

Spectrum reallocation in the 700 MHz digital dividend band

Discussion paper

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Executive summary

The Australian Communications and Media Authority (the ACMA) is the government agency responsible for spectrum management in Australia. The ACMA is therefore responsible for allocating the spectrum freed up by the switchover from analog to digital television broadcasting. This spectrum is known as the 'digital dividend'.

Following the Minister for Broadband, Communications and the Digital Economy's announcement in June 2010 that identified the size (126 MHz) and frequency band (694–820 MHz) of the digital dividend, the ACMA is now developing its approach to the configuration and allocation of this spectrum in accordance with the objectives of the *Radiocommunications Act 1992* (Radiocommunications Act) and government policy objectives for the digital dividend. This paper describes the interrelated processes which will lead to allocation of the digital dividend and commences the ACMA's public consultation on the allocation of the digital dividend.

Chapter 1 describes the three bodies of work required to realise the digital dividend (digital switchover, restack and reallocation) and how the dependencies between these three processes affect allocation policy. It outlines how both switch off of analog television and the restacking of continuing television services are necessary preconditions to reallocation, and the ACMA's plan to run these processes in parallel. It further explains the ACMA's role in carrying out reallocation, including fundamental decisions about the type of licences to be issued and the form of the allocation process.

Chapter 2 of the paper proceeds to canvass the reallocation process that the ACMA intends to follow in order to allocate the digital dividend. The ACMA's approach is predicated on an assumption that maximising the public interest will be the primary determinant of licence use for this spectrum into the future. This chapter sets out the legislative framework that governs the ACMA's actions as well as the detailed steps of the spectrum reallocation process required by Part 3.6 of the Radiocommunications Act. In conjunction with the technical framework for the digital dividend, this legislative process will result in legislative and administrative instruments that implement the ACMA's approach to the configuration and allocation of the digital dividend.

In order to carry out the reallocation process, the ACMA must first configure the digital dividend spectrum for sale. This initially involves identifying the external frequency and geographic boundaries of the digital dividend spectrum, based on the characteristics of the spectrum and the likely uses. Once these external boundaries have been determined, the ACMA will be able to develop a technical framework that governs the operation of radiocommunications devices within the identified spectrum.

In configuring the digital dividend the ACMA believes that international harmonisation will maximise the economic benefits to Australia. As existing or emerging digital dividend arrangements in the United States and Europe do not provide optimal models for Australia, the ACMA considers that Australia's interests are likely to be best served by harmonisation with the digital dividend configuration emerging in our own Asia–Pacific region. Australia has therefore been an active participant in discussions occurring at the Asia–Pacific Telecommunity Wireless Forum (AWF) on harmonisation of 700 MHz planning arrangements in the Asia–Pacific region, where recent decisions indicate a consensus has been reached.¹ The AWF decision and other issues affecting configuration are discussed in detail in Chapter 3.

¹ The Asia–Pacific Telecommunity (APT) is an international organisation whose aim is to foster the development of telecommunication services and information infrastructure throughout the Asia–Pacific region. Its membership includes countries of the Asia–Pacific region, telecommunications providers, equipment manufacturers, and research and development organisations with interests and activities in associated fields. The APT Wireless Forum (AWF) is one of a number of work program areas within the

Once the optimal configuration of the digital dividend spectrum is known, the ACMA will develop the allocation procedures for the spectrum, which involves designing suitable spectrum products, choosing a suitable allocation method and specifying detailed rules for the allocation process. The product design will divide the spectrum into lots defined by frequency and geography, based on the parameters set out by the technical framework. As successful purchasers will be issued with licences authorising use of the part of the spectrum represented by their lots, the product design will also specify proposed licence conditions setting out the rights and obligations of the licensees. Finally, the ACMA will also consider issues related to timing of the allocation, both in relation to the switchover and restack processes and to the allocation of other spectrum bands. The development of allocation procedures is discussed in Chapter 4.

This discussion paper aims to provide stakeholders with background information on the digital dividend reallocation, including its close relationship with broadcasting planning, and the proposed steps for the reallocation, both legislative and technical. This consultation offers industry stakeholders the opportunity to shape and inform the ACMA's thinking regarding various aspects of the upcoming digital dividend allocation at an early stage. In particular, stakeholder preferences are sought on:

- > the frequencies and geographic boundaries of the spectrum to be allocated
- > the timing of the allocation, especially in relation to negotiations for international harmonisation and the availability of other spectrum in Australia
- > the division of the spectrum into lots for allocation.

This paper focuses on the reallocation of UHF digital dividend spectrum. Related issues, such as the vacation of analog television channels in the VHF bands as a result of analog television switch off, are outside the scope of the present paper.

As described below, the ACMA invites stakeholders to provide their views on the allocation process by commenting on this paper, via the Spectrum Tune-Up to be held in November or directly with the ACMA.

Invitation to comment

The ACMA invites members of the public to make submissions on the issues raised in this paper. Submissions may be sent by post to:

Manager
Major Spectrum Allocations Section
Australian Communications and Media Authority
PO Box 13112
Law Courts
Melbourne VIC 8010

Or via facsimile to: +61 3 9963 6899
Or via email to: majorspectrumallocations@acma.gov.au

Electronic submissions in Microsoft Word or Rich Text Format are preferred. Media enquiries should be directed to Mr Donald Robertson on +61 2 9334 7980 or by email to media@acma.gov.au. Any other enquiries may be directed to Eve Osiowy, Manager, Major Spectrum Allocations Section, +61 3 9963 6906.

The closing date for submissions to this discussion paper is **6 December 2010**.

APT. The purpose of the AWF is to assist the region to make the best possible use of wireless technologies in telecommunication and to facilitate the efficient planning for use of the spectrum resources to encourage regional harmonisation.

Digital Dividend Spectrum Tune-Up

To coincide with the public consultation period for this paper and to assist interested parties in preparing their submissions, the ACMA has scheduled the *Digital Dividend Spectrum Tune-Up*. The Tune-Up will take place in Sydney on Wednesday 3 November 2010.

The Tune-Up will offer the opportunity to hear ACMA and stakeholder perspectives on the issues driving the configuration and allocation of the digital dividend. It will be an opportunity for interested parties to learn more about the issues raised in this paper and how they might be addressed. There will also be the opportunity to contribute directly to panel discussions. There will be a charge for attendance to cover costs in staging the event. Tune-Up papers and presentations will be made available to the public on the ACMA website.

The details of the *Digital Dividend Spectrum Tune-Up* are as follows:

| | |
|--------|--|
| Date: | Wednesday 3 November, 2010 |
| Venue: | Australian National Maritime Museum 2 Murray Street Darling Harbour Sydney NSW 2000 |
| Cost: | \$125 |

If you would like further information, please contact Nicole Lawler on + 61 2 6219 5136. Registrations close on 27 October 2010 unless sold out. Registration forms are available at www.acma.gov.au/tuneup/digitaldividend.

Effective consultation

The ACMA is working to enhance the effectiveness of its stakeholder consultation processes, which are an important source of evidence for its regulatory development activities. To assist stakeholders in formulating submissions to its formal, written consultation processes, it has developed [Effective consultation: A guide to making a submission](#). This guide provides information about the ACMA's formal, written, public consultation processes and practical guidance on how to make a submission.

Publication of submissions

In general, the ACMA publishes all submissions it receives. However, the ACMA will not publish submissions that it considers contain defamatory or irrelevant material.

The ACMA prefers to receive submissions which are not claimed to be confidential. However, the ACMA accepts that a respondent may sometimes wish to provide information in confidence. In these circumstances, respondents are asked to identify the material over which confidentiality is claimed and provide a written explanation for confidentiality claims.

The ACMA will not automatically accept all claims of confidentiality. The ACMA will consider each claim for confidentiality on a case-by-case basis.

When can the ACMA be required by law to release information?

The ACMA may be required to release submissions by law under the *Freedom of Information Act 1982* (Cth) or for other reasons including for the purpose of parliamentary processes or under court subpoena. The ACMA will seek to consult respondents of confidential information before that information is provided to another party, but the ACMA cannot guarantee that confidential information will not be released through these or other legal means.

Sharing of information

Under the *Australian Communications and Media Authority Act 2005*, the ACMA is able to disclose submissions to the Minister, to the Department of Broadband, Communications and the Digital Economy including authorised officials, to Royal Commissions and to certain Commonwealth authorities such as the Australian Competition and Consumer Commission and Australian Securities and Investments Commission.

If information is accepted by the ACMA as confidential, the ACMA will seek to consult with the respondent of the information where the ACMA intends to share that information.

Status of this paper

This paper provides background information to assist people in making comments to the ACMA. Nothing in this paper should be taken to bind the ACMA to any particular course of action in later processes.

1. Background

1.1 What is the digital dividend?

Digital dividend refers to the part of the radiofrequency spectrum freed up following the switch from analog to digital television signal transmission. This switch is occurring in countries across the world.² In Australia, the switch off of analog television transmissions is scheduled to be completed by 31 December 2013.

The propagation characteristics of the frequency bands being freed up make the digital dividend highly valued for deploying a wide range of communications services. Accordingly, spectrum managers around the world are seeking to maximise the public benefits of re-farming this spectrum.³ This is most commonly being done by 'restacking' the digital television services in the UHF band after analog switch off, to clear a large, contiguous block of vacant spectrum. The advantage of this process is that, by clearing a contiguous block, it maximises the flexibility of use of the spectrum.

In January 2010, the Department of Broadband, Communications and the Digital Economy (DBCDE) launched its public consultation on the digital dividend in Australia by releasing the *Digital dividend green paper* (the green paper). The green paper sought public comment on the potential uses of the digital dividend spectrum, the amount of spectrum that should be made available and the economic and social costs and public benefits involved in restacking broadcasting services to create a single contiguous block of digital dividend spectrum. More than 100 submissions were received.⁴

1.2 Realising the digital dividend

In June 2010, the Minister for Broadband, Communications and the Digital Economy, the Hon Stephen Conroy (the Minister), announced that the government had decided on a digital dividend in Australia comprised of a single 126 MHz spectrum block (694–820 MHz). On 9 July 2010, the Minister consequently made the *Australian Communications and Media Authority (Realising the Digital Dividend) Direction 2010*, directing the ACMA to clear 126 MHz of spectrum between 694 MHz and 820 MHz inclusive (the 700 MHz band).⁵ The ACMA has also received funding to assist the government to facilitate the realisation of the digital dividend.

Three key processes are required to realise the digital dividend. These are:

- > conversion of analog television broadcasting to digital transmission (switchover)
- > clearance of a contiguous block of spectrum (restack)
- > allocation of the cleared spectrum (reallocation).

This paper focuses on the reallocation process including issues around how the cleared spectrum should be configured and allocated consistent with the objectives of the Radiocommunications Act.

However, as some parts of the reallocation process are dependent on components of the switchover and restack processes, the relevance of switchover and restack and the impact these may have on the implementation of the reallocation process are also discussed.

² Information on overseas digital dividends may be found in Appendix B.

³ Re-farming involves clearing frequencies from existing uses and reassigning them for new (presumably higher value) uses.

⁴ Submissions are accessible on the DBCDE Digital Dividend web page: www.dbcde.gov.au/consultation_and_submissions/digital_dividend

⁵ Section 14(1) of the Australian Communication and Media Authority Act gives the Minister power to give written direction to the ACMA in relation to the performance of its functions and exercise of its powers.

1.2.1 Digital switchover

The first key step necessary for the realisation of the digital dividend is the digital switchover process. Currently, the digital dividend spectrum forms part of the broadcasting services bands (BSBs) which are primarily for the use of broadcasting services.⁶ Originally television broadcasters transmitted television services in these bands using analog signals. However, broadcasters will only transmit digital television services in the future. The process of converting the delivery of television services from analog to digital transmission is known as 'digital switchover'.

The switchover from analog to digital television transmission has been motivated by the superior features of digital transmission and the need for Australian free-to-air broadcasters to keep pace with rising audience expectations. For example, digital television provides greatly improved picture and sound quality. Compared to analog technology, digital technology is also able to transmit more television services in the same amount of radiofrequency spectrum, enabling the provision of additional television services through multichannelling. For the Australian community, the benefits accruing from realisation of the digital dividend are also a key incentive for the switch off of analog transmissions.

The Broadcasting Services Act 1992 requires the ACMA to formulate schemes for the conversion, over time, of the transmission of television broadcasting services from analog to digital mode.⁷ The two schemes, the Commercial Television Conversion Scheme and the National Television Conversion Scheme, commenced on 9 June 1999 and 2 February 2000 respectively.⁸ The objectives of these schemes include:

- > the establishment of 'simulcast periods' during which commercial and national broadcasters are to provide television services in both analog and digital mode
- > the objective that, as soon as practicable after the start of the simulcast period, the transmission of the digital service should achieve the 'same level of coverage and potential reception quality' as is achieved by the transmission of that service in analog mode
- > the objective that, at the end of the simulcast period for a licence or coverage area, the analog transmissions will cease.⁹

The rollout of digital television transmissions commenced in early 2001 and is well underway in metropolitan and regional areas of Australia.¹⁰ Viewers in areas where digital services have been rolled out are currently receiving both analog and digital transmissions by virtue of the simulcast period, or where the simulcast period has ended, digital transmissions only. The ACMA has also determined commencement dates for digital television in a number of remote areas.¹¹ On 19 October 2008, the Minister released the Australian Government's digital switchover timetable, setting out

⁶ The BSBs consist of the frequency bands 526.5–1606.5 kHz, 45–52 MHz, 56–70 MHz, 85–108 MHz, 137–144 MHz, 174–230 MHz and 520–820 MHz. These were assigned as being primarily for broadcasting purposes by the then Minister on 5 October 1992 in *Assignment of Part of the Spectrum to the Australian Broadcasting Authority for Planning*.

