



Australian Government

**Department of Broadband,
Communications and the Digital Economy**

**Review of technologies for digital radio
in regional Australia**

Final report

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Introduction

Digital radio in Australia commenced in the five mainland state capital cities—Adelaide, Brisbane, Melbourne, Perth and Sydney—in mid-2009. Digital radio was introduced to supplement, not replace, analog (AM and FM) radio services. It provides consumers who purchase a suitable receiver with access to additional radio services from commercial, national (ABC and SBS) broadcasters and, since early 2011, wide-coverage community radio broadcasters. Many of the receivers available also provide consumers with additional features that are not available for analog radio services. These may include improved sound quality, text on screen, a pause and rewind function, the ability to connect to the internet and dock with other devices.

When the Australian Parliament passed legislation to implement the framework for the introduction of digital radio in 2007, a parliamentary committee noted that it was too early to prescribe a technology for services in regional areas. Accordingly, the legislation required that a review be undertaken by 1 January 2011 of various technologies suitable for regional digital radio services.

Section 215A of the *Broadcasting Services Act 1992* (the Act) requires the Minister for Broadband, Communications and the Digital Economy to cause to be conducted a review of the relative merits of various terrestrial and satellite technologies for digital radio broadcasting services and restricted datacasting services in regional areas. The Minister must table a report of the review in each House of parliament within 15 sitting days of completion of the report.

The review was conducted by the Department of Broadband, Communications and the Digital Economy (the department) with technical input from the Australian Communications and Media Authority (the ACMA). The review included public consultation with the release of a discussion paper on 17 November 2010 and an invitation to make submissions published in several metropolitan and 43 regional newspapers. Submissions received which were not confidential are published on the department's website¹. The terms of reference for the review are at page 23.

Submissions provide a range of views in response to key issues identified in the discussion paper. In general, many submissions indicated a preference for Digital

¹ www.dbcde.gov.au/regionaldigitalradio

Audio Broadcasting Plus (DAB+) technology in regional areas but recognised it may not be suitable for all areas. Key consumer considerations discussed in submissions included the importance of wide-area coverage and availability of multi-band receivers if more than one technology is used for digital radio. Submissions did not discuss datacasting, noting that no such services are presently in operation.

While the review included a wide range of considerations, this report focuses on areas of particular importance as identified through the public submissions process.

Discussion

There are several technologies that may be suitable for digital radio services in regional Australia. However, any solution will need to consider a range of factors including spectrum availability, the cost and availability of transmission equipment and receivers, and the costs of establishing and maintaining services.

The legislation supporting Australia's digital radio framework recognises that digital radio services are a supplementary rather than replacement technology. The framework supports the commencement of services in those areas where new services are mostly likely to be commercially-viable and digital radio will complement existing analog services. Initially, only incumbent commercial, wide-coverage community and national broadcasters have opportunities to commence digital radio services. During May and June of 2009 the radio industry launched commercial, ABC and SBS digital radio services in Adelaide, Brisbane, Melbourne, Perth and Sydney. Community radio broadcasters in these markets officially launched their digital services in May 2011. The ACMA has granted licences for trial broadcasts in Canberra and Darwin, and trial services commenced in July and August 2010.

For the purposes of digital radio, a regional licence area is a licence area that is not a metropolitan licence area². Of the 102 commercial radio licence areas—excluding the Remote Commercial Radio Zones—96 are regional. The broad definition of regional licence area includes Canberra, Darwin and Hobart; substantially large population centres such as Newcastle and the Gold Coast; and smaller population centres such as Broken Hill and Mount Isa.

While all five metropolitan licence areas have at least six incumbent commercial radio licensees—and up to 11 services each for Melbourne and Sydney—the maximum number of commercial radio services in a regional licence area is four. The majority of regional licence areas (67) are served by two commercial radio licences, including large population centres such as Geelong and Wollongong. Seven regional licence areas have only one commercial radio service, 15 areas have three commercial licences and seven areas have four commercial radio licences.

The number of wide-coverage community radio services also varies between licence areas and is generally substantially lower than in metropolitan areas. The ABC provides five networks to most regional licence areas across Australia, including ABC

² *Broadcasting Services Act 1992*, s. 8AC.

Local Radio which covers over 99 per cent of the population. The ABC also has self-help facilities for a number of its radio services. SBS operates seven transmission facilities in large regional licence areas and self-help facilities are operated at 111 regional locations.

Challenges of providing digital radio in regional Australia

The major challenges for providing digital radio in regional Australia are the need to cover relatively large geographic areas with small and dispersed populations (particularly in inland regions), coverage in coastal and mountainous terrain and availability of spectrum (particularly in regional areas close to major metropolitan centres).

Regional licence areas are diverse—with some sparsely-populated, others dotted with small towns or displaying similar characteristics to metropolitan licence areas. These licence areas vary in size and population density, ranging from Longreach RA1 with a population of 11 213 over an area of 278 425 km² and Cooma RA1 (population 19 583, area 13 924 km²) to Newcastle RA1 (population 522 222, area 5 275 km²) and Gold Coast RA1 (population 469 966, area 1 444 km²). Many inland licence areas have smaller populations spread over large areas, but relatively flat terrain enables wider coverage from a single transmitter. Coastal radio licence areas generally have higher populations in smaller areas but rugged terrain often makes coverage from a single transmitter more difficult. Almost half of all regional commercial services currently have supplementary transmitters as the primary analog AM or FM transmitter is unable to cover the full area.

