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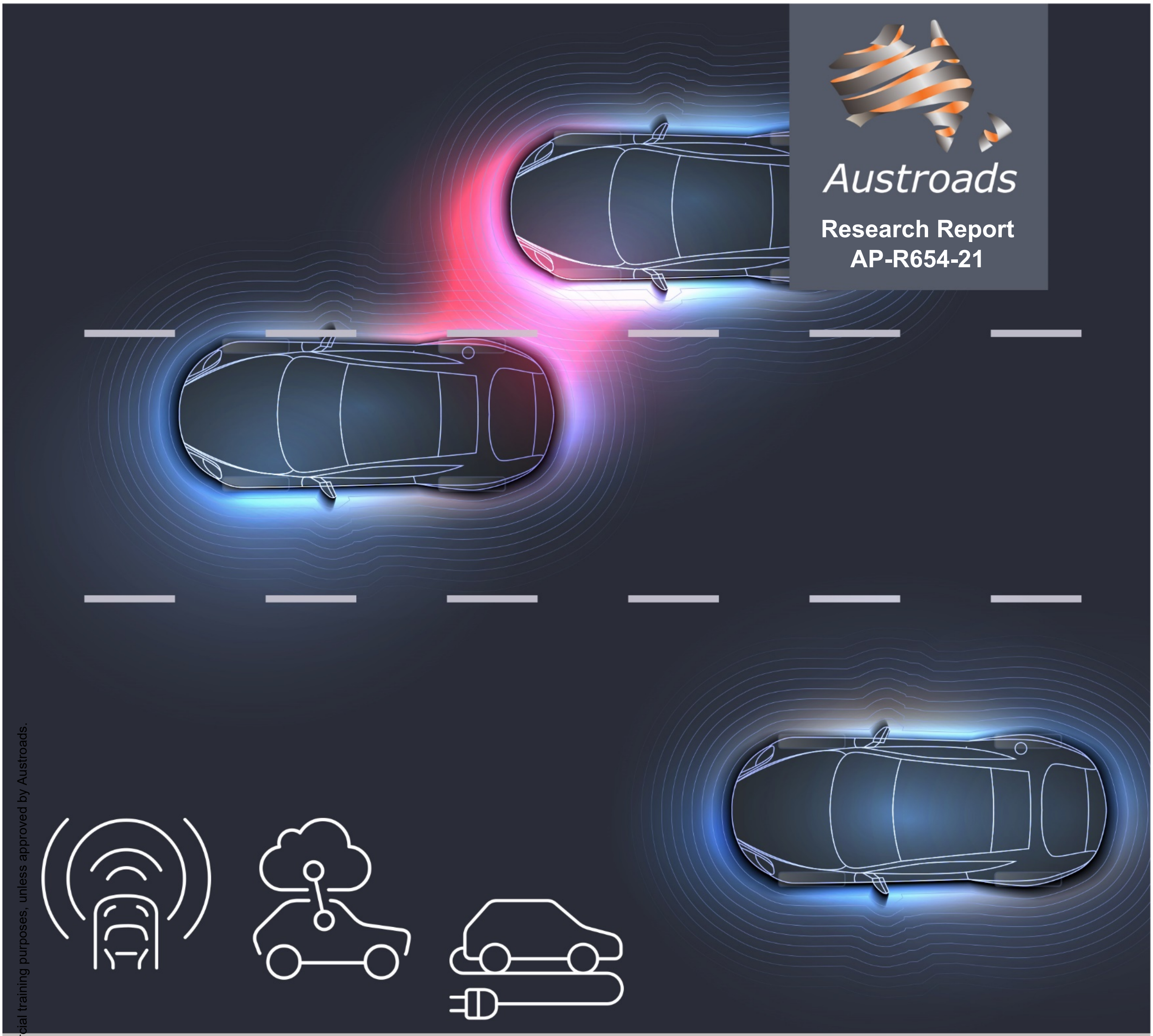

Future Vehicles Forecasts Update 2031

Addendum to *Future Vehicles 2030*

Future Vehicles Forecasts Update 2031

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Abstract

This report is an addendum to the Austroads Future Vehicles 2030 report (AP-R623-20), published in June 2020. Future Vehicles 2030 included forecasts of sales and fleet penetration for eight vehicle technologies or uses, including Automated Driving, Connected Vehicles, Electric Vehicles.

This planned review of the forecasts considers new and emerging evidence in this fast-moving area. This update discontinues the previous forecast of *For Hire With Driver.* The forecast for Electric Vehicles and one forecast for Connected Vehicles are both extended through to 2031 without revision. The remaining forecast for Connected Vehicles and all four forecasts for Automated Vehicles have been revised as well as extended through to 2031. There is no change to the general approach to forecasting and the fleet penetration and technology adoption models used for this.

Keywords

Future vehicle, Automated Vehicle, Connected Vehicle, Electric Vehicle

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About Austroads

Austroads is the peak organisation of Australasian road transport and traffic agencies.

Austroads’ purpose is to support our member organisations to deliver an improved Australasian road transport network. To succeed in this task, we undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.

Austroads provides a collective approach that delivers value for money, encourages shared knowledge and drives consistency for road users.

Austroads is governed by a Board consisting of senior executive representatives from each of its eleven member organisations:

- Transport for NSW
- Department of Transport Victoria
- Queensland Department of Transport and Main Roads
- Main Roads Western Australia
- Department for Infrastructure and Transport South Australia
- Department of State Growth Tasmania
- Department of Infrastructure, Planning and Logistics Northern Territory
- Transport Canberra and City Services Directorate, Australian Capital Territory
- Department of Infrastructure, Transport, Regional Development and Communications
- Australian Local Government Association
- New Zealand Transport Agency.

Acknowledgements

The contribution of government and industry stakeholders has been essential to inform this report. This includes input from the FV&T program team, the task force and other agency contacts. The contribution of James Hurnall from ANCAP, David Gargett from BITRE and Geoffrey MacDonald from TMR is particularly appreciated.

Summary

This report is an addendum to the Austroads Future Vehicles 2030 report (AP-R623-20), published in June 2020. Future Vehicles 2030 included forecasts of sales and fleet penetration for eight vehicle technologies or uses, including Automated Driving, Connected Vehicles, Electric Vehicles. As this is an addendum report, it serves to complement Future Vehicles 2030 and should be read in conjunction with Future Vehicles 2030.

This planned review of the forecasts considers new and emerging evidence in this fast-moving area. All eight forecasts and two models were reviewed, with the outcomes of the review shown in the table below.

Table 0.1: Summary of approaches taken for updates to forecasts

Future Vehicles 2030 model or forecast	Approach taken for Future Vehicles 2031
General technology adoption life-cycle	Continue to use to inform forecasts
General fleet adoption model	Continue to use in forecast calculations
A1 Active Safety Systems	Extend forecast to 2031 on current basis for medium and slow uptake but revise (accelerate) forecast for rapid uptake. Monitor for further signs of acceleration of uptake.
A2 Highly Automated Driving (motorways)	Add a minor delay (2 to 3 years) to the estimates in Future Vehicles 2030 for first introduction, with consequential delays to progress through adoption. Update forecast definitions, particularly for A2.
A4 Highly Automated Driving (urban)	
A5 Highly Automated Driving (rural)	
C1 Interoperable Cooperative ITS	Delay forecast uptake due to slower and more variable progress towards adoption
C2 Embedded mobile data connectivity	Extend forecast to 2031 on current basis
E1 Electric Vehicles	Extend forecast to 2031 on current basis
S2 Vehicles *for hire with driver*	Discontinue forecast

There is diversity in the levels of adoption by 2031 forecast for the technologies. There also remains much variance within each forecast, as indicated by the significant range between the slow, medium and rapid uptake scenarios. The first figure below shows the forecast 2031 sales penetration for new Australian passenger vehicles (car and SUV) fleet, with the slow forecast at the left of the bar, the rapid at the right and the medium forecast as the point where the colours change. The second figures shows the forecast 2031 penetration into the Australian passenger vehicle (car and SUV) fleet as new vehicles sold make their way into the fleet over time.

Figure 0.1 Forecast 2031 Australian passenger vehicle sales penetration by technology

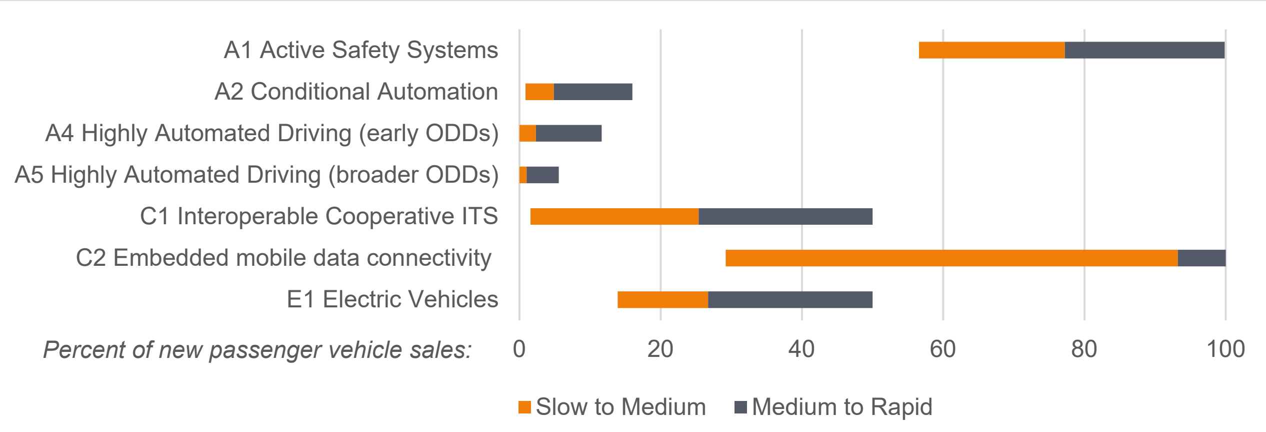
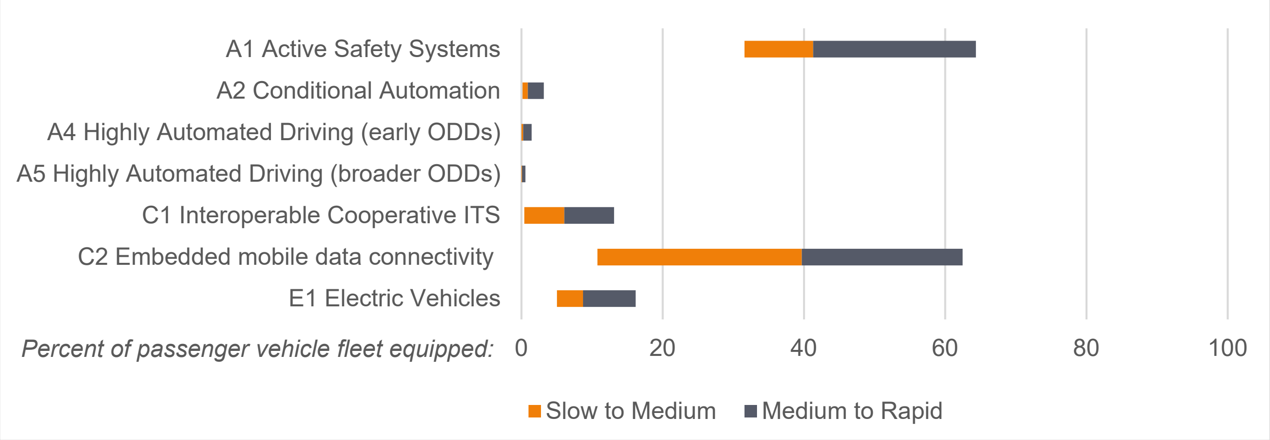


Figure 0.2 Forecast 2031 Australian passenger vehicle fleet penetration by technology



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1. Introduction

In June 2020 Austroads published the Future Vehicles 2030 report (AP-R623-20) that includes forecasts of sales and fleet penetration for eight vehicle technologies or uses, including Automated Driving, Connected Vehicles, Electric Vehicles and use For Hire with Driver.

There has been positive feedback on the Future Vehicles 2030 forecasts. The 2030 forecasts were largely prepared during late 2019, with the intention that the forecasts be updated regularly to reflect changes in anticipated technology adoption.

Future Vehicles 2030 (Austroads, 2020) provided forecasts of technology penetration into the vehicle fleet to assist member agencies and the broader industry in their research and planning for future transport and network operations. The forecasts cover technology penetration based on an assumption of continuation of government action. The forecasts do not indicate the desirability (or otherwise) of technology adoption nor the impacts of increasing technology penetration.

1.1 Purpose

This addendum complements the Future Vehicles 2030 report by providing the first review and update of the forecasts, to both:

- Extend the forecasts from 2030 through to 2031; and
- Update forecasts where new evidence warrants an update.

As this report is an addendum, it should be read in conjunction with the original Future Vehicles 2030 report which provides a more complete description and discussion of the forecasts.

1.2 Scope

This addendum includes a review of all ten models and forecast sets within Future Vehicles 2030:

- General technology adoption life-cycle
- General fleet adoption model (from new vehicle sales to fleet penetration)
- Forecast A1: Vehicles fitted with Active Safety Systems (e.g. Lane Keeping Assistance and Adaptive Cruise Control)
- Forecast A2: Vehicles capable of Highly Automated Driving in motorway environments
- Forecast A4: Vehicles capable of Highly Automated Driving in urban environments (in addition to motorways)
- Forecast A5: Vehicles capable of Highly Automated Driving in rural environments (in addition to urban and motorways)
- Forecast C1: Vehicles fitted with standards-based interoperable Cooperative ITS systems
- Forecast C2: Vehicles fitted with embedded means for connectivity to the cloud
- Forecast E1: Electric vehicles for which the battery is the primary energy source (includes plug-in hybrids and vehicles with range extenders)
- Forecast S2: Cars and SUVs available for transport use other than by owner/lessee, driver provided with vehicle (e.g. taxi, ride-share)

Each of these forecasts was made for passenger vehicles in Australia (cars and SUVs). Future Vehicles 2030 includes a descriptive discussion of differences for different vehicle types, between different geographic areas in Australia and between Australia and New Zealand. No update has been made to these descriptive discussions as part of this round of forecast updates.

1.3 Methodology

This addendum includes a review and update of the forecasts in Future Vehicles 2030 rather than a full bottom-up generation of new forecasts. For each of the models and forecasts the following steps will be undertaken:

- Gather and consider recent pertinent evidence for that model or forecast, including any feedback post-publication on Future Vehicles 2030 as well as high-quality published and unpublished sources;
- Review the model or forecast used in Future Vehicles 2030 and reconsider it in light of this updated evidence;
- If the evidence suggests that the model or forecast remains broadly appropriate, recommend extending the projection from 2030 through to 2031 without otherwise updating the model or forecast; and
- If the evidence suggests that the model or forecast should be updated, revise (as well as extend) the forecast to better reflect the available evidence.

Evidence sources used are similar to those used for Future Vehicles 2030, with a preference for written sources that are primary in nature (e.g. an announced release date to market by a reputable company) with other sources being used to assist the interpretation of primary sources. Other prepared forecasts were generally examined as comparative forecasts rather than as primary inputs to a forecast, unless that forecast were being directly and explicitly adopted (as was the case for an Australian Government Bureau of Infrastructure, Transport and Regional Economics (BITRE) electric vehicle forecast).

2. Consideration of Forecasts and Models

This section provides a summary of the approaches taken following the review of each of the forecasts or models. The reviews of the models and forecast considered both general factors, such as the impact of COVID-19 on vehicle sales, and factors specific to adoption of each technology covered by a forecast.

Table 2.1: Summary of approaches taken for updates to forecasts

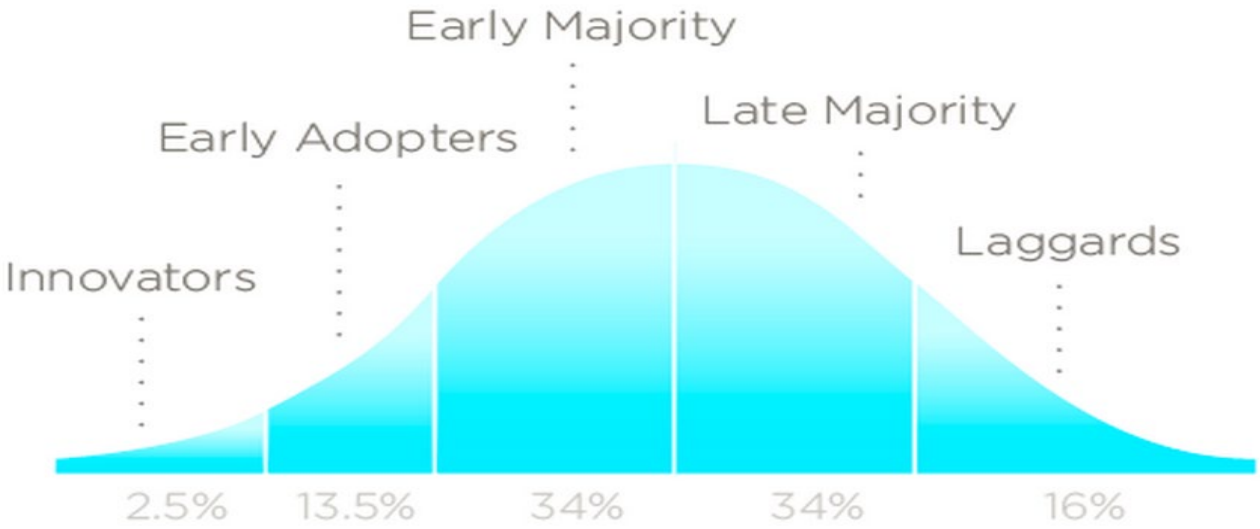
Future Vehicles 2030 model or forecast	Approach taken for Future Vehicles 2031	Refer to
General technology adoption life-cycle	Continue to use to inform forecasts	Section 3
General fleet adoption model	Continue to use in forecast calculations	Section 4
A1 Active Safety Systems	Extend forecast to 2031 on current basis for medium and slow uptake but revise (accelerate) forecast for rapid uptake. Monitor for further signs of acceleration of uptake.	Section 5
A2 Highly Automated Driving (motorways) A4 Highly Automated Driving (urban) A5 Highly Automated Driving (rural)	Add a minor delay (2 to 3 years) to the estimates in Future Vehicles 2030 for first introduction, with consequential delays to progress through adoption. Update forecast definitions, particularly for A2.	Section 6
C1 Interoperable Cooperative ITS	Delay forecast uptake due to slower and more variable progress towards adoption	Section 7
C2 Embedded mobile data connectivity	Extend forecast to 2031 on current basis	Section 7
E1 Electric Vehicles	Extend forecast to 2031 on current basis	Section 8
S2 Vehicles *for hire with driver*	Discontinue forecast	Section 9

3. Review of Model for Technology Adoption

3.1 What was used in Future Vehicles 2030?

The pattern of technology adoption in the forecasts has been informed by a technology adoption life-cycle based around the *diffusion of innovation theory* developed by E M Rogers in 1962 and in common use since. A key implication of this theory is that uptake initially follows a gradual pace, before accelerating and then slowing again as saturation is approached. Sales penetration rates informed by this approach follow an S-curve shape. The speed of progress through the curve was estimated for each forecast area based on available evidence, including of previous adoptions of technology.