⁷ Schedule 4 to the *Broadcasting Services Act 1992*.

⁸ For further information about the conversion schemes, including the legislative instruments, please refer to the ACMA website at www.acma.gov.au/WEB/STANDARD/pc=PC_91843.

⁹ Clauses 6 and 19, Schedule 4 to the *Broadcasting Services Act 1992*.

¹⁰ Department of Broadband, Communications and the Digital Economy, *Report on Digital Television Transmission and Reception*, September 2010, www.dbcde.gov.au/__data/assets/pdf_file/0012/130305/Transmission-and-Reception-Report.pdf.

¹¹ The ACMA determined digital television commencement dates in 2009 and 2010 for these licence areas: Remote and Regional WA TV1, South West and Great Southern TV1, Geraldton TV1, Kalgoorlie TV1 and Western Zone TV1.

the timetable for the switchover to digital-only television.¹² The analog transmissions will be progressively switched off region-by-region across Australia by the end of 2013.¹³

The first Australian full analog-to-digital television broadcasting conversion took place in the regional area of Mildura/Sunraysia, where analog television ceased broadcasting on 30 June 2010. Following switchover, broadcasters are now delivering a full suite of digital-only television services to viewers who received terrestrial analog services in the licence area. Viewers in signal-deficient areas in the Mildura licence area are able to access services through either the new satellite service, Viewer Access Satellite Television (VAST) or additional digital re-transmission facilities provided by broadcasters.¹⁴

As digital switchover continues throughout Australia, the 'same coverage' objective of the conversion schemes will ensure that the vast majority of viewers will continue to receive terrestrial digital television services after the cessation of analog transmissions at the end of the simulcast period. In 2010, regional broadcasters committed to rolling out additional digital transmitters to fill in coverage gaps and to convert around 100 analog retransmission facilities licensed to third parties, such as local councils, in areas where terrestrial television services were not available (blackspots). Viewers in remaining signal-deficient areas, including any analog blackspot sites that are not converted to digital by broadcasters, will progressively be able to access the VAST service.¹⁵

The completion of the digital switchover process will result in the freeing up of parts of the spectrum formerly used for analog transmissions during the simulcast period as a digital dividend, permitting refarming of this spectrum for alternative uses.

1.2.2 Digital channel restack

The second step in realising the digital dividend is the digital channel restack process. As described in the green paper, the restack process is required to achieve a large, contiguous block of spectrum in order to derive the maximum public benefit from the digital dividend.

The digital dividend spectrum corresponds to UHF television channels 52–69. At most transmission sites, each broadcaster currently utilises two television channels, one for its analog signal and a second for its digital signal. Following the closure of analog television services, the channels used to transmit those services will become vacant. However, the digital services will remain in channels 52–69 (as well as the eight channels in VHF Band III). Restacking digital television services by shifting them from the upper end of the UHF television band and concentrating them in the spectrum below channel 52 will be required in order to clear a contiguous block of spectrum suitable for allocation and re-use.

To ensure an efficient restacking of television broadcasting below channel 52, it will be necessary to make changes to spectrum allocations for the transmission of digital

¹² Digital Switchover Taskforce, *Digital TV Timetable by Region*,

www.dbcde.gov.au/data/assets/pdf_file/0007/88108/Digital_TV_Timetable_by_Region_-_Updated.pdf.

The next regions to switch over to digital-only television will be the Broken Hill region in New South Wales and the Riverland, Spencer Gulf, Mt Gambier/south-east South Australia regions in South Australia. These regions will switch over on 15 December 2010.

¹³ Digital Switchover Taskforce, *Rollout Map*, www.digitalready.gov.au/rolloutmap.aspx.

¹⁴ Media release: *Mildura/Sunraysia switches to digital television*—Senator The Hon. Stephen Conroy Minister for Broadband, Communications and the Digital Economy 30 June 2010

¹⁵ Department of Broadband, Communications and the Digital Economy, *Report on Digital Television Transmission and Reception*, May 2010,

www.dbcde.gov.au/data/assets/pdf_file/0010/127918/Transmission_Blackspots_Report_May10.pdf, pp.4–5.

television services that operate outside the digital dividend spectrum. Restack is expected to require retuning of services at most television broadcasting sites. In general, the commencement of the restack process in a licence area cannot occur until analog switch-off is completed for that licence area.

In order to restack television services, the ACMA will need to undertake detailed re-planning of television channel allotments around Australia. In the Ministerial Direction (the direction) of 9 July 2010, the ACMA was directed to consider a range of matters in performing its functions related to restacking digital television services to achieve the digital dividend.¹⁶ The ACMA was directed to consider exercising its powers to make provision for no more than six digital television channels in each metropolitan area and to set aside the equivalent of two VHF Band III television channels (14 MHz) in metropolitan areas to enable digital radio expansion into regional Australia.¹⁷ The ACMA was also directed to consider re-planning television services in the five metropolitan areas so that all five (and potentially six) high powered services operate in the same band (VHF Band III).¹⁸

The direction provides that where changes are not necessary for, or directly consequential to, the achievement of the digital dividend policy objectives, the ACMA should, in regional and remote licence areas, wherever possible:

- > minimise disruption for the affected television audience
- > minimise the financial impact on affected broadcasting services.¹⁹

This recognises that the restack may be an opportunity to reorganise or optimise television broadcasting arrangements above and beyond the requirements of vacating the digital dividend spectrum. The direction establishes a regime of quarterly ACMA reporting on progress towards achieving the objectives of the direction.²⁰ It also directs the ACMA to review the feasibility of using the frequencies 519–526 MHz (channel 27) for future broadcasting purposes.²¹ This would extend the UHF broadcasting services bands by a single megahertz (by dropping the lower edge of the band from 520 to 519 MHz) so as to enable use of channel 27 as a standard 7 MHz broadcasting channel.

Close cooperation will be required between the ACMA and the television industry and other key stakeholders for the preparation and implementation of the new 'restacked' digital channel plans. This process has several key phases:

- > the ACMA is currently determining (in consultation with broadcasting industry stakeholders) the objectives and planning principles that will be applied in the restack re-planning process
- > the ACMA will then prepare, consult on and make a series of detailed area-by-area channel plans that will cover all parts of Australia
- > the broadcast industry will progressively undertake the necessary detailed site planning, equipment ordering and onsite installation and retuning work to implement the revised digital channels.

Following the Minister's direction to the ACMA on 9 July, the ACMA has commenced its consultations with the broadcast industry on the subject of the restack. The ACMA also intends to work closely with industry to develop an overarching project plan and timeline for the process of planning and implementing the restack process to clear services from the digital dividend spectrum as soon as is practicable. In late 2010, the ACMA will implement a series of consultative groups intended to assist with the restack planning tasks. Modelled on engineering working groups that assisted with the

¹⁶ [Australian Communications and Media Authority \(Realising the Digital Dividend\) Direction 2010.](#)

¹⁷ Section 5.

¹⁸ Subsection 6(3).

¹⁹ Subsection 6(4).

²⁰ Section 8.

²¹ Section 9.

initial rollout of digital television, these groups should enable informal consultation and industry collaboration with ACMA engineers on issues such as the planning principles for the restack and preparation of area-by-area channel plans.

While these working groups will be of primary interest to broadcasters and broadcasting infrastructure providers, there will also be wider public consultation on key issues. For instance, the ACMA expects to promulgate its proposed planning principles for comment before finalisation, probably as a revision of the *Technical planning handbook*. The ACMA is also required to consult with the public in the determination of legislative planning instruments such as digital channel plans (DCPs) and licence area plans (LAPs), which will be used to determine the new channel allocations in each area. Details of issues under consideration as part of the restack planning process are outside the scope of the present paper.

While viewers already receiving terrestrial digital television services will not need to buy new TV sets or set-top boxes as a result of restack, they may have to rescan their receivers to re-acquire the digital services after they shift to new channels. There is also a risk that in some areas one or more of the post restack digital channels will be outside the frequency bandwidth of viewers' existing antennas. The ACMA intends to plan the restack so as to minimise or avoid the need for new antennas and will work closely with the government on strategies for assisting viewers with any changes that may be required due to the restack process.

1.2.3 Digital dividend reallocation

The third step in the ACMA's work to realise the digital dividend and the primary focus of this paper is the reallocation of the contiguous block of spectrum that will result from the switchover and restack processes. Reallocation is comprised of two parts:

- > configuration of the spectrum to determine the product for sale
- > allocation of the resulting spectrum products.

Configuration

The ACMA will begin by planning the configuration of the digital dividend spectrum based on potential uses for the band. This process will require the ACMA to determine the optimum licence type, frequency and geographic boundaries for the digital dividend spectrum, as well as the technical arrangements for using the spectrum. These configuration parameters will be embodied in the licences and legislative and administrative instruments made by the ACMA. Although the ACMA will undertake configuration based on the most likely use for the digital dividend spectrum, there may be potential for different uses within the 126 MHz of spectrum to be cleared.

One of the fundamental configuration parameters is the licence type. Under the Radiocommunications Act, the ACMA can issue three types of licences to authorise the use of spectrum: apparatus licences, class licences and spectrum licences. Apparatus licences authorise the licensee to use a specified device at a specified location in a specified frequency band. Class licences authorise the use of low interference potential equipment that meets a standard set of criteria. Spectrum licences authorise the licensee to use the specified frequency band anywhere within the geographic and frequency boundaries of the spectrum space. The appropriate licence type and allocation process for a particular part of the spectrum will be largely determined by the potential uses of that part of the spectrum.

Under the Radiocommunications Act, the Minister is the only person with the power to designate or declare that a part of the radiofrequency spectrum should be allocated by issuing spectrum licences. However, the Radiocommunications Act provides that the Minister must consult with the ACMA and consider any recommendation made by the ACMA. Since the characteristics of the digital dividend spectrum make it suitable for building a network over medium to large geographical areas, it is reasonable to expect that the ACMA will most likely recommend that the Minister specify spectrum licensing as the primary licence type for the digital dividend. The ACMA considers that the

greater flexibility offered by spectrum licences for planning and operating communication networks is likely to increase the value and economic benefits derived from the digital dividend.

However, some parts of the digital dividend spectrum may be less suitable for spectrum licensing, based on the chosen technical planning arrangements. For example, spectrum set aside for guard bands in order to protect services in neighbouring spectrum from interference may be excluded from spectrum licensing due to its lower utility. Similarly, internationally harmonised arrangements between countries with varying digital dividends may mean that some frequencies within the digital dividend spectrum (for example, 806–820 MHz) could be less valuable to potential licensees because they fall outside the harmonised band (698–806 MHz). These frequency bands might therefore be excluded from spectrum licensing. It may also be appropriate to excise some geographic areas of Australia from spectrum licensing. These parts of the digital dividend spectrum would potentially be allocated for use under apparatus or class licences.

The reallocation process (and the remainder of this paper) focuses on the parts of the digital dividend to be allocated under spectrum licences. The ACMA will consider arrangements for spectrum allocated under apparatus or class licences separately through normal planning processes.

Issues affecting configuration of the digital dividend spectrum are discussed in Chapter 3.

Allocation

Once configuration of the digital dividend spectrum is complete, the ACMA will develop an allocation process designed to maximise the public benefit from the allocation of the spectrum licences. This will involve development of appropriate allocation procedures and rules, division of the spectrum into lots for sale, and drafting of detailed licence conditions. The ACMA will also consider the most appropriate timing of the allocation.

There are two legislative processes for the allocation of spectrum licences under the Radiocommunications Act:

- > spectrum licence designation²²
- > spectrum reallocation declaration.

The ACMA intends to follow the process for spectrum reallocation declaration, which is set out in Part 3.6 (sections 153A to 153P) of the Radiocommunications Act. This 'spectrum reallocation process' is designed for use where the relevant spectrum is currently being used by incumbents (encumbered spectrum). It therefore sets out arrangements for the clearance of incumbent users from the spectrum and allocation to the incoming users. As the digital dividend is currently being used by broadcasters and other incumbents, this is seen to be the most appropriate process to ensure a smooth transition.

Given the expected high demand for the digital dividend spectrum as 'waterfront property', the ACMA intends to allocate the spectrum licences authorising use of the digital dividend spectrum through an auction.²³

The ACMA is able to allocate spectrum licences through a number of methods: price-based allocation (auction), tender, or for a pre-determined or negotiated price.²⁴ The second and third methods are generally considered more appropriate for spectrum

²² Spectrum licence designation under section 36 of the *Radiocommunications Act 1992* is most suitable for spectrum that is unencumbered, i.e. not currently in use.

²³ *Digital dividend green paper*, Minister's foreword.

