



Australian Government

Department of Infrastructure and Regional Development

Deputy Secretary

Contact: Mr Charles Hausknecht, 6274 6612

Mr Ian Robinson
Deputy Secretary
Department of Communications
38 Sydney Avenue
FORREST ACT 2603

Brian Kelleher

Dear Mr Robinson

Subject: Spectrum Review

I am pleased to provide a copy of the Department of Infrastructure and Regional Development's (the Department) submission to the Department of Communication's review of the Australian spectrum policy and management framework. The Department has prepared this response in consultation with our portfolio agencies and I apologise for the delay in responding.

The portfolio plays an integral role in driving national infrastructure priorities to enhance the safety, security, efficiency, capacity and sustainability of Australia's transport systems. This responsibility is often undertaken in cooperation domestically with state, territory and local governments and internationally with our Asia-Pacific regional partners.

The Department supports the review as a timely opportunity to reflect in Australia's spectrum policy and management framework the vital importance of the 'public good' and safety-of-life roles of the transport sector and the importance of spectrum management to regional and remote areas of Australia.

It is important to recognise that use of the spectrum is not just for our national transport network, but is necessary for the interoperability and harmonisation of communication, navigation and surveillance capabilities critical for safe and efficient international transport operations and that Australia has obligations as a signatory to several international agreements which rely on spectrum continuity.

The Department's submission provides a broad overview of current and future spectrum usage and allocation from the context of the four transport modes of the portfolio - aviation, marine, road and rail.

The Department has highlighted that broader safety, security and sustainability measures must be used in assessing and valuing 'public good' spectrum allocation. Purely market-based measures applied to commercial spectrum allocations in this context are more problematic and could lead to adverse safety and efficiency outcomes for the transport sector and the Australian economy.

The Department would be happy to provide further information if required. The contact officer for the Department is Charles Hausknecht, Director, Air Traffic Infrastructure, Air Traffic Policy 6274 6612 or email Charles.Hausknecht@infrastructure.gov.au.

Yours sincerely

Andrew Wilson
Deputy Secretary
8 October 2014

Specific Comments against the Spectrum Review - Terms of Reference

1. Simplify the framework to reduce its complexity and impact on spectrum users and administrators, and eliminate unnecessary and excessive regulatory provisions

The Department of Infrastructure and Regional Development (the Department) **supports** examination of the existing eight objectives contained in Section 3 of the *Radiocommunications Act 1992*.

In this respect the Department **supports** consideration of whether a hierarchy or priority of objectives is needed to remove any potential ambiguity for stakeholders regarding application of the existing eight equally weighted objectives.

The Department **supports** investigation of opportunities to remove complexity in the current framework, in line with the Government's commitment to reduce the red tape regulatory burden on industry, without compromising or eroding the overall transparency and integrity of the current framework to achieve efficient, effective and appropriate national outcomes, consistent with Australia's international obligations.

The Department **welcomes** the incorporation of clear statements in the current framework regarding what spectrum bands are out of scope in relation to availability for commercial allocation (e.g. spectrum protected because it enables significant 'public good', safety-of-life functionality, emergency services including where Australia has international obligations to protect spectrum). The Department notes that criteria may need to be developed to demonstrate the case for protection.

The Department **does not support** market based pricing of spectrum in all circumstances, particularly where there is a fundamental and demonstrable 'public good' or national safety and security benefit. In such circumstances it may be better to apply a "cost of denial/ unavailability" approach to pricing, acknowledging that there are often many qualitative rather than quantitative aspects to spectrum valuation in such circumstances.

The Department **supports** examination of simplifying and/or devolving interference management requirements and regulatory powers to the relevant transportation authorities, e.g. in relation to aviation interference.

