass a sign and signal cancelling the restriction. The vast majority of drivers comply with Red X signs and, for the very small minority who do not, the police have the powers to prosecute. The penalty can be three points on the driver's licence plus a £100 fine.	We will work with police forces to raise awareness of Red X signs and enforcement measures, so that drivers know they must not drive in lanes closed by a Red X.
Working with fleet operators: use 'Driving for Better Business' programme to urge businesses to not switch off Automatic Emergency Braking	This measure is a **new commitment we have made** since the 2020 Action Plan.	We will use the Driving for Better Business programme to raise awareness of the benefits of using Advanced Driver Assistance Systems, together with the management of driver distraction, fatigue, and close following. This will help improve compliance with current legislation and guidance. We will particularly focus on Automatic Emergency Braking as these systems reduce the likelihood

		of rear end collisions involving heavy goods vehicles. It's already mandatory for Automatic Emergency Braking systems to be fitted to certain vehicles, but it's not currently illegal for it to be switched off. We will work with the Department for Transport to explore making it illegal to switch off Automatic Emergency Braking.
Investigating safety performance: investigate M6 Bromford viaduct and sections of the M1	The 2020 Action Plan committed to look further at clusters of incidents on sections of the M6 and M1 smart motorway, specifically: • M6 Junctions 5 to 6 (Bromford viaduct), • M1 Junctions 10 to 13, • M1 Junctions 30 to 35, and • M1 Junctions 39 to 42. We have completed extensive independent investigations of these sections of smart motorway. Following the investigations, we have also undertaken feasibility work for the M6 Bromford and M1 and are developing delivery	We are finalising the details of the measures we will take forward to enhance the safety of these sections of motorway. We intend to publish the findings of our safety reviews in June 2021.

	programmes for extra measures.	

Section 3 - Whether All Lane Running is the most suitable type of smart motorway to roll-out or if there are better alternatives

70. The introduction and continuing rollout and development of smart motorways in England has been Government policy since 2008. There are three different types of smart motorway currently operating on the SRN, all sharing the defining feature of variable mandatory speed limits. As set out in the 2020 Stocktake and 2020 Action Plan, no new DHS motorways are planned for construction, all existing DHS motorways will be upgraded to ALR by March 2025 and all future smart motorway schemes are expected to be ALR.

71. There are three types of smart motorway on the SRN:

- **Controlled motorways (CM)** have a permanent hard shoulder. The concept of controlled motorways was developed in 1993/94, with the first scheme introduced in 1995 on the M25 J10-15. CM were often installed where the motorway had previously been widened. Controlled motorways do not provide additional lanes, but do include the provision of technology to control the speed of traffic.

- **Dynamic hard shoulder (DHS) motorways** have a hard shoulder that is opened to traffic based on demand, which runs at a maximum speed limit of 60mph when open. The first pilot scheme opened on the M42 between Junctions 3a and 7 in 2006. These motorways include provision of emergency areas, technology to control the speed of traffic and electronic signage to communicate with drivers. The 2020 Action Plan confirms that all DHS motorways will be upgraded to ALR by March 2025.

- **All lane running (ALR) motorways** convert the hard shoulder of a conventional motorway into a permanent additional driving lane, providing 33% additional capacity compared to conventional or controlled motorways. ALR motorways normally operate at 70mph, with technology enabling the deployment of variable speed limits to manage traffic flow. These motorways include provision of

emergency areas, traffic flow technology and electronic signage, including Red-X, to communicate with drivers. The concept of ALR was developed in 2010/11 and the first schemes opened on the M25 in 2014.

72. Table 3 sets out the number of miles of each type of operational motorway on the SRN and how this has changed over time.

Table 3 – Composition of the SRN by road type[21]

Road Class	Road Length (Miles)									
	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Conventional Motorway	1,778	1,755	1,700	1,697	1,651	1,657	1,617	1,583	1,576	1,564
Controlled Motorway	51	73	115	117	121	121	124	135	137	141
Dynamic Hard Shoulder	16	22	38	51	67	67	67	67	67	63
All Lane Running	-	-	-	-	29	29	62	105	123	141
All SRN 'A' Roads	2,570	2,582	2,583	2,571	2,574	2,570	2,563	2,578	2,611	2,608

Conventional motorways

73. Conventional motorways have two or more lanes and generally have a hard shoulder. They operate at the national speed limit, although some have electronic signs to enable operators to set advisory speed limits when conditions require. These signs are generally spaced between 0.9 and 1.9 miles apart and some sections have larger signs, which can also be used to provide additional information to drivers.