²⁴ Section 60(1) of the *Radiocommunications Act 1992*.

where there is no excess demand. For the digital dividend spectrum, there is a risk that these two methods would result in an inefficient allocation.

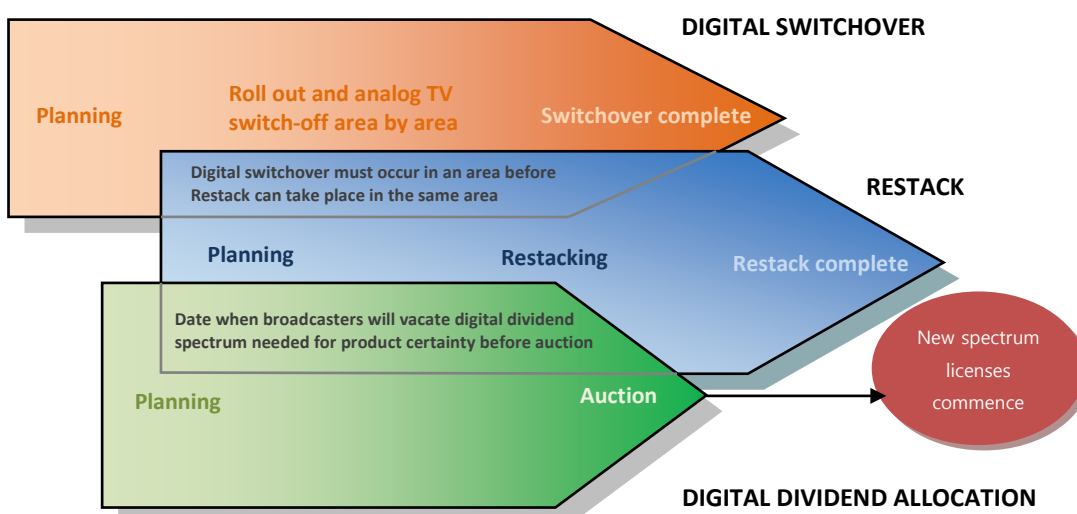
1.2.4 Impact of switchover and restack on the reallocation process

The ACMA's task of managing the switchover, restack and reallocation processes must take account of the dependencies between parts of the three processes. Because analog TV services must be switched off to free up spectrum for digital services shifting from above 694 MHz to lower frequencies, it is not possible to restack digital services in an area until digital switchover has taken place for that area. Similarly, the reallocation process requires the digital dividend spectrum to be vacated through the restack process in order to permit the new spectrum licensees to begin operating in the band.

In order to conduct these three processes efficiently and avoid valuable spectrum lying idle for long periods, the ACMA intends to conduct the digital dividend reallocation process in parallel with the switchover and restack processes, using the Part 3.6 process designed for encumbered spectrum. This will minimise any period in which spectrum is unused between the switch off of analog services and the commencement of services authorised by spectrum licences allocated under the reallocation process.

The major consequence of this parallel process is that the digital dividend spectrum will be reallocated while some parts of the digital dividend spectrum are still in use by broadcasters (see Figure 1). In general, the standard process under Part 3.6 clears incumbent apparatus licensees from the band by cancelling their licences at the end of the reallocation period. However, the situation with the digital dividend is complicated because the spectrum is currently allocated to holders of broadcasting services licences. Holders of some of these licences are entitled to an apparatus licence which cannot be cancelled in the same way as non-broadcasting apparatus licences (protected apparatus licences)²⁵. The digital dividend reallocation is therefore unusual in that protected apparatus licences will be relocated by the restack process to another part of the spectrum instead of being cancelled, while other apparatus licences will be cancelled in the usual way.

Figure 1 Dependencies between digital switchover, restack and reallocation



²⁵ Protected apparatus licences are those issued under sections 101A, 101B, 101C, 102 and 102A of the *Radiocommunications Act 1992*.

Running the digital dividend allocation in parallel with digital switchover and restack will require a high level of confidence about the expected date by which broadcasters will vacate the spectrum. In particular, marketing plans and other product information provided to potential purchasers as part of the allocation process will contain information about the timing of availability of the band. The ACMA will deliver 'product certainty' to potential bidders for digital dividend spectrum by managing and coordinating its work on the restack and reallocation processes.

In addition, the ACMA is considering the effect of any decision to undertake the restack process on an area-by-area basis, similar to the progressive arrangements for the digital switchover process. In such a case, the spectrum might become available in some areas before others, raising the question of whether the digital dividend spectrum licences should authorise progressive entry of new licensees as restack is completed. This could be implemented through appropriate design of spectrum licence instruments, as discussed in Chapter 4.

2 Spectrum reallocation process

As discussed in Chapter 1, the ACMA intends to use the spectrum reallocation process set out in Part 3.6 of the Radiocommunications Act, which is designed for the reallocation of encumbered spectrum, for the allocation of the digital dividend spectrum. This chapter sets out the legislative framework that applies to the ACMA's management of the radiofrequency spectrum, including the digital dividend, and the main steps of the spectrum reallocation process.

The legislative framework sets out the principles and objectives that the ACMA must take into account in reallocating the digital dividend. The framework will guide the various decisions made by the ACMA in relation to the configuration and allocation of the digital dividend, such as the design of the technical framework, product offering and licence conditions. These decisions will be embodied in the administrative and legislative instruments made by the ACMA and the Minister in the spectrum reallocation process.

2.1 Legislative framework

The ACMA has a number of legislative functions and powers that will be relevant to its reallocation of the digital dividend spectrum. In particular, the ACMA will be guided by the object of the Radiocommunications Act, which is to provide for the management of the radiofrequency spectrum in order to further the matters at paragraphs (a) to (h) of section 3 of the Radiocommunications Act, to:

- (a) maximise, by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum
- (b) make adequate provision of the spectrum:
 - (i) for use by agencies involved in the defence or national security of Australia, law enforcement or the provision of emergency services
 - (ii) for use by other public or community services²⁶
- (c) provide a responsive and flexible approach to meeting the needs of users of the spectrum
- (d) encourage the use of efficient radiocommunication technologies so that a wide range of services of an adequate quality can be provided
- (e) provide an efficient, equitable and transparent system of charging for the use of spectrum, taking account of the value of both commercial and non-commercial use of spectrum
- (f) support the communications policy objectives of the Australian Government
- (g) provide a regulatory environment that maximises opportunities for the Australian communications industry in domestic and international markets
- (h) promote Australia's interests concerning international agreements, treaties and conventions relating to radiocommunications or the radiofrequency spectrum.

In addition to the objectives in the Radiocommunications Act, the ACMA has adopted principles for spectrum management to guide its decision making process in relation to

²⁶ The ACMA is working with the Attorney-General's Department and the public safety and law enforcement community in order to ensure access to appropriate spectrum for these purposes.

spectrum management.²⁷ The ACMA will refer to the following principles in making decisions about the realisation of the digital dividend:

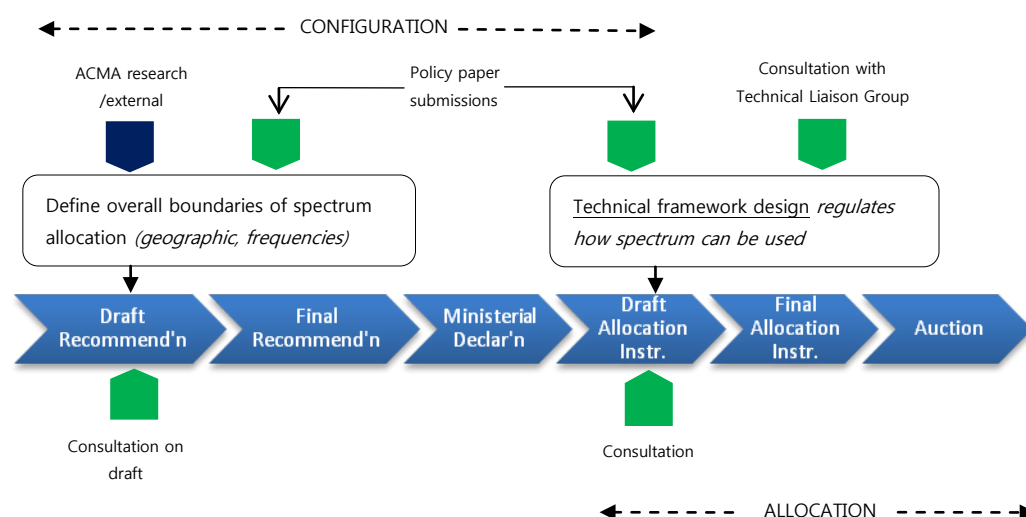
- > allocate spectrum to the highest value use or uses
- > enable and encourage spectrum to move to its highest value use or uses
- > use the least cost and least restrictive approach to achieving policy objectives
- > to the extent possible, promote both certainty and flexibility
- > balance the cost of interference and the benefits of greater spectrum utilisation.

The object described in paragraph 3(a) of the Radiocommunications Act and the first and second spectrum management principles outlined above are significant factors underlying the ACMA's disposition to allocate spectrum licences under a price-based allocation process.

2.2 Main steps in the reallocation process

The main steps in the reallocation process under Part 3.6 of the Radiocommunications Act are set out in Figure 2.

Figure 2 The main steps in the digital dividend reallocation



As indicated by the green arrows in the diagram, the ACMA intends to provide a number of opportunities for stakeholder input into the reallocation process, for both the legislative process (blue arrows) and the development of the external and internal technical frameworks for the digital dividend (white boxes).

Step 1: Draft recommendation and invitation to comment

The first step in the spectrum reallocation process is for the ACMA to prepare a draft recommendation in accordance with section 153F, setting out the spectrum that the ACMA believes should be reallocated. The ACMA must identify the spectrum by frequency and geographic area and suggest a reallocation period within which the reallocation process is to be completed.²⁸ It may also specify other items that the ACMA chooses to include.

²⁷ For a detailed discussion refer to ACMA web page [Principles for Spectrum Management, www.acma.gov.au/scripts/nc.dll?WEB/STANDARD/1001/pc=PC_311683](http://www.acma.gov.au/scripts/nc.dll?WEB/STANDARD/1001/pc=PC_311683).

²⁸ The reallocation period is described further under Step 3.

This instrument must include the external frequency and geographic boundaries of the digital dividend, derived by the configuration process as described in Chapter 3.

The ACMA must undertake a consultation process under section 153G with the incumbent apparatus licensees, who will be the most directly affected by the proposed reallocation. The licensees must be provided with a draft of the recommendation and invited to comment on it. However, the ACMA plans to undertake wide public consultation so that all stakeholders are able to comment on the draft recommendation. The consultation period will last for at least 28 days.

Step 2: Final recommendation to the Minister

After consulting on the draft recommendation, the ACMA will prepare a final recommendation under section 153F to the Minister. In preparing the final recommendation, the ACMA must consider views received during the public consultation period. The final recommendation must include the same information that is required to be included in the draft recommendation.

Step 3: Spectrum reallocation declaration

After the ACMA makes its final recommendation, the Minister will have the power to declare the frequency band and geographic area of the spectrum to be reallocated and the type of licences to be issued under section 153B. In making the declaration, the Minister must have regard to the recommendation from the ACMA. The Minister is only able to make a declaration within 180 days of receiving the recommendation from the ACMA.²⁹ The Minister can only make a declaration about spectrum that was included in a recommendation from the ACMA.

The Minister will also specify two key points in the process: the reallocation period and the reallocation deadline. The reallocation period is the period during which the ACMA must clear incumbent apparatus licences from the spectrum to be reallocated so that the spectrum is available for use by the new licensees.³⁰ The reallocation period must begin within 28 days of the reallocation declaration being made by the Minister, and must run for at least two years.³¹ At the end of the reallocation period, incumbent apparatus licences would usually be cancelled.³² However, in the case of the digital dividend, it is the restack process that must be completed by the end of the reallocation period due to the presence of the protected licences.

The reallocation deadline must be set at least 12 months before the end of the reallocation period.³³ The reallocation deadline is significant because if the ACMA does not successfully auction at least one licence before the reallocation deadline, the declaration will be revoked and the entire reallocation process will need to be re-started. Figure 2 provides a hypothetical example of how the reallocation period and reallocation deadline interact.³⁴

²⁹ Section 153E—the declaration will set out: the reallocation period; the reallocation deadline; the spectrum to be reallocated and whether spectrum or apparatus licences will be issued.

³⁰ Section 153B(4) of the *Radiocommunications Act 1992*.