Figure 3.1 Technology adoption life-cycle stages and sales penetration by stage



Source: Majchrzak et al, 2015

Refer to Section 3.1 and Appendix A in the Future Vehicles 2030 report for full discussion on this model.

3.2 Recent developments

At the time of research and publication for Future Vehicles 2030, this approach to understanding adoption of vehicle technologies was seeing some use however many other forecasts followed quite different patterns. This S-curve pattern was evident in some work 18 months ago, such as the BITRE (2019) forecasts for Electric Vehicle uptake that were informed by actual uptake around the world. Since that time there has been a general shift in forecasts towards S-curve patterns, particularly as other forecasts for uptake of Highly Automated Driving have become more conservative (and closer to where Future Vehicles 2030 was). In consultation with BITRE, their analysis indicates sales penetration of recent vehicle technologies in Australia tends to roughly approximate an S-curve. BITRE adopts a forecasting model based on the S-curve for various vehicle technologies, such as Auto Emergency Braking (AEB) and Lane Keeping Assist (LKA).

3.3 Continued use for Future Vehicles 2031

Recent developments support the continued use of the technology adoption life-cycle and the resulting S-curve for sales penetration. No change has been made to the use of this general guidance model, however this does not preclude changes being recommended to forecast sales (and consequently also fleet) penetration within individual forecast areas.

4. Review of Model for Fleet Adoption

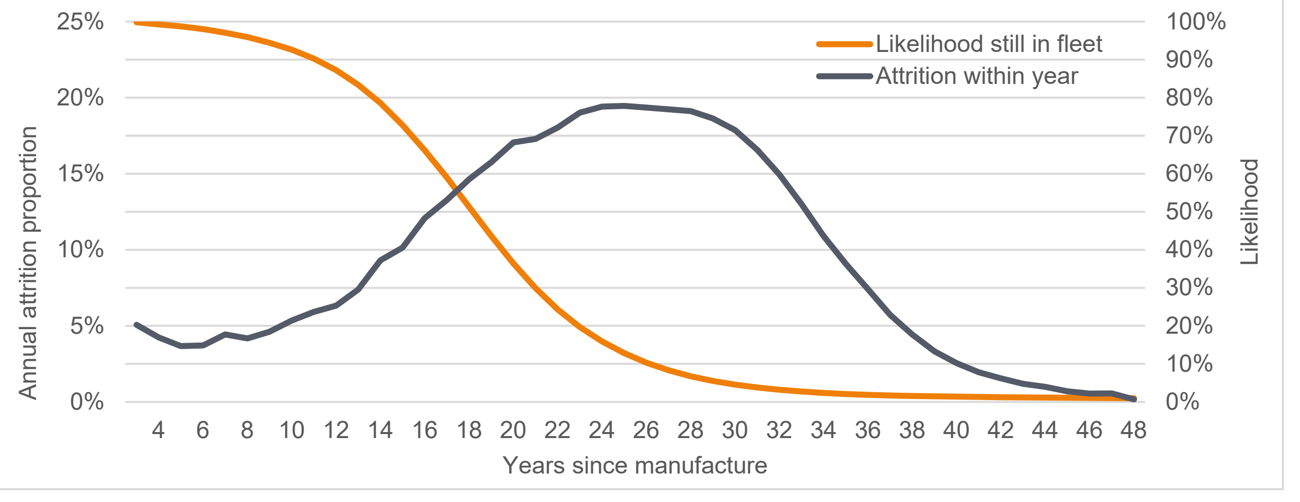
4.1 What was used in Future Vehicles 2030?

The fleet penetration model is used to convert estimates of current and future sales proportions into estimates of prevalence within the fleet.

A model was constructed for Future Vehicles 2030 using detailed time-series data available from the ABS Motor Vehicle Census (ABS, 2019). Patterns were considered for multiple vehicle types, however the basis for the forecasts was the pattern for passenger vehicles, covering both cars and SUVs.

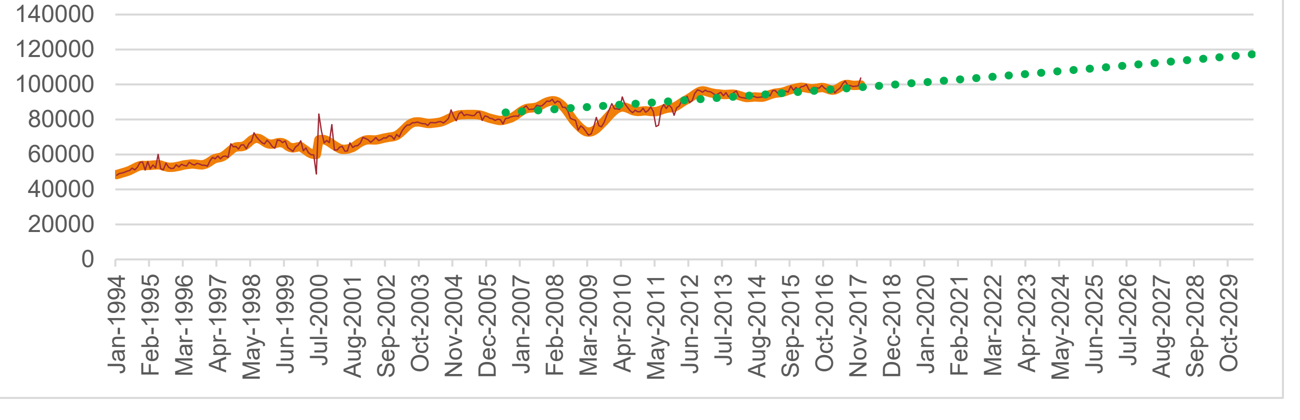
The general pattern of attrition from the fleet is shown in the figure below.

Figure 4.1 Likelihood that a passenger car of a certain age is still in the fleet



Across the time-series used from the ABS (2019), variance was observable from year to year and month to month in vehicle sales levels, such as from dips around recession periods. The trendline in the figure below indicates a small level of annual growth over the long term (1.4% p.a.). This is consistent with the pattern across recent years, notwithstanding differences between the years.

Figure 4.2 Monthly motor vehicle sales - trend and forecast



Refer to Section 3.2 and Appendix B in the Future Vehicles 2030 report for full discussion on this model.

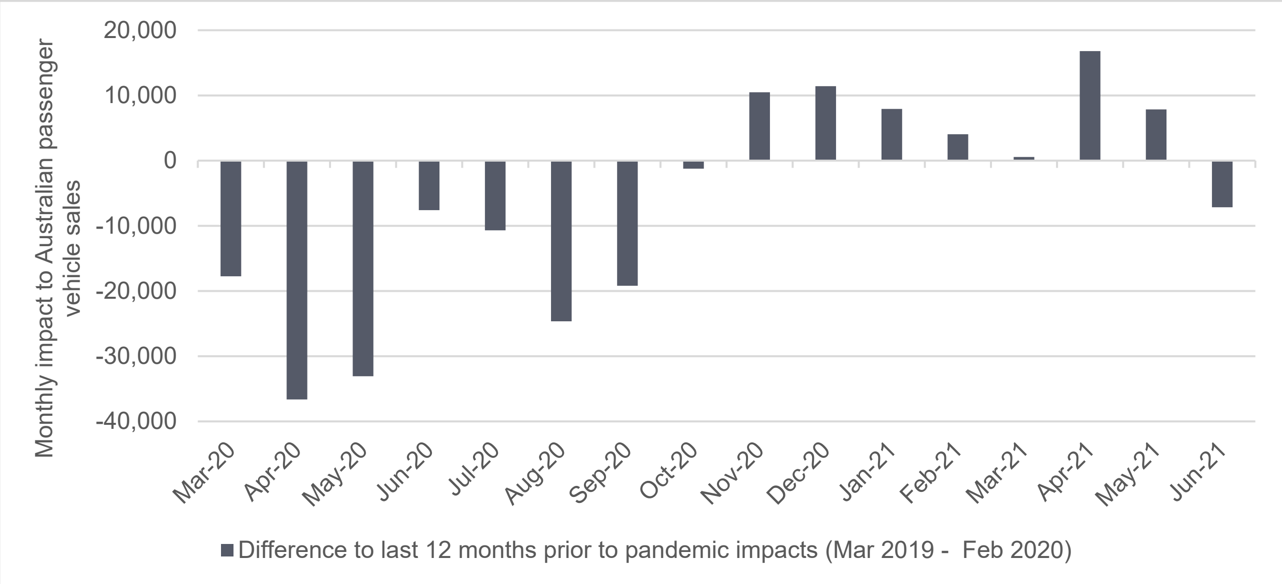
4.2 Recent developments

A frequent question of interest during the last 12 months has been what impact the COVID-19 pandemic, lockdowns and economic consequences have had on vehicle sales and the impact of this on the forecasts.

Official FCAI sales data (VFACTS) has been used to assess data from during the pandemic compared to data from the same month 12 months prior.

Prior to the COVID-19 lockdowns in Australia, the trend had already been for weakness in new vehicle sales, for example sales in January and February 2020 were down 12.5% and 10.3% respectively compared to one year prior. This downturn in sales strengthened during lockdown periods, with both the first national lockdown and the extended duration Victorian second lockdown evident in the figures below.

Figure 4.3 Impact of COVID-19 on new passenger vehicle sales in Australia



The overall change across the first 12-month period after start of lockdowns (March 2020 to February 2021) was a reduction in new vehicle sales of 11.2% compared to the preceding 12-month period. The strongest reductions were in April and May 2020, partly offset by increases in later months. The reduction over that first 12-months was equivalent to a loss of between one- and two-months' worth of sales.

Although sales have generally also been stronger in recent months, there are headwinds to continued strength in sales, such as shortage of semiconductors slowing supply. A shortage became evident during 2020 however the initial impact on vehicle supply did not prevent the recovery in sales. Concern about the shortage has grown during 2021 (e.g. Ewing and Boudette, 2021) along with specific announcements of automotive factory shutdowns due to a lack of supply.

4.3 Continued use for Future Vehicles 2031

No change has been made to the vehicle turnover model used to estimate fleet penetration. Although COVID-19 lockdowns and related economic impacts do show up in the data, the extent of impact is within a normal range of impacts for changes in vehicle sales. The semiconductor shortage is emerging as a risk to vehicle sales, however the extent of impact is as yet unclear and appears most likely to be similar to or smaller than the direct COVID-19 lockdown impact.

No clear indication is evident of a longer-term sustained change in vehicle acquisition and disposal patterns, although attention is warranted in future reviews from the impacts to supply in the short term as well as impacts in the medium to longer term with the transition towards Electric Vehicles.

5. Review of Forecast for Active Safety Systems

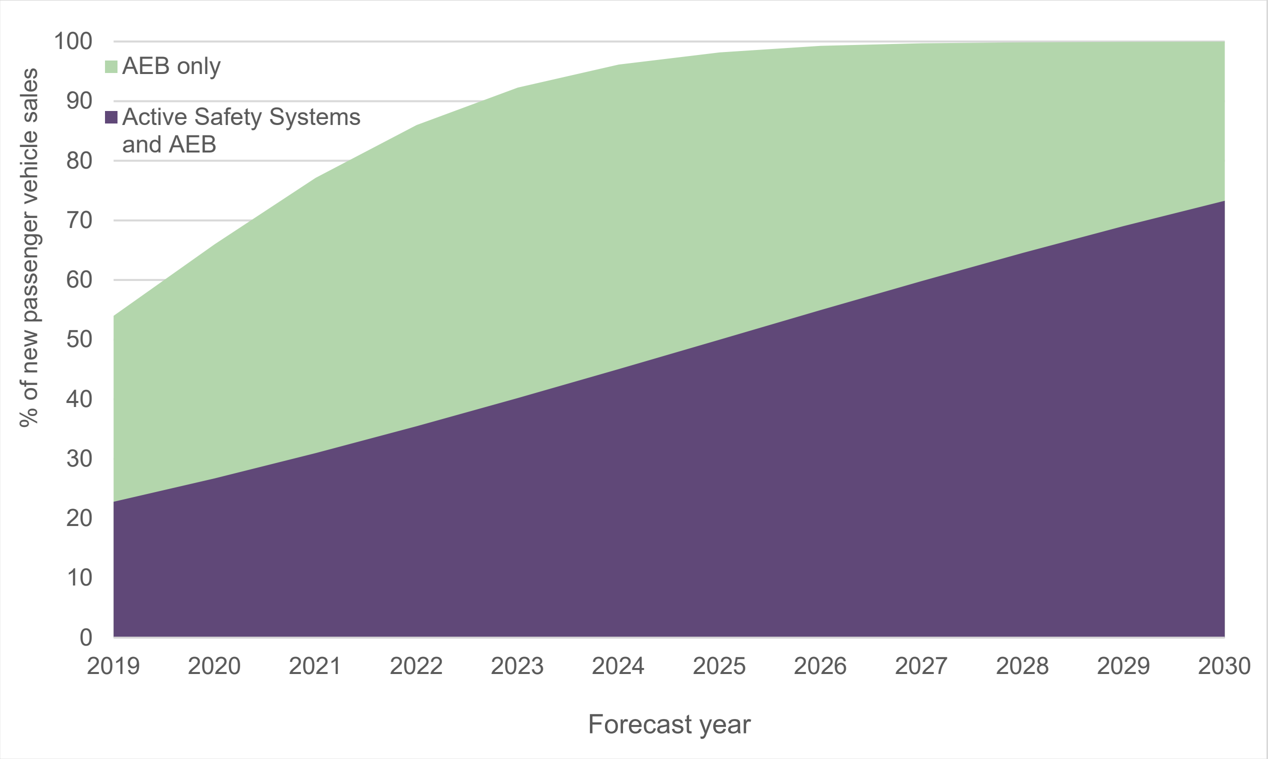
Forecast A1 covers *Active Safety Systems,* defined as covering vehicles equipped with multiple Active Safety Systems that provide driver support with a primary focus on Lane Keeping Assist (LKA) and Adaptive Cruise Control (ACC).

Section 4.1 and Appendix C in the Future Vehicles 2030 report cover this forecast.

5.1 What was forecast in Future Vehicles 2030?

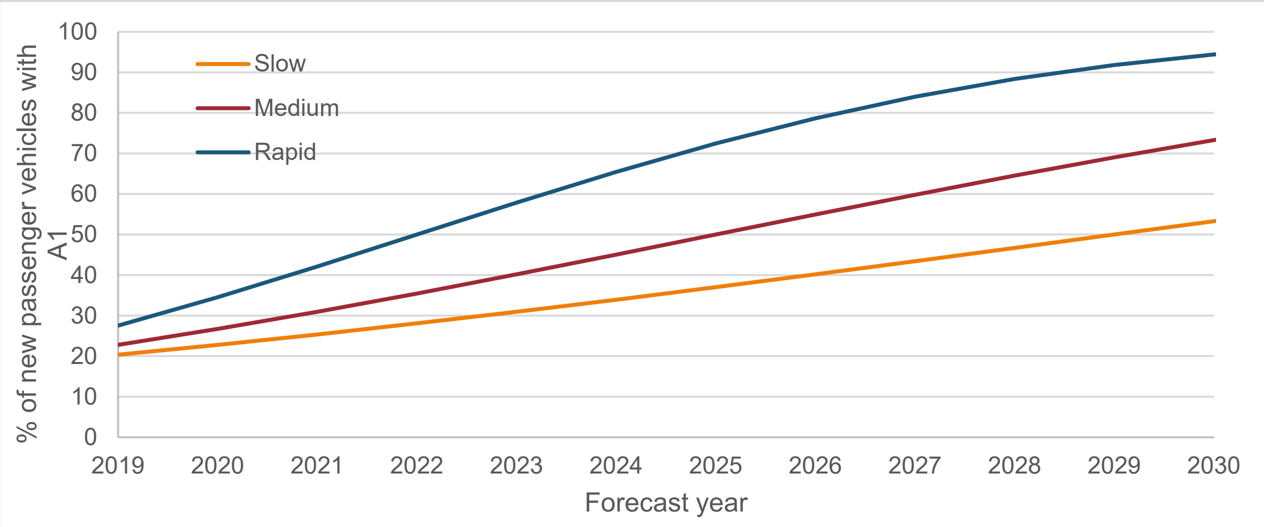
The forecast for Active Safety Systems anticipated that uptake would continue a rapid growth phase through (at least) the period until 2030. The related feature of Auto Emergency Braking (AEB) was forecast to complete the late phases of its sales penetration growth, reaching effective saturation during the period 2025 – 2030. Although Auto Emergency Braking (AEB) was not a required forecast for Future Vehicles 2030, it was included to assist to provide context to the forecasts for Active Safety Systems.