74. Some sections of conventional motorway include a system called MIDAS (Motorway Incident Detection and Automatic Signalling), which uses sensors in the road surface to monitor traffic volumes. MIDAS automatically sets advisory speed limits and information for motorists to provide queue protection, as the motorway becomes more congested.

[21] Source: Highways England scheme information and DfT Road Length Statistics on the strategic road network in England from 2010-19

75. Conventional motorways include a limited amount of CCTV and regularly spaced emergency telephones along the hard shoulder.

76. These motorways are very familiar to drivers, having been in existence for more than 60 years. Conventional motorways do not benefit from the full technology enhancements that exist on all smart motorways, including the extensive network of variable message signs that enable us to better control traffic speed and manage incidents. Hazards associated with travelling at speed are therefore generally higher on conventional motorways, though overall the levels of safety remain very high.

Controlled motorways

77. Controlled motorways include full smart motorway technology and generally have a hard shoulder with up to four driving lanes.

78. Smart motorway technology includes:
    - Electronic signs to display Variable Mandatory Speed Limits (VMSL), Red-X lane closures and provide drivers with better information.
    - Enforcement cameras.
    - Enhanced CCTV coverage
    - MIDAS.

79. Whilst controlled motorways have some impact on congestion by managing traffic flow, they do not add additional lane capacity. To meet the demand for greater capacity, both conventional and controlled motorways would need to be widened to accommodate an additional lane. Many of the benefits of DHS and ALR smart motorways are therefore not realised by conventional and controlled motorways.

Dynamic Hard Shoulder (DHS) motorways

80. DHS motorways were introduced in 2006 as a pilot scheme on the M42. These motorways are essentially a three-lane controlled motorway with the flexibility to open the hard shoulder as a driving lane at peak times, when extra capacity is needed. DHS motorways include emergency areas for drivers to use in the event of an emergency or breakdown.

81. DHS motorways use much of the same technology as controlled motorways, but with an additional CCTV camera system to provide full and

dedicated coverage of the hard shoulder. This essential safety system enables our control room teams to check that the hard shoulder is clear before switching it to a running lane at peak times.

82. These motorways deliver many of the advantages of a controlled motorway, but with the added benefit of significant additional capacity at peak times.

83. There are, however, some disadvantages of DHS motorways:
    - Introduction of the unusual and counter intuitive instruction for drivers to cross a solid white line onto the hard shoulder.
    - Potential confusion for drivers as to whether the hard shoulder is in use as a running lane.
    - Provision of additional lane capacity, but at a reduced 60mph speed limit.
    - Resource-intensive operation, requiring the hard shoulder to be manually opened and closed twice daily.
    - As demand for motorway journeys grows, the hard shoulder will be used as a driving lane at 60 mph for an increasing proportion of the day. On the M42 DHS motorway we typically see the hard shoulder open as a driving lane for two hours in the morning and up to seven hours in the evening.

84. Our latest available data shows that over a 12-month period there were 3.6 million misuse of the hard shoulder offences committed on DHS motorways. This is a combination of those who genuinely thought the hard shoulder was open to traffic and those who knowingly use the hard shoulder when closed to gain an advantage. We have issued over 150,000 warning letters to drivers who misused the hard shoulder informing them what they did wrong and how they should be driving in these situations.

85. ALR motorways were developed by the Highways Agency with the Department for Transport from 2010 onwards to provide additional capacity on our motorways, whilst maintaining the highest levels of safety and building on the experience of DHS motorways.

<u>All Lane Running (ALR) motorways</u>

86. ALR motorways are generally four lane motorways without a hard shoulder, normally operating at the national speed limit.

87. ALR includes the same suite of technology as controlled motorways, with some modifications to the way that drivers are presented with information, more signage and enhanced CCTV coverage. ALR motorways include emergency areas (including an emergency telephone) for drivers to use in the event of an emergency or breakdown. Originally spaced at 1.5 miles apart, these areas will now be designed to be three-quarter miles apart where feasible, with a maximum of one mile (with some exceptions where not feasible to construct additional emergency areas, such as where junctions intersect or on bridges).

88. Our first ALR motorways opened in 2014 on two sections of the M25. Since then, we have closely monitored their performance and published evaluation reports after one, two and three years. These reports showed that both sections of ALR motorway were operating as safely, or more safely, than the conventional motorways they replaced.