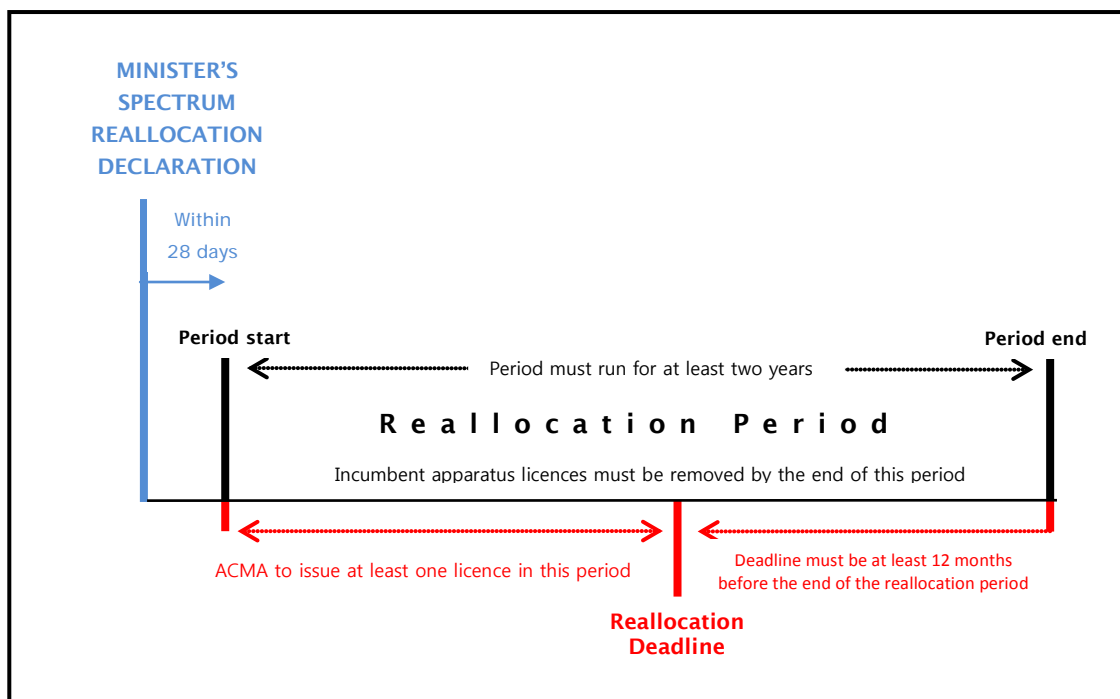
³¹ This is relevant to the timing of the auction, as discussed in section 4.4.

³² Section 153H(2) of the *Radiocommunications Act 1992*.

³³ Section 153B(5) of the *Radiocommunications Act 1992*.

³⁴ Considerations that the ACMA may take into account in making its recommendation to the Minister on a suitable reallocation period are discussed further in chapter 4 of this paper.

Figure 2 Example of interaction between the reallocation period and reallocation deadline



Step 4: Draft allocation instruments

The ACMA must make a number of instruments in order to conduct the auction of the digital dividend. These include a marketing plan under section 39A, an allocation procedures determination under section 60, and technical framework instruments under sections 145 and 262. These instruments will set out the results of the ACMA's work on the configuration and allocation of the digital dividend spectrum, as discussed in chapters 3 and 4 of this paper. In particular, they will specify the legal rights and obligations that will be conferred by the spectrum licences, including the maximum emission limits and other operating conditions for the spectrum set by the technical framework. As most of these instruments are legislative instruments, the ACMA expects to undertake consultation in accordance with the provisions of the *Legislative Instruments Act 2003*.

If the Minister makes a declaration to reallocate the digital dividend for spectrum licensing, the ACMA intends to call for expressions of interest in acquiring spectrum in the 700 MHz band.³⁵ This enables the ACMA to identify interested parties with whom the ACMA needs to undertake further consultation. The ACMA expects to consult with parties who have submitted an expression of interest in relation to its development of the allocation instruments.

The two main allocation instruments are the marketing plan and the allocation procedures determination. The marketing plan sets out the manner and timing of the auction. In general, the marketing plan sets out information about the spectrum that is available and describes high-level procedures for the auction. For example, the marketing plan might specify the type of auction method that will be employed; how the spectrum will be apportioned into lots; and how much spectrum will be reserved for community or public services.³⁶ The marketing plan will also be accompanied by a sample spectrum licence defining the area and frequency band of the licence and

³⁵ Section 44 of the *Radiocommunications Act 1992*.

³⁶ Section 39A(5).

setting out licence conditions, including emission limits, technical advisory guidelines and statutory obligations.³⁷

The allocation procedures determination is made under section 60 of the Radiocommunications Act. It sets out in greater detail the substantive elements of the chosen allocation method. For example, the procedures will detail the auction method and auction rules, registration requirements, fees associated with the auction, reserve prices, deposits payable and methods of payment.³⁸ If the Minister directs the ACMA to do so, the allocation procedures may also impose competition limits, such as a limit on the amount of spectrum that may be purchased by a particular entity.³⁹ These limits will be decided on after consultation between the Minister and the ACCC. The ACMA will be required to incorporate the competition limits once directed by the Minister.

Finally, there are a number of instruments that implement the technical framework for the band. In addition to the sample spectrum licence in the marketing plan, these comprise the Unacceptable Interference Determination under section 145, which specifies the requirements for the registration of radiocommunications transmitters; and the Radiocommunications Advisory Guidelines under section 262, which assist licensees to coordinate with other radiocommunications services.

Step 5: Final allocation instruments

After consultation, the ACMA will make final versions of the allocation instruments. These will be made available to the public, as well as being published on the Federal Register of Legislative Instruments.

Step 6: Auction

Once the allocation instruments have been finalised, the ACMA will be in a position to invite interested parties to register as bidders for the auction. Information sessions will also be held to advise participants of the auction process and give them an opportunity to trial the computer systems that will be used for the auction.

After completion of the auction process, the ACMA will proceed to issue invoices for the winning bids. Upon payment, the ACMA will prepare and send out the spectrum licence documents to successful bidders.

³⁷ Sections 61 and 66.

³⁸ Section 60(2).

³⁹ Sections 60(5), 60(6) and 60(10).

3. Configuring the digital dividend spectrum for reallocation

This section describes issues affecting the ACMA's approach to configuring the digital dividend spectrum for reallocation. There are two aspects to configuring the spectrum for reallocation.

The first is determining the overall geographic and frequency boundaries of the spectrum that should be reallocated for spectrum licensing. These parameters will form the basis of the ACMA's recommendation to the Minister and will identify parts of the spectrum to be spectrum licensed. The second is developing a technical framework that will regulate the use of spectrum *within* those boundaries. This will be developed in consultation with a technical liaison group made up of industry and other stakeholder parties.

In determining configuration of both the overall geographic and frequency boundaries and the technical framework to operate within those boundaries, the ACMA will consider a range of issues including the characteristics and potential uses of the spectrum, the exclusion of the radio quiet zones, as well as international harmonisation and potential alignment of the Australian digital dividend with other countries in the region.

3.1 Characteristics and likely use of the digital dividend

The most likely uses of the digital dividend spectrum flow from the characteristics of the band, which affect its suitability for various purposes.

The digital dividend spectrum is located in the ultra-high frequency (UHF) band of the radiofrequency spectrum. UHF spectrum, especially below 1 GHz, has signal propagation characteristics that make it highly valued for deploying a wide range of communications services.

These propagation characteristics make the digital dividend spectrum useful for delivering a range of mobile and fixed services such as mobile telecommunications networks (telephony and broadband). The growing demand for communications capacity of mobile networks has led to suggestions that the digital dividend be allocated for such purposes.⁴⁰ The wide signal coverage of the 700 MHz band could enable these mobile services to be delivered much more cost-effectively, particularly to rural and remote locations in Australia. The wider signal coverage available would mean that fewer base stations are needed to support a network, significantly reducing the implementation costs for operators and consequently the flow on costs for consumers.

The outcome of previous public consultations conducted by the ACMA and DBCDE has supported the desirability of the 700 MHz band for use in mobile telecommunications services. For example, respondents to the ACMA's discussion paper issued in 2006 regarding potentially suitable spectrum for wireless access services (WAS) indicated that the current UHF broadcasting services band frequencies (520–820 MHz) would be well-suited to mobile services.⁴¹

⁴⁰ Access Economics, *Economic Contribution of Mobile Telecommunications in Australia*, June 2010, p.v.

⁴¹ ACMA [Strategies for Wireless Access Services: Spectrum Access Options](#) discussion paper, December 2006.

Earlier this year, the DBCDE received a wide range of responses to its digital dividend green paper on this subject.⁴² The stakeholders who responded included broadcasters, electricity distribution network owners, equipment manufacturers and related bodies, government agencies and emergency service providers, indigenous broadcasters and representatives, internet service providers, the telecommunications industry and wireless audio device users and suppliers.⁴³

The stakeholders noted a number of potential uses for the digital dividend spectrum, including fixed wireless broadband services, mobile broadband and/or communications services, public safety and security, services for regional and remote Australia (for example, e-health, National Broadband Network, public safety) and smart meters and smart grids.

However, the majority of submissions suggested that the characteristics of digital dividend spectrum were highly attractive for use in the deployment of mobile telecommunications services, particularly Long Term Evolution (LTE) networks. As a 'technology-taker', it is important for Australia to take advantage of the benefits of harmonised equipment in line with international developments. The ACMA therefore, at this point in time, thinks that the most likely configuration of the digital dividend spectrum will be for the deployment of mobile telecommunications services, although it would aim as far as practicable to develop technology flexible technical frameworks that would permit the deployment of other services in the band.

3.2 Determining frequency and geographic boundaries of spectrum to be reallocated

3.2.1 Frequency boundaries

Three main issues are relevant in configuring the frequency boundaries of the digital dividend spectrum for spectrum licensing:

- > the requirement for any necessary guard bands or a mid-band duplex gap on the frequency boundaries
- > the desirability of aligning the frequency boundaries with international arrangements
- > the possible accommodation of low interference potential devices in some parts of the digital dividend spectrum under other licensing arrangements.

Guard bands and mid-band gap

As discussed above, it is considered that the most likely use for the digital dividend spectrum will be the delivery of mobile telecommunications services. If this is so, these services will require guard bands in order to avoid harmful interference to services in neighbouring bands. Similarly, duplex arrangements may dictate that it is necessary to set aside a mid-band gap.

Due to their primary purpose of providing buffers for potential interference, it is unlikely that spectrum in the guard bands and mid-band gap will be in high demand. In addition, the restrictions imposed on this spectrum are likely to preclude technology-flexible use by licensees. The ACMA is therefore considering whether to exclude any guard bands and mid-band gap from the parts of the digital dividend that will be spectrum licensed.

International harmonisation

In determining the frequency boundaries of the digital dividend, the potential for alignment with international arrangements is an important consideration.

⁴² DBCDE [Digital dividend green paper](#), January 2010.

⁴³ DBCDE, *Digital dividend*, Consultations and submissions,

www.dbcde.gov.au/consultation_and_submissions/digital_dividend, accessed 29 July 2010.

The ACMA's preferred approach is to commence domestic planning work in line with the harmonised International Telecommunication Union (ITU) Region 3 plan while continuing to actively participate in the Asia-Pacific Telecommunity Wireless Forum (AWF) to complete the further studies and refine the arrangements. The implementation of the region-wide approach in Australia will be subject to consultation as part of the overall reallocation process.

There are substantial advantages to Australian communications manufacturers, service providers and end users in arrangements that are internationally harmonised. The major advantage is the economies of scale that make manufacturing equipment for both users and providers cheaper. Harmonisation may also facilitate user features such as global roaming. The ACMA is therefore looking to international digital dividend developments in determining its configuration for the digital dividend spectrum.

The major digital dividend band plans currently in existence are the European and US plans. Due to the original arrangements for European broadcasting services, the European digital dividend (790–862 MHz) is in a substantially different frequency range to Australia, meaning there is only a limited overlap (790–820 MHz) between the European and Australian digital dividends. It is therefore unlikely that Australia would be able to achieve significant advantages by attempting to partially align with this plan.

The US digital dividend (698–806 MHz) aligns more closely with the frequency range that will be available in Australia. However, the ACMA considers that the plan implemented in the US is not an efficient use of spectrum because it contains interleaved small blocks of spectrum, requiring more guard bands than a single contiguous block and making handset design more complex. It would also be undesirable to unilaterally implement a modified version of the US plan, since this would effectively constitute a unique digital dividend plan, contrary to the objective of harmonising arrangements.

The ACMA has therefore focussed its efforts for international harmonisation on countries within ITU Region 3 (Asia-Pacific and part of the Middle East). While many of these countries have not yet decided on the size and configuration of their digital dividend, the band under widest consideration (698–806 MHz) falls entirely within Australia's digital dividend (694–820 MHz). This band has been the subject of AWF discussions for harmonisation of arrangements for frequency use since March 2008.

Table 1: Summary of digital dividend band arrangements

| Area | Range of digital dividend | Advantages/disadvantages |
|---|---------------------------|--|
| Australia | 694–820 MHz | |
| Europe | 790–862 MHz | Little overlap with Australian frequency range. |
| United States | 698–806 MHz | Overlapping frequency range but inefficient arrangements. |
| Asia, Pacific and part of the Middle East | Likely 698–806 MHz | Similar frequency range and decision made by AWF on harmonised arrangements. |

The most recent meeting of the AWF in September 2010 led to the adoption of harmonised arrangements for both paired and unpaired configurations. The paired arrangement will use conventional duplex and will consist of 2x45 MHz blocks with a mid-band gap of 10 MHz. For both the paired and unpaired arrangements there are provisions for guard bands of 5 MHz at the bottom and 3 MHz at the top of the band. As the digital dividend spectrum in Australia commences at 694 MHz, this arrangement provides a 9 MHz guard band with adjacent UHF television broadcasting services. While this decision has been taken, the AWF has agreed to undertake further studies to ensure the coexistence of mobile services with adjacent broadcasting

services below the 698 MHz spectral boundary. The results of these studies are to be considered at the next meeting of the AWF in March 2011.

