

ARA Submission

**The Australian Communications and Media Authority's - Expiring
spectrum licences: stage 2**

05 June 2024

The ARA

The Australasian Railway Association (ARA) is the peak body for the rail sector in Australia and New Zealand and advocates for more than 220 member organisations across the industry.

Our membership covers every aspect of the rail industry, including the following:

- passenger and freight operators that keep essential rail services moving;
- track owners, managers, and contractors that deliver a safe and efficient rail infrastructure network; and
- suppliers, manufacturers, and consultants that drive innovation, productivity, and efficiency in the rail industry.

Our members are driven to support vibrant, sustainable, and connected communities through greater rail use across Australia and New Zealand. We bring together industry and government to help achieve this ambition.

Our advocacy is informed by an extensive research program, which ensures we offer solutions that are grounded in evidence and focused on delivering tangible value in our daily lives.

The rail industry has a crucial role in the region's sustainable development and growth and offers meaningful and rewarding careers for tens of thousands of people in the local regions.

Our significant program of work is focused on supporting a strong advocacy agenda and creating opportunities for the rail industry to network, collaborate, share information, and maximise the benefits we have to offer the wider community.

The ARA thanks the Department of Infrastructure, Transport, Regional Development, Communications, and the Arts for the opportunity to make this submission, which was developed in consultation with ARA member organisations.

Any questions regarding this submission should be directed to [REDACTED]
[REDACTED]

Australia's Rail Industry

Rail is a significant industry in Australia, creating economic activity through its operations and capital investments. It is an industry with activities across every major metropolitan and regional area and is supported by the full spectrum of skills in the Australian workforce.

In 2019, the rail industry contributed around \$30 billion to the Australian economy and employed more than 165,000 workers (directly and indirectly in full-time equivalent terms, FTE). The industry is made up of around 900 businesses that are located in approximately 20 major hubs.

The ARA provides the following information on behalf of, and consolidating input from, railway 1800 MHz licence holders. It responds to the matters for feedback presented in the ACMA document: *Expiring Spectrum Licences (stage 2)* – information gathering and views on uses of frequency bands and alternative licence conditions.

General comments

ARA welcomes specific mention of rail safety and control communications as one of three main classes of services used in these expiring spectrum licence bands.

ARA notes that rail typically has licensed about 2.75% of current expiring spectrum licences below 4 GHz: typically, 30 MHz of rail spectrum from a total metropolitan bandwidth of about 1088 MHz (not including 900 MHz band). Electronic news gathering has licensed about 4.6%. Therefore, rail industry has smallest amount of spectrum under 4 GHz.

Issues for comment

ARA welcomes the invitation to rail spectrum licence holders to present current and potential future uses of the spectrum for rail safety and control communications, and how these promote long-term public interest.

Spectrum licences

ARA notes that rail benefited from spectrum trading by being able to enter this market to secure 1800 MHz spectrum for rail safety and control communications.

Rail spectrum holders were also instrumental during aggregation process for 1800 band that established large licence bandwidths that enabled 4G and 5G to be efficiently deployed.

Rail licencees have secured spectrum in metropolitan areas that, in general, is sufficient to provide coverage for rail corridors in all states. This spectrum is seen to have been sufficient to deploy initial train radio voice and data radiocommunications and is being relied upon as jurisdictions begin to deploy train control systems which will be in use for decades – further demonstrating long-term public interest use.

ARA is aware that various rail spectrum holders have made use of third-party authorisations to support both government and private industry in testing and trialling network solutions.

Again, rail licencees have demonstrated that technology-flexible technical frameworks continue to enable multiple generations of radiocommunications technology – a feature that rail jurisdictions will make use of as they repurpose spectrum and migrate from older systems to current and future rail equipment standards.

ARA is of a view that rail operators have demonstrated that current spectrum management is working efficiently; that technical frameworks are flexible; and that spectrum is suitable for large private networks providing different kinds of services to that of mobile network operators.

Information requested from incumbent licensees

Public interest criterion 1: facilitates efficiency

Rail transport is the most efficient mode of land transportation and should be given utmost importance in the discussion around expiring spectrum licenses. As we plan for the future of transportation, it is crucial to recognise and highlight the pivotal role that rail systems play in enabling the seamless movement of people and goods. The reason behind rail's efficiency is its unmatched capacity utilisation. Rail networks can transport millions of passengers daily, with frequent schedules, managing large-scale mobility demands without getting congested like other modes of transportation. Moreover, rail transport is highly energy-efficient, which makes it environmentally sustainable. Trains consume significantly less energy per mile than individual modes such as automobiles or buses, thus reducing carbon emissions and promoting environmental conservation.

The railway offers cost-effective travel options for passengers and businesses, fosters job creation and economic development along rail corridors, and generates multifaceted fiscal returns. Moreover, the social impact of rail transport is immense. It provides accessible and inclusive travel options beyond socio-economic boundaries, promoting affordable and convenient travel while enhancing social cohesion. In urban areas, rail systems promote sustainable mobility, reducing traffic congestion on roads and enhancing connectivity between cities and regions.

Current use of 1800 MHz spectrum by Australian railways

Appendix A lists the licences held by ARA members in the 1800 MHz spectrum band.