89. Between 2015 and 2018, Highways England progressively trialled a new type of radar-based system, designed to automatically detect stationary vehicles in live lanes, firstly on the M62 and then on two ALR sections of the M25. The stopped vehicle detection (SVD) technology had previously been used in Sweden and offered the potential to make ALR motorways even safer, by helping to reduce the risks associated with live lane stops when traffic volume is low, and therefore faster moving.

90. The trials showed that this technology would deliver additional safety benefits on ALR motorways and has been a standard element of smart motorway design since 2018.

91. It is important to note that while radar SVD technology reliably identifies stopped vehicles and reduces the risks associated with live lane breakdowns, it does not eliminate live lane stops or breakdowns. It should be noted that it is illegal for drivers to stop on a motorway unless in an emergency and we always encourage drivers to regularly check their vehicles to reduce the risk of breaking down.

92. The technology typically identifies a stopped vehicle within 20 seconds, and provides an alert to our control room. At the same time, it can also automatically display a 'report of obstruction' message to drivers to warn oncoming drivers of a stopped vehicle ahead. Our operators then set a Red

X signal to close one or more lanes, adjust speed limits and deploy traffic officers.

93. SVD technology is currently being commissioned on stretches of the M3 and the M20 and installed on a stretch of the M1. In our progress report we have made the commitment that **all new smart motorways will have SVD installed before they open, including the six schemes currently in construction**.

94. The 2020 Action Plan set a challenging target for us to install radar SVD technology on 21 existing ALR motorways by March 2023. Based on our experience of installing the technology we are now **able to accelerate the completion** of this programme. We will install radar SVD technology on every existing ALR scheme by end of September 2022.

95. ALR delivers all the smart motorway benefits described in section 1 of this submission. ALR also offers specific additional benefits compared to DHS, including:

    - A more intuitive and consistent user experience, compared to DHS removing the risk of hard shoulder misuse.
    - Ability to meet future demand for motorway journeys. DHS would likely become less distinct from ALR over time, as it would need to be active more often to accommodate growing demand.

96. ALR has been Government policy since 2011 and is the current standard for increasing motorway capacity in England.

97. In recognition of this, and to offer greater consistency and familiarity to road users, all existing DHS motorways will be upgraded to all lane running by March 2025 as set out in the 2020 Action Plan. **No new DHS motorways are planned for construction** and all future smart motorway schemes are expected to be ALR.

<u>Worldwide experience</u>

98. Highways England has good relationships with other highways authorities around the world. We work closely with other authorities on a range of issues, including road safety where it is always beneficial to share best practice. Our Design Manual for Roads and Bridges (DMRB) is often

considered the best in class around the world and has helped establish the UK as a global leader on road design and safety.

99. In tackling their own congestion challenges, some other countries have also adopted smart motorways as a solution. The smart motorways used elsewhere in the world are generally either DHS or ALR. Australia and New Zealand have recently opened sections of ALR motorway to address congestion around Perth and Wellington, respectively.

Section 4 - Public confidence in using smart motorways

100. We want everyone who travels or works on any of our roads to feel confident and safe and we recognise that we have more work to do to build public confidence in driving on motorways without a permanent hard shoulder.

101. Transport Focus recently published the findings of their research '*All-lane running smart motorways: the drivers' view*' in December 2020. We welcome the report and will be writing to Transport Focus setting out our response to their recommendations. Although the sample size of this survey was limited (less than 60), we are interested in the conclusions as they offer us another opportunity to listen to the views of road users.

102. The 2020 Action Plan also sets out a package of 18 measures designed to retain the benefits of smart motorways, raise the bar on safety, and address public concerns. These measures include making sure that drivers are better informed about the extra features of smart motorways, as well as tackling perceptions and public confidence in their safety. Our progress in delivering against these actions is set out in section 2 of this submission.

103. We recently launched our biggest ever road safety campaign to inform and reassure drivers, so they know what to do if they break down on any motorway, including one without a hard shoulder. The campaign includes a television advert that reaches a prime-time audience, as well as reaching drivers through radio, social media and online.

104. The 'Go left' message at the heart of the campaign is designed for easy recall by drivers when the advice is most needed. The television advert was tested in focus groups for relevance and recall and we were supported by the recovery industry in developing the campaign.