The ACMA is also monitoring international developments for the spectrum above the 698–806 MHz band covered by the AWF plan. In particular, although the spectrum in the frequency band 806–820 MHz forms part of Australia’s digital dividend, the AWF has not included this spectrum in the harmonised plan. As an international consensus is not yet available on the future of the band 806–820 MHz, the ACMA is likely to allocate this spectrum separately from the rest of the digital dividend. For example, the ACMA is monitoring the progress of further developments within the ITU and considering whether this spectrum could be included in the 900 MHz band plan review (covering 820–960 MHz).

Questions

1. Should the ACMA align its configuration of the digital dividend spectrum with the harmonised Region 3 arrangements? If not, what configuration arrangements should the ACMA put into place for the digital dividend spectrum?
2. What are the benefits and risks of the ACMA’s preferred approach? Is there evidence to support the stated benefits or risks?

Low interference potential devices in the spectrum

The ACMA notes that wireless microphones and similar equipment have been operated in parts of the digital dividend spectrum under the *Radiocommunications (Low Interference Potential Devices) Class Licence 2000* for a number of years. As part of the broader reconfiguration of the band, the ACMA is working with the wireless microphone community (including the Australian Wireless Audio Group) to make suitable provision for the operation of such equipment in the future. The ACMA is also monitoring international developments in relation to wireless audio equipment.

The ACMA expects that current class licensing arrangements for wireless microphones will continue in the band below 694 MHz. However, the deployment of some equipment in specific television markets may encounter issues as television channel arrangements change during the restack process. To mitigate any local deployment issues, the ACMA suggests that equipment with as wide a tuning range as possible should be the first choice for users, as tuneable equipment is more likely to retain its utility through the restack period and beyond.

For spectrum above 694 MHz, the ACMA notes that this spectrum will be progressively cleared through the switchover period until December 2013 and subsequent restack period and that device deployment by new users is likely to occur beyond that time. As part of its planning processes for that band, the ACMA will examine whether it will be possible to determine a specific allocation for wireless microphones or make suitable sharing arrangements.

3.2.2 Geographic boundaries

The second dimension of the spectrum to be reallocated is the geographic dimension. In its recommendation to the Minister, the ACMA will advise on the specific geographic area or areas that it recommends for inclusion in the spectrum reallocation. The ACMA may consider that the proposed area should cover the entire territory of mainland Australia and Tasmania. Alternatively, submissions on this paper, information about past spectrum allocations and other research, may lead the ACMA to recommend that certain defined parts of the country be excised from the geographic scope of this allocation process.

This section of the paper discusses factors that may influence the geographic scope for the digital dividend reallocation in Australia and whether some geographic areas should be excised from its recommendation to the Minister. In deciding whether the

recommendation should advise the exclusion of some defined areas, the ACMA will take a range of factors into account, including:

- > specialised needs that may make an area's exclusion desirable
- > types of likely future services to be offered using digital dividend spectrum
- > geographic remoteness of the area.

It is important to note that a decision to excise certain areas from the ACMA's recommendation to the Minister concerning the digital dividend reallocation does not mean that new services cannot be made available in these areas. The ACMA would retain the option to put into place apparatus or class licensing arrangements in excised areas to enable new services.

This section does not discuss the division of the digital dividend spectrum into spectrum licences or lots for auction. These issues are discussed in the next chapter. If the areas identified in this section are not excised from the reallocation process, the ACMA will consider the relevance of distinguishing such areas for the purpose of the geographic definition of lots (see section 4.2.2).

Remote parts of Australia

One possible option is for the ACMA to excise all remote areas from the scope of its recommendation to the Minister. This option has the support of a number of submissions to the green paper.

Advantages of excising remote areas

The main advantage of excising remote areas from the spectrum licence reallocation of the digital dividend is that the spectrum would remain available for allocation under apparatus or class licensing for innovative local purposes. While it may be impractical to issue spectrum licences for very small geographic licence areas, apparatus licensing is designed to suit the purposes of specific installations. For example, some submissions to the green paper suggested that the spectrum in remote areas should be made available for community broadband networks in small towns. Spectrum licensing might not be efficient for such a purpose because it is better suited to larger licence areas. It might therefore be preferable to excise spectrum in remote areas from the reallocation process in order to make it available on a case-by-case basis under apparatus or class licensing.

This option is supported by evidence about the current usage of spectrum in remote areas. It is clear that the demand for communications services and service capacity varies considerably across Australia. The geographic pattern of services that have been deployed by industry in nearby spectrum-licensed bands, including the 800 MHz, 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz bands, shows that infrastructure and services in these bands are concentrated in metropolitan centres (namely, state and territory capital cities), with significant (although fewer) deployments also rolled out in regional centres and surrounding areas.

In contrast, spectrum in remote areas of Australia is rarely used, according to an internal review of current spectrum licence deployments.⁴⁴ There is some evidence to suggest that where national spectrum licences have been issued, licensees have focussed their deployment of services in metropolitan and regional areas, leaving under-utilised spectrum in remote parts of their licence.⁴⁵ This may be attributable to the low commercial attractiveness of remote regions due to their sparse populations, long distances from larger regional or urban centres, and high infrastructure investment costs.

⁴⁴ ACMA, *Review of the 2.5 GHz band and long-term arrangements for ENG*, discussion paper, January 2010, p.22.

⁴⁵ See footnote above.

For these reasons, it may be desirable to excise remote areas from the geographic scope of the digital dividend spectrum allocation. Table 2 shows a list of comparable bands to the proposed digital dividend spectrum. It includes a summary of the geographic scope of licences in these bands and demonstrates the pattern described above. Spectrum in all of these bands is used for wireless access services (WAS). Previous allocations in bands used for WAS (which includes mobile telecommunications) are relevant in reallocation planning for the digital dividend, as the ACMA expects that these are likely potential uses for the digital dividend.

Table 2 Spectrum-licensed bands available for WAS in Australia⁴⁶

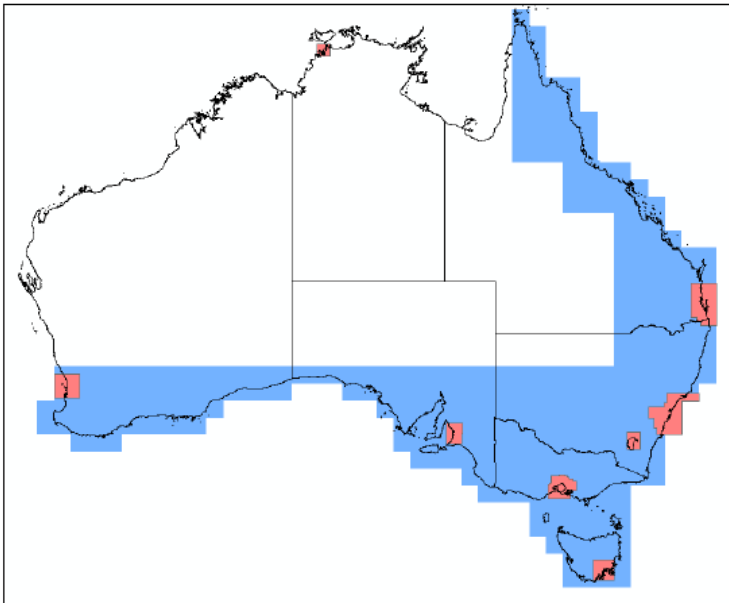
| Band | Allocation | Spectrum | Licence type | Existing usage and licence area |
|--|-----------------|----------|--------------|--|
| 825–845/ 870–890 MHz | 2 x 20 MHz | 40 MHz | Spectrum | Mobile telephony (CDMA and GSM850). Licensed areas Australia-wide. |
| 1710– 1785/1805– 1880 MHz | 2 x 75 MHz | 150 MHz | Spectrum | Mobile telephony (GSM1800). Licensed for metropolitan and regional use only. |
| 1900–1920 MHz | 20 MHz | 20 MHz | Spectrum | 3G services. Licensed in capital cities only. |
| | | | Apparatus | Broadband. Licensed in regional and remote areas only. |
| 1920– 1980/2110– 2170 MHz | 2 x 60 MHz | 120 MHz | Spectrum | 3G mobile telephony and broadband. Licensed in capital cities (2 x 60 MHz) and regional areas only (restricted to upper 2 x 20 MHz). |
| 2302–2400 MHz | 98 MHz | 98 MHz | Spectrum | Broadband. Licensed areas Australia-wide. |
| 3425–3442.5 /3475– 3492.5 MHz | 2 x 17.5 MHz | 35 MHz | Spectrum | Fixed wireless access, Broadband. Licensed in capital cities and major regional centres only. |
| 3442.5– 3475/ 3542.5–3575 MHz | 2 x 33.5 MHz | 65 MHz | Spectrum | Broadband. Licensed in capital cities and major regional centres only. |

If a decision was made to exclude remote areas from the reallocation, it would then be necessary to consider the scope of the areas classified as 'remote'. It is relevant to note that the term already has a number of possible meanings in the context of the communications and media industries. The ACMA therefore emphasises that it has not defined or identified areas that would be classified as 'remote' parts of Australia in relation to the digital dividend spectrum at this time. However, areas that could possibly fall within this description would include large parts of central Australia and regions that are very sparsely populated. For example, Figure 3 illustrates one hypothetical geographic split between remote and other parts of Australia, with metro areas shaded pink, regional areas shaded blue and non-shaded areas representing 'remote' areas. This map broadly reflects spectrum licences allocated in bands for WAS applications, although there are alternative bases on which such a division might

⁴⁶ Based on Table 3 in the ACMA discussion paper, *Review of the 2.5 GHz band and long-term arrangements for ENG*, January 2010, page 12.

be accomplished. For example, remote areas might be classified by population density or other census data.

Figure 3 Hypothetical definition of remote areas for the 700 MHz band reallocation.



Disadvantages of excising remote areas

While there are advantages to excising remote areas from the 700MHz reallocation, there may also be disadvantages, for example, there may be demand specifically for digital dividend spectrum in remote areas.⁴⁷

Spectrum in the 700 MHz band has propagation characteristics that make it particularly suitable for mobile telecommunications services due to its ability to provide wider signal coverage than higher frequency bands. Combined with new technologies, this could lower the costs of infrastructure rollout significantly. Digital dividend spectrum in remote parts of inland Australia might therefore appear more attractive for the rollout of mobile services compared to previously allocated bands.

There has also been a recent increase in demand from current spectrum users of WAS bands wishing to acquire access to spectrum in regional and remote areas to boost existing services. An example of this is in the 2 GHz band, allocated for 3G mobile services, where the ACMA recently received applications for apparatus licenses to operate 3G services at an extensive range of sites in remote and regional Australia.⁴⁸

The ACMA will take these and other factors that arise into account when forming a view about whether to excise remote areas from the geographic scope of the spectrum licences.

Questions

3. Should remote parts of Australia be excised from spectrum licensing of the digital dividend band? Why?

⁴⁷ This section discusses excision of these areas from spectrum licensing, making them available for apparatus licensing. Alternatively, it could be appropriate to deal with these areas through auction lot design, as discussed in Chapter 4.

⁴⁸ ACMA media release, *Spectrum released to improve mobile telecommunications in regional and remote Australia*, ACMA, 14 July 2010 www.acma.gov.au/WEB/STANDARD/pc=PC_312216.

4. If not, how much digital dividend spectrum should be made available in remote areas of Australia? Should different amounts of spectrum be made available for spectrum licensing in different areas, for example, metro versus rural?
5. What services would potential licensees of digital dividend spectrum expect to deploy in remote Australia?
6. What level of demand do potential service providers expect in remote parts of Australia for services that are likely to be operated in the digital dividend spectrum?
7. How should the boundaries of remote parts of Australia be determined when reallocating digital dividend spectrum?

Remote areas with specialised needs

Related to the consideration of excision of remote areas for spectrum management purposes pursuant to the objectives of the Radiocommunications Act, there are some remote areas that may require special treatment, such as excision from spectrum licensing, subject to government review.

For example, the Australian Government recently announced an Indigenous broadcasting and media sector review to consider, among other things, the carriage of Indigenous broadcasting and media on new digital platforms.⁴⁹ The review is expected to provide the government with important information to assist it in making informed decisions about the free-to-air carriage of Indigenous television on new digital broadcasting platforms by 31 December 2010. The outcome of this review will influence and assist the ACMA in spectrum planning for those areas served by Remote Indigenous Broadcasting Services transmissions.

Mid West Radio Quiet Zone

Another potential candidate for excision from the geographic scope of the reallocation is the Mid West Radio Quiet Zone (RQZ). The RQZ is located near Boolardy Station, around 200 kilometres east of Meekatharra in a very sparsely populated area of Australia.

The ACMA maintains the RQZ in remote Western Australia to provide conditions suitable for radioastronomy research. In this area, all radio emissions are minimised in order to enable the use of highly sensitive radio telescopes, which operate over a very wide range of frequencies. This includes frequencies in the digital dividend. The RQZ forms the foundation of Australia's bid to host the proposed Square Kilometre Array (SKA) telescope⁵⁰.

