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BRIEFING PAPER

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Smart motorways and All Lane Running

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Summary

This paper explains the ongoing debate about the safety of All Lane Running (ALR) on smart motorways, including the Government's stocktake and action plan, published in March 2020.

Smart Motorways are a technology-driven approach to tackling the most congested parts of the motorway network by increasing capacity and making journeys more reliable through controlling the flow and speed of traffic, with driver information displays provided on over-head gantries.

There are three types of smart motorway, one of which is All Lane Running (ALR), where the full width of the road is usable with emergency refuge areas (ERAs) alongside. Highways England (HE) developed ALR to enable a reduction in the amount of infrastructure necessary to implement a smart motorway scheme.

Since the inception of ALR schemes there have been concerns about their safety, in particular the permanent loss of the hard shoulder and the frequency of ERAs. Surveys of public opinion have consistently reflected these concerns. Some notable fatalities on ALR motorways in the past few years have also fuelled concerns about safety. HE has always maintained that smart motorways, including those with ALR, are no more dangerous than other motorways, and in some ways safer.

The Secretary of State for Transport, Grant Shapps, announced in October 2019 that he had asked the Department for Transport to carry out an evidence stocktake to gather the facts quickly and make recommendations on smart motorways. The DfT published the outcome of the stocktake and a forward action plan on 12 March 2020. Overall, the evidence showed that in most ways, smart motorways were as safe as, or safer than, conventional ones, but not in every way. In particular, the specific risk related to live lane breakdowns had increased and there was confusion over the different types of smart motorways. The action plan published alongside the stocktake is intended to address these issues, to make smart motorways safer and provide greater public confidence in their use.

The Commons Library website contains briefings on other roads policy issues.

1. Highways England

Highways England (HE) is a body corporate, established on 8 December 2014 by incorporation under the *Companies Act 2006* as a company limited by shares. On 1 April 2015 it was appointed as a strategic highways company by the Secretary of State by way of an Order in accordance with section 1 of the *Infrastructure Act 2015*.[1] HE is the highway, street and traffic authority for the Strategic Road Network (SRN).

The SRN comprises approximately 4,300 miles of motorways and major 'trunk' A-roads in England. While the SRN represents only around two per cent of the total length of England's road network, the Department for Transport estimates that it carries roughly one-third of the total motor vehicle traffic.

The SRN expands as new roads and capacity are added and contracts as other roads are 'de-trunked' (i.e. devolved to local highway authorities). On coming into office in 1997 the Labour Government thought that approximately 40 per cent of the trunk road network could be devolved in this way and by 2006 a little over 2,100 miles of the SRN had been de-trunked. A list of de-trunking orders made between 2004 and 2014 is available.

The establishment of HE included a multi-year funding settlement, called a Roads Investment Strategy (RIS). To date there have been two RISs:

- **RIS 1** ran from 1 April 2015 to 31 March 2020. It included a headline £15.2 billion investment figure. Major schemes announced as part of RIS 1 included the controversial Stonehenge Tunnel, completion of the M62 smart motorway, and dualling the A1 from London to Ellingham.
- **RIS 2** began operating on 1 April 2020 and will run until 31 March 2025. It is funded directly from motoring taxes – Vehicle Excise Duty – via a roads fund. The RIS 2 budget is £27.4 billion. RIS 2 was published alongside the 2020 Budget, which highlighted three schemes that are part of RIS 2: dualling the A66 Trans-Pennine route, upgrading the A46 Newark bypass, and building the Lower Thames Crossing. HE has also been asked to make £2.3 billion of additional savings on operating and capital expenditure during RIS 2.

The Office of Rail and Road (ORR) is responsible for monitoring the performance of HE and Transport Focus champions the needs of road users on the SRN.