Figure 5.1 Forecast for AEB and Active Safety Systems sales uptake, medium scenario



The sales forecast is reproduced above as this is where each technology-specific forecast is undertaken. The fleet forecast is a product of this sales forecast and the general fleet penetration model discussed in Section 4.

Figure 5.2 Forecast A1 (sales): Active Safety Systems as a % of new passenger vehicles sold



5.2 Recent developments and discussion

At this stage of uptake of Active Safety Systems, the anticipated trend would be to see an increasing number of models having standard fitment of both Lane Keeping Assist (LKA) and Adaptive Cruise Control (ACC). This appears to be happening, particularly for newly released or updated models. While the forecast covers passenger vehicles (cars and SUVs), it is useful to note that the top-selling light commercial vehicle, Toyota Hilux, now also has both ACC and a variant of LKA fitted as standard to all models across the range (Toyota, 2020).

The table below sets out Active Safety System fitment on the ten top-selling new Australian passenger vehicles for a three month period, based on VFACTS sales data for December 2020, January 2021 and February 2021. These ten models represent around 56,000 total sales in this three-month period, which is only 22% of the total 259,295 passenger vehicle sales, showing the diversity of models in this market.

Table 5.1: Active Safety Systems on top selling passenger vehicles in Australia in February 2021

Make and Model	Sales Dec 2020 to Feb 2021	Lane Keeping Assistance	Adaptive Cruise Control
Toyota RAV4	9,358	Standard on most models in range, other models have warning only	Standard on all models in range
Toyota Corolla	7,005	Standard on most models in range, other models have warning only	Standard on all models in range
Mazda CX-5	6,189	Standard on all models in range	Standard on all models in range
Hyundai i30	6,158	Standard on all models in range	Standard on most models in range
Toyota Prado	5,300	Standard on all models in range	Standard on all models in range
Toyota LandCruiser	5,606	Limited availability	Limited availability
Mitsubishi ASX	4,523	Limited or no availability	Limited or no availability
Nissan X-Trail	~4,500	Top spec models only	Top spec models only
Kia Cerato	~4,300	Standard on all models in range	Limited availability
Hyundai Kona	4,199	Standard on all models in range	Standard on all models in range

Most of the top selling models have extensive or standard fitment of Active Safety Systems. The models with the least availability tend to have early introduction dates for the first model in that generation, e.g. Toyota LandCruiser (2007), Mitsubishi ASX (2010) and Nissan X-Trail (2013).

For AEB fitment to Australian light vehicles, there is potential regulatory action in progress (DITRDC, 2020). The recommended option would mandate the fitment of AEB to newly introduced light vehicle models from 1 July 2022 and to all new light vehicles from 1 July 2024.

5.3 What adjustment has been made?

The uptake of Active Safety Systems (LKA and ACC) appears to be tracking ahead of the forecast. Forecast sales penetration for 2021 was 31% in the medium scenario (and 42% in the rapid scenario), whereas implied current uptake based on top selling models is closer to 70%. After consultation with industry stakeholders, it is as yet unclear however whether this observed pattern represents a sustained acceleration in uptake or an outlying data point.

A change has been made to the rapid forecast for Active Safety Systems to reflect the observation that current uptake may be running significantly ahead of forecast levels. For the medium and slow forecasts, it is recommended to reconsider the data in the next review period to validate whether the apparent acceleration has been sustained.

The supporting forecast for AEB was included in Future Vehicles 2030 to provide context for the forecasts for Active Safety Systems. An extended or updated forecast for AEB is not provided within this addendum report.

5.4 Adjusted and extended forecast for C2 Embedded Mobile Connectivity

The tables and figures provide the extended forecast for C2 Embedded Mobile Data Connectivity through to 2031.

Table 5.2: Future Vehicles 2031 comparison of sales and fleet forecasts for 2031 compared to 2030

Uptake scenario	2025 sales	2030 sales	2031 sales	2025 fleet	2030 fleet	2031 fleet
Slow	37%	53%	57%	16%	28%	32%
Medium	50%	73%	77%	19%	37%	41%
Rapid (updated)	**90%**	**~100%**	**~100%**	**32%**	**59%**	**64%**
Rapid (previous)	73%	94%	n/a	26%	50%	n/a

The acceleration of the rapid forecast leads to an acceleration of both sales uptake and fleet penetration in this scenario. For example, sales in 2025 increase from 73% to 90% in the rapid scenario and fleet penetration in 2030 increases from 50% to 59% in the rapid scenario.

Figure 5.3: Future Vehicles 2031 extended and updated sales forecast for A1 Active Safety Systems

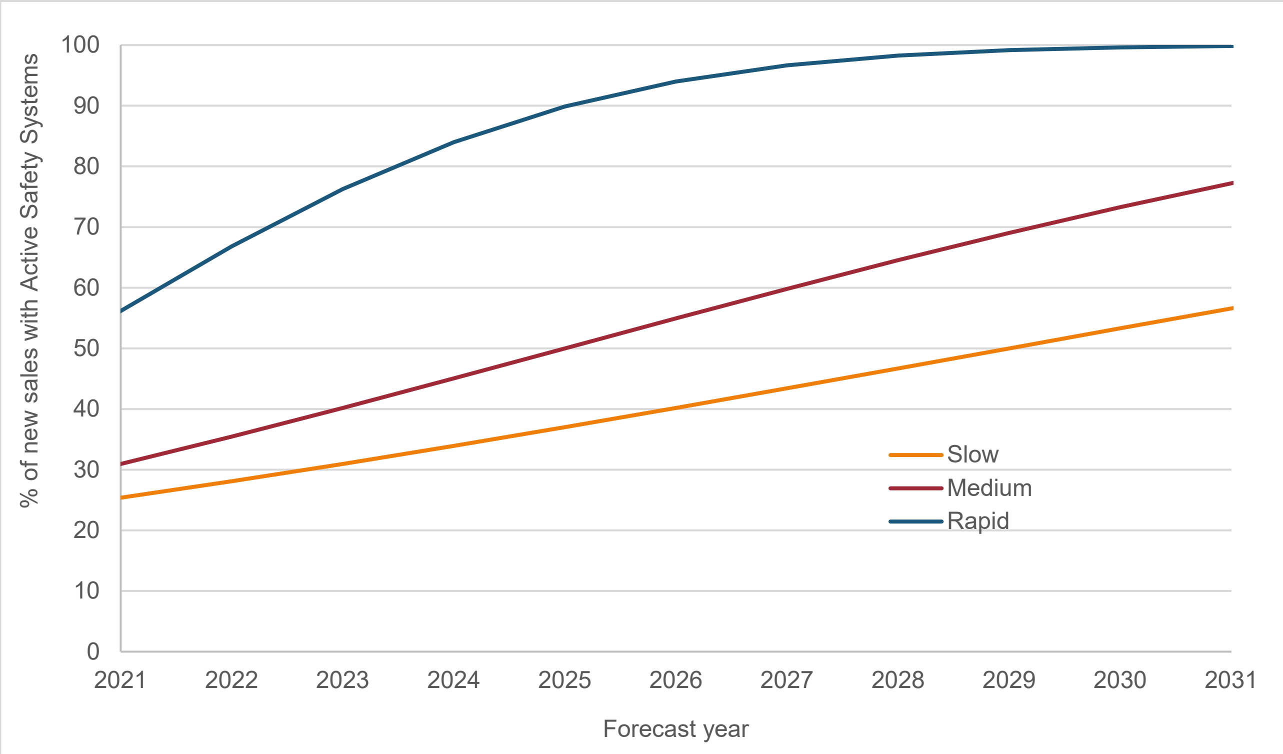
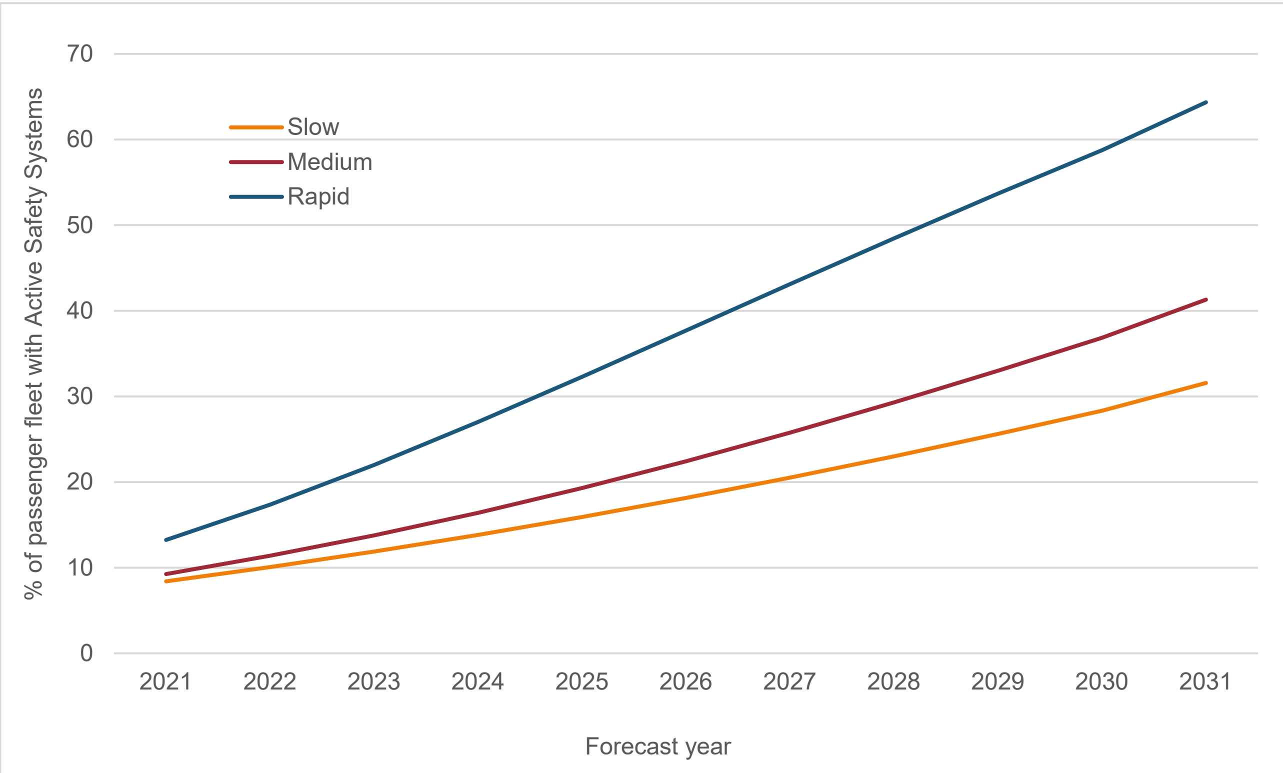


Figure 5.4: Future Vehicles 2031 extended and updated fleet forecast for A1 Active Safety Systems



6. Review of Forecasts for Highly Automated Driving

In Future Vehicles 2030, this group of forecasts covered:

- Forecast A2 for *Highly Automated motorway driving*, defined as vehicles capable of operating without a driver available to take over control on motorway segments, but not full door to door journeys;
- Forecast A4 for *Highly Automated Driving for many urban journeys*, defined as vehicles capable of operating without a driver on a high proportion of full door to door urban journeys, as well as on urban and higher volume rural motorways; and
- Forecast A5 for *Highly Automated Driving for many rural journeys*, defined as vehicles capable of operating without a driver on rural roads as well as motorways.

This group of three forecasts is further defined as covering incremental functionality, such that a vehicle capable of A5 is also capable of A4 and A2.

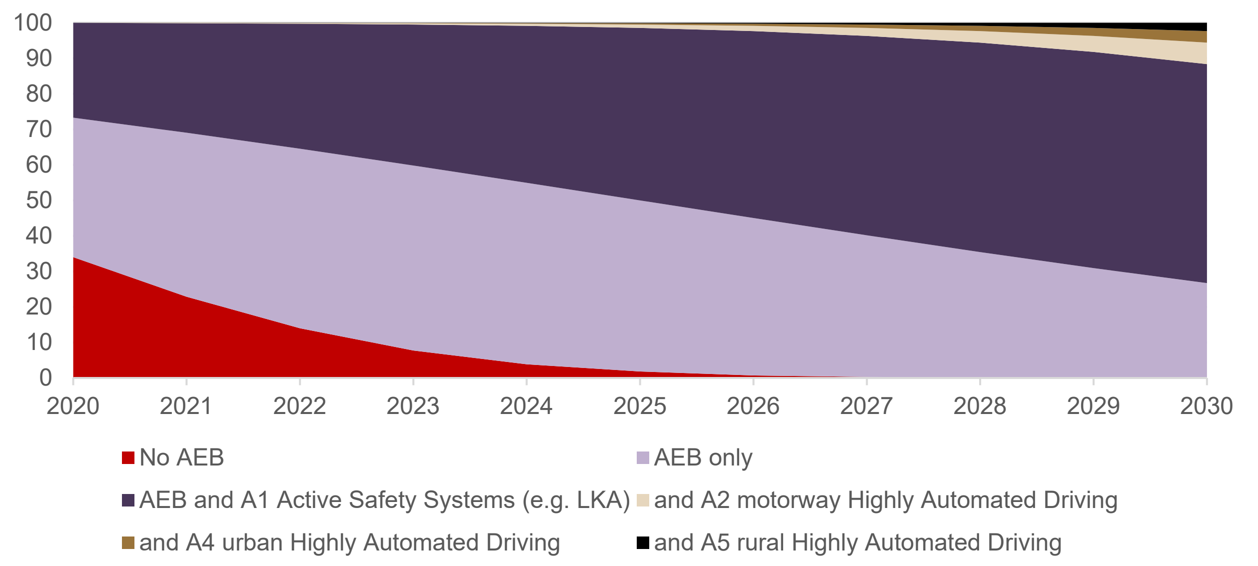
Section 4.1 and Appendix D in the Future Vehicles 2030 report cover this group of forecasts.

It is noted that the forecasts align primarily with Operational Design Domains (ODDs) rather than Society of Automotive Engineers (SAE) levels of automotive driving. All three forecasts cover functionalities within SAE Level 4 (L4) automation, although there was some allowance for forecast A2 (motorway driving) to include vehicles capable only of SAE L3 automation (in which the driver needs to remain available to resume control).

6.1 What was forecast in Future Vehicles 2030?

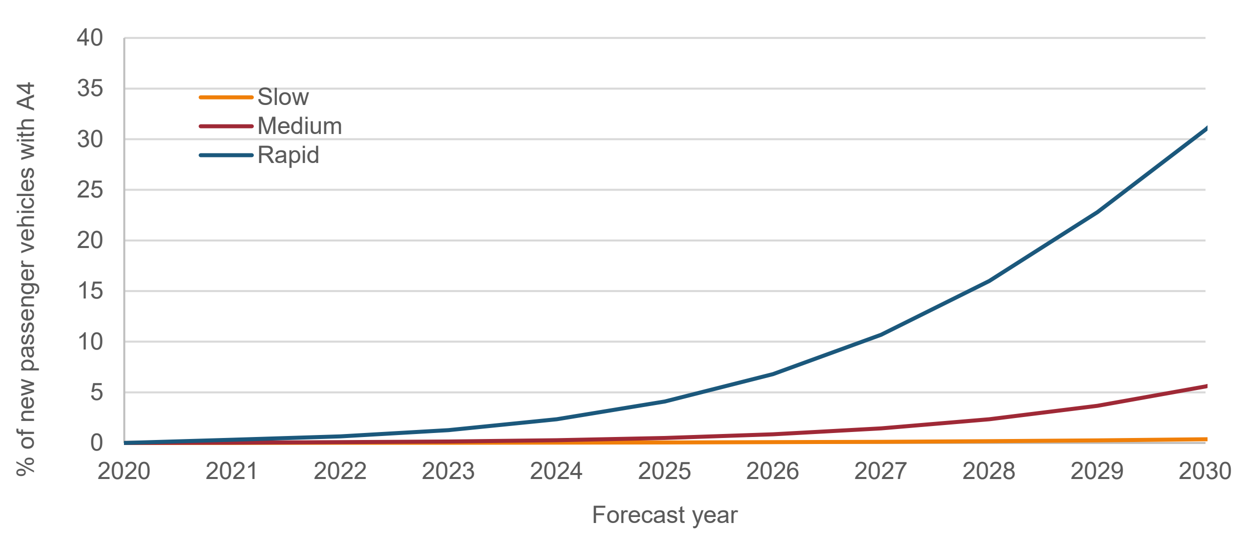
The medium forecast for Highly Automated Driving was for only a minority (~12%) of vehicles sold in 2030 to be capable of any form of Highly Automated Driving, with many of these capable only of Highly Automated Driving in motorway and motorway-like settings. The first availability of this vehicle capability was forecast to be in 2021 for motorway-like settings, with urban capability forecast to follow in 2024.

Figure 6.1 Medium forecast for vehicles capable of Highly Automated Driving as a % of vehicles sold



The levels of uncertainty in these forecasts led to a significant range between the slow and rapid forecasts, as shown in the image below for urban settings (A4). By 2030, the slow forecast was for <1% of vehicles sold to be capable of Highly Automated Driving in urban settings, ranging up to 31% of sales in the rapid adoption scenario.