The RQZ serves an important public interest which requires particular attention to ensure it is protected. Currently, this protection is set out in the ACMA's Radiocommunications Assignment and Licensing Instruction (RALI) MS32 and Embargo 41 documents.⁵¹ These place an embargo on the ACMA assigning new licenses for all frequencies from 100 MHz to 25.25 GHz within the inner 'restricted' zone of the RQZ, up to a 150 kilometre radius from the RQZ centre.⁵² The outer 'coordination' zone of the RQZ requires new operators of radio emitting devices in this

⁴⁹ *Indigenous broadcasting and media sector review*,
www.minister.dbcde.gov.au/media/media_releases/2010/069

⁵⁰ www.ska.gov.au.

⁵¹ Embargo 41 www.acma.gov.au/webwr/radcomm/frequency_planning/spectrum_embargoes/emb41.pdf and the RALI MS32 www.acma.gov.au/webwr/radcomm/frequency_planning/frequency_assignment/docs/ms32.pdf can be downloaded from the ACMA website.

⁵² The RQZ centre is defined by these co-ordinates: latitude 26°42'15" South, longitude 116°39'32" East. The radius of the restricted zone varies based on frequency; the 150 km radius applies for the frequency range 100-230 MHz and the 100 km radius applies for the frequency range 230 MHz-25.25 GHz.

area to coordinate with the CSIRO to ensure that their signal strength is below prescribed power thresholds when measured at the RQZ centre.⁵³

The ACMA has released a public discussion paper seeking submissions on appropriate future arrangements to protect the RQZ and to further support Australia's bid for hosting the SKA.⁵⁴ The paper proposes that the ACMA:

- > introduce a radioastronomy band plan that will, among other things, replace Embargo 41 and largely duplicate its provisions
- > extend the lower boundary of the protected frequency range from 100 MHz to 70 MHz to enable the requirements of the SKA bid to be met
- > make consequential amendments to the Australian Radiofrequency Spectrum Plan to enable the introduction of the band plan
- > leave the existing RALI MS32 in place.

The ACMA proposes to incorporate protections for the RQZ in the digital dividend reallocation and is considering several possible ways to do so. These include:

- > excising the RQZ from geographic areas covered by the 700 MHz band reallocation process
- > offering new 700 MHz band spectrum licenses that include the RQZ, but also include conditions that duplicate the restrictions set out in Embargo 41, the proposed radio astronomy band plan and RALI MS32
- > designing a licence in the 700 MHz band reallocation that closely covers the area of the RQZ and assigning this licence to CSIRO, which manages the radio astronomy facilities in the RQZ.⁵⁵

In the event that the ACMA recommends the general excision of remote parts of Australia from spectrum licensing under the digital dividend allocation, the area covered by the RQZ is likely to fall within this category. This would avoid the need to protect the RQZ by managing it separately.

Questions

8. Would any of the three alternative scenarios described above provide suitable protection to the RQZ? Which one and why?
9. Is there a different method of protecting the RQZ in the reallocation of the digital dividend band that would be preferable? Why?

3.3 Development of the technical framework

The second part of the configuration of the digital dividend involves development of technical arrangements within the established boundaries. In parallel with the steps of the spectrum reallocation process, the ACMA will be developing a technical framework for the spectrum licences, setting out the technical requirements for operating radiocommunications equipment under the spectrum licences. The operating parameters set out by the technical framework will be incorporated into the allocation instruments that are the end result of the legislative process.

The technical framework defines important parts of the spectrum licence asset, particularly its relationship to other spectrum users in adjacent frequency bands and geographic areas. The framework is implemented in a number of documents, including:

⁵³ The specific power threshold limit for emissions in the 700 MHz band is described in the [RALI MS32](#).

⁵⁴ *Planning for the radio astronomy service*, www.acma.gov.au/WEB/STANDARD/pc=PC_100628.

⁵⁵ This lot would be for the exclusive purpose of radioastronomy research activities and would bar commercial services.

- > the draft spectrum licence containing the core conditions and other licence conditions⁵⁶
- > section 145 Determination of Unacceptable Interference used to specify the requirements for the registration of radiocommunications transmitters
- > section 262 Radiocommunications Advisory Guidelines to assist licensees to coordinate with other services.

The framework contained in these documents provides arrangements to manage interference and provide licensees with legal certainty about their rights.⁵⁷ They therefore form an important part of the spectrum product.

These framework documents are developed by the ACMA in consultation with industry through a technical liaison group (TLG). A TLG is made up of technical representatives from interested stakeholders and is designed to discuss technical issues relating to use of the spectrum by prospective licensees.

The development of the technical framework for spectrum licensing within the digital dividend will take a similar form to that taken in previous spectrum licence allocations. Typically the consultation takes the form of an introductory meeting followed by the circulation of a number of discussion papers within the TLG. These discussion papers look at various aspects such as power levels, out-of-band emissions, receiver characteristics, performance requirements, propagation modelling, site management and deployment constraints.

Spectrum licensing offers a technology-flexible, market-oriented approach to managing the radio frequency spectrum. While technical frameworks are designed to be technology-flexible, the development of the framework requires the consideration of the technology or family of technologies that are most likely to be deployed in the band. Nevertheless, the flexibility inherent in the framework allows licensees to choose how they deploy devices within their spectrum space, the nature of the service they wish to deliver, and the technology that they use, provided that the conditions set by the technical framework can be met. Consequently, it is in prospective licensees' interests to participate in the technical framework development to ensure that the framework can most efficiently accommodate their technical requirements.

The ACMA will invite interested parties to participate in the technical framework development process after the external boundaries of the digital dividend reallocation have been settled. This will be done via a notice on the ACMA website, a media release and direct contact with stakeholders who have previously indicated an interest.

⁵⁶ Sections 61 and 66.

⁵⁷ For more information on spectrum licensing technical frameworks see the information paper available on the ACMA website at: www.acma.gov.au/WEB/STANDARD/pc=PC_311701.

4. Allocating the digital dividend

This chapter sets out the issues associated with the allocation of the digital dividend spectrum, such as allocation procedures, product design (in terms of lots and licences) and timing of the auction. This chapter also discusses spectrum licences, which define the rights and obligations of spectrum licensees. The ACMA aims to develop allocation procedures that reflect the needs of potential bidders and promote the efficient allocation and use of the spectrum, thus maximising the overall public benefit derived from the digital dividend.

The ACMA will consider these issues in preparing the draft and final allocation instruments for the reallocation, particularly in its development of the marketing plan and the allocation procedures determination. In accordance with the requirements of the *Legislative Instruments Act 2003*, the ACMA intends to undertake consultation before final versions of these instruments are made. However, these issues are being raised in this paper in order to give the ACMA early guidance on stakeholder concerns.

4.1 Priced based allocation of spectrum licences

The ACMA generally allocates spectrum licences via a price based allocation process.

Price based allocation is the allocation of a licence by auction, tender, pre-determined price or negotiated price, rather than by other means, such as a lottery, a queuing system (such as first come first served over the counter) or a merit-based administrative system.⁵⁸ Section 60(1) of the Radiocommunications Act provides that spectrum licences are to be allocated through price based allocations unless certain exceptions apply.⁵⁹

Price based allocation by auction is particularly suitable for high-value licences such as the digital dividend spectrum licences, for which there is excess demand compared to the supply of spectrum in this band (or bands with similar propagation characteristics). Where demand outstrips supply, the auction mechanism ensures that the available spectrum is allocated to those bidders who value it the most. The assumption is that the willingness to pay for the spectrum is a measure of the value of the service for which the spectrum will be used if acquired (opportunity cost). In policy terms, auctions are the simplest and most transparent method of allocating resources where there is competing demand.

Auctions may be conducted using a number of formats, including the English open outcry format, the simultaneous multi-round formats, and formats that enable package bidding. The format chosen will depend on the configuration arrangements discussed in Chapter 3, which will strongly influence the characteristics of the product, that is, how the spectrum is packaged for sale and the licence conditions attached to the packages. This decision may also be affected by timing issues such as the availability of substitutable or complementary spectrum and the length of the reallocation period. The auction methods currently being considered by the ACMA for the digital dividend spectrum are described in Appendix A.

After choosing an auction format, the ACMA will develop detailed rules about how the auction will be undertaken. These will include specifying rules for bidder qualification and registration, bidding, reserve prices, charges and fees, and other rules necessary

⁵⁸ Under merit-based administrative systems, tenders are evaluated against policy criteria other than price alone, such as the social benefits of the service proposed, the commercial status and viability of the tenderer and other criteria.

⁵⁹ Section 82 sets out exceptions dealing with the public interest in re-issuing licences to existing spectrum licensees.

to avoid collusion and maintain the probity of the allocation process. As discussed in Chapter 2, any competition limits imposed by the Minister will be incorporated into these rules. At this stage, the ACMA has not selected an auction format or set the auction rules. However, it is considered likely that the auction will be conducted over an online auction system and that more complex auction formats may result in an auction that takes place over a number of days.

The auction format and rules will be described in detail and given legislative effect by the marketing plan and allocation procedures determination.

4.2 Packaging the spectrum for sale

The ACMA is seeking information from stakeholders to assist it to design spectrum products and allocation procedures that reflect the needs of potential bidders. The first step is to divide the spectrum for sale into lots according to frequency and geographic area. Lot dimensions are important because the lot design could make one auction format more likely to result in an efficient outcome than others. For example, when considering the number of lots in one auction, there are trade-offs between facilitating participation by entities wanting to roll out different services region by region, allowing the option of package bidding, and the complexity of participating in the auction.⁶⁰

Given this, the ACMA seeks information from stakeholders about their plans relating to the use of the digital dividend. This will be used to select lot dimensions, timing and an auction design that balance the needs of stakeholders and ensure the efficient allocation and use of spectrum.

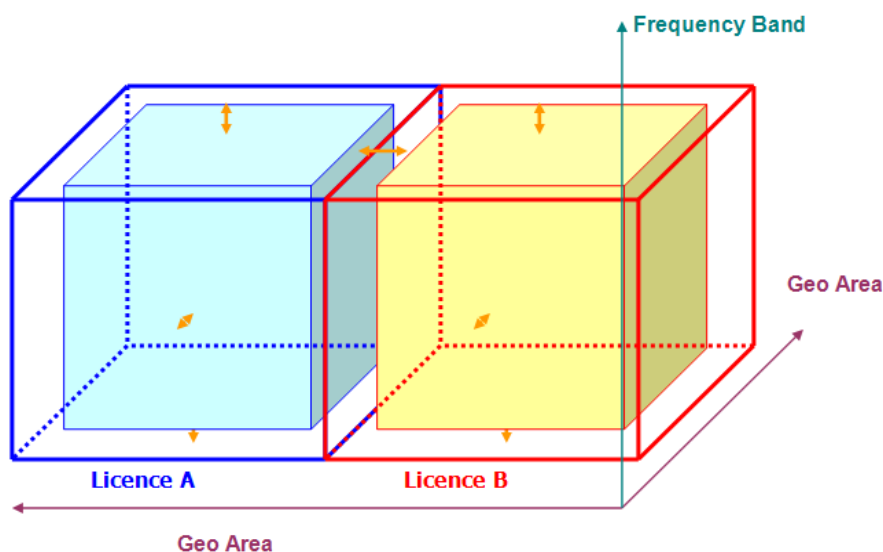
4.2.1 Product dimensions

Lots (spectrum) can be considered to exist in three dimensions—they cover a geographic area (latitude and longitude) and the bandwidth occupied. In Figure 4, the geographic area represents the horizontal dimensions and the radiofrequency bandwidth the vertical dimension.

It is important to note that the spectrum represented by a lot does not necessarily correspond to the spectrum that will be authorised under the resulting spectrum licence. The ACMA may choose to aggregate a number of adjacent lots won by the same bidder into a single spectrum licence for policy reasons. Alternatively, a single lot covering all of Australia may be composed of a number of spectrum licences, each relating to a particular geographic region or state. These details will be fully documented in the allocation instruments, particularly the marketing plan and allocation procedures determination.

⁶⁰ The ACMA has outlined the high level auction designs under consideration for up-coming spectrum allocations—including the digital dividend—in previous presentations, for example at the 2.5 GHz Spectrum Tune-Up in May 2010. An overview of the three high level auction designs currently under consideration is included in [Appendix A](#) of this report.

Figure 4 Spectrum space



After allocation, the spectrum space represented by each spectrum licence can be further subdivided into standard trading units to facilitate trading and allocation of spectrum. Standard trading units provide minimum frequency or geographic areas to facilitate future trading and recombination of lots and licences while ensuring that the spectrum is not subdivided into unusable quantities.

4.2.2 Geographic area

There are a number of different approaches to defining the lots according to geographic regions.⁶¹ In the past, the ACMA has offered spectrum lots using several approaches.⁶² For example:

- > in the initial 800 MHz and 1800 MHz bands auction (personal communications services), held in May 1998, the spectrum was divided into licences covering separate metropolitan areas, regional centres, and state-wide regional and remote areas
- > in the 2 GHz band auction (third generation mobiles), held in March 2001, both Australia-wide licences and licences covering particular metropolitan/regional areas were offered
- > in the auction for the residual spectrum in the 800 MHz and 1800 MHz bands (personal communications services), held in February 2001, the spectrum was made available under Australia-wide licences with the five major capital cities excised.