2. Improve the flexibility of the framework and its ability to facilitate new and emerging services including advancements that offer greater potential for efficient spectrum use, while continuing to manage interference and providing certainty for incumbents

The Department **supports** flexibility in the framework to enable it to be more responsive and efficient in relation to enabling additional functionality and services utilising the spectrum. However, there should be clear recognition of the need to provide certainty and in some cases protection for certain incumbents and/or continued functionality which may limit the application of a fully flexible commercial spectrum allocation approach.

For example, aviation spectrum use is well established with specific frequency allocations for the various types of equipment being operated (e.g. voice communications, air traffic control radar systems, radio frequency navigation aids). The Civil Aviation Safety Authority (CASA) has no scope to vary the allocated spectrum and has minimal approval requirements for this equipment and relies on being able to accept equipment approvals from recognised National Airworthiness Authorities (e.g. by the US Federal Aviation Administration) removing the need for re-approval in Australia.

Further, global allocations are required for safe, efficient and cost-effective transport and provide a fundamental tenet for global and regional harmonisation with other benefits for Australia. For example Australia has a policy to harmonise its vehicle standards with international standards developed through the World Forum for the Harmonisation of Vehicle Regulations where possible, many of which are based on European standards but are also widely applied by automatic trading partners in Asia as this helps facilitate international trade in motor vehicles.

Whilst there may be opportunities for greater flexibility in spectrum sharing by incumbents and new users, caution is necessary to ensure incumbents have suitable access to interference-free spectrum to meet operational needs well into the future particular when allocations are required for transport safety-of-life purposes.

It is important that planning instruments reflect the treaty framework established by the International Telecommunications Union (ITU) Radiocommunication Sector, as for example, ITU Radio Regulations are used as the framework for the relevant International Civil Aviation Organization (ICAO) Annexes and Standards and Recommended Practices (SARPs).

In terms of administrative simplicity and efficiency, the Department **strongly supports** the review considering the ability for planning instruments, such as the Australian Radiofrequency Spectrum Plan, to be able to be updated and harmonised with international allocations in a more flexible and agile way.

Appropriate resourcing may be a major determinant in improving the flexibility and responsiveness of the framework, especially if the need to manage interference (and technical standards) were to increase, particularly in an environment of capacity pressures on spectrum due to increased demand from existing and new services.

3. Ensure efficient allocation, ongoing use and management of spectrum, and incentivise its efficient use by all commercial, public and community spectrum users

Competition and a market-based pricing approach for commercial use may drive efficiencies in use of the spectrum allocated for commercial purposes and incentives could be developed to capture further efficiencies in commercial uses. However, this is not necessarily true of spectrum supporting significant functionality in the public and community domain, including safety-of-life functions, where application of a market-based pricing approach may comprise safety outcomes within the national, regional and global framework.

The Department **would not support** a market-based approach to ‘public good’ users such as aviation. Charging arrangements are unlikely to deliver any efficiency benefit within the aeronautical bands, or more broadly, within the safety bandwidth.

The Department **supports** work to provide a clear definition regarding the term ‘efficiency’ as applied in this respect. The distinction between ‘spectrum efficiency’ and ‘spectrum occupancy’ should be clearly understood with regard to safety and associated communications – this may require consideration of whether an audit of actual spectrum occupancy is required as a starting point.

Again, it may also be useful to identify spectrum that is out of scope for spectrum trading, i.e. spectrum that is allocated purely for ‘safety services’ and ‘emergency services’ and thus deemed a ‘public good’.

Any fundamental changes to the allocation and management of spectrum must be introduced in a way whereby the necessary safety and security controls and functions are not lost, have a cognisance of the long-term investment cycles of transport infrastructure, and take into account the ability of the transport sector to safely and efficiently transition to a new arrangement.

4. Consider institutional arrangements and ensure an appropriate level of Ministerial oversight of spectrum policy and management, by identifying appropriate roles for the Minister, the Australian Communications and Media Authority, the Department of Communications and others involved in spectrum management

The Department **supports** the clear identification and articulation of clear roles and responsibilities of the responsible Minister, the Department of Communications and the Australian Communications and Media Authority (ACMA), particularly under the governing legislation.