The commercial radio industry has indicated a strong preference for the use of VHF Band III spectrum for all digital radio services. On 14 July 2010, the Minister for Broadband, Communications and the Digital Economy directed the ACMA, in planning metropolitan television services following the analog switch-off, to consider making available 14 megahertz of spectrum to facilitate the future rollout of digital radio in regional Australia. Television services also use VHF Band III spectrum and congestion is most acute in areas close to major metropolitan centres. The switch-off of analog television in December 2013 is unlikely to free up sufficient spectrum for digital radio services in regional licence areas. This is because, generally, where a certain part of spectrum is used in an area for a particular service to avoid interference, it cannot be reused in adjoining areas. Therefore, the use of VHF Band III spectrum for radio services in regional licence areas will require some technical and planning compromises.

Key issues

1. Considerations for consumers

The discussion paper asked what aspects of digital radio should receive priority in regional areas; whether additional digital-only services would be appealing if compromises are required; whether technical standards should be mandated for radio receivers so they could receive all platforms if a hybrid model is adopted; and whether the range and cost of receivers influenced purchasing decisions for digital radios.

The major consumer issues that contributors identified in submissions included the importance of superior sound quality for digital radio services and the need for additional services to encourage the adoption of digital radio in regional areas. Some contributors strongly supported requirements for minimum standards for audio quality, whereas others argued that the market would resolve this issue. Submissions also argued for provisions of a range of in-home, mobile and in-car receivers and that wide-area coverage for regional services is important.

Submissions expressed mixed views on whether mandating receivers capable of receiving all technologies is necessary if a hybrid model involving two digital technologies is adopted.

Commercial Radio Australia (CRA) noted that the successful take-up of digital radio relied on achieving a balance of the consumer aspects and ‘there is no benefit to wide-area digital radio coverage unless good audio quality, new and compelling content, and multimedia options are available to consumers at a reasonable cost of purchase for a new device’³. The DRM Consortium noted that the ‘key for the listener is good audio quality and big coverage (and) the listener will be attracted by good content and will want to listen to it as long as possible in good audio quality’⁴. In its submission, AsiaSpace considered that wide-area coverage, high fidelity audio quality, program choice, enhanced services and affordable receivers are of equal and high priority⁵.

³ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

⁴ www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

⁵ www.dbcde.gov.au/__data/assets/pdf_file/0011/132869/Asiaspace_Pty_Ltd.pdf

Other submissions emphasised the importance of high quality sound⁶, with one saying ‘it is of paramount importance to provide the same level of audio quality (noting that DAB+, Digital Radio Mondiale 30 (DRM30) and Digital Radio Mondiale Plus (DRM+) all use the same audio coder) in regional Australia as that enjoyed by residents in metropolitan areas’⁷. Other contributors said additional local content⁸ and a range of services⁹ are also important.

Submissions to the review noted that providing additional services will help promote the take-up of digital radio in regional areas. The ABC stated that ‘one of the main attractions of digital radio for audiences is access to new, different and compelling content and it is the opportunity to provide this type of content that underpins the ABC’s commitment to the platform’¹⁰. The ABC noted that, in addition to simulcasting its five analog networks in the major metropolitan licence areas, it also provided six digital-only radio services.

Contributors considered that a wide range of receivers is needed for a successful introduction of digital radio in regional Australia. The range of receivers should reflect the different usage patterns for radio, including in-home, portable and in-car use. This was supported by the SBS submission which noted that a range of receivers—hybrid if necessary—starting at a low cost, is needed by consumers and should be available in vehicles¹¹. One submission stressed the importance of having digital radio receivers installed on the production line for new vehicles as a significant amount of radio listening is done in cars¹².

If two different digital radio technologies are adopted in Australia, contributors had different views on whether it is necessary to mandate receivers able to pick up all available technologies. The Community Broadcasting Association of Australia (CBAA) said the use of digital radio technologies other than DAB+ is not a viable

⁶ www.dbcde.gov.au/__data/assets/pdf_file/0004/132898/Ted_Richards.pdf;
www.dbcde.gov.au/__data/assets/pdf_file/0004/132880/Daniel_Henshaw.pdf;
www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

⁷ Name withheld.

⁸ www.dbcde.gov.au/__data/assets/pdf_file/0007/132856/Alan_Wagin.pdf

⁹ www.dbcde.gov.au/__data/assets/pdf_file/0006/132882/Doug_Moncur.pdf

¹⁰ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

¹¹ www.dbcde.gov.au/__data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

¹² www.dbcde.gov.au/__data/assets/pdf_file/0006/132855/Alan_Hughes.pdf

proposition unless multi-technology receivers are standard¹³. The DRM Consortium stated that it is very important for receivers to receive all technologies as ‘the listener does not care about the technologies used (and) ultimately he/she wants to be able to listen to (their) favourite programmes’¹⁴. This view was supported by several members of the public. However, AsiaSpace argued that ‘it should not be mandatory for receivers to be interoperable with all the technologies as this will increase the complexity and cost of receivers (and) it should be left to the marketplace to determine the receiver capabilities and features’¹⁵.