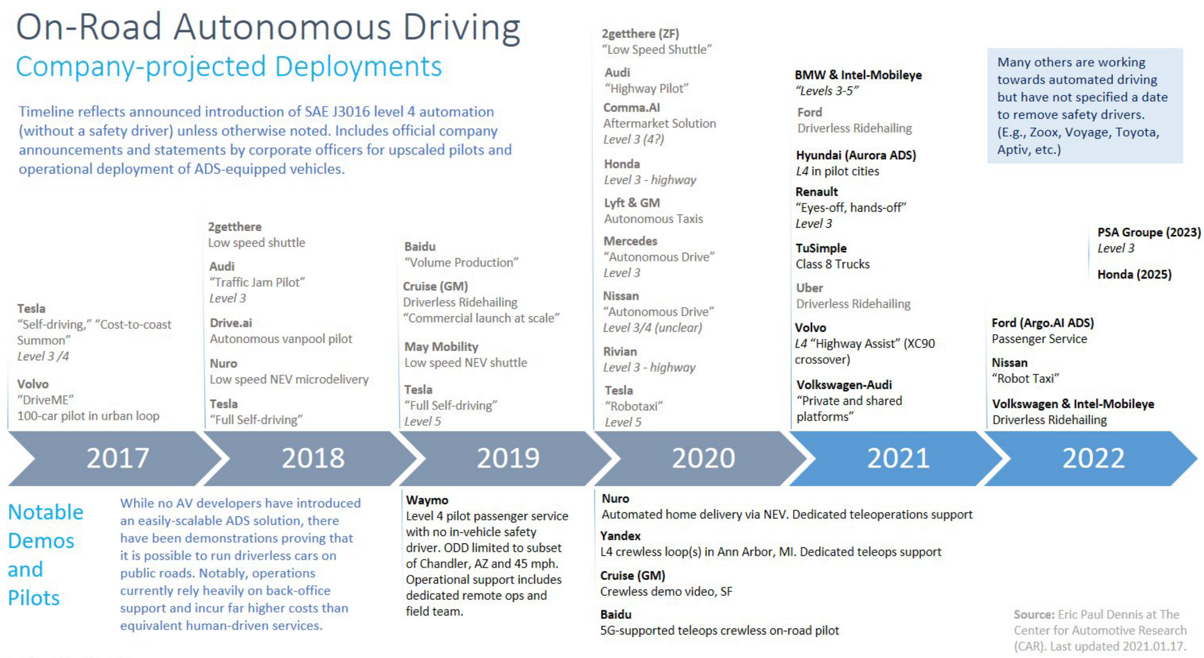
Figure 6.2 Forecast range for vehicles sold capable of Highly Automated Driving in urban settings (A4)



6.2 Recent developments and discussion

At the time of production of forecasts for Future Vehicles 2030, the forecast uptake rates for both sales uptake and fleet penetration were significantly more conservative (slower) in Future Vehicles 2030 than in comparative forecasts. A section of the report (Section D6) was included to specifically explore this difference and explain why it was appropriate for the Future Vehicles 2030 forecasts to be running many years behind projected uptake and penetration in these other forecasts.

Figure 6.3 Announced dates for Highly Automated Driving (top) and achieved milestones (bottom)



Source: Dennis, 2021

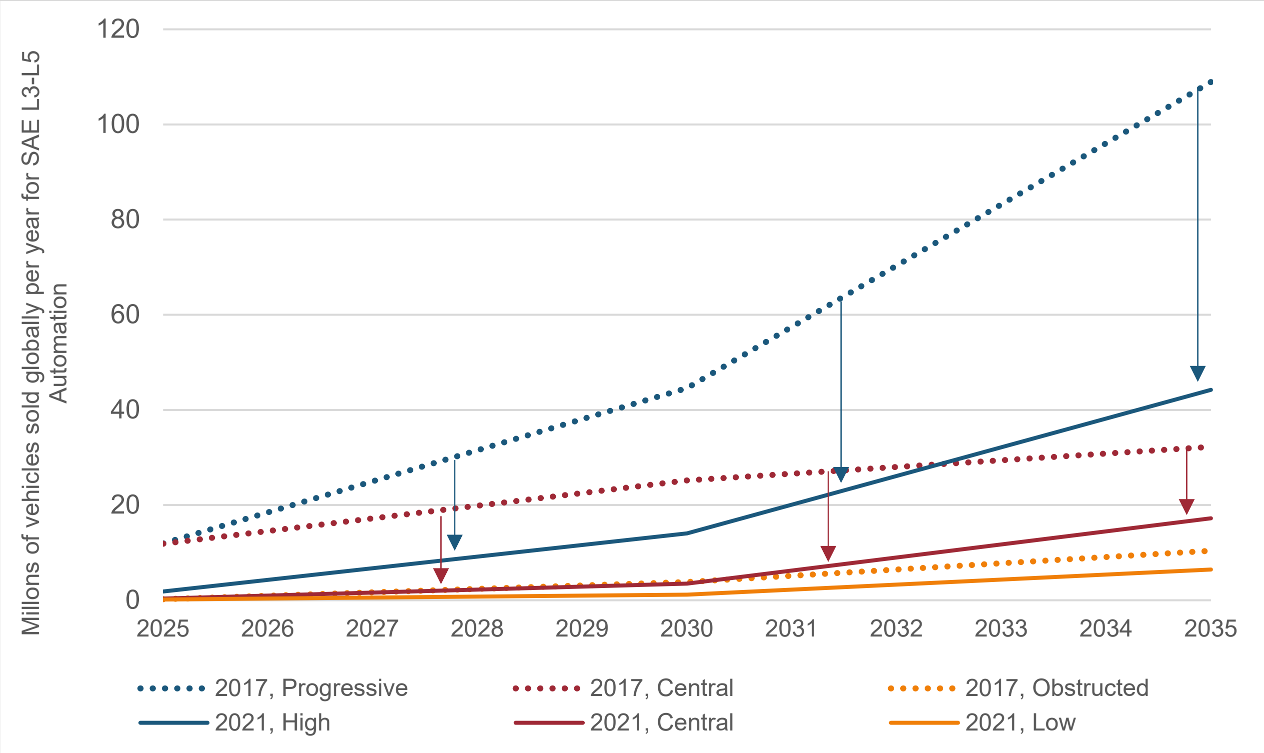
Since Future Vehicles 2030 there have been further announcements of slippages. For example, the image above from an analyst at the Center for Automotive Research (Dennis, 2021) shows that although a range of manufacturers and developers had previously announced that market availability for Highly Automated Driving would occur in 2020 (or earlier), the only deployments of Highly Automated Driving remain limited pilots and demonstrations.

Examples of recent statements indicating delayed ambitions by manufacturers and governments include:

- The Volkswagen Group CEO stated in late 2020 that he anticipated Highly Automated Driving to be first available for sale between 2025 and 2030 (Automotive News Europe, 2020)
- The Chinese Government is planning for Highly Automated Driving to be available by 2025 and account for 20% of sales by 2030 (Tabeta, 2020)

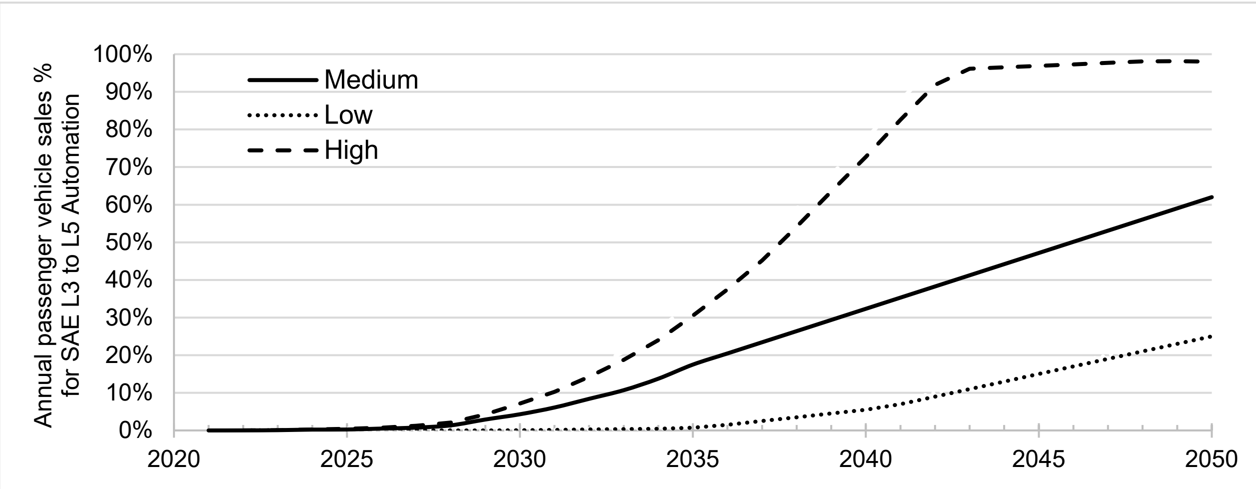
During the last 18 months there has been a significant adjustment in comparative forecasts such that the most recent forecasts are now either similar to those in Future Vehicles 2030 or more conservative. One example that typifies the updates to forecasts can be seen in comparing the UK Connected Places Catapult (2021) to the Transport Systems Catapult (2017) market forecast. In the image below, the 2017 forecasts are shown in dashed lines and the equivalent 2021 forecasts are shown in solid lines. There is a clear downward shift right across the forecast period from 2025 – 2035, representing both later introduction and slower growth.

Figure 6.4 Differences between UK Catapult 2021 and 2017 forecasts



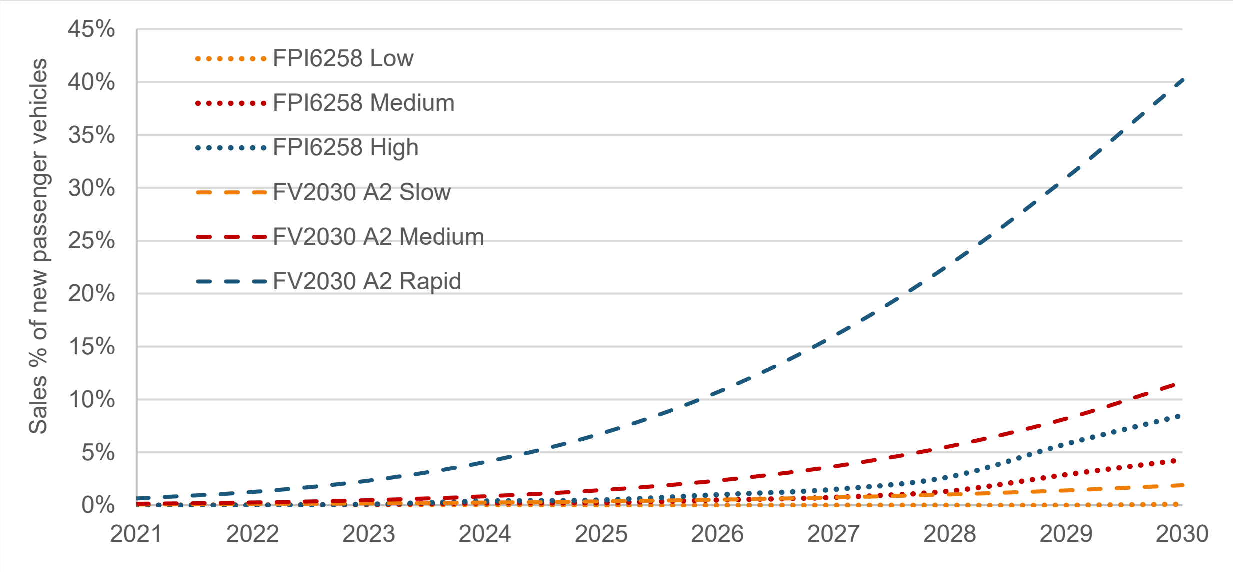
In a current project (FPI6258) being undertaken by ARRB for Austroads, scenarios of Automated Driving uptake are being estimated through to 2050 to inform advice on physical infrastructure investment.

Figure 6.5 Draft scenarios for passenger vehicle sales for Automated Driving SAE L3-L5 in Austroads FPI6258



The figure below compares the FPI6258 scenarios with the Future Vehicles 2030 forecasts, for the forecast category A2 as this has the strongest definition alignment (although remaining a slight mismatch in definition). For each of the uptake rate scenarios (slow / low, medium and rapid / high), the more recent evidence used in FPI6258 has contributed to a less optimistic forecast (slower or later adoption).

Figure 6.6 Comparison of Future Vehicles 2030 and FPI6258 scenarios for passenger vehicle sales



The FPI6258 forecast scenarios are informed by both a recent (February 2021) literature review and interviews and workshops with a wide range of industry stakeholders. This means that they reflect updated evidence and assumptions compared to the Future Vehicles 2030 forecasts.

BITRE is understood to be developing forecasts of uptake for Automated Driving along with other vehicle features. Consultation has been undertaken with BITRE regarding the draft forecasts in their work, Austroads FPI6258 and this project to update the Future Vehicles 2030 forecasts. There appears to be general alignment between the draft forecasts, with differences primarily being associated with differences in purpose. For example, the high scenario for FPI6258 is deliberatively aggressive in nature to allow testing by an economic model of 'what if' questions if uptake were to occur at that rate.

6.3 What adjustment has been made?

The uptake of Highly Automated Driving appears to be progressing behind the evidence used for the Future Vehicles 2030 forecasts, which were themselves much less optimistic than comparative forecasts at that time.

A change has accordingly been made to the estimates of first availability of the technology (see Table 6.2 below), informed by both a work in a current Austroads project (FPI6258) and discussions with BITRE. This adjustment has the effect of delaying estimates of first availability for two years in each of the rapid and medium scenarios and three years in the slow scenario.

As discussed in the Future Vehicles 2030 report, the date for first adoption is only one input into forecasts of adoption and care should be taken not to place too much emphasis on these dates over the general adoption patterns predicted by the forecasts. The first adoption date has been shown in the table above as the simplest way of indicating the nature of change to the forecasts.

Reasons for delayed forecasts of adoption compared to Future Vehicles 2030 include:

- Progress towards Automated Driving remains behind previous public statements by developers that formed part of the evidence base for Future Vehicles 2030; and
- Further consideration to the likely time lag for first availability in Australia and New Zealand compared to some overseas markets.

An additional change has been made to the structure of the forecasts to reflect changes in how developers appear to be progressing plans for making technologies available to market. An example of this is Honda undertaking a limited launch of SAE Level 3 Traffic Jam Pilot in 100 leased Honda Legends in Japan (Honda, 2020).

Table 6.1: Updated and previous (Future Vehicles 2030) forecast definitions

Code	Updated definition	Previous definition
A2	*Conditional Automation* such as Traffic Jam Pilot or Motorway Pilot. Minimum automation level is SAE L3, with a driver not continuously monitoring but available for fall-back. Note: no current Australian and New Zealand market products (such as Traffic Jam Assist or Autopilot) meet this definition.	*Highly Automated motorway driving*, defined as vehicles capable of operating without a driver available to take over control on motorway segments, but not full door to door journeys. Although strict interpretation of definition required SAE L4, some allowance was made for inclusion of SAE L3 motorway driving.
A4	*Highly Automated Driving – early ODDs* covers expected early Operational Design Domains (ODDs) such as some full door to door urban journeys and urban and higher volume rural motorways. The minimum automation level is SAE L4 – no fall-back ready driver. This definition is broadly similar to the Future Vehicles 2030 definition for forecast A4.	*Highly Automated Driving for many urban journeys*, defined as vehicles capable of operating without a driver on a high proportion of full door to door urban journeys, as well as on urban and higher volume rural motorways
A5	*Highly Automated Driving – broader ODDs* covers expected a broader range of ODDs, extending to more urban and rural roads and conditions. The minimum automation level is SAE L4 – no fall-back ready driver. This definition is broadly similar to the Future Vehicles 2030 definition for forecast A5.	*Highly Automated Driving for many rural journeys*, defined as vehicles capable of operating without a driver on rural roads as well as motorways

The changes in definitions mean:

- Forecast A2 now explicitly includes conditional automation such as Traffic Jam Pilot and considers this on urban roads as well as motorways; and
- Forecasts A4 and A5 see more minor adjustments, with an explicit rather than implicit use of the language of ODDs.