The Department also **supports** the development of a Government policy statement regarding the Government's national and international approach to management of spectrum in Australia, including its impacts on Australia's regional and remote communities. The policy statement could include principles the Government expects to be applied in spectrum allocation and management, and outline detailed consultation processes with other portfolios, industry and the community before significant spectrum policy proposals are presented to the Government for consideration.

The review might also consider the issue of greater collaboration and efficiency between agencies. For example, Airservices Australia (Airservices) currently manages a number of spectrum bands, used for navigation and surveillance systems, and there may be opportunity to investigate whether these bands can be jointly managed in the future between Airservices and the Department of Defence, noting the current collaboration between these agencies on developing a harmonised civil-military air traffic management system (i.e. the "OneSKY" project).

5. Promote greater consistency across legislation and sectors, including in relation to compliance mechanisms, technical regulation and the planning and licensing of spectrum

The Department **supports** investigation of measures to improve consistency across legislation and the transport sector, including in relation to compliance mechanisms, technical regulation and the planning and licensing of spectrum, where it is sensible to do so.

The Department also **supports** ACMA retaining its technical role supported by commensurate resourcing and would welcome investigation to identify any areas of regulatory overlap and/ or gaps between ACMA and transport regulatory agencies, as well as the opportunity to investigate opportunities to simplify administration arrangements while still meeting ACMA requirements.

Whilst currently rather complex, the licensing arrangements are seen as effective. However the Department **supports** further investigation of the scope for this process to be simplified and made more to accommodate new license types that better reflect spectrum efficient technology.

The Department **supports** the Department of Communications and ACMA considering arrangements for updating planning and legislative instruments and where possible, harmonising this process with international allocations in a more flexible and agile manner, which provides potential benefits for Australian trade.

6. Develop an appropriate framework to consider public interest spectrum issues

The Department **strongly supports** the development of a framework to consider public interest spectrum issues, on the premise that spectrum bandwidths, particularly those supporting safety-of-life and emergency services functions are not compromised, in favour of specific commercial interests.

There would be benefit in better defining public interest services, in order to provide greater transparency and guidance. In this respect, clearly defining what is meant by the term "public interest" spectrum and developing a supporting assessment methodology, including criteria, would support a robust decision framework. The framework would also need to be able to reflect the constraints on Australia in fulfilling national, regional and international obligations and commitments.

The Department **acknowledges** that quantifying in commercial terms broader “non-economic” benefits remains challenging and open to subjective assessments. Further challenges in this regard are occurring with the increasing number of private commercial entities now involved as users of radiofrequency spectrum on behalf of government entities.

However the Department **supports** the use of safety, security and sustainability measures in the Government’s overall assessment of future spectrum policy and management priorities.

7. Develop a whole-of-government approach to spectrum policy

The Department **supports** a clear articulation of a whole-of-government approach to spectrum policy. This should include setting out the relevant consultative mechanisms between the Commonwealth and its agencies with State, Territory and local governments.

The Department reaffirms its **support** for the development of a national Government policy statement for spectrum management, covering all spectrum users (public, commercial, and community), and laying out the Government’s policy principles and objectives in relation to spectrum allocation and the roles and responsibilities of the regulator and policy department in delivering those outcomes.

The statement must recognise safety-of-life and emergency services functions inherent within the spectrum context. The statement should also identify and consider that certain transportation modes not only meet national demand, but also meet international commitments and obligations.

8. Develop a whole-of-economy approach to valuation of spectrum that includes consideration of the broader economic and social benefits

In line with the Department’s comments on terms of reference #3 and #6, the Department supports the consideration of broader economic and social benefits on valuation of the spectrum.

The Department **does not support** complete adoption of a “highest bidder” policy approach to spectrum allocation and management in the future.

Specific users must be able to have allocated, and obtain access to, the appropriate parts of the spectrum to deliver ‘public good’ functions particularly where these are critical to demonstrated safety-of-life functions.