2. The potential adoption of DAB+

The discussion paper sought opinions on whether the DAB+ digital radio system used in the five mainland state capitals is a suitable technology for use in regional Australia. The paper asked if DAB+ can economically provide equivalent coverage to existing regional analog radio services and whether it should be rolled out in areas where it may not match the coverage of current analog AM services. It also sought industry and the public’s views on the potential costs of DAB+ for regional areas, the radiofrequencies that should be used, and whether to use DAB+ in VHF Band III if compromises in coverage and interference management resulted.

Common themes in many submissions were that DAB+ should be the primary system for providing digital radio in regional Australia and that it can be economical in areas where there are several broadcasters and/or services to share the capital and operating costs. However, there was an acknowledgment that spectrum availability may be an issue in some areas and the costs may increase for broadcasters in smaller markets. VHF Band III is considered by contributors to be the most suitable frequency for DAB+, although some considered that more than 14 megahertz of spectrum should be made available. Submissions differed on whether to use DAB+ if coverage cannot match existing analog AM and FM coverage.

¹³

www.dbcde.gov.au/__data/assets/pdf_file/0003/132879/Community_Broadcasting_Association_of_Australia.pdf

¹⁴ www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

¹⁵ www.dbcde.gov.au/__data/assets/pdf_file/0011/132869/Asiaspace_Pty_Ltd.pdf

Most radio industry organisations that made submissions to the review supported the use of DAB+ in regional Australia. Broadcast Australia noted that DAB+ is ‘the appropriate technology to roll out to regional Australia in the context of digital radio remaining a complementary service (to analog radio) for the foreseeable future’¹⁶. The ABC said the DAB family of standards in VHF Band III ‘remains the only proven digital technology with widespread international support for which receivers are readily and widely available (and) as this is likely to remain the case for the short to medium term, DAB+ should be deployed nationally as the primary digital radio platform as soon as possible’¹⁷. SBS said it considers DAB+ and Digital Radio Mondiale (DRM) the only viable digital radio technologies suitable for Australia, based on adoption of the technologies, availability of receivers, spectrum availability, coverage characteristics and cost¹⁸. The CBAA said it supported the immediate focus on the consolidation and development of DAB+ as the core digital radio technology¹⁹.

Submissions from members of the public also supported adopting DAB+ as a primary digital radio system, with several people offering solutions to potential problems with the use of DAB+ in regional areas. One contributor noted that ‘transmissions of DAB+ are limited by radio horizon and path obstructions so some national (ABC) analog services operating at higher power on the medium frequency (AM) band will be difficult to replicate in VHF Band III. A solution might be low power translators of single frequency networks (SFNs) but SFNs by nature are difficult to implement and are costly’²⁰. Other submissions noted that as DAB+ uses a multiplex to aggregate up to nine broadcaster services for single transmission it is more suitable for larger regional markets which have multiple broadcasters²¹.

Many submissions from the radio industry argued that DAB+ is economical, particularly when multiple broadcasters could share the capital and operating costs of a multiplex transmitter. CRA said that, based on industry modelling, DAB+ services are ‘a viable replacement for FM services when using high-powered primary transmitters with lower-powered infills and/or SFNs, as operational costs are lower

¹⁶ www.dbcde.gov.au/__data/assets/pdf_file/0007/132874/Broadcast_Australia.pdf

¹⁷ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

¹⁸ www.dbcde.gov.au/__data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

¹⁹

www.dbcde.gov.au/__data/assets/pdf_file/0003/132879/Community_Broadcasting_Association_of_Australia.pdf

²⁰ Name withheld.

²¹ www.dbcde.gov.au/__data/assets/pdf_file/0006/132855/Alan_Hughes.pdf

than for analog FM but can also be shared'²². However, some members of the public argued that DAB+ may not be economical in smaller markets where fewer broadcasters shared the costs.

Submissions expressed a wide range of views on the potential coverage for DAB+ services in regional areas and whether the technology should be introduced if compromises in coverage and/or interference management are required. While Broadcast Australia said DAB+ could achieve equivalent coverage to FM services in most regional markets, there was general acknowledgment from radio industry submissions that DAB+ may not be able to match the wide-area coverage of some high-powered AM services without using multiple transmitters. Several members of the public expressed similar views, with one saying that DAB+ could not be used to replace the very wide coverage of the analog medium frequency (MF) AM band without a large investment in 'fill-in' transmitters²³.

There were a range of views about whether DAB+ should be used if it could not match existing analog radio coverage. The ABC noted that DAB+ had the potential to reach up to 98 per cent of the population using a similar number of transmitters to the current FM network, but will struggle to match the coverage of high and medium-powered AM transmitters that reach most of the remaining population²⁴. The DRM Consortium noted that DAB+ is useful in covering high population areas but is expensive to roll out over large geographic areas²⁵.