In New South Wales (NSW), Queensland (QLD), Western Australia (WA) and Victoria (VIC), the spectrum licences are used for privately owned and operated radio networks. These networks are used by railways to support the safe & efficient transportation of passengers and freight by providing voice and data communications between trains and operators.

In NSW, QLD and VIC the radio networks are based on the Global System for Mobile Communications – Railway (GSM-R) standard and EIRENE specifications which are used in 38 countries¹. Support for GSM-R technology is expected to cease between 2030 and 2035 pending vendor agreements and contractual arrangements. A portion of the spectrum is reserved for guard bands, effectively mitigating interference to rail safety and control communications caused by Mobile Network Operators (MNOs) deploying high-power mobile phone carrier sites near rail corridors.

In WA the radio network is in delivery to 3GPP LTE standards with Mission Critical Push-To-Talk and Communications Based Train Control applications.

In South Australia (SA), the spectrum has been used to trial prospective technologies, however they are currently not in active use.

There are no spectrum trading arrangements or acquisition through the secondary market currently in place.

More detail on the current use of these spectrum licences in each jurisdiction is provided in Appendix B.

¹As highlighted in the Global Railway Review (September 2017), the GSM-R system is based on GSM and EIRENE (European Integrated Radio Enhanced Network) – MORANE specifications (Mobile Radio for Railways Networks). This standard for GSM-R is the result of over 10 years of collaboration between EU railway companies and is maintained by the UIC (International Union of Railways). As the international wireless communications standard for railway communication and applications, GSM-R is our common communication platform and for use as a Train Control System.

Rail patronage in Sydney, Melbourne, Brisbane, Perth and Adelaide were trending upwards prior to the COVID-19 pandemic and are currently increasing back to pre-pandemic levels. Further details on rail patronage, freight, and expenditure can be accessed publicly on the Bureau of Infrastructure and Transport Research Economics (BITRE)², and Roy Morgan websites³.

Planned use of 1800 MHz spectrum by Australian railways

In NSW, QLD, WA and VIC, it is planned to continue the use of spectrum licences for privately owned and operated radio networks to support the safe & efficient transportation of passengers and freight by providing voice, video and data communications between trains and operators. The spectrum will also support critical data transfer for modern signalling systems like the European Train Control System (ETCS) and Communication-Based Train Control (CBTC), enabling increased efficiency and safety in Australian railways.

ARA members in NSW, QLD and VIC are mindful of the end of support for GSM-R approaching in 2030/2035. The International Union of Railways (UIC) is working with global suppliers and the 3rd Generation Partnership Project (3GPP) to provide railways with a replacement for GSM-R, the Future Railway Mobile Communications System (FRMCS). Transition between the GSM-R and FRMCS is likely to require a long period of operating two radio networks in parallel.

SA is also exploring future use of the 1800 MHz band to deploy a new FRMCS for critical rail safety and operational communications.

It is anticipated that FRMCS requirements will be embedded in 5G standards, allowing railways to purchase equipment from a wider market and come with additional functionality such as remote condition monitoring and safety critical voice and data communications. Overall, rail will continue to operate within the current allocations of the 1800 MHz band. Additionally, there is the need for utilising the 1900-1910 MHz band allocations to extend network coverage beyond the reaches of the current 1800MHz spectrum boundaries and to the regions, and potentially support the transition between old and new radio networks.

Geographically, networks will expand and extend, including additional coverage for the metropolitan train network and new key facilities. Challenges such as property changes and deploying high-power MNO sites adjacent to railway land are continually addressed to ensure uninterrupted coverage.

FRMCS planning activities include considering future sharing arrangements and fostering collaboration with third parties. However, there are no plans for spectrum trading or acquisition through the secondary market.

More detail on the planned use of the spectrum licences held by ARA members is provided in Appendix C.

How does your current and planned use of the spectrum facilitate efficiency?

ARA members are deploying UIC standard equipment and protocols have been limited to GSM-R and low channel re-use to ensure high quality voice and data radiocommunications to operate rail safety and control communications.

Current uses include:

- driver to signaller/controller voice communications;
- Railway emergency call - a high priority call for informing drivers, signallers, controllers, and trackside workers of a situation requiring all trains in an area to stop.

² <https://www.bitre.gov.au/sites/default/files/documents/bitre-yearbook-2023.pdf>

³ <https://www.roymorgan.com/findings/9281-public-transport-patronage-rises-post-pandemic-july-2023>

Recent developments in Europe to support an increasing number of rail applications have led to new standards based on current 3GPP 5G radiocommunications and rail will benefit from high capacity FRMCS to increase operational monitoring, and various passenger security and vehicle video.

In addition to submissions that engage with the issues and guidance at Appendix B, we are seeking evidence and analysis relating to:

> productive, allocative and dynamic efficient uses and outcomes

ARA views the allocation of dedicated spectrum to rail use over a long period (20 years for the 1800 MHz band) and at public interest pricing to be a significant contribution to the long-term public interest derived from the use of spectrum. It supports both passenger and freight movements and greater use of rail services is aligned to national objectives of rail interoperability and decarbonization.

> evolving use of the spectrum over the current and potential future licence term

ARA expects that rail use of 1800 MHz spectrum will be ongoing for decades to come – mirroring expectations of UIC in Europe, UK and other countries.

GSM-R has a limited support life of about 7 years beyond 2028. Between now and about 2035, ARA expects all existing GSM-R networks to be overbuilt with 5G-based FRMCS networks.