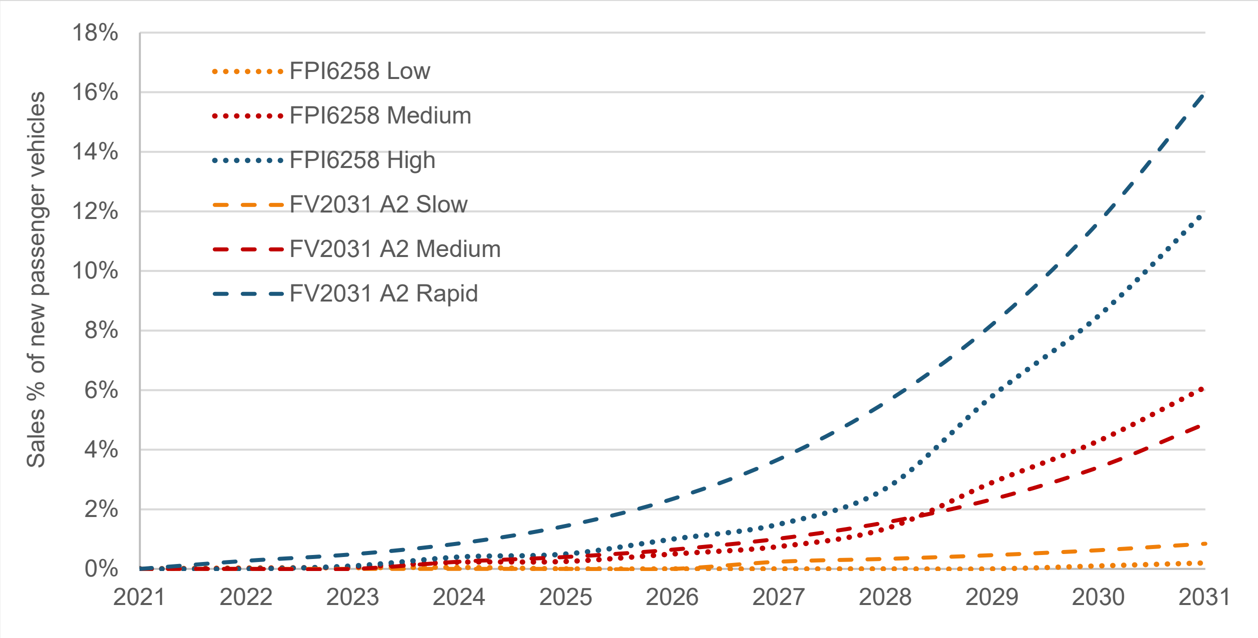
Table 6.2: Updated and previous (Future Vehicles 2030) dates forecast for technology to be first available in Australia

Uptake scenario	Conditional Automation	Highly Automated Driving – early ODDs	Highly Automated Driving – broader ODDs
Slow (updated)	**2027**	**Beyond 2031**	**Beyond 2031**
Slow (previous)	2024*	2029	2030
Medium (updated)	**2024**	**2026**	**2028**
Medium (previous)	2022*	2024	2026
Rapid (updated)	**2022**	**2023**	**2025**
Rapid (previous)	2020*	2021	2023

* Note that the updated definition of forecast A2 (Conditional Automation) differs from the previous definition of this forecast.

The figure below follows on from Figure 6.6 to illustrate the improved alignment with Austroads project FPI6258 following updates to the Future Vehicles 2031 forecasts. Following the updates, there remains some difference between the Future Vehicles 2031 forecasts and the scenarios considered in FPI6258, however these are much reduced.

Figure 6.7 Comparison of updated Future Vehicles 2031 forecasts and FPI6258 scenarios



6.4 Updated forecast for A2 Conditional Automation

The tables and figures below provide the revised and extended forecast for A2 Conditional Automation.

Table 6.3: Future Vehicles 2031 comparison of updated and previous sales and fleet forecasts

Uptake scenario	2025 sales	2030 sales	2031 sales	2025 fleet	2030 fleet	2031 fleet
Slow (updated)	**None**	**<1%**	**<1%**	**None**	**<1%**	**<1%**
Slow (previous)*	<1%	2%	n/a	<1%	<1%	n/a
Medium (updated)	**<1%**	**3%**	**5%**	**<1%**	**<1%**	**1%**
Medium (previous)*	1%	12%	n/a	<1%	2%	n/a
Rapid (updated)	**1%**	**12%**	**16%**	**<1%**	**2%**	**3%**
Rapid (previous)*	7%	40%	n/a	1%	8%	n/a

Note that as discussed in Section 6.3, the definition for forecast A2 has been updated compared to that used for Future Vehicles 2030. The updated definition provides more explicit inclusion of Conditional Automation SAE L3 including on urban roads (e.g. some applications of Traffic Jam Pilot) as well as motorways.

Figure 6.8: Future Vehicles 2031 updated and extended sales forecast for A2 Conditional Automation

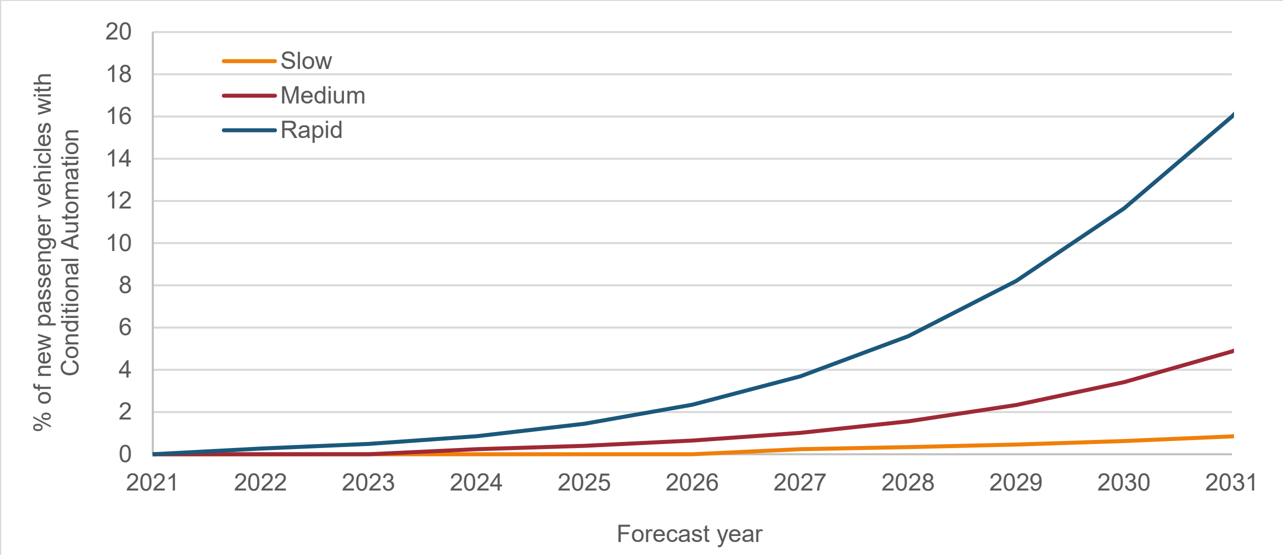
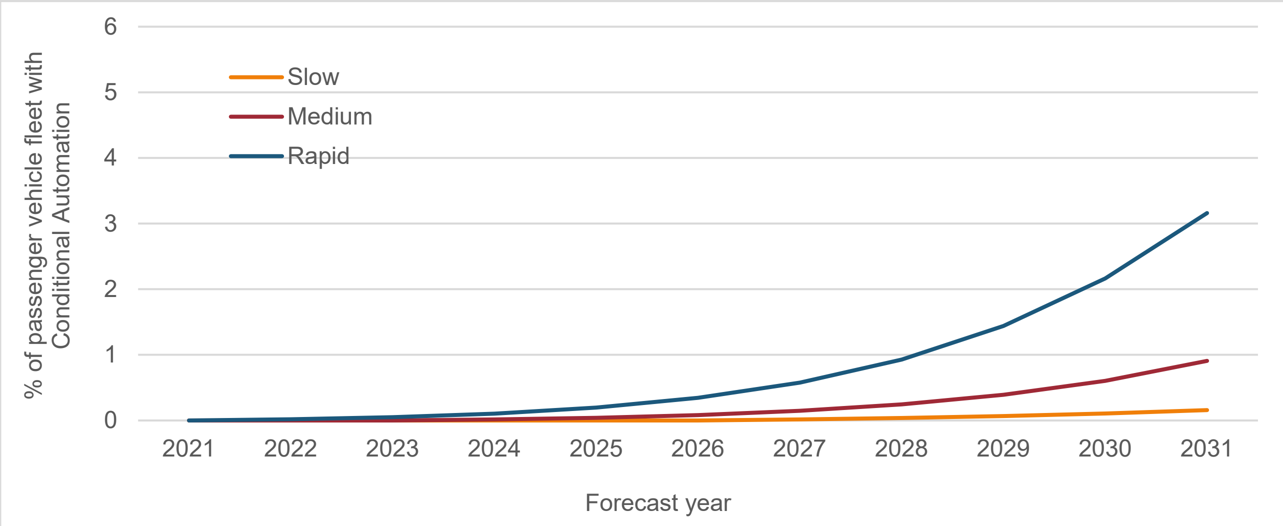


Figure 6.9: Future Vehicles 2031 updated and extended fleet forecast for A2 Conditional Automation



6.5 Updated forecast for A4 Highly Automated Driving (Early ODDs)

The tables and figures below provide the revised and extended forecast for A4 Highly Automated Driving (early ODDs). As noted in Section 6.3, these early ODDs include some full door to door urban journeys and urban and higher volume rural motorways.

Table 6.4: Future Vehicles 2031 comparison of updated and previous sales and fleet forecasts

Uptake scenario	2025 sales	2030 sales	2031 sales	2025 fleet	2030 fleet	2031 fleet
Slow (updated)	**None**	**None**	**None**	**None**	**None**	**None**
Slow (previous)	None	<1%	n/a	None	<1%	n/a
Medium (updated)	**None**	**2%**	**2%**	**None**	**<1%**	**<1%**
Medium (previous)	<1%	6%	n/a	<1%	1%	n/a
Rapid (updated)	**1%**	**8%**	**12%**	**<1%**	**1%**	**1%**
Rapid (previous)	4%	31%	n/a	<1%	4%	n/a

Figure 6.10: Future Vehicles 2031 updated and extended sales forecast for A4 Highly Automated Driving (early ODDs)

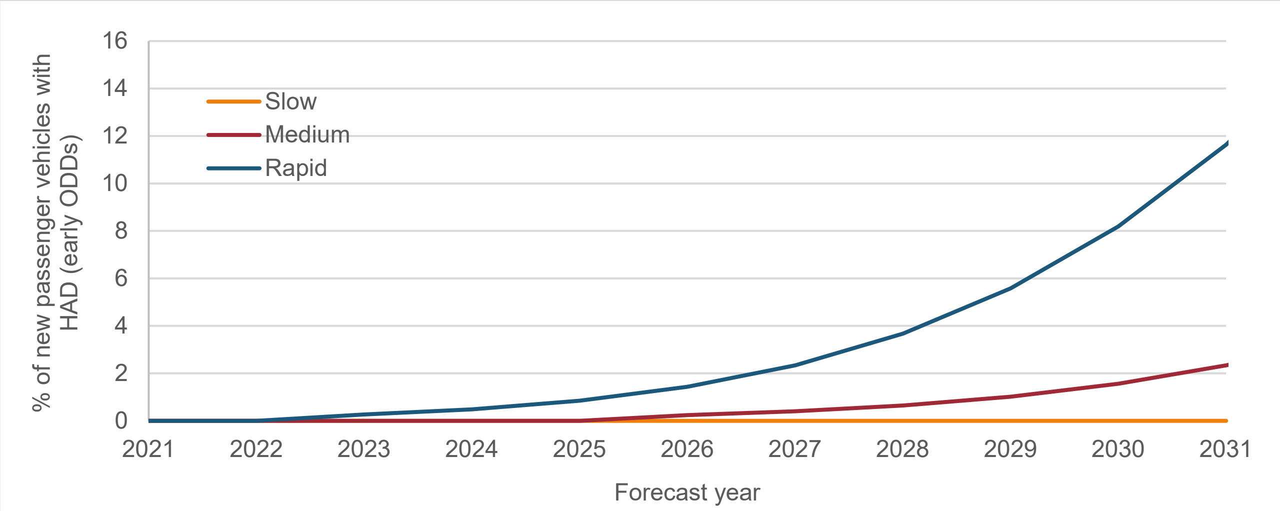
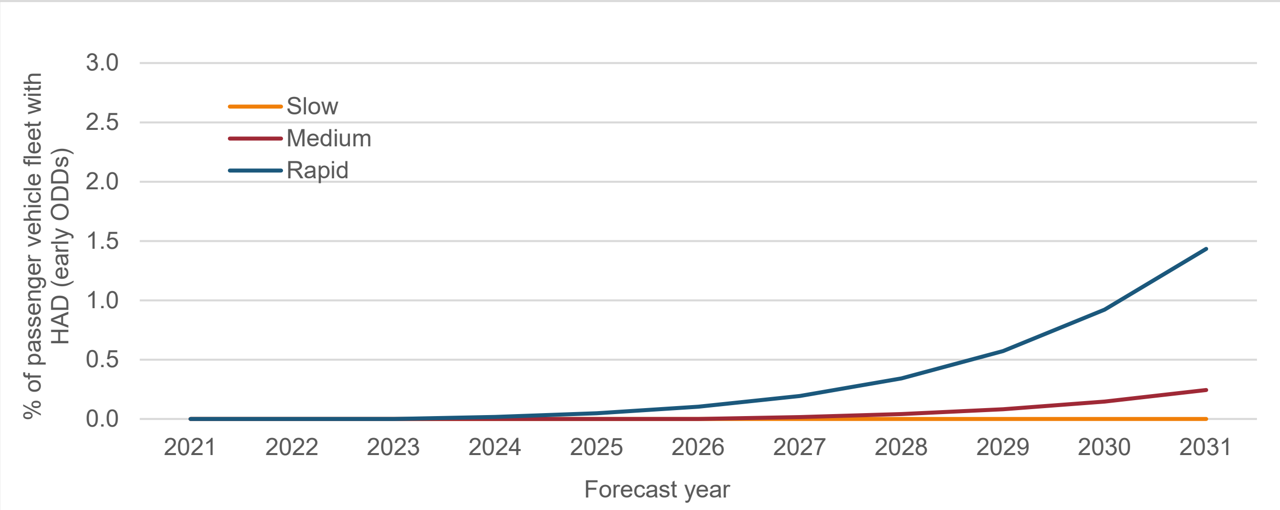


Figure 6.11: Future Vehicles 2031 updated and extended fleet forecast for A4 Highly Automated Driving (early ODDs)



6.6 Updated forecast for A5 Highly Automated Driving (Broader ODDs)

The tables and figures below provide the revised and extended forecast for A5 Highly Automated Driving (broader ODDs). As noted in Section 6.3, these broader ODDs extend to more urban and rural roads and conditions than for forecast A4.

Table 6.5: Future Vehicles 2031 comparison of updated and previous sales and fleet forecasts

Uptake scenario	2025 sales	2030 sales	2031 sales	2025 fleet	2030 fleet	2031 fleet
Slow (updated)	**None**	**None**	**None**	**None**	**None**	**None**
Slow (previous)	None	<1%	n/a	None	<1%	n/a
Medium (updated)	**None**	**<1%**	**1%**	**None**	**<1%**	**<1%**
Medium (previous)	None	2%	n/a	None	<1%	n/a
Rapid (updated)	**<1%**	**4%**	**6%**	**<1%**	**<1%**	**<1%**
Rapid (previous)	1%	16%	n/a	<1%	2%	n/a

Figure 6.12: Future Vehicles 2031 updated and extended sales forecast for A5 Highly Automated Driving (broader ODDs)

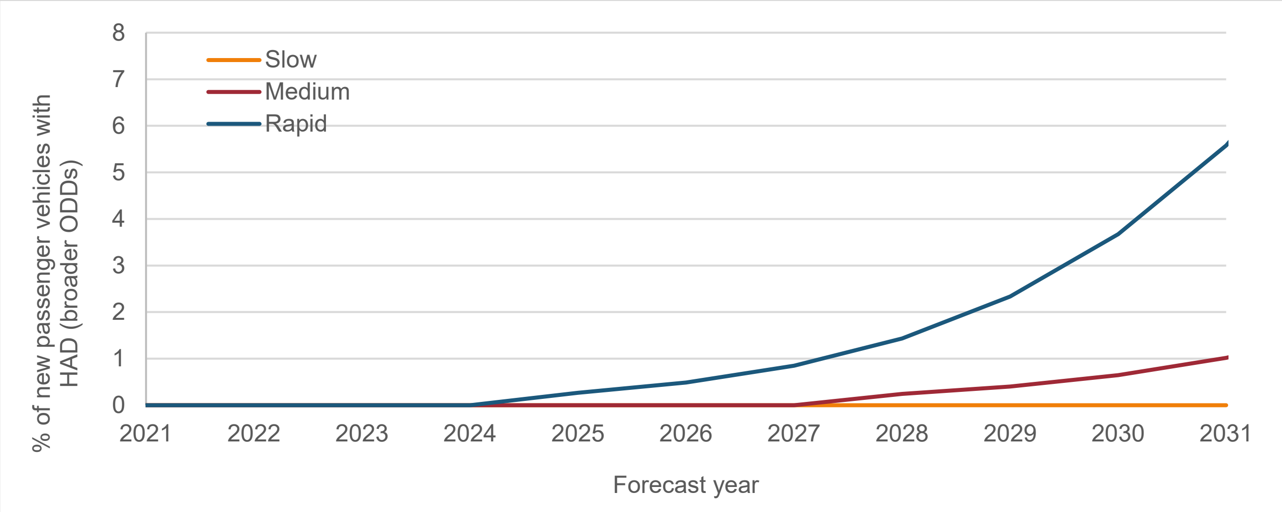
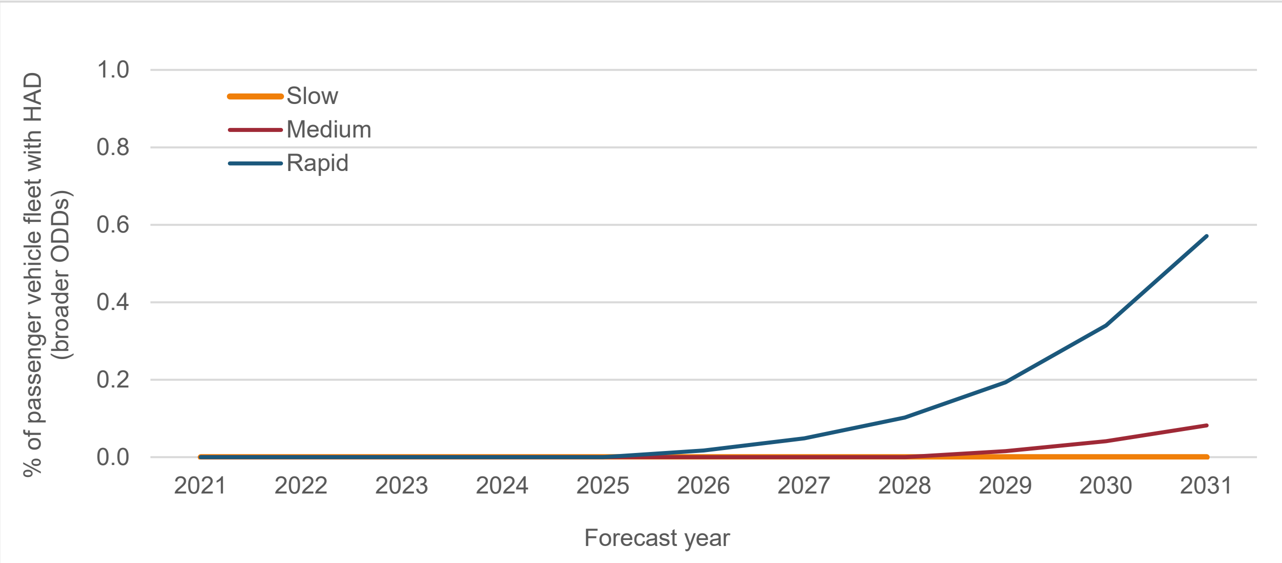


Figure 6.13: Future Vehicles 2031 updated and extended fleet forecast for A4 Highly Automated Driving (broader ODDs)



6.7 Updated forecast for all included Automated Driving types

The charts below combine the updated and extended forecasts for each of the forecasts covered in Sections 5.4, 6.4, 6.5 and 6.6. The first of these charts shows the sales forecasts for the medium scenario, followed then by the rapid and slow scenarios.