CRA recommended the introduction of DAB+ in regional areas even if compromises in interference management are required²⁶. It said DAB+ should be provided to the majority of the population in each licence area and that the ACMA should work with broadcasters to optimise coverage²⁷. The CBAA also noted that a trial of infill transmitters in Melbourne appeared successful and such transmitters may provide coverage in regional areas²⁸.

²² www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

²³ www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

²⁴ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

²⁵ www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

²⁶ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

²⁷ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

²⁸

www.dbcde.gov.au/__data/assets/pdf_file/0003/132879/Community_Broadcasting_Association_of_Australia.pdf

However, some members of the public said DAB+ should not be used in regional areas if coverage cannot match that of existing AM radio services or, at least, existing FM services. Others said DAB+ should be rolled out despite the potential coverage deficiencies because ‘something is better than nothing’²⁹ or because future technology advancements may overcome such problems³⁰.

Contributors generally agreed that VHF Band III is the most appropriate spectrum for DAB+ in regional Australia despite the potential for spectrum congestion, particularly in licence areas adjacent to Sydney, Melbourne and Brisbane. Although spectrum in the L-Band is reserved for potential digital radio services, a number of submissions identified drawbacks.

Broadcast Australia said that while using L-Band spectrum for DAB+ services is technically possible, it is ‘undesirable’ because it is likely to increase broadcasters’ costs and the cost of receivers³¹. The ABC noted that coverage at the L-Band frequencies is more limited than VHF Band III due to propagation issues. It also said more than four L-Band transmitters may be required to replicate the coverage from a single VHF Band III transmitter³². SBS noted that L-Band had problems with building penetration and reach³³ while the Communications Law Centre said the use of L-Band in Canada in low density regional areas was often cited as the primary reason for DAB’s demise in that country³⁴.

Submissions provided a range of views on the appropriate VHF Band III channels for DAB+ digital radio services in Australia and the preferred amount of spectrum required. Broadcast Australia, the ABC and SBS expressed a preference for three VHF Band III channels to be reserved, with Broadcast Australia suggesting that Channels 10, 11 and 12³⁵ and the ABC recommending Channels 9, 9A and 10³⁶. SBS suggested allocating UHF Channel 27, which is not currently used, for digital

²⁹ www.dbcde.gov.au/__data/assets/pdf_file/0008/132875/Carmel_Brown.pdf

³⁰ www.dbcde.gov.au/__data/assets/pdf_file/0009/132885/Graham_Turvey.pdf

³¹ www.dbcde.gov.au/__data/assets/pdf_file/0007/132874/Broadcast_Australia.pdf

³² www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

³³ www.dbcde.gov.au/__data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

³⁴ www.dbcde.gov.au/__data/assets/pdf_file/0011/132878/Communications_Law_Centre_UTS.pdf

³⁵ www.dbcde.gov.au/__data/assets/pdf_file/0007/132874/Broadcast_Australia.pdf

³⁶ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

television services to enable three VHF Band III channels to be reserved for digital radio³⁷. A member of the public identified VHF Channel 13, currently used by the Department of Defence, as suitable for digital television and digital radio services³⁸.

CRA said while it considered that 21 megahertz of spectrum is the optimum amount for DAB+ services, it is possible to provide services using 14 megahertz if all broadcasters shared a single multiplex in many licence areas³⁹. The CBAA considered that while a reserved amount of spectrum (14 megahertz) is useful, it is also 'a stringent limitation'⁴⁰ on the services that could be provided. SBS also noted that all broadcasters may need to share a single multiplex and that this could result in fewer digital-only national broadcaster services in some regional areas. SBS said an alternative may be for national broadcasters to use SFNs⁴¹. A private contributor said that while SFNs may be an option to ensure sufficient spectrum use in regional areas, there are a number of technical problems including mush zones in overlapping coverage areas, the requirement for multiple transmitters and the inability to insert local programming⁴². The Communications Law Centre raised the potential for aggregation of licence areas to ensure spectrum availability but considered this is not desirable⁴³.

The availability of receivers was seen as a significant advantage for the DAB+ digital radio platform. The ABC noted that DAB (including DAB+) is the only digital radio standard with international support for which receivers are widely available⁴⁴. The Communications Law Centre considered that the use of DAB+ in metropolitan areas and the maturing receivers market, which included several low cost models, are an advantage⁴⁵. CRA said the adoption of DAB+ in regional areas would be a driver for additional low cost receivers⁴⁶.

³⁷ www.dbcde.gov.au/_data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

³⁸ www.dbcde.gov.au/_data/assets/pdf_file/0004/132889/Matt_Whitehorn.pdf

³⁹ www.dbcde.gov.au/_data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

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www.dbcde.gov.au/_data/assets/pdf_file/0003/132879/Community_Broadcasting_Association_of_Australia.pdf

⁴¹ www.dbcde.gov.au/_data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

⁴² Name withheld.