ARA expects that current GSM-R projects and LTE are likely to be migrated to FRMCS and future RMR systems as UIC standards are developed in parallel with 3GPP.

> current and planned services provided, including the technology and bands used, geographic availability, and whether providing coverage or capacity/infill

Geographically, rail spectrum use has currently been limited to heavy rail/urban rail/freight rail corridors. With increased capacity of 5G-based systems, coverage could be extended to light rail and metro which all interface with existing urban/suburban rail networks.

Coverage is the main concern, but this is of no value if capacity to provide necessary services - in worst-case scenarios - is insufficient. With GSM-R on urban networks in Australia, rail operators have used most of 2 x 15 MHz spectrum.

ARA notes that GSM-R has a limited support life of about 7 years beyond 2028. Between now and about 2035, ARA expects all existing GSM-R networks to be overbuilt with 5G-based FRMCS networks. 5G and FRMCS provide a modern radiocommunications platform for train control systems.

A difficulty Europe has had is limited spectrum to both operate GSM-R and to be able to deploy next generation network in 2 x 5.6 MHz's. Only until 1900-1910 MHz was reserved, has an opportunity to deploy latest 3GPP network standards been possible.

ARA expects Australian rail operators to take advantage of European expertise and equipment by following a similar model of operating two networks in different bands. This is because Australia's rail market is not sufficient to deviate significantly from international standards and practice.

> third-party or sharing arrangements currently in place or under active consideration, including those that may be in place with another spectrum licensee

ARA is not aware of any third-party or sharing arrangements in place.

> anticipated trading or acquisition of spectrum through the secondary market

ARA is not aware of any state rail operator seeking additional spectrum through secondary market.

> issues with current planning, licensing or technical arrangements that prevent efficient use of the spectrum

ARA is aware of some geographic areas of spectrum licences not totally covering rail operational areas. ARA members may need to implement alternate train control technologies in these areas using other resources.

> how current and proposed future uses of the spectrum could align with the objective in the MPS to facilitate opportunities for new entrants and use cases, including for LEOsats, noting that new entrants and use cases could use spectrum covered by ESLs in ways that are more efficient, and generate economic value and social benefits.

ARA and its members are following use of spectrum licences with LEOsats with interest as it has potential to provide broad coverage across whole spectrum licence area at, presumably, low cost.

ARA members, although interested, considers this to be an emerging technology and will continue to monitor developments and use cases before considering rail use more specifically.

Public interest criterion 2: promotes investment and innovation

Federal and state governments are investing heavily in railways. There is recognition at the highest level of government that Australian railways need to be interoperable and invest in the latest train control technologies to support improvements in efficiency and safety. Future investment in the radio systems that provide the data communications supporting these technologies is critical.

The Australian government has provided \$9.5 billion over the forward estimates, and \$16.5 billion over 10 years, for projects that improve productivity, liveability, and sustainability. All while maintaining focus on ensuring the deliverability of the over \$120 billion, ten-year infrastructure investment pipeline. With State governments also investing heavily it is expected that rail patronage and freight will continue to increase after recovering from the impacts of the COVID-19 pandemic.

In the previous section the ARA noted the intentions of Australian railways to transition or upgrade their current radio networks to FRMCS on 5G. The use of this technology enables ARA members to leverage innovations from an increased supplier market. Innovation will also come directly from the implementation of FRMCS as the standards will support additional use cases such as remote condition monitoring and critical video for passenger and staff safety.

FRMCS opens opportunities for competition by embedding rail requirements in 5G standards, enabling ARA members to procure equipment from multiple suppliers, fostering innovation and efficiency.

How does your current and planned use of the spectrum promote investment and innovation?

ARA expects that State governments can only invest in modern rail radiocommunications and control systems if sufficient spectrum is available and re-issued for as long as it is required.

Much of this investment is in local infrastructure to provide Radio Access Networks (RAN) and core switching infrastructure. These RANs provide high reliability radiocommunications to support numerous rail safety and control applications.

In addition to submissions that engage with the issues and guidance at Appendix B, we are seeking evidence and analysis relating to:

> how current and proposed future uses of the spectrum could align with the objectives in the MPS relating to:

> capacity for sustained investment and innovation, with reference to existing investments, and how licence conditions could enable licence holders to be responsive to new demands, opportunities and technologies

ARA member's priority is safety, and rail safety is governed by Rail Safety National Law. Where new technologies are developed that are cost effective or provide a lower risk than current systems, then rail authorities will invest to take advantage of new technology. A limiting factor is being able to utilise same spectrum bands supported by European dominated suppliers.

Examples of newer, low-cost technologies include axel counters, ETCS and CBTC, radio communications, Global Navigation Satellite System (GNSS) positioning, and satellite communications.

> connectivity and investment in regional areas to deliver improved communications services to end users, with reference to an increased availability and choice of services for end users, in particular for end users with limited options under existing arrangements; voice and data mobile network coverage; and access to high-speed data services.

ARA notes that most rail operators serve metropolitan areas and their spectrum licence broadly covers their operational areas. Rail services, however, traverse multiple rail jurisdictions and serve regional and remote Australia.