105. Our online materials provide drivers with comprehensive advice on how to stay safe on motorways, including:

- Practical guidance on what to do if you get into difficulty on a motorway, whether it has a hard shoulder or not.
- What to do in the event of a breakdown in a live lane or if you are involved in a collision.
- How to check your vehicle before a journey to reduce the risk of breaking down.
- Additional advice on what to do if you or anyone in your vehicle has a disability.

106. The 'Go left' campaign will continue to run throughout April when we will begin to fully evaluate its efficacy.

107. At the end of March, we completed a 'mid-wave' evaluation of the campaign to understand the views of 1285 people aged 17+ in England who ever drive on motorways and major A-roads. The mid-wave analysis showed:

- Just under **half the target audience spontaneously recall seeing the advert or associated communications** relating to what to do in the event of a motorway breakdown.
- When prompted, over **half the target audience recognise at least one element of the campaign** (53%). Television (41%) and radio advertising (39%) are most well recognised.
- The campaign is **more likely to have been seen or heard by those aged 17-24, or those aged 55+**.
- The campaign is seen to be **clear** (89%), **memorable** (80%) and **relevant** (72%). The advice, songs and humour tend to be more well liked than disliked (liked by around half of the target audience and disliked by only around 1 in 10).
- When asked which messaging they spontaneously recall, **'Move left' is the highest spontaneously recalled theme**.

108. The mid-wave' evaluation is encouraging, with indications of significant cut through with our target audience. We will be undertaking a thorough post campaign evaluation to understand the impact that the campaign has had overall.

109. Our latest campaign follows a number of previous safety campaigns aimed at helping road users stay safe. These include awareness campaigns to promote:

- Red X compliance.
- Vehicle checks.
- Obeying the speed limit.
- Breaking down.
- Lane discipline.
- Driving in rain.
- Tailgating.
- Motorcyclist safety.

110. Independent analysis provided by Transport Focus from the National Road User Satisfaction Survey over the period 2014/15 to 2019/20 demonstrated year-on-year improvements in the awareness of:

- Emergency areas (58% in 2019/20 compared to 36% in 2014/15);
- Use of the hard shoulder as an extra lane during busy times (74% in 2019/20 compared to 64% in 2014/15);
- Understanding when there is no hard shoulder when it permanently converts to a traffic lane (64% in 2019/20 compared to 39% in 2014/15).

111. We will continue to invest in road safety campaigns, working with partners in the industry, and supporting others in their campaigns.

112. Although not specifically related to smart motorways, Highways England will also be supporting a safe return to our roads as COVID-19 restrictions ease in the coming months. Our focus will be on encouraging road users to check their vehicles before making a journey, recognising that they may not have been driven regularly during lockdown.

Section 5 - The impact of smart motorways on the usage and safety of other roads in the strategic road network

113. Smart motorways provide much needed additional capacity on England's busiest and safest roads. Without increasing motorway capacity to meet growing demand, motorway journeys would become less reliable, less

predictable and less safe due to increased congestion. As a result, it would be less attractive for road users to drive on motorways for all or part of their journeys. Given that motorways are by some margin our safest roads, this trend would lead to an overall reduction in safety on the SRN and on local roads.

114. It is difficult to quantify the exact impact of smart motorways on the wider road network, though it is clear that increasing capacity on our safest roads is good for the overall safety performance of the network.

115. We have undertaken a high-level analysis to determine what the possible safety implications would be if one chose to return ALR motorways to a conventional layout with a hard shoulder. By closing one lane on a four-lane ALR motorway, we would reduce the capacity of that motorway by 25%. If that lost capacity was directly displaced onto A-roads we expect there would be a negative safety impact. Depending on how much traffic was displaced this could range from an additional 0.6 fatalities or 2.4 serious casualties per year (if 1% of traffic was displaced) up to an additional 25 fatalities or 224 serious casualties per year (if 25% of traffic was displaced).

116. When also considering other negative impacts, we estimate the economic cost would be £350m per year (if 1% of traffic was displaced) up to £2.85bn per year (if 25% of traffic was displaced).

117. Re-instating the hard shoulder on ALR motorways is possible, but it would be costly, disruptive and likely lead to a significant reduction in the overall safety performance of the SRN.

Section 6 - The effectiveness of Highways England's delivery of the smart motorways programme, the impact of construction works, and the costs of implementation

<u>Smart motorways in Road Investment Strategy (RIS) 1</u>

118. Highways England invested £2.7bn in the development and delivery of smart motorway schemes in RIS1 (2015-2020), against a budget allocation of £2.6bn.