Figure 6.14: Future Vehicles 2031 updated and extended sales forecast all Automated Driving types – medium

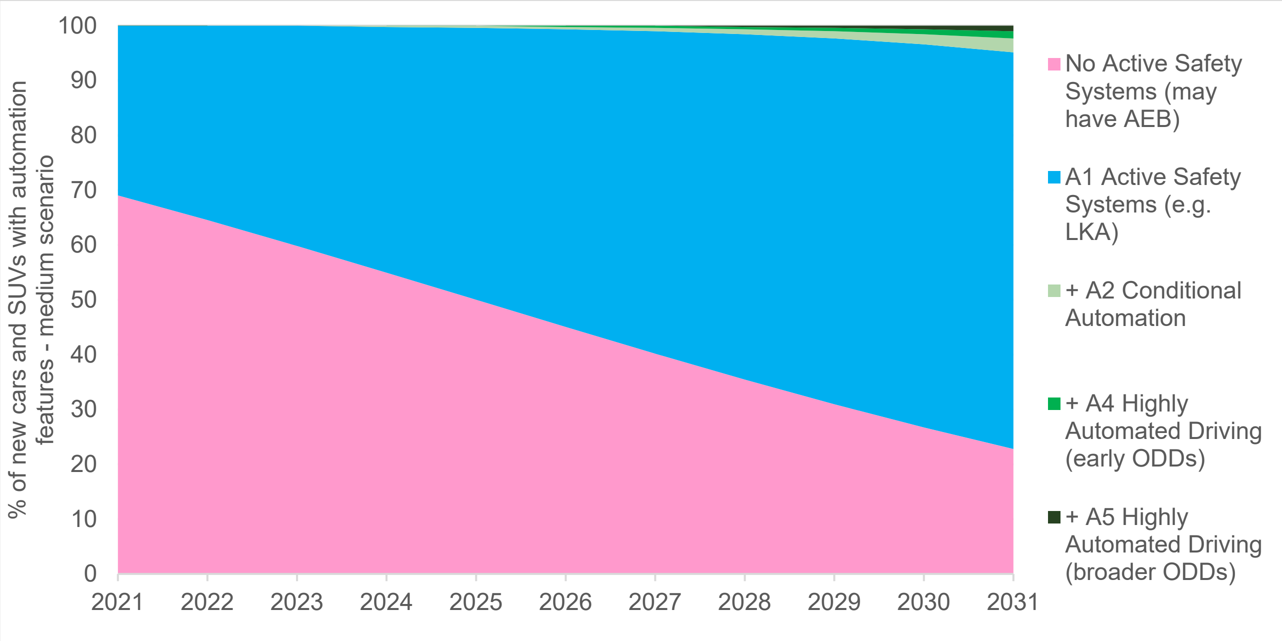


Figure 6.15: Future Vehicles 2031 updated and extended sales forecast all Automated Driving types – rapid

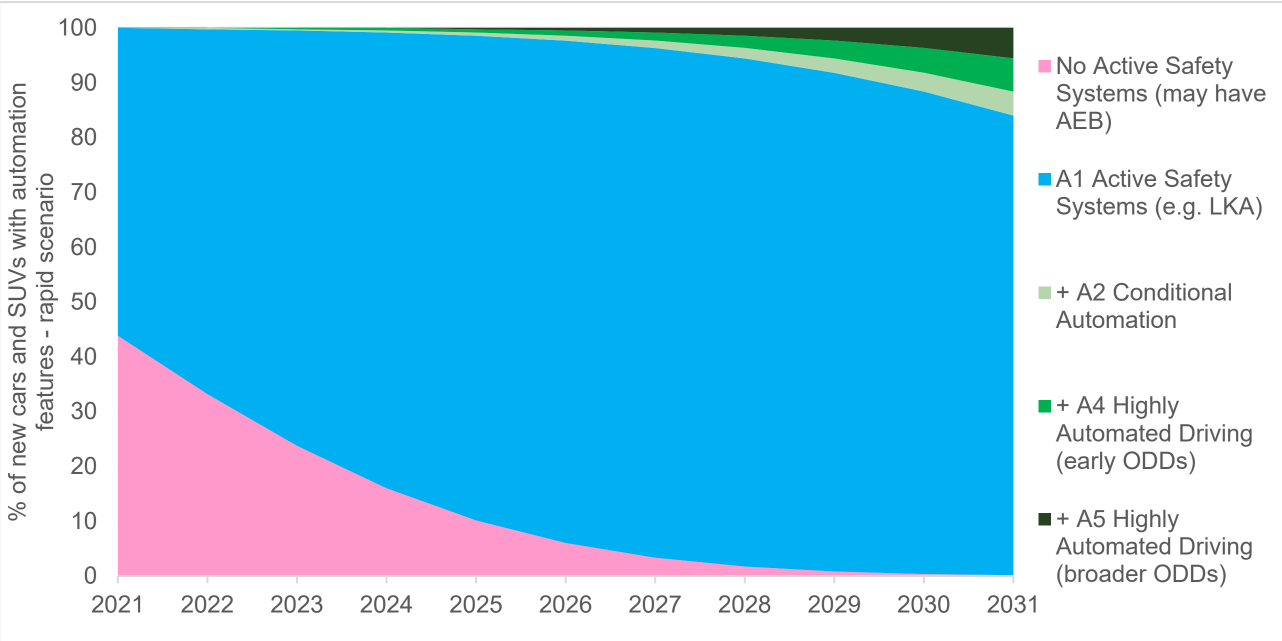
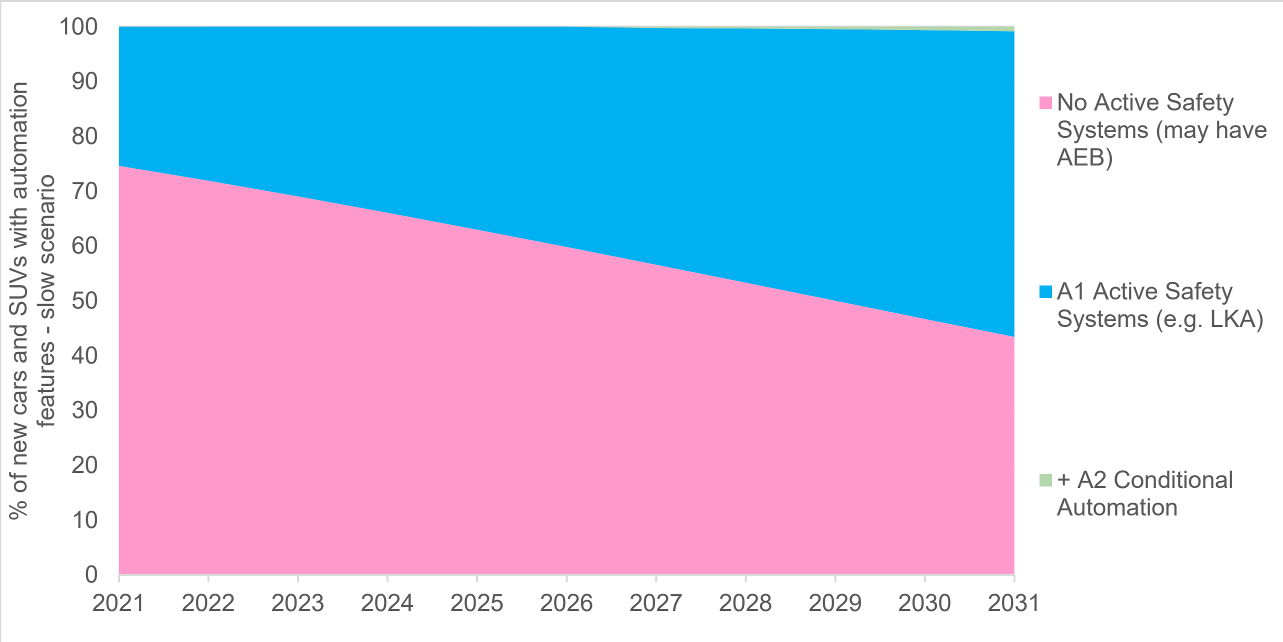


Figure 6.16: Future Vehicles 2031 updated and extended sales forecast all Automated Driving types – slow



7. Review of Forecasts for Vehicle Connectivity

This group of forecasts covers:

- Forecast C1 for vehicles equipped with standards-based interoperable Cooperative ITS systems
- Forecast C2 for vehicles with embedded mobile data connectivity to the cloud that could be used for a variety of services such as live traffic information, over-the-air updates, automated crash notification, concierge and booking services

The forecast for C1 is not dependent on one specific communications standard for Cooperative ITS but rather considers both major candidates: the European ETSI standards (ETSI G5 as used in the Queensland CAVI trials) and the emerging C-V2X standards.

A key requirement for forecast C2 was that connectivity was embedded in the vehicle and not dependent on pairing to a smartphone.

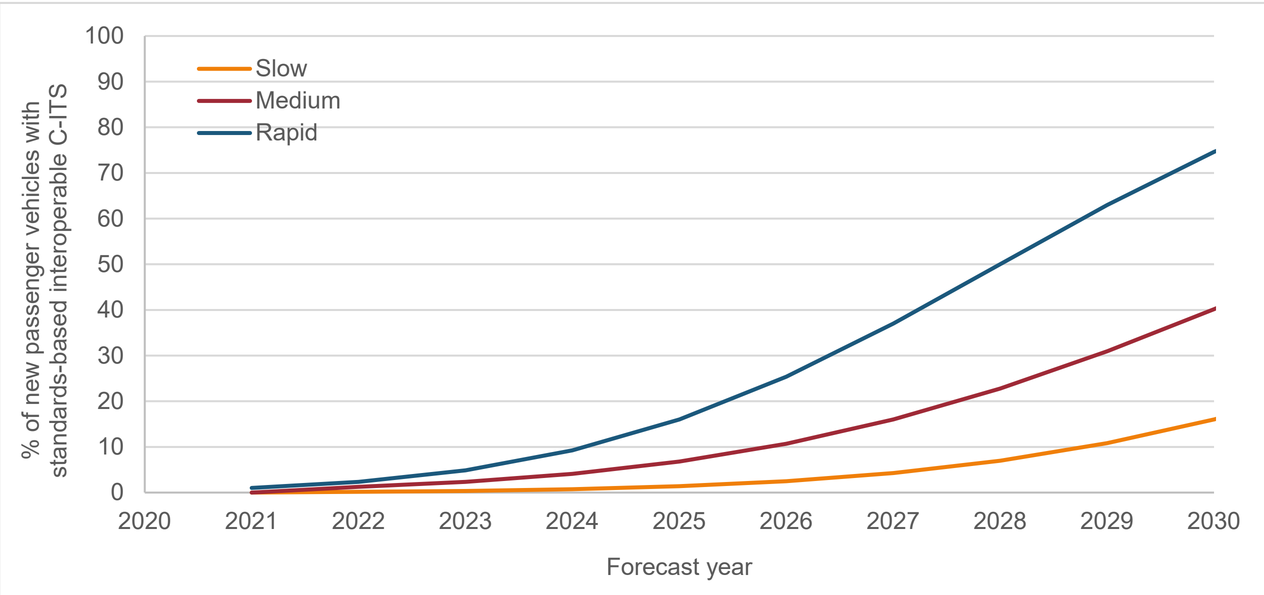
The two forecasts in this category are not interdependent, however it was assumed based on industry intelligence that it was likely that vehicles equipped with Cooperative ITS (C1) would also be equipped with embedded connectivity to the cloud (C2).

Section 4.2 and Appendices E and F in the Future Vehicles 2030 report cover these forecasts.

7.1 What was forecast in Future Vehicles 2030?

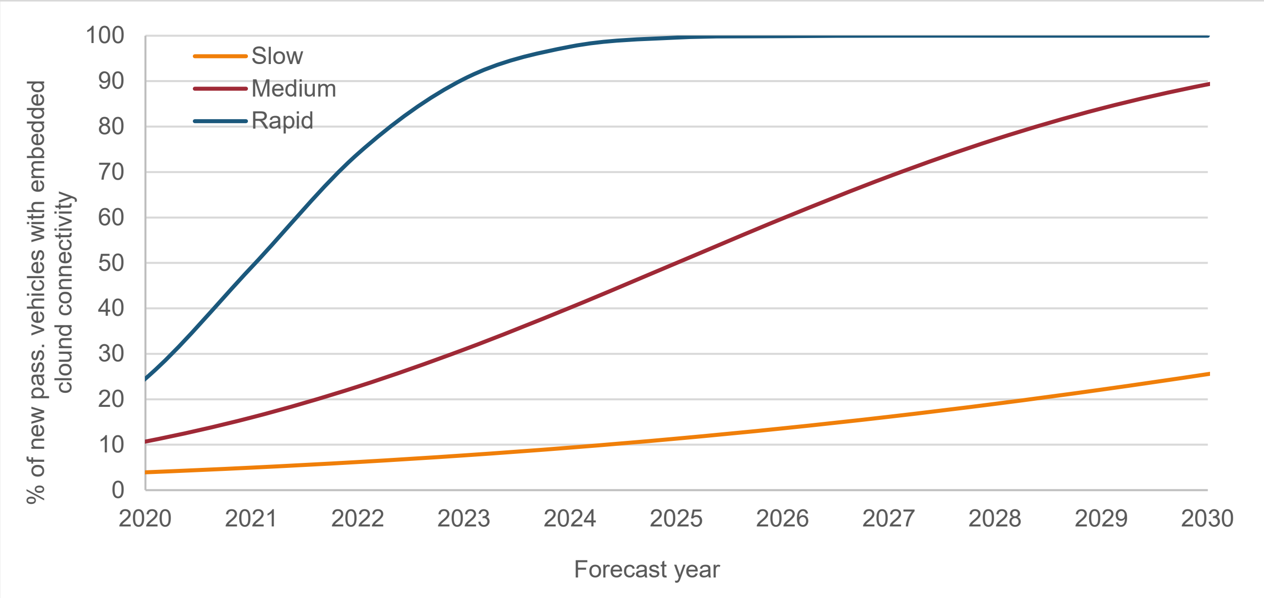
For standards-based interoperable C-ITS (forecast C1), the forecast was for first adoption to start in 2021, with sales uptake increasing to a range between 16 – 75% (medium = 40%) by 2030.

Figure 7.1 Forecast range for vehicles sold with standards-based interoperable C-ITS (C1)



For embedded connectivity to the cloud (forecast C2), the forecast was for adoption to continue, with sales uptake increasing to nearly 100% by 2025 in the rapid case but to only 26% by 2030 in the slow uptake scenario. This forecast area reflects the limited availability of local data (hence the gap in estimates even in 2020) and the local market uptake lagging other developed markets such as Europe, North America and Japan.

Figure 7.2 Forecast range for vehicles sold with embedded cloud connectivity (C2)



7.2 Recent developments and discussion

7.2.1 Standards-based interoperable C-ITS

For standards-based interoperable C-ITS, the period since the Future Vehicles 2030 forecasts has been one of volatility and uncertainty:

In November 2020, concluding a process that had been in discussion for several years, the US Federal Communications Commission (FCC) reallocated the lower 45MHz of the 5.9 GHz band to unlicensed use (e.g. for WiFi). The upper 30MHz was maintained for Intelligent Transport applications but designated for the C-V2X technology rather than the DSRC technology that had been primarily used in the US up to that point. Applications using DSRC will need to transition to C-V2X over time (FCC, 2020). The move to C-V2X has been supported by some manufacturers. In January 2019, Ford committed to introducing C-V2X in all new vehicle models in the US market, beginning in 2022 (Butler, 2019).

In Europe, the European Commission issued in May 2019 a regulatory decision adopting the ETSI G5 standard (similar to DSRC), however this was withdrawn and replaced with a technology-neutral following a rare non-approval of this decision by the European Council in July 2019 (Valerio, 2019).

This regulatory uncertainty appears to have contributed to delays in availability on C-ITS on new vehicles. In October 2019, Volkswagen announced that the 8th generation Golf would be fitted with C-ITS as standard. It has since been confirmed that Australian market models will not be fitted with C-ITS upon introduction, with no announced plans for this to change.