Another potential approach to defining geographic boundaries, which has been used by the Federal Communications Commission in the US, is to offer licences based on regional economic area groupings, which comprise multiple states with close economic ties—for example, the C-block in the 700 MHz band auction (held in March 2008) was split into 12 regions, and the 1.4 GHz band auction (July 2007) used 6 regions.⁶³

⁶¹ This section deals with how the digital dividend spectrum is divided up by geographic area into lots to be auctioned. This is distinct from the previous discussion of geographic area, which deals with whether parts of Australia should be included in the reallocation at all.

⁶² For examples of different geographic boundaries used for spectrum licences, see ACMA, *Radiofrequency spectrum auctions list*, www.acma.gov.au/WEB/STANDARD/pc=PC_364, accessed 28 July 2010.

⁶³ FCC, *Auctions Summary*, http://wireless.fcc.gov/auctions/default.htm?job=auctions_all#completed, accessed 29 July 2010.

Other possible approaches may include geographic boundaries based on states and territories; Australia-wide metropolitan, regional and/or remote licences; eastern and western Australia; central, eastern and western Australia; and/or time zones within Australia (that is, states and territories using the same time zone across the year such as the Australian Capital Territory, New South Wales, Tasmania and Victoria).

The best approach to defining the geographic dimensions of the lots will be informed by potential bidders' expected use of the spectrum. For example, if all potential bidders are seeking to deploy networks in all major metropolitan and regional centres, it may be best to define Australia-wide lots that include those areas. If some potential bidders are interested in only deploying networks in one or few states or regions, it may be preferable to define some lots on a state-by-state or region-by-region basis. Alternatively, it may be considered optimal, as in the case of the 2 GHz band auction, to define some lots as Australia-wide and some on a regionally disaggregated basis.

The ACMA is seeking feedback on how to best define the geographic dimensions of lots.

Questions

10. Over what geographic region or regions are interested parties planning to deploy a service?
11. What is the best way to define the geographic dimensions of lots in the digital dividend band?

4.2.3 Radiofrequency requirements and uses

The ACMA is seeking a better understanding of what frequency dimensions would best suit the needs of service providers attempting to acquire spectrum via an upcoming allocation process for the digital dividend.

The ACMA has a number of options for dividing the digital dividend spectrum into lots by frequency. Although lots may not be smaller than the standard trading unit for the relevant spectrum licences, the ACMA may create larger lots. It is also possible to include lots of varying sizes in a single auction.

The size and type of lots will also depend on the proposed use for the band. Although the most likely use of the digital dividend spectrum will be mobile telecommunications, there is a wide range of bandwidths that might be suitable for this purpose. In addition, it is possible to provide paired lots (for FDD)⁶⁴ transmissions) or unpaired lots (for TDD⁶⁵ transmissions). Other uses of the band could require different frequency arrangements.

The ACMA notes that:

- > the US auctioned the spectrum in paired and unpaired lots—auctioning paired spectrum with bandwidths ranging between 2x1 MHz to 2x11 MHz, and another 6 MHz of unpaired spectrum⁶⁶
- > Germany auctioned digital dividend spectrum as paired spectrum—auctioning 2x5 MHz lots.⁶⁷

⁶⁴ Frequency-division duplexing is a method of duplex communications where the transmitter and receiver signals operate at different carrier frequencies, using separate frequency bands of the same size.

⁶⁵ Time-division duplexing emulates full duplex communication through the application of time-division multiplexing to separate outward and return signals.

⁶⁶ FCC, *Auction 73—700 MHz band*,

http://wireless.fcc.gov/auctions/default.htm?job=auction_summary&id=73, accessed 28 July 2010.

The AWF recently agreed on a harmonised band plan that involves 2x45 MHz (refer to section 3.2.1). It is likely that the lots offered in the digital dividend reallocation will be sold primarily as paired spectrum, consistent with international developments.

Questions

12. What services are interested parties planning to deploy in the digital dividend band? What are the technological requirements in terms of spectrum usage? Will these services require paired or unpaired spectrum?
13. If spectrum in the digital dividend part of the 700 MHz band is configured as paired spectrum, how will it affect the costs of providing the proposed service? Would this affect be the same or different if the digital dividend band was configured as unpaired spectrum?
14. What is the minimum bandwidth required to deploy the proposed technology in the digital dividend part of the 700 MHz band? Is there an optimal bandwidth for deploying the same technology for this service?
15. Would the cost of delivering the proposed service within a single region be affected by whether the spectrum acquired by an interested party is within a single (contiguous) block or spread across a number of smaller blocks (non-contiguous)? How would any difference impact on service delivery costs?
16. Would the cost of delivering the proposed service in multiple areas (for example, coverage in several capital cities) be affected if the spectrum acquired by an interested party is in the same frequency block in each area, or is broken up into a different spectrum block for each area? How would any difference impact on service delivery costs?

4.3 Licence design

This section examines issues affecting the design of the spectrum licence instruments for the digital dividend allocation. A spectrum licence authorises the licensee, or a person authorised by the licensee, to operate radiocommunications devices in accordance with the conditions contained in the licence.⁶⁸ The contents of the spectrum licence instrument may therefore affect the value or demand for digital dividend spectrum licences, by varying the rights and obligations of the licensee.

Each spectrum licence contains basic details about the licensee, frequency band and duration of the licence, followed by a number of licence conditions. Some conditions are statutory conditions that must be included in every spectrum licence; others may be included at the ACMA's discretion. In both cases, there are two classes of conditions: core and non-core conditions.

The contents of spectrum licences are governed by sections 64 to 71 of the Radiocommunications Act.⁶⁹

4.3.1 Licence details

Under sections 64 and 65 of the Radiocommunications Act, a spectrum licence must specify the following basic information:

- > the person who is the licensee
- > the day on which it comes into force (commencement date)
- > the period for which the licence is in force (licence duration).

⁶⁷ Bundesnetzagentur, *Drahtloser Netzzugang zum Angebot von Telekommunikationsdiensten— Frequenzversteigerung*, Spectrum auction results, www.bundesnetzagentur.de/frequenzversteigerung2010/ergebnisse.html, accessed 29 July 2010.

⁶⁸ Section 64 of the *Radiocommunications Act 1992*.

⁶⁹ Part 3.2, Division 1, Subdivision C.

As the successful bidder will be either the person who is the licensee or an associated person, this section only discusses the policy considerations relating to the commencement date and licence duration.

4.3.2 Commencement date

The commencement date will be the day specified on the licence as the date of licence effect. If no day is specified on the licence, the commencement date will be the day on which the licence was issued.

The ACMA has the discretion to determine the commencement dates of the digital dividend spectrum licences. There are two main options. The first option is for the ACMA to set a common commencement date for all these licences. This would provide certainty for bidders faced with planning and investment decisions. This could also facilitate the future administration of the band. However, this option could mean that spectrum remains unused until all areas are ready for use, even if some are ready for use earlier. In such a case, parts of the digital dividend spectrum may be left unused during the reallocation process.

Alternatively, the ACMA could potentially stagger the commencement dates of the licences. This could permit bidders to gain early access to spectrum in areas that have already been cleared through the restack process. For example, if metropolitan areas are cleared ahead of regional areas, the commencement date for licences in those areas could be brought forward to create a staggered deployment. This would reduce the length of time that spectrum would be left vacant during the reallocation process.

However, delayed or staggered commencement dates could create complications for future management of the spectrum, since all licences in a band would need to expire or be surrendered in order to re-farm the band. Further, area-by-area commencement dates would be dependent on the progress of channel planning under the restack process. It would also be undesirable for spectrum to be reserved for a spectrum licensee until the commencement date, effectively granting the licensee rights for longer than the maximum licence duration.

Questions

17. Should all the spectrum licences commence on the same date? Should spectrum licences in a particular licence area commence on the same date? If so, what should the ACMA consider when selecting this date?
18. Would it be preferable to make the commencement date flexible? How flexible should the commencement date be? What benefits or disadvantages might result?
19. Should the ACMA consider staggering the commencement date of licences in accordance with the availability of spectrum under the restack process?
20. Are there any other considerations that the ACMA should take into account in determining the commencement date for the digital dividend spectrum licences, such as the availability of spectrum in other bands, for example, 2.5 GHz?

4.3.3 Licence duration

Under section 65(3) of the Radiocommunications Act, a spectrum licence may be issued for any period up to 15 years, beginning on the commencement day. The spectrum licence will expire at the end of this period, as there is no automatic right of renewal under the Radiocommunications Act.

Most spectrum licences issued by the ACMA or its predecessors have been issued for 15 years, although some have previously been issued for 10 years.⁷⁰

It is possible for the ACMA to issue licences for shorter periods. Some potential advantages of a shorter licence term might include: lower up-front costs for prospective users of the spectrum, reduced barriers to entry for new entrants, and more frequent re-farming which may enable quicker access to spectrum for new technologies and uses. There may also be a number of disadvantages. For example, the shorter licence term might discourage investment in new networks or services, since a successful bidder would have less time to recover its infrastructure costs during the life of the licence. It is also likely that there would be increased transaction costs to the ACMA (in its role as spectrum manager) and industry participants.

The ACMA's initial preference is to allocate spectrum licences for a period of 15 years. However, it will consider stakeholder views on this issue.

Questions

21. How long should the spectrum licences operate? Is it preferable to have as long a term as possible, that is, 15 years? Are there reasons why a shorter term might be preferable?
22. Should all the spectrum licences have the same term or should the ACMA be flexible in the term of the licence?

4.3.4 Core conditions

The core conditions essentially define the spectrum space within which the licensee is authorised to operate radiocommunications devices under the licence.

The core conditions of a licence have stronger protections than the non-core conditions. The ACMA cannot vary a core condition without the licensee's consent⁷¹, but it can vary non-core conditions by written notice to the licensee.⁷² In addition, any change to the core conditions of a spectrum licence upon re-issue (under section 82 of the Radiocommunications Act) is a reviewable decision.⁷³ The core conditions must be included in any sample spectrum licences that are prepared by the ACMA to accompany a marketing plan for a spectrum allocation.⁷⁴

The statutory core conditions are set out in section 66 of the Radiocommunications Act and specify:

- > the part or parts of the spectrum in which the operation of radiocommunications devices is authorised under the licence
- > the area of Australia in which the operation of radiocommunications devices is authorised under the licence
- > the maximum permitted level of radio emissions outside these spectrum and area boundaries.

In addition, there are two optional core conditions that the ACMA may include at its discretion.

⁷⁰ This was the maximum term available under the *Radiocommunications Act 1992* at the time.

⁷¹ Section 72 of the *Radiocommunications Act 1992*.

⁷² The decision to vary non-core conditions under section 73 is a reviewable decision under paragraph 285(a) of the *Radiocommunications Act 1992*.

⁷³ Section 285(d) of the *Radiocommunications Act 1992*. This means that the licensee can apply to the ACMA for internal reconsideration of the decision to vary the original licence conditions upon re-issue.

⁷⁴ Section 61(2) of the *Radiocommunications Act 1992*.

First, the ACMA may include a core condition specifying the time periods during which operation of radiocommunications devices is authorised under the licence, such as particular times of the day or particular days of the week.⁷⁵ The ACMA does not believe that this condition would be suitable for any of the suggested uses for the digital dividend.

Second, for spectrum licences issued through reallocation of spectrum (such as the digital dividend), the ACMA may include a condition for the progressive authorisation of parts of the spectrum as the parts become available due to the expiry, surrender or cancellation of the apparatus licences formerly occupying that part of the spectrum.⁷⁶

Questions

23. Should the ACMA consider incorporating either of the optional core conditions in the digital dividend spectrum licences? Why or why not?

4.3.5 Non-core conditions

The non-core conditions of a spectrum licence focus on the obligations of the licensee. Some non-core conditions are statutory conditions that are required in all spectrum licences. For example, the requirement for Australian residence or an Australian permanent business establishment set out in section 69A of the Radiocommunications Act must be included in all spectrum licences. Similarly, rules for third party authorisations, requirements to pay associated charges and the registration requirements for transmitters are mandatory conditions under sections 67 to 69 of the Radiocommunications Act. The ACMA does not have the discretion to omit these conditions from spectrum licences.

Other non-core conditions are optional. The ACMA has the power under section 71(1) of the Radiocommunications Act to include any conditions that it thinks fit in a spectrum licence. For example, in Germany, the UK and the US, spectrum managers have imposed or propose to impose rollout obligations on digital dividend spectrum. In Singapore, Ireland, Austria and South Africa, such conditions apply to licences for spectrum in other high-demand frequency bands. These obligations are intended to maximise the public benefit from the spectrum by ensuring that services are made available by the successful bidder in a timely manner. However, they may have an adverse effect on the successful bidder, restricting investment in network infrastructure to the timetable and locations specified by such conditions in a way that reduces the value of the spectrum, discourages spectrum trading and potentially lowers the overall public benefit.

The ACMA may also consider using this section to incorporate special conditions for the protection of the RQZ, as discussed in Chapter 3. These conditions would require spectrum licensees to operate their services in a way that does not disrupt the operation of the RQZ.