Further information on HE and the Road Investment Strategy can be found in Commons Library briefing paper CBP 8899, 29 April 2020

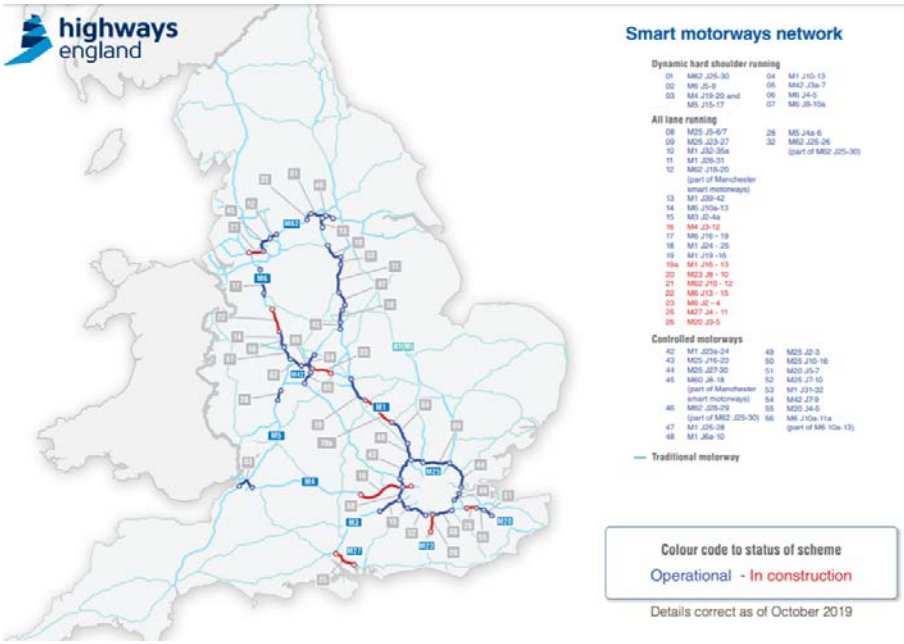
[1] *Infrastructure Act 2015 (Commencement No.1) Regulations 2015* (SI 2015/481)

2. Smart motorways

Smart Motorways are a technology-driven approach to tackling the most congested parts of the motorway network by increasing capacity and making journeys more reliable through controlling the flow and speed of traffic, with driver information displays provided on over-head gantries.

A map of current and planned smart motorways schemes (as of October 2019) is shown in the graphic below:[2]

Smart motorway schemes currently under construction can be examined in further detail on the HE major projects website.



Highways England explains how smart motorways work as follows:

> Smart motorways relieve congestion by making the hard shoulder available for use by traffic. On some smart motorways the hard shoulder is opened at busy times. On others it is permanently converted into a traffic lane (known as all-lane running). Regularly spaced refuge areas are used for emergencies - driving at 60mph you will reach a place you can stop in an emergency every 75 seconds on average.
>
> Smart motorways use pioneering technology to:
>
> - monitor traffic levels
> - change the speed limit to smooth traffic flow, reduce frustrating stop-start driving and improve journey times
> - activate warning signs to alert you to traffic jams and hazards up ahead
> - close lanes – for example to allow emergency vehicles through[3]

There are three types of smart motorway:

[2] HE, Smart motorways network, October 2019
[3] HE, *Improvements and major road projects: smart motorways* [accessed 7 July 2020]

- **Dynamic hard shoulder**: where the hard shoulder is temporarily opened up to traffic;
- **Controlled motorway**: with three or more lanes, a hard shoulder and variable speed limits; and
- **All lane running**: where the full width of the road is usable with emergency refuge areas alongside.[4]

Section 3 of this paper discusses the third of these – All Lane Running (ALR) – in more detail, as it has proven the most controversial form of the scheme. Section 4 sets out the results of a recent Government review into their safety.