The Volkswagen Golf announcement created industry excitement that the much-anticipated wide deployment of C-ITS on vehicles may finally be underway. Since that time, no notable announcements have been identified that show follow-on momentum with other vehicle models.

7.2.2 Embedded mobile data connectivity

For embedded mobile data connectivity, the period since the Future Vehicles 2030 forecasts has seen Australia and New Zealand continuing to see slower growth in fitment and uptake compared to other markets.

The forecast level of fitment of embedded connectivity to new passenger vehicles in Australia for 2020 ranged between 4% (slow) and 25% (rapid) with the medium scenario forecast at 11%. Forecasts at this level reflect an expectation that adoption would be continuing, through early adopter phases into early majority. For the move into the early majority phase we would expect to see mainstream brands starting to fit embedded connectivity as standard.

One mainstream brand to move most strongly towards embedded connectivity in Australia is Ford. All new models across the car, SUV and light commercial ranges now include the FordPass Connect embedded modem as standard (Ford Australia, 2020). With 59,601 vehicles sold during 2020, Ford represents around 6-7% of the Australian market for new light vehicles.

The mainstream brands such as Ford commencing standard fitment embedded connectivity follows on from premium brands such as BMW (around 2-3% share of sales) and Tesla (<1% share of total sales).

The combination of Ford and BMW would approximately reach the medium forecast even before considering other brands. It is therefore reasonable to conclude that the forecast is not too aggressive.

At the other end, the forecast could be too conservative if standard fitment was occurring on the highest volume mainstream brands such as Toyota, Mazda and Hyundai. This appears to be starting in select models (e.g. Yaris Cross as covered in Dowling, 2020) but not yet across the range. The forecast anticipates acceleration of growth through the coming years, which this pattern appears to fit with.

7.3 What adjustment has been made?

The Future Vehicles 2030 forecast for standards-based interoperable C-ITS used the available evidence base, including stakeholder input, to estimate first availability of the technology on Australian market production vehicles in 2021 for both the rapid and medium scenarios. This now appears unlikely to be achieved.

A change has been made to the forecast for standards-based interoperable C-ITS due to progress toward uptake running behind forecast levels. The adjustment has the effect of delaying each scenario by around two or three years.

For embedded connectivity to the cloud, the forecasts in Future Vehicles 2030 appear to be broadly appropriate – the medium forecast in particular appears neither too aggressive or too conservative. No change to this forecast is recommended.

7.4 Updated forecast for C1 Interoperable C-ITS

The tables and figures provide the revised and extended forecast for C1 Interoperable C-ITS through to 2031.

Table 7.1: Future Vehicles 2031 comparison of updated and previous sales and fleet forecasts

Uptake scenario	2025 sales	2030 sales	2031 sales	2025 fleet	2030 fleet	2031 fleet
Slow (updated)	**None**	**<1%**	**2%**	**None**	**<1%**	**<1%**
Slow (previous)	1%	16%	n/a	<1%	4%	n/a
Medium (updated)	**<1%**	**16%**	**25%**	**<1%**	**4%**	**6%**
Medium (previous)	7%	40%	n/a	2%	12%	n/a
Rapid (updated)	**2%**	**37%**	**50%**	**<1%**	**9%**	**13%**
Rapid (previous)	16%	75%	n/a	4%	23%	n/a

Following the update or revision, the updated medium scenario now follows close to the levels of the previous slow forecast. The updated rapid scenario is close to but slightly below the previous medium forecast.

Figure 7.3: Future Vehicles 2031 extended sales forecast for C1 Interoperable C-ITS

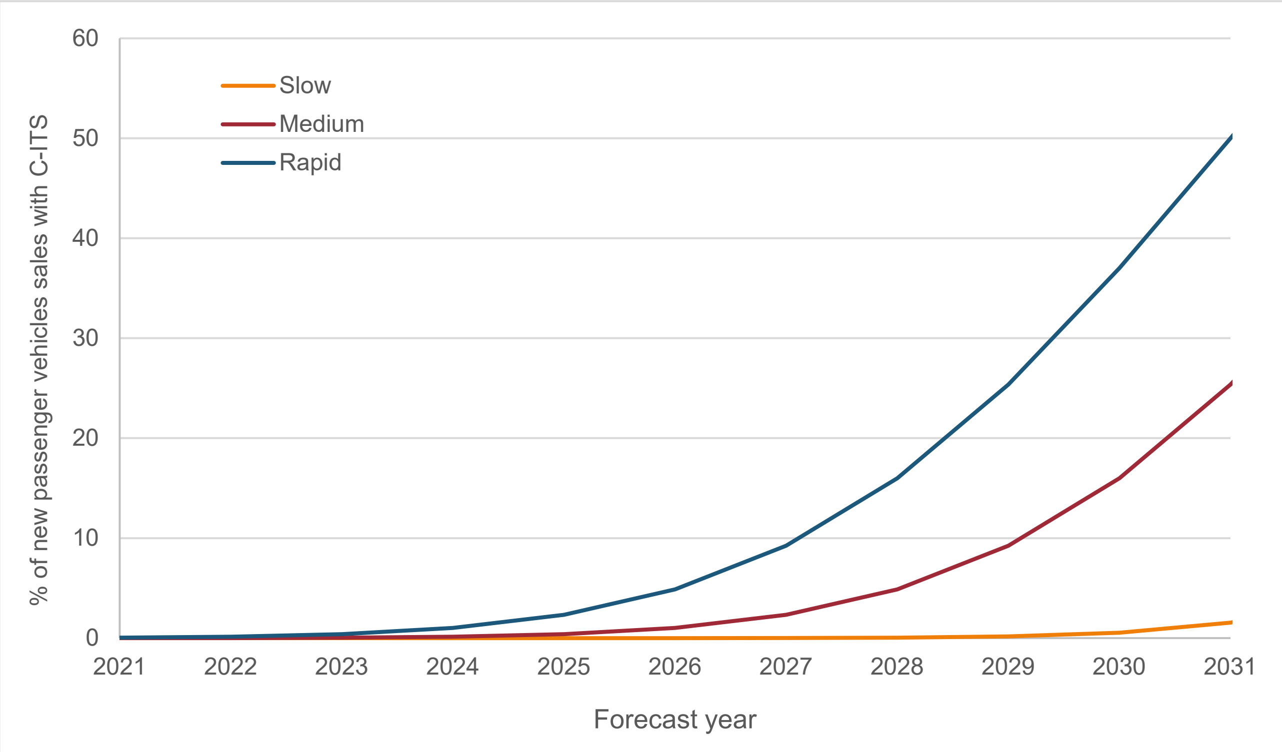
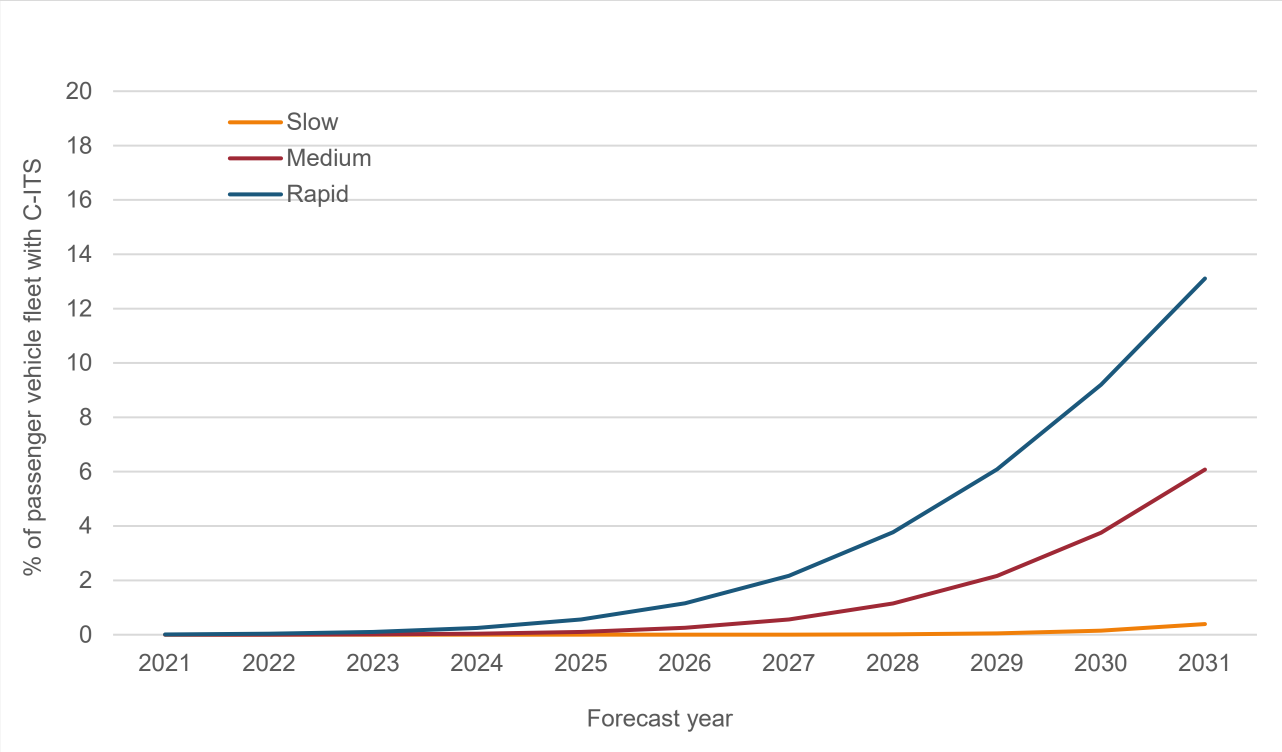


Figure 7.4: Future Vehicles 2031 extended fleet forecast for C1 Interoperable C-ITS



7.5 Extended forecast for C2 Embedded Connectivity

The tables and figures provide the extended forecast for C2 Embedded Mobile Data Connectivity through to 2031.

Table 7.2: Future Vehicles 2031 comparison of sales and fleet forecasts for 2031 compared to 2030

Uptake scenario	2030 sales	2031 sales	2030 fleet	2031 fleet
Slow	26%	29%	9%	11%
Medium	89%	93%	34%	40%
Rapid	100%	100%	57%	62%

Figure 7.5: Future Vehicles 2031 extended sales forecast for C2 Embedded Mobile Data Connectivity

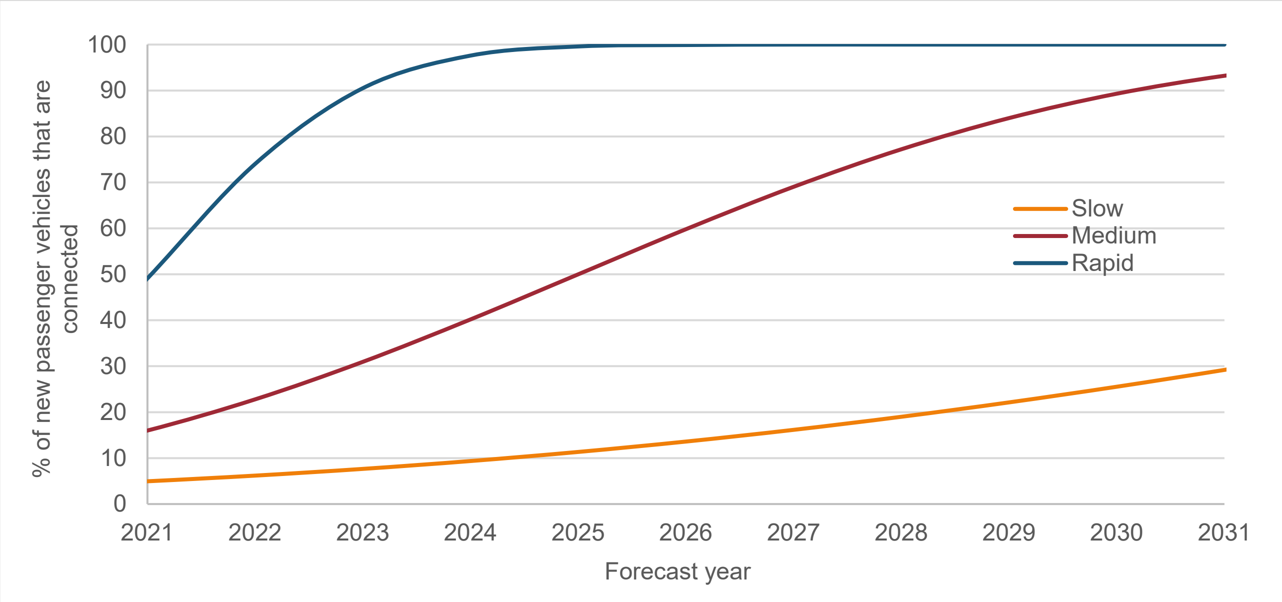
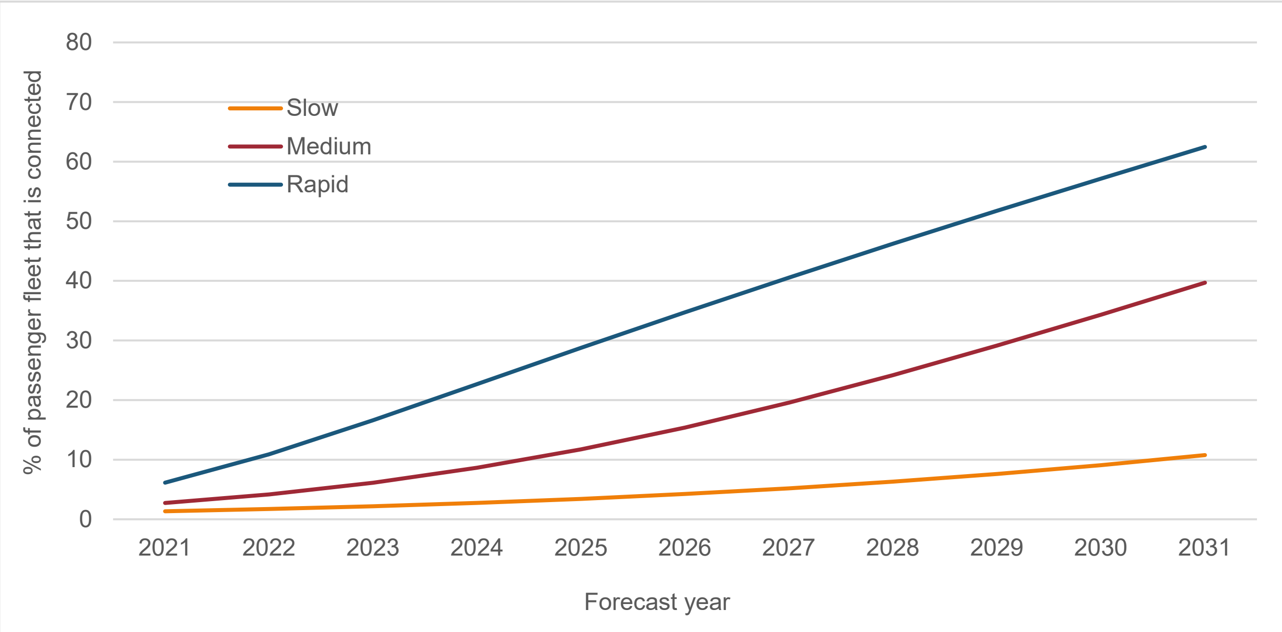


Figure 7.6: Future Vehicles 2031 extended fleet forecast for C2 Embedded Mobile Data Connectivity



8. Review of Forecast for Electric Vehicles

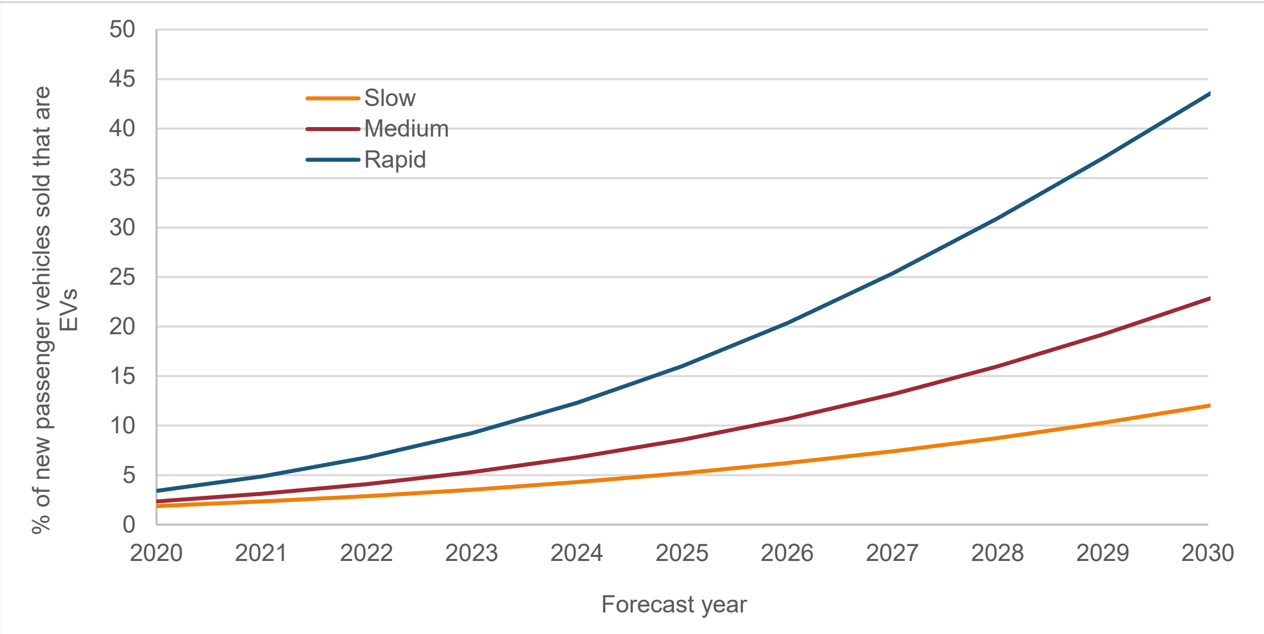
The forecast in this category is E1 for Electric Vehicles in which a battery is the primary energy source. This includes vehicles with range extenders and Plug-in Hybrids (PHEVs). It excludes milder forms of hybrid technology and hydrogen fuel-cell vehicles. The Future Vehicles 2030 included some discussion around potential uptake of hydrogen fuelled vehicles.