In developing a valuation of spectrum allocation for different uses, commercial value on ‘public good’ functions will need to overcome significant sensitivities and a degree of subjectivity in placing a “dollar value” on these functions.

BACKGROUND

AVIATION

Spectrum is a critical enabler for Australia's aviation communications, navigation, surveillance/ air traffic management (CNS/ATM) system. Its role enables the safe and efficient operation of air services in international, domestic and regional aviation in Australia and is vital to the transition of aircraft from our airspace regional to neighbouring Asia –Pacific ATM operations. Spectrum's importance is specifically recognised in the ICAO Standards and Recommended Practices (SARPs).

Aeronautical services are recognised internationally to be prime users of radio frequencies without which aircraft operations would not be capable of meeting the global demand for safe, secure, efficient and cost-effective transport. The prominent safety-of-life element, present during all phases of an aircraft's flight, is accorded special treatment internationally and is granted protection from harmful interference through agreed measures.

Aeronautical equipment operates as safety-of-life type equipment in specific spectrum as allocated by the International Telecommunications Union (ITU) and detailed by ICAO. This ensures international interoperability of communications and navigation equipment for both Australian aircraft operating overseas as well as foreign aircraft visiting Australia.

Aeronautical spectrum has historically been divided into two main functions: air-ground communications and radionavigation; although satellite-based services are more and more being used and are dependent on spectrum access. For radio communication, only a few frequency bands in the high frequency (HF) spectrum and one single frequency band in the very high frequency (VHF) spectrum are used for air/ground communications. A variety of frequency bands are available to support aviation navigation services, both for ground based and airborne systems. Generally, these frequency bands meet the current (and future) requirements for aeronautical services.

Aviation is a global operation and therefore world-wide allocations are required to enable international standardisation of equipment and systems to support safe and global air traffic. The ITU Radio Regulations are used as the framework for the relevant ICAO Annexes and SARPs.

The ICAO SARPs in Annex 10 are developed in accordance with Article 37 of the ICAO Convention for the purpose of ensuring the safety and regularity of air navigation. In addition to the Radio Regulations, the SARPs specify interface and performance standards for internationally agreed systems satisfying specific operational requirements of aeronautical services. It follows that certainty of access to interference-free spectrum is essential for the operation of aeronautical services.

Future aeronautical radio services are anticipated to make much greater use of bandwidth efficient systems through the application of modern technology for reduction of channel spacing, and increased channel capacity and digital technology.

The overall effect of these technological improvements is to meet the expected increase in air traffic around the world in the years ahead, which in some areas is expected to double, without any significant increase in spectrum. Therefore some aviation bands that may appear under-utilised at present will become more heavily utilised in the near future due to new technology and/or anticipated aviation requirements.

In addition to CNS systems developed for the aviation sector, Airservices also operate other RF systems, such as bearers used to provide critical voice and data services in order to facilitate safe and efficient air traffic services, and land mobile radios used by aviation rescue firefighters.

MARITIME

Spectrum access is also critical to the maritime sector and the maritime mobile service (MMS) forms an important part of Australia's radiocommunications community.

A wide range of organisations and individuals use the spectrum allocated to the MMS including search and rescue (SAR) organisations, coast guard stations, domestic and international commercial shipping, including commercial fishing vessels, recreational vessels and Australian Defence Force mobile units (air, sea, and land), and associated fixed stations, as well as visiting military units.

The international nature of the MMS means that Australian allocations are required to be largely consistent with the harmonised ITU allocations to the MMS, with much of the planning work being driven and overseen by the ITU and the International Maritime Organization (IMO). The IMO is responsible for ensuring the safety and security of shipping activities.

The allocations are also widely used for general communications by the both commercial and non-commercial vessels. In addition, vessels make major use of non- Global Maritime Distress and Safety System (GMDSS) mobile satellite spectrum, for ship's business and crew communications, and for contact with shore authorities.