[4] DfT, *How to drive on a smart motorway*, updated 3 March 2020

3. All Lane Running (ALR)

Highways England (HE) developed ALR to enable a reduction in the amount of infrastructure necessary to implement a smart motorway scheme. Permanent conversion of the hard shoulder to a running lane along with the ability to dynamically control mandatory speed limits is a key aspect of ALR. HE have said that this "removes the complex operating regime of opening and closing a dynamic hard shoulder" and that it would result "in significant cost savings without a reduction in safety".[5]

A list of smart motorways with ALR is provided below.[6]

M1	J16 to 13 (under construction); J19 to J16; J24 to J25; J28 to J31; J32 to J35a; J39 to J42
M3	J2 to J4a
M4	J3 to J12 (under construction)
M5	J4 to J6
M6	J2 to J4; J10a to J13; J13 to J15 (under construction); J16 to J19
M20	J3 to J5 (under construction)
M23	J8 to J10
M25	J5 to J6/7; J23 to J27
M27	J4 to J11 (under construction)
M62	J10 to J12 (under construction); J18 to J20; J25 to J26

3.1 Safety concerns

Since the inception of ALR schemes there have been concerns about their safety, in particular the permanent loss of the hard shoulder and the frequency of emergency refuge areas (ERAs), which are spaced at an average of every 2 km or less[7] (the maximum spacing is 2.5 km) .[8] In its June 2016 report the Transport Select Committee concluded that it did not support the nationwide roll out of ALR on the basis that the

[5] Mouchel for HE, *Smart motorways all lane running: GD04 assessment report*, August 2015, para 1.1
[6] RAC, *Smart motorways - what are they and how do you use them?*, 22 January 2020; and HE, *Improvements and major roads projects* [accessed 8 July 2020]
[7] *Letter from Jim O'Sullivan to the chair of the Transport Committee*, 25 September 2019
[8] Motorways: Laybys: Written question – 248614, 8 May 2019

attendant safety risks associated with the scheme had not been fully addressed.[9]

Surveys of public opinion have consistently reflected these concerns: a survey of 15,000 AA members, published in October 2016, found that only 1 in 10 felt safer on ALR stretches of motorway compared with conventional motorways with a hard shoulder. More than half of those surveyed agreed with the statement that the "construction of all-lane running motorways should be stopped".[10] A November 2019 survey for the RAC found that almost three quarters of drivers who had driven on ALR motorways were worried about not being able to reach an ERA should they break down. Only half of these drivers said they would know what to do if they had a break down and were unable to reach a refuge area[11].

Some notable fatalities on ALR motorways in the past few years have also fuelled concerns about safety.[12] In January 2020 the BBC current affairs show *Panorama* featured the safety record of ALR motorways.[13]

Existing safety features of ALR include 'standard' roadside technology, which displays speed and lane information (including 'Red X' signs), and traditional CCTV. A Motorway Incident Detection and Automatic Signalling (MIDAS) system, which detects slow-moving traffic and warns drivers by setting appropriate messages and speed limits, is also in use on all stretches of ALR motorways. A Stopped Vehicle Detection (SVD) system, which automatically detects individual stationary stopped vehicles on the carriageway, currently operates on a small proportion of the ALR network. It will become standard for new ALR schemes constructed from 2020.[14]

The three main safety concerns are the risk of stopping in a live lane, non-compliance with Red X signs, and the adequacy of ERAs:

- **The risk of stopping in a live lane**: a 2015 report for HE found that the risk of a vehicle stopping in a live lane in low-flow conditions was increased by over 200 per cent where ALR is in use.[15] HE told the Transport Committee that "of the 136 hazards we looked at, the risk associated with stopping in a live lane in low-flow conditions has increased by 200%, but that risk makes

[9] Transport Committee, *All lane running* (Second Report of Session 2016–17), HC 63, 30 June 2016, para 22
[10] "Smart motorways a dumb idea, say fearful road users", *The Times*, 16 October 2019
[11] RAC press notice, "68% of drivers say smart motorways compromise safety", 29 November 2019
[12] e.g. multiple fatalities on the same stretch of the M1 in South Yorkshire in 2018-19 (see: "Smart motorway deaths: Jason Mercer's widow wants system stopped", *BBC News*, 3 September 2019 and "Extra police patrols are deployed to prevent more casualties on a 'smart motorway' stretch of the M1 where the scheme has been blamed for four deaths", *Mail on Sunday*, 21 September 2019) and the May 2018 death of eight-year-old Dev Naran, killed when a lorry hit his grandfather's car that was stranded in a live lane on an ALR stretch of the M6 (see: "Coroner warns smart motorways are putting 'lives at risk' after boy, eight, died when a lorry hit his grandfather's car on a hard shoulder that had been opened to traffic", *Daily Mail*, 13 October 2019)
[13] BBC Panorama, *Britain's Killer Motorways?*, 27 January 2020
[14] DfT & HE, *Smart Motorway Safety: Evidence Stocktake and Action Plan*, 12 March 2020, paras 1.5-1.7
[15] Op cit., *Smart motorways all lane running: GD04 assessment report*, para 5.4.1