⁴³ www.dbcde.gov.au/_data/assets/pdf_file/0011/132878/Communications_Law_Centre_UTS.pdf

⁴⁴ www.dbcde.gov.au/_data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

⁴⁵ www.dbcde.gov.au/_data/assets/pdf_file/0011/132878/Communications_Law_Centre_UTS.pdf

⁴⁶ www.dbcde.gov.au/_data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

3. The potential adoption of DRM30/DRM+

The discussion paper asked whether either or both of the Digital Radio Mondiale systems (DRM30 operating on the medium and high frequency (AM) bands and DRM+ operating on the VHF bands) could provide digital radio services in regional areas. In particular, the paper asked whether DRM30 or DRM+ can economically provide equivalent coverage to existing regional analog radio services, the potential costs of doing so, the best frequencies for each platform, and whether a hybrid DAB+/DRM system would be viable.

A number of submissions provided comments on the potential adoption of DRM30 and/or DRM+. A common theme in many submissions was that DRM30 could provide economical, wide-area coverage similar to high-power regional AM radio services and DRM+ had potential to provide wide-area coverage equivalent to regional FM radio services. Submissions also noted that a lack of available receivers is the main drawback to adopting DRM at the current time.

Broadcast Australia said that while DRM30 is well-suited to providing economical wide-area coverage for regional areas to enable the duplication of existing AM services, the ideal spectrum for the technology is the existing band of AM frequencies, which is not currently available and, even on a DRM/AM simulcast, would cause adjacent channel interference to existing services⁴⁷. The SBS submission recommends adopting DRM to serve more sparsely-populated areas because it argues DAB+ will not be economical in these regions⁴⁸. Other submissions said DRM allows a more appropriate use of spectrum where fewer services are broadcast, thus reducing transmission costs when compared with DAB+⁴⁹.

Some submissions discussed the merits of DRM+ in providing digital radio services in regional areas. One contributor noted that existing analog radio services provided different coverage footprints to suit their licence areas and in many regions the number of commercial and wide-coverage community services is limited. The submission said: 'In considering the above and the fact that national analog services are wide coverage services, particularly on MF (medium frequency), both DRM+ and

⁴⁷ www.dbcde.gov.au/__data/assets/pdf_file/0007/132874/Broadcast_Australia.pdf

⁴⁸ www.dbcde.gov.au/__data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

⁴⁹ www.dbcde.gov.au/__data/assets/pdf_file/0004/132889/Matt_Whitehorn.pdf

DRM30 would need to be considered as potential spectrum solutions'⁵⁰. Additionally, 'DRM+ could also be considered as a potential cost-effective solution to accommodate a small number of services'⁵¹.

A member of the public considered that DRM30 would be suitable for wide-area coverage in regional Australia and DRM+ would be suitable in regional town centres and capital cities. He noted that 'a single LF (low frequency) transmitter could provide a service for all Australia'⁵².

There were mixed views on the viability of a hybrid DAB+/DRM receiver, with some industry organisations and members of the public not supporting a hybrid model. CRA said that while a hybrid model is technically possible, a wide range of affordable receivers is unlikely to be produced any time soon⁵³. It said that 'for low cost receivers to come to market, consumer electronics need to be able to be sold to a world market (and) as no other country is planning to rollout a mix of DAB+ and DRM services, this is unlikely to be a reality in the foreseeable future'⁵⁴.

Others said that while the lack of DRM capable receivers is a major impediment to adopting DRM in Australia, its adoption as the main digital radio standard in Russia and India may lead to the availability of suitable receivers in the future. The DRM Consortium noted that an announcement of a rollout of DRM in Australia, with a requirement for combined multi-standard receivers, would encourage the supply of inexpensive receivers, and that current activities in India and Russia would soon lead to mass-market production⁵⁵.

Other industry organisations and members of the public supported a hybrid model as long as safeguards are in place to ensure the availability of receivers that could receive both technologies. Some submissions considered that dual-mode models may not be as important for fixed or in-home receivers but are very important for in-car and mobile receivers. Remote area broadcaster Rebel Media said DRM+ is a possible alternate digital solution provided regional DRM+ services are planned at the same

⁵⁰ Name withheld.

⁵¹ Name withheld.

⁵² www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

⁵³ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

⁵⁴ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

⁵⁵ www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

time as DAB+ services and timely multi-platform receiver availability is addressed⁵⁶. Others said a hybrid model is viable provided multi-platform receivers are mandated or that a strong labelling program is implemented⁵⁷. One member of the public said that if the cost of hybrid receivers was significantly more than DAB+ only receivers it may disadvantage consumers living outside metropolitan licence areas⁵⁸.

An open narrowcasting operator argued that a hybrid model is likely to prove viable if DRM is used for local community radio and open narrowcasting services nationally, in addition to supplementing DAB+ in wide-coverage areas that DAB+ cannot adequately cover⁵⁹. One submission said that ‘assuming a hybrid model is the choice for Australia, at this stage it would have to be a unique receiver that is capable of tuning into MF, VHF Bands I, II and III with decoding chips capable of decoding DAB+ and DRM (30 and +)’⁶⁰. Another said that while a hybrid model is viable, it would be more expensive than a DRM-only model and ‘it is unfortunate that, with the benefit of hindsight, that Australia didn’t just wait and opt for DRM alone’⁶¹.