Public interest criterion 3: enhances competition

The transition to FRMCS and 5G facilitates competition by allowing equipment and support services to be procured from multiple suppliers. This approach aligns with ACMA's directives and promotes innovation and diversity within the market, ultimately benefiting consumers and stakeholders.

How does your current and planned use of the spectrum enhance competition?

Rail is not using spectrum to enhance competition directly as each rail jurisdiction must provide train control and radio communication services as part of safety systems to comply with Rail Safety National Law.

Indirectly, it is expected that efficiency of rail will be improved leading to lower costs to government and providing alternatives to road transport for commuters.

In addition to submissions that engage with the issues and guidance at Appendix B, we are seeking evidence and analysis relating to:

> how LEOsats could contribute to promoting the long-term public interest, including how spectrum can support inter-operability between terrestrial services and satellite services.

ARA members have not investigated use of LEOsats, however obvious possibilities include:

- Backup radiocommunications; and
- General road coverage for other state transport modes.

Public interest criterion 4: balances public benefits and impacts

Rail transportation serves as a cornerstone of public infrastructure, providing essential benefits that resonate across various sectors of society. Its inherent capacity for mass transit significantly alleviates road congestion, reduces carbon emissions, and fosters sustainable urban development. Railways enhance connectivity and link communities, businesses, and economic hubs. They bolster trade, stimulate economic growth, and create employment opportunities by facilitating efficient movement of goods and passengers. Embracing advancements in rail communication technologies further enhances safety, reliability, and efficiency, safeguarding the well-being of commuters and stakeholders. Therefore, allocation of spectrum for rail co advances public safety and operational efficiency and upholds the broader public interest by bolstering sustainable transportation networks essential for societal progress and prosperity.

Passengers rely on rail for a range of social and economic purposes. In 2019, the rail industry contributed around \$30 billion to the Australian economy and employed more than 165,000 workers. The industry is made up of around 900 businesses in approximately 20 major hubs⁴.

Since 2010, the demand for rail in Australia has been steadily increasing by around 2% each year. In the past 10 years, the largest increase in rail patronage occurred in 2016, as rail patronage grew by 7% nationally. Updated Deloitte Access Economics forecasts predict that patronage could grow by another 16% from 2018 to 2026. This forecast does not take into account the impacts of the COVID-19 pandemic which have seen patronage levels fall significantly in 2020. Instead, this forecast reflects long term trends in the industry.

Rail transport generally generates fewer external costs than other modes of transport. In particular:

- Lower carbon emissions - Every passenger kilometre travelled by rail, instead of car or motorcycle, saves an additional 50 grams of CO₂ equivalent being emitted, valued at 5c per journey.
- Lower congestion costs - Every commuter that changes to rail reduces the aggregate travel time across all remaining road users by up to 28 minutes, valued at between \$3 and \$10, depending on the city.
- Safety benefits from reduced crash costs - Every rail journey that replaces a car trip reduces accident costs by around \$1.37.
- The health benefits from increased walking and reduced air pollution - Rail passenger travel generates 75 per cent less PM₁₀ emissions for each kilometre travelled when compared to road travel, valued at 5c a trip. Further, every rail journey generates around \$7.00 in health benefits from walking. If Australia can keep maintaining the increase in the use of trains and trams instead of cars, then a further 20% increase in patronage could result in \$1.2 billion in benefits per annum for society in terms of reduced carbon emissions, health benefits from reduced air pollution and more walking, less congestion and reduced road accident costs.

The Security of Critical Infrastructure Act 2018 (Critical Infrastructure Act) applies to Australian railways who have obligations under the act to continue the delivery of services. The affordable long-term reallocation of ESL's held by ARA members is critical to the ongoing safe and efficient operation of these rail services.

How does your current and planned use of the spectrum balance public benefits and impacts?

Broadly, public benefit of spectrum is lowering cost of providing public transport service by moving towards advanced train control systems, increasing capacity, and improving safety by supervising driver operations and automatic operations.

These in turn support public benefits in the form of delivering on Commonwealth priorities: increase in productivity through greater use of rail, and decarbonisation.

⁴ [REPORT-ValueofRail2020-1.pdf \(ara.net.au\)](#)

Public interest criterion 5: supports relevant policy objectives and priorities (including regional, rural, and remote connectivity, investment and competition)

Federal communications policy objectives and priorities generally do not directly apply to ARA members.

How does your current and planned use of the spectrum support regional, rural, and remote connectivity, investment and competition?

The Australian Government, States and Territories recognise the important role of rail to connect people and freight across cities, regions and ports – and have established a shared national commitment to rail investments and interoperability initiatives. This is also reflected in the current rail interoperability priority agreed by National Cabinet.

ARA notes that rail 1800 MHz spectrum is limited to metropolitan areas, however, this spectrum that is used for rail safety and control communications is used by passenger and freight rail transport through metropolitan areas and into regional, rural and remote locations.

ARA members currently use their spectrum licences in metropolitan areas only. Generally, rail spectrum licences are sufficient but, for example, in QLD, an extension of the railway to the Sunshine Coast would need to make use of 1900 MHz to provide coverage. Commentary on investment and competition has been included in our responses for Public Interest Criterion 2 and 3.

ARA feedback

ARA has provided feedback on items requested by ACMA in this section.

Approaches to alternative uses for spectrum

ARA understands that the rail industry will have future access to the 1900 MHz spectrum in harmony with European Union, UK, and New Zealand allocations.