Spectrum usage in the maritime mobile service occurs in the VLF, MF, HF, VHF, UHF, SHF and EHF frequency bands. This includes allocations to the maritime mobile-satellite service in the UHF and SHF bands. All of these allocations play important roles in the GMDSS prescribed in Chapter 4 of the International Convention for the Safety of Life at Sea 1974 (the SOLAS Convention).

In addition, the International Convention on Maritime Search and Rescue 1979 provides an international system covering SAR operations, to which Australia is a party. Close cooperation between aviation and maritime sectors is necessary for these two Conventions to be effective. To this end, a joint ICAO and IMO document - the International Aeronautical and Maritime Search and Rescue Manual (IAMSAR) - is the key SAR document used world-wide, and Volume III is required to be carried on ships subject to the SOLAS convention.

There are also several other international conventions, relating to Australia's responsibility to establish and maintain a SAR service, including the *United Nations Convention on the Law of the Sea 1982* (UNCLOS).

Although many of the radio frequencies which are the focus of maritime community relate to the channels for distress, urgency and safety communications, as part of the GMDSS, they are also used for safety-of-navigation, such as for assisting collision avoidance, efficient traffic management in and around ports, or around areas of special significance for environmental reasons, or for routing vessels safely due to navigational constraints. In addition, vessels make wide use of mobile satellite services, including 406 MHz Cospas-Sarsat distress beacons with 121.5 MHz homing beacons.

Satellite spectrum is also used for satellite detection of 162 MHz automatic identification system (AIS) transmissions by ships for the Australian S&R region and also for Long-Range Identification and Tracking of ships (LRIT). Satellite spectrum (mobile satellite service) is used for tracking of self-locating marker datum buoys in S&R and response to pollution incidents. Radar spectrum (radio determination service) is used by the Australian Maritime Safety authority (AMSA) and other tasked S&R aircraft, for surveillance of shipping in parts of the Great Barrier Reef and Torres Strait, and also used widely by ports throughout Australia.

Some vessels that operate in close proximity to land stations in Australia, also utilize the land mobile service provisions as 'ambulatory stations'. In addition, vessels make significant use of the mobile satellite service and the MMS, as well as the services under the radiodetermination service e.g. radars, racons (radar beacons), and the radionavigation satellite service, (e.g. GPS). Other services include the port operations service, and the ship movement service (a safety service).

Elements of the maritime radiocommunication links are also often carried by services other than the maritime mobile service, such as the fixed service (FS), or the mobile satellite-service (MSS). Examples are the distress and safety high-frequency (HF) stations at Wiluna (WA) and Charleville (QLD), which are remotely controlled and monitored from Canberra.

Ships are also prolific users of non-GMDSS satellite communications, which use the MSS, and in the vicinity of coastal cellular telephone/data infrastructure, also use the fixed service for both data and voice. Hydrographic and meteorological buoys with radio transmitters also use a small amount of spectrum in various locations of the radio spectrum, and use both HF and satellite allocations (FSS, MSS and MMSS) under the meteorological aids service, or the ISM band, or via cellular mobile network data connections. The Under Keel Clearance Management (UKCM) system for deep draught vessels transiting the Torres Strait use data access for the cellular network in the area.

Ships make use of the standard frequency and time signal service on HF, as well as the standard frequency and time signal-satellite service.

Aids to Navigation (e.g. lighthouses, light buoys, medium frequency (MF) Differential GPS transmitters (maritime radionavigation service), radars, radar beacons, and AIS base stations) are located around the coast, and their operation is monitored by various techniques including cellular telephone networks and satellite using the fixed service, fixed satellite service, and mobile satellite service. Aids to Navigation used by States and the Northern Territory also use cellular telephone/data networks for monitoring, and in some cases, satellite data connections in more remote locations.