Submissions said although DRM30 can operate on the medium frequency AM band used for analog commercial, national and community broadcasting, the current number of services on that band and the potential for night-time interference to distant services on the same frequency would exclude use of the band unless analog radio services are switched off. The ABC said ‘there is no spare spectrum in the AM Band in Australia to enable simulcasts of existing AM stations on DRM30 using separate frequencies’⁶². Pacific Media Technologies said medium frequency spectrum had ‘become too polluted by interference to be worth considering seriously’⁶³.

The ACMA has embargoed the 26 megahertz high frequency band for possible future digital radio services and a number of submissions identified this spectrum as potentially suitable for DRM30 services. The Communications Law Centre noted that, to obtain the maximum amount of coverage, it is desirable for DRM30 to use MF spectrum. However, there may be no practical way to achieve it given the number of

⁵⁶ www.dbcde.gov.au/__data/assets/pdf_file/0009/132894/Rebel_Media.pdf

⁵⁷ www.dbcde.gov.au/__data/assets/pdf_file/0004/132889/Matt_Whitehorn.pdf

⁵⁸ www.dbcde.gov.au/__data/assets/pdf_file/0006/132882/Doug_Moncur.pdf

⁵⁹ www.dbcde.gov.au/__data/assets/pdf_file/0011/132887/Justin_Christie_Open_Narrowcasting_Operator.pdf

⁶⁰ Name withheld.

⁶¹ www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

⁶² www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

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www.dbcde.gov.au/__data/assets/pdf_file/0008/132884/Glen_English_Pacific_Media_Technologies_Pty_Ltd.pdf

broadcasters using the band. Therefore, the government should consider using the 26 megahertz band embargoed by the ACMA⁶⁴. Another submission suggested that low-powered community broadcasters transmit in DRM30 on the 26 megahertz band⁶⁵.

A number of submissions called for the reservation of the VHF Band I spectrum currently used for analog television channels 0, 1 and 2 for possible use by DRM+ services after the switch-off of analog television in 2013. The ABC noted that ‘DRM+ may prove a more viable solution (than DRM30) for infill and wider area coverage in rural and remote areas (and) the ABC considers that VHF Band I spectrum should be cleared during the analog television switch-off and the digital television restack and be reserved for the possible future use of DRM+ for digital radio’⁶⁶.

SBS suggested setting aside channels 0, 1 and 2 for DRM+ for local community radio services⁶⁷. Rebel Media also supported the use of DRM+, saying that ‘in areas where (VHF) Band III spectrum is limited and Band I/II spectrum is available, it may be the only realistic option for digital broadcasting (if) suitable Band I/II spectrum is reserved after analog TV shut-down’⁶⁸. Several members of the public also suggested reserving VHF Band I spectrum for digital radio⁶⁹.

4. Other technology solutions (IBOC, Satellite)

The discussion paper asked whether other technologies such as in-band on-channel (IBOC) and satellite had changed sufficiently since 2007 that they are now suitable to deliver digital radio in regional areas of Australia.

Radio industry submissions argued that, except for DAB and DRM, there are no existing terrestrial or satellite technologies that had developed significantly since 2007 to the extent where they could effectively and economically deliver digital radio within Australia’s existing infrastructure and radio broadcasting environment⁷⁰.

⁶⁴ www.dbcde.gov.au/__data/assets/pdf_file/0011/132878/Communications_Law_Centre_UTS.pdf

⁶⁵ www.dbcde.gov.au/__data/assets/pdf_file/0006/132855/Alan_Hughes.pdf

⁶⁶ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

⁶⁷ www.dbcde.gov.au/__data/assets/pdf_file/0003/132897/Special_Broadcasting_Service.pdf

⁶⁸ www.dbcde.gov.au/__data/assets/pdf_file/0009/132894/Rebel_Media.pdf

⁶⁹ Name withheld; www.dbcde.gov.au/__data/assets/pdf_file/0006/132855/Alan_Hughes.pdf; www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

⁷⁰ www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

The majority of submissions to the review agreed that satellite technologies have the potential to deliver digital radio services Australia-wide. However, the delivery of a national satellite digital radio service would need support from infill terrestrial repeaters for those areas the satellite signal could not effectively reach. CRA's submission stated that this would add to the cost of coverage for regional Australia⁷¹.

The general view expressed in submissions was that, despite the coverage comments noted above, a satellite solution for the delivery of a free-to-air digital radio services is not the most economical solution for industry or consumers. CRA's submission stated that satellite broadcasting is barely viable in the United States of America (USA) which had a population of 300 million people and used a subscription radio model. While Australia is roughly the same size as the USA (without Alaska), its population is only 22 million⁷².

A number of submissions stated that satellite services are unable to provide local programming, or that the economics of providing local programming is questionable⁷³. However, AirSpace's submission stated that satellite technologies are able to broadcast a large number of channels which could provide opportunities to localise services with relevant news, weather, traffic and sports information⁷⁴.