ARA highlights the need for 1900 MHz spectrum in addition to current rail licences in 1800 MHz to follow the EU lead in having access to two spectrum bands for redundancy, capacity, interference management, technology migration and expansion of rail safety and control communications beyond the current geographic boundaries of 1800 MHz spectrum licenses.

In the European Union the Electronic Communications Commission (ECC) Decision 20(02) specifies the harmonised use of the paired frequency bands 874.4 - 880.0 MHz and 919.4 - 925.0 MHz. The ARA is open to discussion with ACMA on future use of the 900 MHz band.

We also welcome submissions from incumbent licensees detailing alternative uses for spectrum currently subject to ESLs. Submissions should specify:

> why an alternative use for the relevant spectrum would promote the long term public interest

ARA members generally have an 1800 MHz licence with a rail safety and control communications condition, and another smaller licence that has no conditions. While GSM-R is in use, ARA members are of a view that these licences will be needed to provide guard bands to limit interference from nearby high power and high-gain mobile network transmitters and therefore should be considered spectrum used for rail and re-issued at a public interest price.

> high-level changes to licence conditions and technical frameworks that would be required to implement the alternative use.

ARA recommends that all rail 1800 MHz spectrum licences are conditional on being used for rail safety and control communications to demonstrate that rail has no intention to commercialise rail spectrum or compete with MNOs – rail spectrum is used for rail safety and control communications and for guard band interference protection from high power and high-gain transmitters.

Resilience and temporary disaster responses

Resilience of telecommunications infrastructure to natural disasters, and the availability of communications services during emergencies, were raised most recently in the House of Representatives Standing Committee on Communications and the Arts' 2023 report Connecting the country: Mission critical – Inquiry into co investment in multi-carrier regional mobile infrastructure.

ARA members also consider current GSM-R networks to be mission-critical and are considered critical freight infrastructure asset and critical public transport asset under Security of Critical Infrastructure Act 2018.

We welcome feedback from stakeholders concerning resilience and temporary disaster responses that arise in the context of spectrum licences and the ESL process.

ARA notes that rail services can be affected by floods, torrential rains, bushfire, and similar events. These weather events can disrupt fixed line communications and isolate base-stations. Likewise, electricity supplies can be interrupted and, depending on weather, solar systems may not provide sufficient energy to run sites. This results in poor coverage and can limit train operations.

Regarding roaming, ARA is not opposed to supporting emergency use of licensed spectrum and would be willing to participate in discussions to investigate how this can be achieved while still delivering reliable passenger and freight transport services.

Views on uses of frequency

ARA agrees with the ACMA's views on uses of spectrum, that will likely best promote the long-term public interest, are based on current information about international harmonization, industry standardization, equipment availability, and domestic and global environments.

Specifically, ARA agrees that continued support for use of the 1800 MHz band for rail safety and Wireless Broadband (WBB) uses is conducive to promoting the long-term public interest – noting that international factors, such as FRMCS as developed by UIC, will enable migration away from GSM-R towards 5G-based systems.

Australia's 900 MHz band was not able to accommodate rail requirements and use. To address this, ARA members in five states agreed to acquire 1800 MHz spectrum to standardize equipment within Australia that would enable states and operators to work towards interoperable radiocommunications for rail safety and control.

As UIC has developed rail standards, they have also sought additional spectrum to deploy FRMCS based on 5G standards. Europe, UK, and other countries have settled on 1900 MHz for deployment of parallel networks. Once commissioned, each country will be able to upgrade or replace current GSM-R networks to support FRMCS and Railway Mobile Radio (RMR).

Rail operators intend to follow Europe and UK lead in using two bands for rail safety and control communications. This permits a progressive 'walking' strategy of refarming spectrum to remain within support cycles of UIC and 3GPP standards. In this way, ARA members will be demonstrating best practice management of Australia's largest private networks.

ARA notes that the consultation paper states that ETCS is becoming increasingly obsolete.

ARA wishes to inform the ACMA that, unlike GSM-R, ETCS is not an obsolete technology and will persist for many decades as primary EU train control system independent of future radiocommunication networks. ETCS remains mandatory and the industry standard for all EU-funded projects and is being deployed in Australian and New Zealand railways.

ACMA has requested information from rail safety licensees regarding potential transitions to the 1900 MHz band. Unfortunately, detailed timeframes are difficult to determine as FRMCS standards and equipment are still under development by the UIC. Current projections expect standards to be finalised and equipment availability from mid to late 2020. ARA expect FRMCS-compatible equipment to be globally available on the 1800 MHz band, suggesting the potential for concurrent use of the 1900-1910 MHz and 1800 MHz bands.

However, the exact spectrum allocation hinges on completing thorough investigations into future use cases. Timelines for use of 1900MHz for rail are expected to vary between Jurisdictions and will be influenced by factors such as GSM-R obsolescence, longevity of other technologies such as MCX over 4G/5G, favourable 1900MHz technical conditions and the need for ETCS L2 in areas that sit outside of current 1800MHz spectrum boundaries.

The rail industry would be in a better position to provide further clarity of expected 1900MHz use in the coming years as individual jurisdictions commence FRMCS feasibility projects.