119. Our RIS1 programme included a commitment to start work on the construction of 19 smart motorway schemes and open 12. Both commitments were achieved, delivering an additional 301.4 smart motorway lane miles, against a target of 286 miles.

120. We also delivered £265m efficiency savings within the smart motorways programme.

121. We have made good progress against challenging targets on customer sentiment regarding smart motorway roadworks, with scores steadily improving over the RIS1 period. These are based on monthly, independent audits by Ipsos MORI of our major roadworks, and cover road user perception of roadworks (e.g. lighting levels, length of work, amount of signage and delay) and visible evidence of customer measures in roadworks (e.g. active workforce, variable messaging with distance/time to end of works and temporary lane markings).

Realisation of benefits

122. We estimate that the increased capacity that has been delivered by smart motorways has resulted in journey time savings of over 28 million hours, an economic value of £350m.

123. If we had invested the same funding to increase capacity through conventional widening, we estimate an equivalent journey time saving of 11.4 million hours and less than half the economic return of smart motorways.

124. Over their 60-year economic appraisal period, we estimate the economic value of the smart motorways currently in operation will be £10.6bn.

Driving efficiency

125. Highways England launched the **'Smart Motorways Alliance'** in 2020, which is a new delivery model that enables us to work more efficiently and collaboratively with supply chain partners.

126. The Smart Motorway Alliance model challenges the traditional approach to design and delivery, with the objectives of safer and more efficient delivery of infrastructure and improved customer satisfaction.

127. The Alliance model builds on some key principles, including:
    - Developing **long-term and collaborative relationships** with our partners and the wider supply chain.
    - **Less customer disruption**, through more efficient delivery.
    - **Reducing time on site** through right first time design and off-site construction.
    - Long-term pipeline of investment providing the supply chain with confidence to invest in **skills and innovation**.
    - Incentivized, **performance driven contracting** with supply chain partners.

128. We have awarded contracts to six Alliance partners under the 10 year framework to focus on the following areas of delivery:
    - **Three On-site Assembly Partners**, responsible for the on-site aspects of construction works assembly and delivery, interfacing with other members to support efficient and safe design and delivery with predictable cost and schedule outcomes.
    - **Two Digitally-Enabled Design Partners**, responsible for scheme design from initial concept through to delivery and closeout, seeking early involvement from the On-Site Assembly Partners and wider supply chain to support innovation and 'right first time' design.
    - **One Production Management Partner**, responsible for leading and coordinating an integrated programmatic approach to delivering and optimising the achievement of the Alliance's overall objectives.

129. The Alliance model will make an important contribution to our overall £2.23 billion efficiency target for RIS-2.

<u>Digital design and modular construction</u>

130. As smart motorways are designed and built to common standards, we are able to drive efficiency through the programme by using digital design and modular construction techniques.

131. We have developed the Rapid Engineering Model (REM) to optimise the design of smart motorways. The REM helps human designers to ensure that we consider a full range of factors such as topography, driver sight lines and

existing structures into account when designing a smart motorway. Human designers take a final decision on the specification of any road.

132. The REM enables quicker development of our network through automatic digital design. Three-dimensional topographic data is analysed alongside environmental data to help identify opportunities and risks within a specific project, or along an entire asset in our network. This has reduced design time from months to weeks, and means that scheme options can be produced and assessed much faster.

133. We are also increasingly using modular construction to deliver smart motorways, as this is more efficient, less disruptive to road users and safer. We have developed modular emergency areas, which can be assembled on site from a number of pre-manufactured parts.

134. In addition, we have developed a product catalogue of the components we use to construct smart motorways. The catalogue helps us to work smarter by ordering the right materials when we need them, schedule just in time deliveries and rehearse what will happen on site when the individual components are fitted together. We have used this way of working to accelerate the installation of stopped vehicle technology on smart motorways.

135. Using digital tools to support better logistics, such as just in time deliveries has also helped us to drive greater efficiencies. On the M4 J3 to J12 project, we have a control hub where logistics of all lorry deliveries is co-ordinated from vehicle and plant trackers, shown visually on a GIS map within the hub. This approach results in less waste on site as we don't have to store spare materials. It can also mean we have to spend less time on site because we get the parts we need delivered exactly when we need them; reducing delays while we wait for materials.

ENDS

April 2021