Several submissions also noted that satellite technology is primarily used overseas to provide subscription services⁷⁵ instead of free-to-air services. However, AsiaSpace said the market should determine whether a satellite service should be free, subscription-based, or both⁷⁶.

Generally, submissions to the review stated that, given the high cost of space and ground infrastructure, satellite technology would not be the most cost-effective option⁷⁷ for providing digital radio services to regional Australia. Additionally, costs for consumers⁷⁸ would be significantly greater than other technologies due to the requirement for consumers to purchase and install a satellite dish.

⁷¹ www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

⁷² www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf

⁷³ www.dbcde.gov.au/__data/assets/pdf_file/0007/132874/Broadcast_Australia.pdf
www.dbcde.gov.au/__data/assets/pdf_file/0010/132877/Commercial_Radio_Australia.pdf
www.dbcde.gov.au/__data/assets/pdf_file/0005/132881/Digital_Radio_Mondiale.pdf

⁷⁴ www.dbcde.gov.au/__data/assets/pdf_file/0011/132869/Asiaspace_Pty_Ltd.pdf

⁷⁵ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

⁷⁶ www.dbcde.gov.au/__data/assets/pdf_file/0011/132869/Asiaspace_Pty_Ltd.pdf

⁷⁷ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

⁷⁸ www.dbcde.gov.au/__data/assets/pdf_file/0009/132867/Andrew_Butlin.pdf

A number of submissions noted that satellite signals may not prove as reliable as terrestrial transmission because they can be compromised and may not penetrate through roofs of multi floored buildings, through bridges, in city CBDs and through trees without support from additional infrastructure⁷⁹.

The discussion paper also asked whether any other technologies may be suitable for digital radio in regional Australia. A small number of submissions supported the use of internet radio, suggesting that the rollout of the National Broadband Network (NBN) and next-generation wireless and satellite technology would allow the majority of Australians to stream radio over the internet⁸⁰. However, completion of the NBN is not envisaged for a number of years. Additionally, access to free-to-air radio services over the internet is subject to the download limit policies and charging models of individual internet service providers.

Another potential option raised through the discussion paper was IBOC Hybrid Digital (HD) radio. These services are carried on the AM and FM broadcasting bands using the same frequency as the analog radio services they simulcast. The bandwidth required for IBOC/HD services increases from 9 kilohertz to 50 kilohertz for AM services and from 100 kilohertz to 400 kilohertz for FM services.

There was limited commentary in the submissions on the viability of IBOC services. The ABC's submission to the review notes that, technically, IBOC has never worked effectively at night on AM services due to sky-wave interference. Additionally, IBOC is based on USA spectrum plans which require 10 kilohertz per AM channel rather than 9 kilohertz as in Australia. Therefore, using this technology in regional Australia would require Australia to replan its use of the AM band and may not accommodate all regional broadcasters⁸¹.

⁷⁹ www.dbcde.gov.au/__data/assets/pdf_file/0006/132855/Alan_Hughes.pdf

⁸⁰ www.dbcde.gov.au/__data/assets/pdf_file/0005/132854/A_P_Whichello.pdf

⁸¹ www.dbcde.gov.au/__data/assets/pdf_file/0004/132871/Australian_Broadcasting_Corporation.pdf

Key findings

The framework for the introduction of digital radio was intended to provide the radio industry with a 'digital footing' to enable it to compete in a rapidly-changing environment in which technological developments, such as MP3 players and the internet, are changing listening patterns and reshaping the way audio content is created, distributed and consumed.

The submissions to the review highlighted the desire of the radio industry, organisations and members of the public to see digital radio rolled out to regional areas of Australia. Submissions acknowledged that there are a number of issues, such as availability of suitable spectrum, terrain diversity and technical limitations associated with such a rollout.

Recurrent themes raised in the review included the following.

- **The importance for regional consumers of high-quality audio, additional digital-only services, good value receivers, and good geographic coverage across regional areas.** Submissions argued that regional listeners should receive equivalent benefits from digital radio as those available to listeners in the five metropolitan licence areas. They also expressed the desire for a regional rollout as soon as practicable.
- **A preference for DAB+ as the primary digital radio technology in Australia** as this system is currently in operation in metropolitan licence areas and a range of receivers is available. DAB+ was acknowledged as a technology that can aggregate and broadcast multiple services through a single multiplex, thereby allowing a number of broadcasters to share transmission costs. However, contributors noted that DAB+ can only operate on VHF Band III (or on L-Band, which has not been successful in other countries) and requires a large amount of spectrum for each multiplex.
- **A general acknowledgment that DAB+ may not suit all regional licence areas** due to spectrum congestion on VHF Band III, which is also used for digital television services, and potentially higher costs for broadcasters in areas with a small number of services. Some submissions considered that compromises may resolve spectrum and cost issues, while others said they are not prepared to accept compromises in providing digital radio to regional audiences.