Alternative licensing conditions

ARA welcomes an invitation to provide feedback about the potential effectiveness and impacts of alternative licence conditions including views on the practical implications of applying such conditions.

Given the critical role of rail transportation in ensuring public safety and facilitating essential services, ARA advocates for the exemption of rail from alternative licensing conditions. Alternate licensing conditions such as Use It Or Lose It (UIOLI) or Use It Or Share It (UIOSI) would disadvantage the rail industry. It would create uncertainty to the longer-term tenure of rail spectrum, impacting government's ability to plan for future rail transport needs. It may take many years to develop acceptable business cases, secure funding, procure and implement safety and control communications systems. Rail operators must maintain uninterrupted access to communication infrastructure to manage operations, particularly during emergencies and disasters, effectively. Exempting rail from alternative licensing conditions ensures operators can prioritise safety and operational efficiency without unnecessary regulatory burdens. This exemption acknowledges the unique needs and responsibilities of the rail sector, safeguarding its ability to deliver reliable and secure services essential for the well-being of passengers and communities. By fostering a regulatory environment conducive to rail operations, we reinforce our commitment to maintaining high safety and service excellence standards in the rail industry.

ARA is concerned that suggestions of placing conditions on continued access to spectrum will limit ability of state rail authorities to plan and deploy new rail corridors to serve growing populations and growth areas. It can be expected, either now or in future, that there are areas under rail industry spectrum licences that are not currently used because there is currently no rail corridor through these localities.

As with large-scale projects, it takes decades to plan new housing developments and suburbs; to define road and rail transport corridors; and to resume and remediate land in preparation for commercial and residential development. Should spectrum be conditional on use, then rail may lose access to licensed spectrum before transport corridors are reserved. ARA, therefore, perceives the application of conditions on the use of spectrum could be a deterrent to expanding rail services.

Regarding roaming, ARA is not opposed to supporting emergency use of licensed spectrum and would welcome the opportunity to participate in discussions to investigate how this can be achieved while still delivering reliable passenger and freight transport services.

Appendix A - further detail on current use of 1800 MHz in Australian railways

Table 1 below lists the licences held by ARA members in the 1800 MHz spectrum band.

Table 1: Licences held by ARA members

Licensee	Licence Number	Spectrum	Bandwidth	Scope limited to the provision of rail safety and control communications
Victorian Rail Track	9460484	1770-1775, 1865-1870	2 x 5 MHz	No
Victorian Rail Track	9460485	1775-1785, 1870-1880	2 x 10 MHz	Yes
Queensland Rail Limited	9263460	1770-1775, 1865-1870	2 x 5 MHz	No
Queensland Rail Limited	9367783	1775-1785, 1870-1880	2 x 10 MHz	Yes
Public Transport Authority of Western Australia	9263461	1770-1775, 1865-1870	2 x 5 MHz	No
Public Transport Authority of Western Australia	9367781	1775-1785, 1870-1880	2 x 10 MHz	Yes
Department of Planning Transport and Infrastructure	9460456	1775-1785, 1870-1880	2 x 10 MHz	Yes
Sydney Trains	9460463	1770-1775, 1865-1870	2 x 5 MHz	No
Sydney Trains	9460464	1775-1785, 1870-1880	2 x 10 MHz	Yes

Appendix B - further detail on current use of 1800 MHz in Australian railways

Victoria:

VicTrack holds two licences in the 1800 MHz band on behalf of the Victorian Government. These licences are detailed in Table 2 below.

Table 2: Victorian Rail Track Corporation's spectrum licences in the 1800 MHz band

Licence Number	Spectrum	Bandwidth	Geographical boundary	Scope of licence
9460484	1770-1775, 1865-1870	2 x 5 MHz	Metropolitan Melbourne	Nil
9460485	1775-1785, 1870-1880	2 x 10 MHz	Metropolitan Melbourne	The licence only authorises the operation of radiocommunications devices for the purpose of the provision of rail safety and control communications

The two licences are used for rail safety and control communications through the Digital Train Radio System (DTRS) that support metropolitan rail services. These services support an annual patronage of 99.5 million⁵. The metropolitan rail operator, Metro Trains Melbourne (MTM) have included availability of the DTRS as a component of their Safety Management System (SMS) co-regulated with the Office of the National Rail Safety Regulator (ONRSR). As such, MTM cannot operate train services if the DTRS is unavailable.

The DTRS uses part of the spectrum covered by the licences directly for:

- Voice communications between train drivers and operational staff including safety critical Railway Emergency Calls
- Data communications of:
 - train location information used to make key decisions relating to delivery of train services to the timetable,
 - status of signalling equipment in locations where it is prohibitively expensive to deliver wired telecommunications infrastructure on the railway.

The DTRS depends on the remainder of the spectrum covered by the two licences for use as guard bands to mitigate interference from Mobile Network Operators (MNO) as they deploy high-power sites near rail corridors.

The DTRS is based on the GSM-R standard and EIRENE-MORANE specifications.

The geographical boundary of the two spectrum licences includes the current metropolitan railway lines and key railway facilities. It also includes a future expansion of the metropolitan railway line to the outer suburban growth area of Wallan.

For these current 1800 MHz licences, the Victorian Government has no third party or sharing arrangements.

New South Wales:

Sydney Trains holds two spectrum licences in the 1800MHz band. These licences are detailed in Table 3 below.