> up only 5% of the total risks associated with the operation".[16] HE told the Committee in September 2019 that 38% of road users who stopped on stretches of ALR motorway stopped in a live lane.[17] Breakdown recovery operators such as the RAC can only attend live lane recoveries after HE has made the scene safe.[18]

- **Non-compliance with Red X signs**: Red X signs are displayed on overhead screens to close lanes on sections of ALR motorway where there has been an accident or where a car has broken down and is unable to safely move off the carriageway. HE told the Transport Committee in September 2019 that the Red X non-compliance rate on ALR motorways is 7 per cent.[19]
- **The adequacy of Emergency Refuge Areas (ERAs)**: On ALR motorways the only safe areas available for a vehicle to stop in an emergency are ERAs. They are 100m in length (the average length of a football pitch) set back from the left-hand side of the motorway with a 30m central stopping area located centrally within.[20] As stated above, they are spaced on average every 2 km or less.[21] In 2016 the Transport Committee heard concerns that there were not enough ERAs on ALR motorways and that too many drivers were using the areas outside of emergencies.[22] The RAC and the AA also cited concerns that the length of ERAs meant that HGVs, typically a length of up to 18.5 metres, would not leave enough space for a recovery vehicle. The London Fire Brigade pointed out that on some gradients of roads, recovery from an ERA would be even more difficult.[23]

3.2 Highways England's view on safety

Highways England (HE) has always maintained that smart motorways, including those with ALR, are no more dangerous than other motorways, and in some ways safer.

Back in 2015 HE published a safety risk assessment of ALR by the consultants Mouchel. This concluded that ALR was "likely to meet" its safety objectives. It said that there would be:

> A reduction in risk for a significant number of the highest scoring existing motorway hazards, due to a controlled environment being provided through a combination of regularly spaced mandatory speed signals, speed enforcement, and full CCTV coverage.[24]

However, it also pointed to a new hazard, specific to ALR, related to vehicle exits from ERAs (see above) and said that two existing hazards

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[16] Op cit., *All lane running*, para 53
[17] *Letter from Jim O'Sullivan to the chair of the Transport Committee*, 25 September 2019
[18] RAC, *Explained: how the RAC deals with smart motorway breakdowns*, 22 January 2020
[19] Op cit., *Letter from Jim O'Sullivan to the chair of the Transport Committee*
[20] Ibid.
[21] Motorways: Laybys: Written question – 248614, 8 May 2019
[22] Op cit., *All lane running*, para 29; evidence from the RAC and AA, the Met Police and vehicle recovery operators
[23] Ibid., para 36
[24] Op cit., *Smart motorways all lane running: GD04 assessment report*, executive summary

would increase in risk: vehicle stops in a running lane (off peak) and vehicle drifts off carriageway (i.e. leaving the carriageway as a result of road the environment). Overall, it concluded that these new and increased hazards would likely be "countered by the decrease in risk of existing … hazards" and that ALRs represent approximately a reduction of risk of 18% when compared with the safety baseline.[25]

In September 2019 Jim O'Sullivan, Chief Executive of HE, wrote to the Transport Select Committee. He said that over their first three years of operation the first two ALR schemes on the M25 demonstrated a 27 per cent improvement in safety performance.[26] Together with seven other ALR schemes that had been in operation for one year, they showed a 28 per cent reduction in the casualty rate, outperforming the national trend by ten per cent.[27]

On the question of live lane breakdowns, Mr O'Sullivan told the Committee in person the following month that:

> … a live lane breakdown is more likely on a smart motorway than a conventional motorway. However, by way of compensation, the hard shoulder is nothing like as safe a space as an emergency area. Whichever design one chooses to build, there will be trade-offs.
>
> […] Live lane breakdowns happen on dual carriageways, they happen on conventional motorways and they happen on smart motorways. If you suffer sudden engine failure in lane three or lane four—what one might call the outside lane—of a conventional motorway, you are probably not going to make it to the hard shoulder. On a smart motorway, if that happens we have the MIDAS system, which will detect that the traffic behind you is slowing down. It will automatically set the signs and signals. We are starting to introduce stopped vehicle detection and you are on a CCTV camera.[28]

Mike Wilson, Chief Engineer of HE, explained to the Committee why ERAs on ALR motorways are safer than hard shoulders on conventional motorways in the event of breakdown:

> Hard shoulders are safer than live lanes, but they are not safe places … emergency areas are safer than hard shoulders for two reasons, fundamentally. They are wider than hard shoulders; an emergency area is 4.6 metres wide, whereas a hard shoulder, on average, is about 3.5 metres wide. Some road users weave in and out of the hard shoulder, and the discontinuous nature of an emergency area means that that behaviour is less on smart motorways.[29]

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[25] Ibid., executive summary
[26] Op cit., *Letter from Jim O'Sullivan to the chair of the Transport Committee*
[27] Ibid.
[28] Transport Committee, *Oral evidence: The work of Highways England*, HC 60, 23 October 2019, Qq45-46
[29] Ibid., Q58

4. Government stocktake and action plan, 2019-20

For many years the Government reiterated those arguments made by Highways England and argued that ALR was safe and that work was ongoing to improve issues such as ERAs and information to drivers to ensure better compliance with Red X signs and knowledge of the correct procedures to follow in the event of breakdown.[30]

However, as set out in section 3.1, above, safety concerns amongst stakeholders, MPs and the public have persisted. In response to these concerns the Secretary of State for Transport, Grant Shapps, announced on 23 October 2019 that he had asked the Department for Transport to "carry out, at pace, an evidence stocktake to gather the facts quickly and make recommendations" on smart motorways.[31]

The DfT published the outcome of the stocktake and a forward action plan on 12 March 2020, alongside an 'overarching safety report' on the nine ALR motorways currently in operation.[32] In his foreword to the stocktake the Secretary of State said that:

> Overall, what the evidence shows is that in most ways, smart motorways are as safe as, or safer than, the conventional ones. But not in every way. So I am clear that more work is needed to ensure that smart motorways are as safe as they can be.[33]

The key safety findings of the evidence stocktake were as follows:

> The high level statistics suggest that fatal casualty rates on the ALR network as it stands are lower, while injury rates are slightly higher. The risk modelling suggests that when converting conventional motorways to ALR, many risks decrease, while some increase. For example, the risks of a vehicle being driven too fast, and of a vehicle drifting off the carriageway, reduce whilst the risks of unsafe lane changing and of a vehicle stopping in a live lane increase. Looking at like-for-like studies of specific roads which have been converted to ALR: the overall casualty rate declines significantly; the fatal and serious casualty rate increases slightly, but within the statistical margin of error; and the FWI[34] rate declines. The same studies further indicate that the motorway types differ in terms of the underlying risks.
>
> […] Overall, the evidence shows that in most ways, smart motorways are as safe as, or safer than, conventional motorways, but not in every way.[35]

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[30] See, e.g. *All lane running: Government Response to the Committee's Fifth Report of Session 2016–17* (Sixth Special Report of Session 2016–17), HC 858, 9 December 2016

[31] HC Deb 24 October 2020, c1120

[32] DfT, Smart Motorway All Lane Running Overarching Safety Report 2019, 12 March 2020

[33] Op cit., *Smart Motorway Safety: Evidence Stocktake and Action Plan*, p6

[34] Fatal and Weighted Injuries (FWI) measure – this applies a weighting to the different severities of casualty, to give a single composite metric in which to assess changes in safety