Section 4.3 and Appendix G in the Future Vehicles 2030 report cover this forecast.

8.1 What was forecast in Future Vehicles 2030?

The sales uptake forecast for Electric Vehicles (E1) in Future Vehicles 2030 was based substantially on a forecast by BITRE (2019). The forecast was for growth to continue in EV adoption, but at rates below that in some other developed markets.

Figure 8.1: Future Vehicles 2030 sales forecast for E1 Electric Vehicles



The forecast sales proportion for EVs in 2020 was 2.3% in the medium scenario, with the slow and rapid scenarios ranging form 1.9% to 3.4%. Based on 2020 passenger vehicle sales, this was equivalent to 17,000 (slow), 21,000 (medium) or 31,000 (rapid) vehicles sold.

The BITRE (2019) forecasts used as the forecast basis had slightly lower figures for 2020 due to differences in the curve shape used. BITRE's forecast for 2020 was 5,000 (slow) and 13,600 (rapid) battery electric and plug-in hybrid electric vehicles to be sold, based on share of total vehicles sold.

8.2 Recent developments

In the 18 months since research for the Future Vehicles 2030 forecasts, there has been significant growth in Electric Vehicle sales globally, as adoption moves beyond the early stages to become mainstream. Fully Electric Vehicles and PHEVs accounted for 4.2% of global vehicle sales in 2020, up from 2.5% in 2019 (Margeit, 2021).

The scope of the forecast in Future Vehicles 2030 is cars and SUVs in Australia. Battery electric and plug-in hybrid electric vehicle sales reached a total of 8,100 in Australia during 2020 (BITRE estimate 2021). This represents a total of 1.05% of new vehicle sales.

In the latter stages of the forecast period, there is significant momentum internationally for Electric Vehicles, with phase-outs planned for new vehicles powered by petrol or diesel by both manufacturers and governments. Examples include:

- Countries within the European Union setting out phase out dates of 2030 or 2035 (Zachariah, 2021)
- Jaguar to produce only Electric Vehicles by 2025, with Land Rover following by 2030 (Leggett, 2021)
- Volvo will produce only Electric Vehicles by 2030, with a target of 50% sales being electric by 2025 (Misoyannis, 2021)
- California banning the sale of new petrol-powered cars from 2035 (Koseff and Gardiner, 2020)
- Within our region, New Zealand planning to introduce a Clean Car Import Standard with CO_2 targets reducing over time (Dobson, 2021a)

The availability and attractiveness of Electric Vehicles can be expected to increase in the Australian market due to these international actions. The forecast 2030 sales penetration rates of 11% to 45% (with 27% as medium) were based on detailed analysis by BITRE (2019). Both the BITRE analysis and Future Vehicles 2030 use an assumption of continuation of current government action rather than a policy change. During May 2021, there was an announcement by the Victorian Government of a $3,000 subsidy (VicGov, 2021) and a target of 50% sales penetration by 2030. There is also commentary of a potential stamp duty waiver in NSW (Hagon, 2021). It is notable that the target of 50% sales penetration by 2030 set by some Australian states such as Victoria and NSW is only marginally higher than the forecast rapid scenario and could therefore be considered to broadly fall in line with the forecast range, albeit at the limits of the range.

Hydrogen vehicles were also included in Future Vehicles 2030, but as an item for discussion rather than a specific forecast. Activity within the last 18 months has included some early (pilot) deployments of hydrogen vehicles by Hyundai and Toyota, along within a refuelling site for each deployment.

8.3 Is a change to the forecast recommended?

No change is recommended to the Electric Vehicle forecast (E1). The international momentum towards Electric Vehicles has also further strengthened, suggesting that any downward revision to the forecasts is likely to be only for the shorter-term. If Australia were to more closely follow international markets in Electric Vehicle adoption, then an upward revision to the later years of the forecast may be warranted. This would likely be associated with a policy change on Electric Vehicles at the national level in Australia. There are early signs of a shift in policy, at least at a state level, however these would be best considered as part of a future update once a broader pattern of such policy changes becomes clearer.

8.4 Forecast extended to 2031

The tables and figures provide the extended forecast for E1 Electric Vehicles through to 2031.

Table 8.1: Future Vehicles 2031 comparison of sales and fleet forecasts for 2031 compared to 2030

Uptake scenario	2030 sales	2031 sales	2030 fleet	2031 fleet
Slow	12%	14%	4%	5%
Medium	23%	27%	7%	9%
Rapid	43%	50%	13%	16%

Figure 8.2: Future Vehicles 2031 extended sales forecast for E1 Electric Vehicles

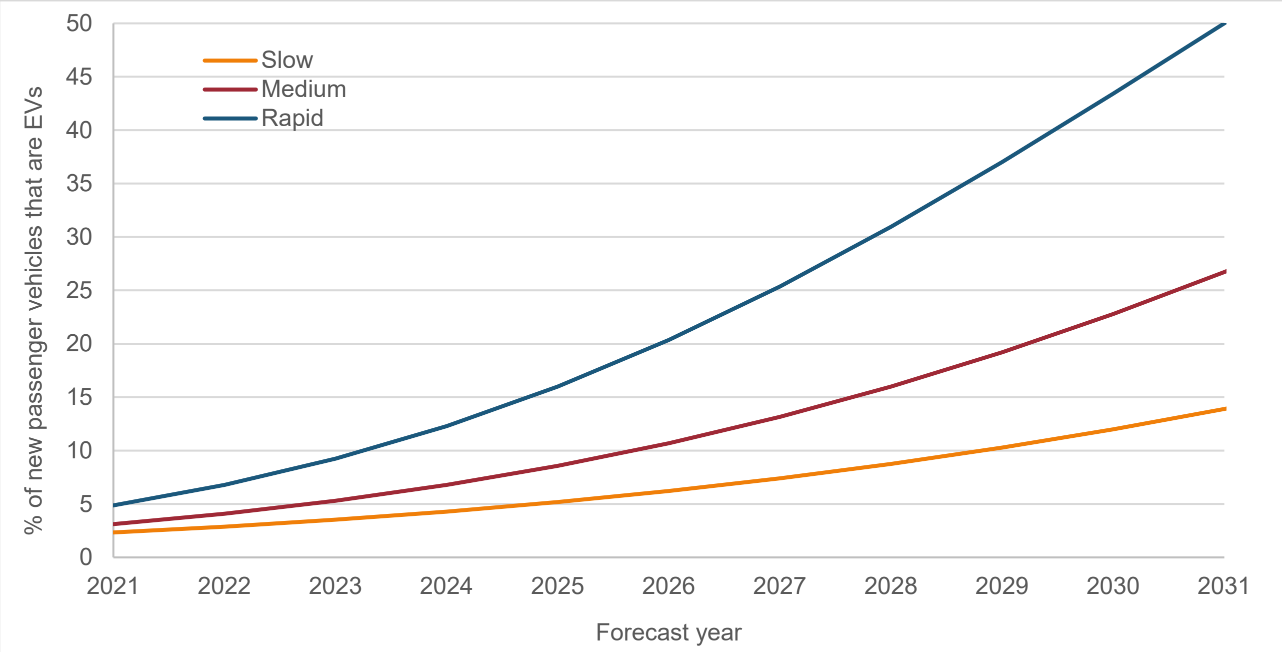
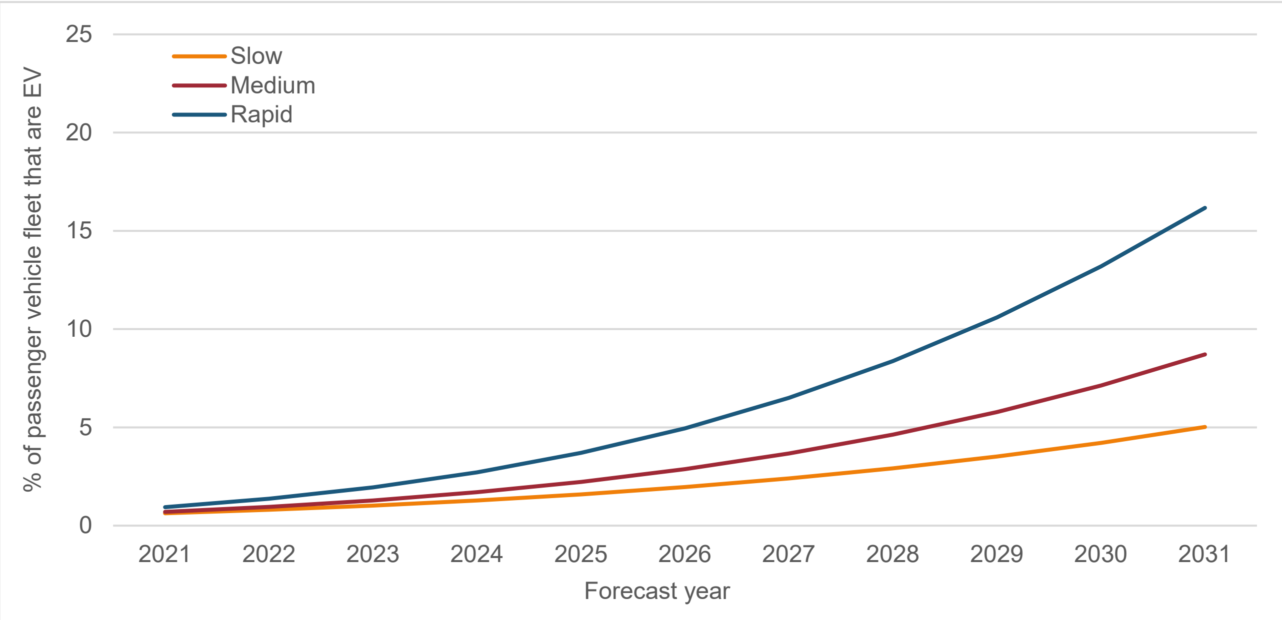


Figure 8.3: Future Vehicles 2031 extended fleet forecast for E1 Electric Vehicles



9. Previous Forecast for Shared-Use Vehicles

The forecast in this category is S2 covering *for hire cars with driver*. This was the only forecast based around the usage of a vehicle rather than a technology embedded in the vehicle. Vehicles covered by this forecast are cars and SUVs that are used to transport people other than by owner/lessee, with a driver provided with the vehicle (such as for taxi and ride-share). As the use of a vehicle may change during the life of the vehicle, this forecast is the only one of the series to not use the fleet penetration model as part of the forecasting approach.

Section 4.4 and Appendix H in the Future Vehicles 2030 report cover this forecast.

9.1 What was forecast in Future Vehicles 2030?

The analysis of the evidence base indicated that share of the passenger fleet used *for hire with driver* was already different between different sizes of metropolitan area and that such a distinction was likely to remain. Forecasts were therefore produced for larger size cities such as Sydney and Melbourne and small cities such as Auckland and Adelaide.

Figure 9.1 Fleet proportion forecast for *For Hire with Driver* in a larger city (example Melbourne)

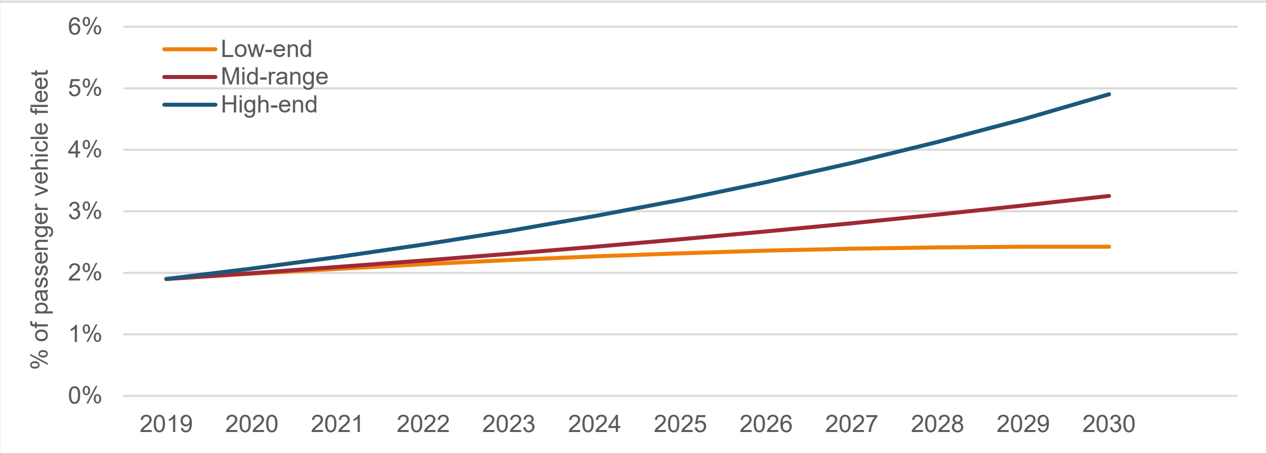
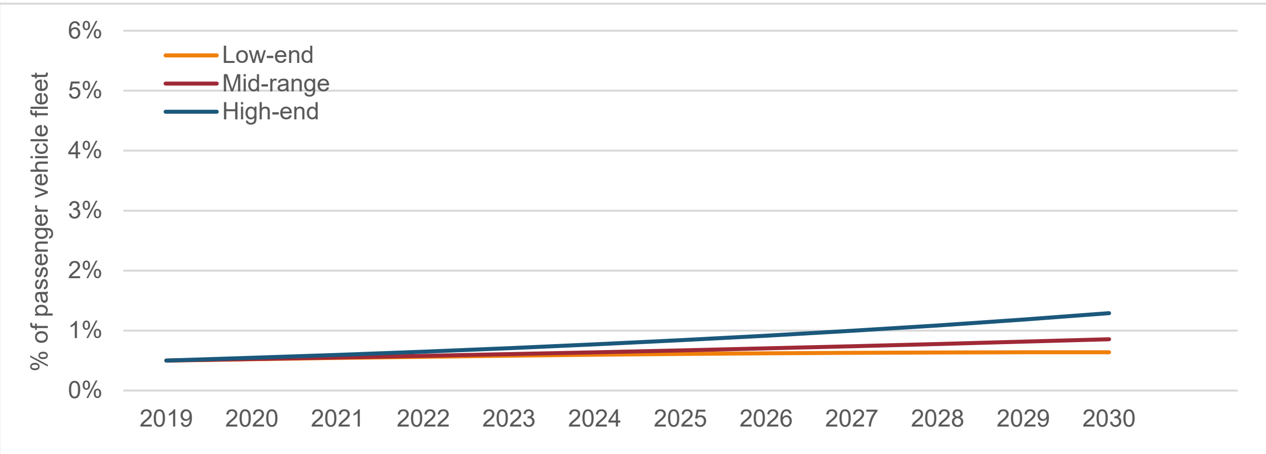


Figure 9.2 Fleet proportion forecast for *For Hire with Driver* in a smaller city (example Adelaide)



Consistent with other forecasts in Future Vehicles 2030, the forecast is for a proportion of fleet, not a proportion of total travel undertaken. Particularly for this forecast category, there is likely to be a difference of relevance between proportion of fleet and proportion of travel (Vehicle Kilometres Travelled or VKT) due to the higher usage of some *for hire with driver* vehicles.

9.2 Recent developments and discussion

For much of the last 12 months, the usage of vehicles *For Hire with Driver* for passenger transport has been affected by the COVID-19 pandemic. The S2 forecast excludes cars and SUVs used only for goods transport but not for transporting passengers for payment, because:

- Jurisdictional registration and licencing schemes have so far been limited to covering the transport for passengers for payment, in some senses as an extension to or replacement of previous taxi registration schemes; and
- There is very limited data around cars and SUVs used to transport goods for payment, particularly in longer-standing types of uses such as pizza restaurant and newspaper delivery as opposed to app-based methods.

Member agencies and their colleagues in government have been considering various aspects of the impact of COVID-19 and any lasting effects, including anticipated changes in utilisation of rideshare and taxi services.

The impact of COVID-19 and the uncertainty as to follow-on impacts to utilisation of rideshare and taxi services means that there is not the same suitability of evidence base for a forecast as existed in the lead up to publishing Future Vehicles 2030.

9.3 Discontinuance of forecast

The S2 forecast for the usage of vehicles *For Hire with Driver* for passenger transport stands apart from the other forecasts in Future Vehicles 2030 as it represents a use of a vehicle rather than technology fitment to a new vehicle. This means that the S2 forecast has never been as suited to the Future Vehicles 2030 forecast methodology and a different method was applied to this category to make a forecast possible. The impacts of COVID-19, and a question as to the extent of impacts being temporary or longer lasting, have further reduced the potential to make a forecast for this category within the scope and methods of Future Vehicles 2030. The impacts of COVID-19 also appear to have increased growth of *For Hire with Driver* vehicles being used solely for goods transport, and this is out of scope for the forecast.

The forecast for S2 For Hire with Driver has been discontinued due to difficulty in providing a suitable updated forecast within the scope and methods of Future Vehicles. This occurs due to the combination of the different nature of this forecast (vehicle use rather than embedded vehicle technology) and increased uncertainty from COVID-19 pandemic impacts.

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