⁵ Department of Transport, Annual Report 2021-22, page 160 - [DoT-Annual-Report-2021-22-v1.pdf \(content.vic.gov.au\)](#)

Table 3: Sydney Trains' spectrum licences in the 1800 MHz band

Licence Number	Spectrum	Bandwidth	Geographical boundary	Scope of licence
9460463	1770-1775, 1865-1870	2 x 5 MHz	Greater Sydney	Nil
9460464	1775-1785, 1870-1880	2 x 10 MHz	Greater Sydney	The licence only authorises the operation of radiocommunications devices for the purpose of the provision of rail safety and control communications

These two spectrum licences are used for operating the Digital Train Radio System (DTRS) to deliver safe and efficient rail services in Greater Sydney area. The DTRS enables secure two-way voice and data communication between train crews and network control personnel. Sydney Trains' DTRS network extends from Newcastle in the North to Lithgow in the West and Kiama in the South. The DTRS provides rail safety and control communications for both passenger and freight transportation across the Sydney Trains network. It supports 259 million passenger journeys and the safe movement of approximately 29 million tonnes of freight annually.

The DTRS uses part of the spectrum covered by the licences directly for:

- Voice communications between train drivers and operational staff including safety critical Railway Emergency Calls
- Data communications of:
 - Retrieving diagnostic log files from onboard equipment
 - Carrying out remote software upgrades on onboard equipment

5MHz of the spectrum (licence no 9460463) is currently used as a guard band under Sydney Trains spectrum management strategy. To mitigate interference from MNOs as they deploy high-power sites near rail corridor.

The DTRS is based on the GSM-R standard and EIRENE-MORANE specifications.

For these current 1800 MHz licences, Sydney Trains has no third party or sharing arrangements.

Queensland:

Queensland Rail holds two licences in the 1800 MHz band. These licences are detailed in Table 4 below.

Table 4: Queensland Rail spectrum licences in the 1800 MHz band

Licence Number	Spectrum	Bandwidth	Geographical boundary	Scope of licence
9263460	1770-1775, 1865-1870	2 x 5 MHz	South East Qld	Nil
9367783	1775-1785, 1870-1880	2 x 10 MHz	South East Qld	The licence only authorises the operation of radiocommunications devices for the purpose of the provision of rail safety and control communications

The two licences are currently being used for implementation of the ETCS L2 digital Signalling system in South East Qld. ETCS L2 will allow more trains on existing tracks, increasing the rail network's capacity, while maintaining safety. More train services will assist in meeting the demand from projected patronage growth on public transport in South East Queensland (SEQ) and provide for a significant increase in patronage and services during the 2032 Olympic Games.

The licenses are used by the Data Radio System (DRS) which provides a high availability data bearer for the ETCS L2 system being implemented in South East Qld.

The ETCS L2 system is currently under development. Testing and commissioning has commenced on the Shorncliffe Pilot Line, which will be used to prove the functionality, performance and safety of ETCS L2 prior to rollout in the CRR tunnel and to greater parts of the South East Qld Passenger rail network⁶.

Qld Rail is using 1800MHz spectrum covered by the licences above to provide:

- a DRS data bearer for ETCS L2 digital signalling system on the Shorncliffe Pilot Line.
- a DRS data bearer for testing of Automatic Train Operation (ATO) on the Shorncliffe Pilot Line. ATO will be used to ensure train alignment with passenger screen doors that will be implemented at each underground CRR station. This ensures passenger safety through the precise alignment of train entry/exit doors to the platform screen doors.
- A DRS data bearer within an Integration lab for testing of ETCS L2 functionality, performance, interfaces, configuration, software and hardware updates.
- DRS at rollingstock manufacturing facilities to provide connectivity to the ETCS L2 system Core to test & commission the ETCS L2 fitment onboard rollingstock.
- Verification of DRS coverage modelling.

In addition, Guard Bands are implemented within the QR spectrum licenses to provide mitigation against interference from Mobile Network Operator (MNO) services along the rail corridor.

The initial DRS deployment is based on the GSM-R standard and European Union's EIRENE-MORANE specifications. The DRS uses the GPRS standard for data transmission.

The geographical boundary of the two spectrum licences covers most of the Qld Rail metropolitan passenger rail network, with the exception of the Sunshine Coast – to Gympie Nth section and the proposed Direct Sunshine Coast rail network to Maroochydore. The current 1800MHz spectrum licence northern boundary is located at Beerwah, some 70km short of the northern most point of the suburban passenger rail network.

For these 1800 MHz licences, there is no third party or sharing arrangements. Qld Rail had previously arranged sharing of spectrum with an international airline carrier to test aircraft based low power mobile phone base stations for passenger communications and commenced (but not completed) negotiations with Base2 who were developing a GSM-R interface for rollingstock radio terminals used on the defined Interstate Rail corridor operated by the Australian Rail Track Corporation (ARTC).

⁶ <https://crossriverrail.qld.gov.au/construction/shorncliffe-line-works/shorncliffe-line-trackside-signalling-work-updates/>

Appendix C - further detail on planned use of 1800 MHz in Australian railways

Victoria:

Victoria is exploring a transition the DTRS to (or replace the DTRS with) the Future Railway Mobile Communication System (FRMCS).