- **A preference for DRM (DRM30 in the medium frequency bands and/or DRM+ in the very high frequency bands) to supplement DAB+ services in regional areas.** DRM was acknowledged as a spectrum-efficient technology with relatively low transmission costs and the flexibility to operate across a number of broadcasting bands. A number of contributors expressed a preference for DRM (either DRM30 or DRM+) to supplement regional coverage if DAB+ is unable to provide effective coverage in regional areas. Submissions also acknowledged that a lack of available DRM-capable receivers is a drawback and that dual-mode digital radio receivers would be required if the technology is adopted.
- **Reserving spectrum in the medium frequency and very high frequency bands to enable digital radio services to be provided in regional areas.** The Minister has issued guidance to the ACMA that, to facilitate the future rollout of digital radio to regional Australia, 14 megahertz of spectrum in VHF Band III should be made available in each metropolitan licence area for digital radio purposes. Both DAB+ and DRM+ can operate in VHF Band III. DRM can also operate in VHF Bands I and II. Submissions said that if DRM technology is adopted, the most suitable spectrum should be identified and reserved. Some suggested that reserving the soon-to-be-vacated VHF Band I analog television channels will allow more options in determining suitable technologies for digital radio in regional areas.

Attachments

Terms of reference

Australia's high quality radio broadcasting services play a vital role in people's lives. There is a radio in almost every house, car and work place, with Australians listening to an average of over 13 hours of radio each week⁸². Commercial, community and national radio are popular sources of news, information and entertainment. Radio also remains a key source of information in times of emergency.

The Australian Government introduced legislation in 2007 for digital radio services to operate alongside existing analog (AM and FM) services, allowing listeners within defined coverage areas who purchase a suitable receiver to gain access to additional radio services. Under the digital radio framework, services commenced in those areas with the most commercial potential.

Commercial and national (ABC and SBS) digital radio services began operating permanently in Australia's five mainland state capital cities—Adelaide, Brisbane, Melbourne, Sydney and Perth—in May and June 2009. Wide-coverage community radio broadcasters began test services in October 2010, with the majority of these licensees expected to be fully operational by the end of 2010.

At the time the digital framework was introduced, it was recognised that the digital radio technology used for the first services was unlikely to be appropriate for some regional areas. In recognition of this, amendments to the [Broadcasting Services Act 1992](#) (the Act) included a requirement for a review that focused on technologies suitable for regional Australia.

[Section 215A of the Act](#) requires the Minister for Broadband, Communications and the Digital Economy to cause to be conducted a review of the relative merits of various terrestrial and satellite technologies for digital radio broadcasting services and restricted datacasting services in regional areas. Under the Act, the review must occur by 1 January 2011. The Minister must table a report of the review in Parliament in accordance with the statutory requirements.

⁸² Roy Morgan Research, March 2010

www.roymorganonlinestore.com/News/1038---Australians-spent-the-largest-part-of-their.aspx

As required by the Act, the review will also consider:

- the development of these technologies (whether or not in Australia)
- the availability and price (whether or not in Australia) of
 - transmission equipment
 - domestic reception equipment
- whether legislative amendments are required to facilitate the transmission of
 - digital radio broadcasting services in regional licence areas
 - restricted datacasting services in regional licence areas
- the geographic coverage of the technologies used to transmit
 - digital radio broadcasting services
 - restricted datacasting services
- the characteristics of digital radio and restricted datacasting services that are likely to result from the technologies used to transmit these services in regional areas.

Glossary

Decoder	An electronic device that converts a signal from one form to another.
Datacasting services	Datacasting services are defined in section 6 of the Act as services that deliver content in the forms specified to persons having equipment appropriate for receiving the content, where the delivery of the service uses the broadcasting services bands.
Ensemble	An alternative term for a multiplex, where a number of digital radio services are combined for a single transmission.
Multiplex	The combination of multiple digital data streams into a single signal for transmission on a single frequency.
Mush zone	A mush zone can occur in the coverage area of a single frequency network when an echo of a signal of equivalent strength to the primary signal is received outside the acceptable guard interval for the radio or TV receiver. The echo signal will subsequently prevent reception of the service. Mush zones usually occur in locations between transmitters in a single frequency network.
Regional commercial radio broadcasting licence	A commercial radio broadcasting licence that has a regional licence area. A regional licence area is a licence area that is not a metropolitan licence area (Sydney, Melbourne, Brisbane, Perth, Adelaide and the licence area known as Western Suburbs Sydney RA1) (Subsection 43C(8) of the Act).
Single Frequency Network	A broadcasting network where several transmitters using the same frequency send out an identical signal simultaneously.
Small licences	Licences in licence areas with a population under 30 000. Population figures in a licence area are determined by the ACMA pursuant to section 30 of the Act.
VHF Band I	Radio frequencies between 47 megahertz and 88 megahertz. This band has been used in Australia for broadcasting analog television channels 0, 1 and 2.
VHF Band II	Radio frequencies between 88 megahertz and 108 megahertz. This band is used in Australia for analog FM radio broadcasting and analog television channels 3, 4 and 5.

VHF Band III

Radio frequencies between 174 megahertz and 230 megahertz. This band is used in Australia for analog and digital television channels 6–12 and Digital Audio Broadcasting Plus (DAB+) in the five mainland state capital cities.