AMSA and other government agencies makes use of satellite reception of ships' automatic identification system (AIS) transmissions at VHF (162 MHz) to obtain maritime domain awareness for several purposes, the prime one being awareness of shipping in the Australian S&R Region.

Many maritime activities such as oil and gas operations including crew and pilot transfer also use elements of the aeronautical mobile service of various types.

An important issue is the status of services (i.e. primary or secondary) in Article 5 of the Radio Regulations and in the Australian Radiofrequency Spectrum Plan. Although most of the Radio Regulations are reproduced in the Australian plan, there are a number of footnotes that reflect specific Australian requirements, and since Australia is in ITU Region 3 it is found that not all of maritime usage is globally harmonized.

The same satellite spectrum can be used for safety services, public correspondence, or 'non-critical' services, and while the Radio Regulations pay great heed to internationally agreed 'safety services', the importance of related spectrum which supports for example, feeder links of various types are not provided the same protection, other than by sound frequency co-ordination, and planning by the spectrum regulators and service providers.

It should be noted that a review and modernization of the GMDSS has just begun at the IMO, which is being performed in parallel with the examination of the future spectrum requirements for e-Navigation, and there may be a requirement for increased allocation of spectrum to the maritime mobile service (including the MMS) in the future.

As far as shipping is concerned, there will never be a time where all communications to/from ships is provided by one radiocommunications technology, portion of spectrum, or economic model.

While certain services are provided free to users, independent of subscription, the shipping industry already pays considerable charges on a user-pays principle using satellite communications for ship's business, crew communications, education and entertainment, as well as passenger entertainment and services on passenger ships, whilst at sea (including when at anchor off ports) and also to coastal telecommunications networks, when in range.

ROAD TRANSPORT

The main aspect of spectrum management of interest to the road transport sector is spectrum allocation to support the operation of Cooperative Intelligent Transport Systems (C-ITS). The Department is working with state, territory and New Zealand road authorities, through Austroads to develop a coordinated approach to C-ITS, that would maximise the safety, productivity and environmental benefits of C-ITS.

C-ITS refers to the use of wireless communications and real-time information sharing between vehicles, roadside infrastructure and personal devices. This will enable the next generation of vehicle and transport applications that cooperatively work together to deliver outcomes that are beyond what is achievable with standalone applications.

While the C-ITS ecosystem will involve several wireless technologies, including existing broadcast and cellular networks, it is the use of low latency Dedicated Short Range Communications (DSRC) in the 5.9 GHz band that is seen as vital for safety-critical applications.

Key international regions, including Europe, USA and Canada have formally allocated the 5.9 GHz band for C-ITS use. In 2008, the Australian Communications & Media Authority (ACMA) issued Embargo 48, which has protected the 5.9 GHz band (5.850-5.925 GHz) in Australia to enable planning to continue towards the use of ITS within the band, consistent with other key international regions.

International harmonisation will be critical to enable interoperability between equipment, consistency in services, and reduced effort and duplication with regards to deployment.

As nominated in the *Policy Framework for Intelligent Transport Systems in Australia*, Austroads are taking a lead role in progressing management arrangements for C-ITS in the 5.9 GHz band, and in April 2014 made a submission to ACMA, including the key recommendation that the spectrum allocation process be recommenced for C-ITS use of the 5.9 GHz band.

RAIL TRANSPORT

Passenger rail and spectrum use

Radio spectrum is used by rail networks to facilitate a range of communications, including train-to-control verbal communication.

The five state capital metropolitan passenger rail systems are moving towards a single radio standard, Global System for Mobile Communication - Railway (GSM-R), to replace their existing, ageing systems. GSM-R runs on 1800 MHz spectrum in Australia, and has been designed to meet the needs of future safety and control communications systems. GSM-R allows transmission of a large quality of data (not just voice) and operates with a high level of reliability.