[35] Ibid., paras 1.33 & 1.35

However, the stocktake also stated that "Within this overall picture, the specific risk related to live lane breakdowns has increased and there is confusion over the different types of smart motorways".[36] The action plan published alongside the stocktake is intended to address these issues, to make smart motorways safer and provide greater public confidence in their use. The commitments in the action plan are as follows:

1 **Ending the use of dynamic hard shoulders**: i.e. create more ALR motorways. DfT/HE will convert all existing dynamic hard shoulder smart motorways into ALR by the end of March 2025 so there will be only one type without a permanent hard shoulder. They believe that this will provide a more consistent experience for motorists;

2 **Faster rollout of stopped vehicle detection (SVD)**: HE will be asked to deliver this in 36 months (by March 2023), bringing the programme forward by several years.[37] HE will also launch a large-scale trial of a technology system that analyses CCTV images. This will make greater use of the full CCTV coverage on smart motorways, providing another option alongside current radar technology;

3 **Faster attendance by more HE traffic officer patrols**: HE will aim to reduce the attendance time from an average of 17 minutes to 10 minutes;

4 **Committing to a new standard for spacing of places to stop in an emergency**: Going forward, HE will commit to a maximum spacing for ERAs of 1 mile apart and look to, where feasible, provide them every ¾ of a mile apart;

5 **Delivering ten additional ERAs on the M25**;

6 **Considering a national programme to install more ERAs on existing smart motorways**: There will be a thorough evaluation of the M25 programme, collecting data on live lane stops before and after the extra emergency areas are installed;

7 **Investigate M6 Bromford viaduct and sections of the M1**: Where an intervention is considered likely to make a difference, HE will look to make changes to the motorway at these locations;

8 **Making ERAs more visible**: all existing ERAs will have a bright orange road surface, dotted lines on the surfacing showing where to stop, better and more frequent signs on approach to the emergency area showing where it is and new signs inside giving information on what to do in an emergency. These improvements will be installed by the end of spring 2020. HE is also committing to install more traffic signs in between places to stop in an emergency. Typically, these will be between approximately 330 and 440 yards apart and will show how far it is to the next place to stop in an emergency, to help motorists reach one and avoid stopping in a live lane.

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[36] Ibid., p61

[37] HE began the procurement process in late March 2020, see: "Highways England to launch £32m stopped vehicle detection procurement", *Highways Magazine*, 23 March 2020

9 **More communication with drivers**: DfT/HE is committing to an additional £5 million on national and targeted communications campaigns to increase awareness and understanding of smart motorways, how they work and how to use them confidently;

10 **Displaying 'report of obstruction' messages**: Automatic display of a 'report of obstruction' message on overhead signs to warn oncoming drivers of a stopped vehicle ahead, starting on the M25 Junctions 23 to 27 and Junctions 5 to 7 followed by the M3 Junctions 2 to 4a;

11 **Places to stop in an emergency shown on your satnav**: HE will work with satnav providers to ensure that places to stop in an emergency, such as motorway services, ERAs and remaining areas of hard shoulder such as on slip roads, are shown on the screen of the device when needed;

12 **Making it easier to call for help if broken down**: Increasing numbers of new cars come with an eCall or 'SOS' button which can be used to call for help. DfT/HE will work with car manufacturers to build greater awareness and understanding of this function in newer cars;

13 **Updating the Highway Code**: DfT is committing to an update of the Highway Code to provide more guidance for motorists on smart motorway driving, this will include ERA signage for the first time;

14 **Closer working with the recovery industry on improving training and procedures**;

15 **Reviewing existing ERAs where the width is less than the current standard and if feasible and appropriate widen to the current standard**; and

16 **Review of use of red flashing lights**: Review to commence immediately.[38]

The action plan was well received by motoring organisations the AA and the RAC, though Nicholas Lyes, Head of Roads Policy at the RAC, cautioned that "it remains to be seen whether these measures go far enough to protect drivers who are unfortunate enough to break down in live lanes".[39]

[38] Ibid., pp61-70
[39] "Government release smart motorway action plan", *Transport Network*, 12 March 2020

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