FRMCS is expected to continue delivering existing services provided by DTRS, with additional supporting data communications to support the modern train control systems including Communication-Based Train Control (CBTC) and European Train Control System (ETCS).

It is expected that the transition to 5G technology will mitigate interference from high-power MNO sites adjacent to railway land, however guard bands will still be required during the transition from the current DTRS to the FRMCS. Testing and analysis will need to be completed to confirm any possible future reduction in guard bands once fully transitioned to the FRMCS.

The Victorian Government plans to explore opportunities related to FRMCS including use of the 1900-1910 MHz band alongside the existing 1800 MHz spectrum licences and voice and data communications for regional trains, light rail, bus, and emergency services, which may be enabled by third party or sharing arrangements.

FRMCS may need coverage augmentation for additions or extensions to the metropolitan train network, mitigating coverage impacts from high-power MNO sites and private developments adjacent to railway land, as well as increasing coverage overlap to support reliability targets for future ETCS deployments.

There will be a period of transition between the DTRS and the future system where it is likely Victoria will need to operate both radio systems in parallel.

In addition, the Victorian Government's Big Build⁷ includes the Suburban Rail Loop, a 90km rail line linking every major train service from the Frankston Line to the Werribee Line. Subject to procurement outcomes and timing, pricing and technical constraints, the Suburban Rail Loop will need access to 1800 MHz and/or 1900 MHz spectrum.

New South Wales:

Currently, European Train Control System (ETCS) - Level 2 is being deployed on a section-by-section of Sydney Trains network. This will utilise Sydney Trains DTRS network to carry train movement authority and signalling information. Spectrum utilisation will be further optimised to meet end to end performance requirements of ETCS-L2 and provide additional capacity due to the expected increase in the number of train services.

Sydney Trains is also exploring to transition the DTRS from GSM-R to FRMCS. FRMCS will continue to support existing applications provided by the DTRS. It will enable new advanced applications such as remote train condition monitoring, remote infrastructure monitoring, and critical real time video for rail safety. Sufficient spectrum availability is crucial for implementing these services.

It is expected that both GSM-R network and FRMCS will co-exist until roll out of the FRMCS network is fully completed.

Queensland:

GSM-R

⁷ <https://www.budget.vic.gov.au/our-big-build>

As discussed in appendix C, 1800MHz spectrum is planned to be used to provide for the initial ETCS L2 and ATO within the Cross River Rail Tunnel scheduled for revenue services in 2026.

While Qld is in the early stages of ETCS L2 implementation, it is planned to be extended throughout the other parts of the SEQ passenger rail network. Planning is under way for ETCS implementation south of the CRR tunnel to Varsity Lakes on the Gold Coast in readiness for the 2032 Olympic and Paralympic Games. It is likely that the migration off GSM-R onto FRMCS in these rail sectors will begin in 2033, the 1800MHz spectrum will be required to ensure continuity and support of operations up until the migration activities have been successfully completed until 2036.

FRMCS

GSM-R technology is approaching obsolescence somewhere between 2030 and 2035 pending vendor supportability and contractual arrangements.

As a result, the department of Transport and Main Roads (TMR) is working with Qld Rail to commence planning activities to transition to the Future Railway Mobile Communication System (FRMCS). The FRMCS project is in its early phases and about to commence identification of possible Use Cases.

While FRMCS is expected to replace mobile data provided by GSM-R for ETCS and ATO, additional capability of 5G technology could be utilised to provide mission critical broadband data to deliver applications such as CCTV, operational voice, track possession terminals, infrastructure & rollingstock condition monitoring, tunnel warning systems to name a few. As part of the use case development, Qld are keeping a close eye on developments of mobile broadband use cases for rail by other rail entities in Australia as well as overseas.

It is expected that the transition to 5G technology will mitigate interference from high-power MNO sites adjacent to railway land, however guard bands will still be required during the transition from the current DTRS to the FRMCS. Testing and analysis will need to be completed to confirm any possible future reduction in guard bands once fully transitioned to the FRMCS.

Due to the unavailability of 1800MHz Spectrum to the Sunshine Coast, TMR and Qld Rail are exploring the use of 1900 to 1910 MHz spectrum for any future implementation of ETCS on the Direct Sunshine Coast Rail in readiness for the 2032 Olympic and Paralympic Games. As such, Qld Rail and TMR would welcome a timely resolution of favourable technical conditions and allocation of the 1900 to 1910 MHz spectrum to the rail industry to provide certainty of access to spectrum.

Whilst there is some discussion on the use of 1900 to 1910MHz for FRMCS, Qld Rail expect ongoing use of 1800MHz spectrum for:

- Continued use of GSM-R until migration completion (2030 to 2036)
- Transitioning between GSM-R (2G) and FRMCS (5G)
- Future transition between FRMCS (5G) and replacement technologies (6G?)
- Additional capacity for new FRMCS use cases and applications that are unable to be catered for by 10MHz of 1900 MHz TDD spectrum
- Management of interference between FRMCS and MNO networks. MNO networks operating in the 1920 to 1980 MHz band may be susceptible to interference from FRMCS operating in 1900 to 1910 MHz. In locations where there are constraints on equipment location such as tunnels, it may not be possible to implement FRMCS in the 1900 to 1910 TDD band without impacting MNO services.
- National rail harmonisation and interoperability for freight and long-distance passenger operations.