By allowing communication systems to transfer data between trains and the control centres, moving to GSM-R will also allow operators to implement next-generation train control systems. These systems are able to provide more continuous, real-time information to train drivers regarding the safe speed and appropriate braking curves they should use to minimise travel time without risking collisions between trains. Effectively, for a congested or close to congested network, the new systems allows for an increase in the number of train services per time period over the same hard infrastructure without compromising safety. The jurisdictions are proposing slightly different but compatible systems, broadly based on the European Train Control System (ETCS) standards.

There are significant benefits in implementing a nationally consistent spectrum allocation, namely:

- Economies of scale in control system development and deployment. Whilst individual states are expected to implement slightly different systems, the core components will share similar technical features related to the spectrum band. As such, Australia will be able achieve economies of scale in manufacturing and import components for the new systems.
- Shared development cost amongst states. Whilst the benefits of the new systems will be most significant in the congested networks in Sydney and Melbourne (and in the medium term, Brisbane), the extensive costs of developing the new control systems independently may be larger than the benefits for South Australia and Western Australia over the short term. A common platform allows for more cost effective shared or purchased development.
- Whilst the new control systems will primarily benefit passenger services within the metropolitan regions, a common platform will reduce the cost of operating trains between cities. This will primarily impact interstate freight trains traversing the Australian Rail Track Corporation's (ARTC's) network between capitals. Whilst ARTC is developing a separate communication system (based on the 900 MHz frequency), by creating a common platform in the capital cities, freight rail operators will require less communication systems in order to operate in multiple networks without risks to network efficiency or safety.

Spectrum licences for passenger rail agencies in the five capital cities were renewed in 2013. The Government agreed to reissue 2x10 MHz licences at an up to 50% price discount with several conditions including that the spectrum would only be used for rail safety and control communications system and that each state provide an in-principle commitment to rollout the next generation systems within the licence period (to mid-2028).

The price discount reflected the economic benefits of supporting more efficient passenger rail movements through a national consistent allocation of radio spectrum for urban passenger rail. All states have renewed and paid for the 2x10 MHz licences.

The States were also provided the opportunity to renew the remaining 2x5 MHz licences on full commercial terms, including at commercial rates. NSW, Victoria, Queensland and Western Australia renewed these additional licences; South Australia allowed the 2x5 MHz licences to lapse.

ACMA will undertake a review of spectrum usage five years under this arrangement prior to the end of the licence (2023) as part of its general review of the 1800 MHz. It is anticipated that this review will inform ACMA's decision to offer the agencies renewal of the spectrum from 2028.

Freight rail and spectrum use

In 2005, the Australian Government committed \$69.6 million to the ARTC to implement a new telecommunication system across the non-metropolitan sections of the interstate rail network.

The new communications system is based on Telstra's Code Division Multiple Access (CDMA) technology. It provides a single communications medium across the whole network, replacing nine separate communication systems. Train operators are in the process of completing the upgrading of locomotives to use this system with the final in-cabin equipment upgrades scheduled to be complete by the end of 2014.

ARTC is building on this communication system with the development of the Advanced Train Management System (ATMS). ATMS is a communications based safe working system, which will replace physical train control and signalling systems with an advanced digital system utilising global positioning, broadband communications and satellite technology. It is being developed by ARTC for use on the interstate rail network.

ARTC has entered into a commercial contract with Telstra to host CDMA and ATMS on its mobile broadband network. The ARTC/Telstra network eliminates the need for ARTC to contract directly for spectrum and eliminates the need for changes in spectrum used by train operators as they cross state borders on the interstate rail network.

The Australian Government has committed \$50 million to assist ARTC move ATMS into the implementation phase, starting with a series of live trials before moving to broader roll out across the interstate network.

ARTC has been an early adopter in terms of digital technology for train communications and control. Contracting on a commercial basis has reduced the complexity for ARTC and also resulted in the extension of Telstra's mobile broadband network as communication networks were extended to ensure ARTC's entire network had coverage. ATMS will rely upon sufficient capacity being available in Telstra's network into the future.