Questions

24. Are there any optional conditions that the ACMA should consider including in the digital dividend spectrum licences? Why?

4.4 Timing issues

The auction procedures and rules also set out the timing of the auction. As discussed in Chapter 1, the interdependencies between the three processes mean that it will be necessary to take into the account the switchover and restack processes in planning the digital dividend auction. The Minister has stated an expectation that the digital

⁷⁵ Sections 66(3) and (4).

⁷⁶ Section 66(5).

dividend spectrum be auctioned in late 2012, with clearance of the spectrum as soon as possible after the switch-off of analog television services on 31 December 2013.⁷⁷

One significant consideration will be the length of the reallocation period. The complexity of the switchover and restack processes suggest that a longer period would be required than the statutory minimum reallocation period prescribed in legislation. The ACMA will therefore need to consider the amount of time required for the clearance of the band through restack.

Another issue affecting the timing of the digital dividend allocation relates to proposed allocation of the 2.5 GHz band (see below). The ACMA has separately canvassed the desirability of reallocating some of this spectrum for mobile telecommunications services.⁷⁸ There have also been suggestions made in submissions to the green paper that there is a strong relationship between the two bands, which the ACMA may wish to take into account in relation to the timing of the digital dividend allocation.⁷⁹

It will also be essential to ensure that successful bidders have adequate time to plan and deploy the next generation networks that are likely to utilise the digital dividend spectrum. Based on submissions made in response to the green paper, the ACMA understands that there is a general preference from the telecommunications industry to utilise any spectrum they acquire as soon as possible after analog switch-off.

The allocation of parts of the 2.5 GHz band and the effect of the reallocation period are discussed further below.

4.4.1 Allocation of the 2.5 GHz band

The government's policy is to proceed with the allocation of the 2.5 GHz band in 2012–13.⁸⁰ It is therefore likely that the digital dividend spectrum and 2.5 GHz band could be allocated within a similar timeframe. Spectrum in the 2.5 GHz band has also been identified by the ACMA (and the ITU) as suitable for mobile telecommunications services.⁸¹ The ACMA recognises the 2.5 GHz band may potentially be complementary to the digital dividend spectrum when both are used to offer mobile telecommunications services, especially using new LTE technologies, to customers.

Feedback and views received from public consultations held by the ACMA and the DBCDE and other industry forums strongly indicate that the Australian mobile telecommunications industry generally regards spectrum in the digital dividend and 2.5 GHz bands as complementary for rolling out next generation mobile networks.⁸² Some

⁷⁷ Media release: *Size and location of the Digital Dividend*, Senator The Hon Stephen Conroy Minister for Broadband, Communications and the Digital Economy 24 June 2010.

⁷⁸ *Review of the 2.5 GHz band and long-term arrangements for ENG*, www.acma.gov.au/WEB/STANDARD/pc=PC_312013.

⁷⁹ Submissions expressing the view that the bands were complementary were made by AMTA, Alcatel-Lucent, Crown Castle, Ericsson, GSMA, IP Wireless, Nokia Siemens Network, Optus, Qualcomm International, Telstra and Vodafone Hutchison Australia.

⁸⁰ Media release: *Receipt of Request for Costing of Election Commitment (Sale of rights to use 2.5 GHz spectrum)*, Department of Finance and Deregulation, 16 August 2010.

⁸¹ ACMA, *Review of the 2.5 GHz band and long-term arrangements for ENG*, discussion paper, January 2010.

⁸² ACMA, *Review of the 2.5 GHz band and long-term arrangements for ENG*, www.acma.gov.au/WEB/STANDARD/pc=PC_312013, accessed 29 July 2010.

Telstra, *Submission in response to the Department of Broadband, Communications and the Digital Economy's (DBCDE) Digital dividend green paper*, 26 February 2010, Submission in response, pp. 4–5. VHA, *Digital dividend green paper—Submission to the Department of Broadband, Communications and the Digital Economy*, February 2010, p. 3. DBCDE, *Digital dividend*, consultations and submissions, www.dbcde.gov.au/consultation_and_submissions/digital_dividend, accessed 29 July 2010.

stakeholders have also expressed views that the two bands should be auctioned at the same time.

Given this, the ACMA is considering the relative merits of auctioning each band as soon as practicable given the issues relevant to each allocation process, or achieving an agreed sequencing. If it is decided to work towards an agreed sequencing, the options include auctioning:

- > at the same time in a single process
- > at the same time but in separate auction processes
- > in sequence with the digital dividend auctioned first
- > in sequence with the 2.5 GHz spectrum auctioned first.

The relative merits of each approach will depend on potential bidders' expected use of the spectrum, the impact on their operations of a delay in the availability of either band, the risks of delays to each process, and the administrative complexity associated with each sequencing option. The ACMA is undertaking further work to establish the desirability of sequencing these two allocations and seeks stakeholder views on relevant considerations such as complementarities of the two bands.

Regulators in other jurisdictions have taken different approaches to the timing and sequencing of auctions when reallocating spectrum in comparable bands.

- > The French regulator (ARCEP) is proposing to hold the 2.5 GHz band (referred to in Europe as the '2.6 GHz' band) and 800 MHz auctions as separate processes—with the 2.5 GHz auction being held one month in advance of the 800 MHz auction.⁸³
- > The German regulator (Bundesnetzagentur) auctioned spectrum in the 800 MHz, 1.8 GHz, 2 GHz and 2.5 GHz bands at the same time but not in a single process so that parties could not submit package bids containing lots from both bands.⁸⁴
- > The Minister for Business Innovation and Skills in the UK has instructed the regulator (Ofcom) to combine the 800 MHz and 2.5 GHz band awards and use an auction process that allows package bidding.⁸⁵

One of the reasons given by the French regulator for holding the auctions in separate processes is that a large operator may not necessarily require spectrum in 2.5 GHz band to ensure capacity in urban areas, but may require spectrum in the 800 MHz band to provide a wholesale roaming service to other operators.⁸⁶ Therefore, the value of holding a combined allocation process that allows bidders to acquire spectrum in both bands in a single process may be outweighed by the complexity introduced by a combined process. In contrast, the UK Minister for Business Innovation and Skills is 'requiring Ofcom to coordinate a combined auction of 2.6GHz and 800MHz spectrum as soon as possible in order that operators can deliver widespread high speed mobile broadband'.⁸⁷

⁸³ ARCEP, *Modalités d'attribution des bandes de fréquences 800 MHz et 2,6 GHz pour le déploiement de réseaux mobiles à très haut débit—Consultation publique*, discussion paper, 27 July 2010, pp. 71–72.

⁸⁴ Bundesnetzagentur, *Drahtloser Netzzugang zum Angebot von Telekommunikationsdiensten—Frequenzversteigerung*, Spectrum auction results, www.bundesnetzagentur.de/frequenzversteigerung2010/ergebnisse.html, accessed 29 July 2010.

⁸⁵ DBIS, *UK to see surge in next generation of mobile technology under new Government plans*, media release, <http://nds.coi.gov.uk/content/Detail.aspx?ReleaseID=414707&NewsAreaID=2>, accessed 29 July 2010.

⁸⁶ ARCEP, *Modalités d'attribution des bandes de fréquences 800 MHz et 2,6 GHz pour le déploiement de réseaux mobiles à très haut débit—Consultation publique*, discussion paper, 27 July 2010, p. 72.

⁸⁷ DBIS, *UK to see surge in next generation of mobile technology under new Government plans*, media release, <http://nds.coi.gov.uk/content/Detail.aspx?ReleaseID=414707&NewsAreaID=2>, accessed 29 July 2010.

Some service providers may prefer to acquire a combination of high and low frequency spectrum to use in the deployment of new mobile networks. However, there may be potential future users of the digital dividend or 2.5 GHz bands for whom the bands are not complementary. Potential purchasers may also vary in the importance they attach to acquiring spectrum in both bands. Factors such as the type of service that prospective spectrum users wish to deploy and their current spectrum holdings may influence the importance of acquiring spectrum in both bands.

The ACMA is seeking views from stakeholders on the importance of holding allocations for the digital dividend and 2.5 GHz bands as a separate or combined process.

Questions

25. If the digital dividend spectrum is available, when would interested parties expect to deploy a proposed service using this spectrum?
26. If there was a delay in the availability of either the digital dividend or the 2.5 GHz band spectrum, when would this start to affect plans to deliver services to consumers? How would this affect investment or operating plans of interested parties?
27. What is the expected cost to interested parties of a change in investment or operating plans arising from a delay in the availability of the digital dividend or the 2.5 GHz band?
28. How is the planned use of the digital dividend dependent on access to other bands, including for example the 2.5 GHz band?
29. If the 2.5 GHz band spectrum is available, when would interested parties expect to deploy a proposed service on the 2.5 GHz spectrum?
30. What is the preferred approach to the timing of the digital dividend and 2.5 GHz band auctions? Should the timing of these two allocations be coordinated?

4.4.2 Reallocation period

Related to the timing of the auction, the ACMA must also advise the Minister on the duration of the reallocation period for reallocating the digital dividend.⁸⁸ The reallocation period is significant because it determines the deadline for the clearance and reallocation of the digital dividend spectrum. This section will focus on the issues that will help determine the optimal term for the reallocation period.

Spectrum in the digital dividend is currently occupied by providers of television broadcasting services and users of class-licensed low-interference potential devices.⁸⁹ The ACMA intends to recommend a reallocation period that takes the following issues into account for incumbents:

- > providing adequate time to allow incumbents to transition to new spectrum access arrangements
- > ensuring the spectrum does not remain unencumbered for an extended period of time after the restack occurs
- > ensuring that successful bidders are able to effectively utilise spectrum to rollout new technologies as soon as possible.

⁸⁸ See the explanation of the reallocation period in section 2.2, under Step 3: Spectrum Reallocation Declaration. Section 153F(2) of the *Radiocommunications Act 1992*.

⁸⁹ Examples of these types of devices include wireless audio devices, biomedical telemetry transmitters and transmitters used for underground communications.

The ACMA's recommendation to the Minister on a suitable reallocation period will be informed by the timetable for implementation of the restack process, as agreed between the ACMA and broadcasting industry stakeholders. However, that timetable is outside the scope of this paper.

Appendix A—Auction design methodologies

There are currently four auction designs which the ACMA has examined in relation to the upcoming allocations of spectrum. These are:

- > a simultaneous multi-round (SMR) auction
- > a simultaneous multi-round with hierarchical package bidding (SMR–HPB) auction
- > a combinatorial clock auction (CCA) using either:
 - > the Ausubel, Cramton and Milgrom (ACM) version of the combinatorial clock auction (Standard CCA)
 - > a simplified version of the combinatorial clock auction which is based on a form developed by Porter, Rassenti Roopnarine and Smith⁹⁰ (simplified CCA).

Simultaneous multi-round (SMR) auction

The SMR auction is a simple generalisation of the English auction to multiple items in which all items are auctioned simultaneously. A number of single licences are open for bidding at the same time, and remain open as long as there are acceptable bids placed on any of the licences.

Bidding occurs in a sequence of rounds, with the results (in particular, the amounts of the highest bids) of each round announced to the bidders before the start of the next round. The highest bid on each item becomes the provisional winning price.

Bidders may submit multiple bids in each round for the available lots and can shift their demand between lots over successive rounds, subject to certain activity rules. After each round, high bidders for each lot are identified. The auction continues until there is a round in which there is no bid made for any lot. In this final round, bidders win the lots for which they have the standing high bids and pay the amount of their high bids.

In SMR auctions, lots typically correspond to the right to use a specific frequency block (or blocks) in a defined geographic area.⁹¹ An SMR auction could also use generic lots, in which parties bid first for a right to acquire a certain amount of spectrum (bandwidth), and subsequently submit supplementary bids to express preferences for where the spectrum they have acquired is located in the band. Generic lot bidding can be used to minimise the risk of frequency fragmentation that is present in an SMR when parties bid for specific lots.

There is great variation, both across frequency bands and between countries, in the way spectrum is packaged. In Europe, the majority of (but not all) SMR auctions have featured national licences. In countries with large geographic areas, such as Australia, Canada and the United States, it is common to award lots on a regional or local area basis. As a result, the number of lots may be large.

The SMR format is simple to understand, flexible and has been adapted with reasonable effectiveness to a wide variety of situations. It has been used to allocate spectrum in Australia in the past.

⁹⁰ David Porter, Stephen Ransenti, Anil Roopnarine, and Vernon Smith, 2003 Combinatorial Auction Design, Proceedings of the National Academy of Sciences of the United States of America, vol 1000, no 19, pp.11153–11157 available on line at www.pnas.org/content/100/19/11153.

⁹¹ It would also be possible to conduct a two-stage SMR in which generic frequency lots are auctioned in the first stage (for parts of the spectrum that are regarded as close substitutes) and a second phase is used to assign specific frequencies to those parties submitting winning bids in stage one. This could assist to minimise the risk of fragmentation.

The SMR does not allow parties to submit package bids—a single bid for a bundle of lots. Because of this parties may be exposed to winning some but not all of the lots they require to deploy services, or alternatively, paying an amount that exceeds their value in order to win the desired package of lots. This is referred to as the exposure problem.

SMR with hierarchical package bidding (SMR-HPB) auction

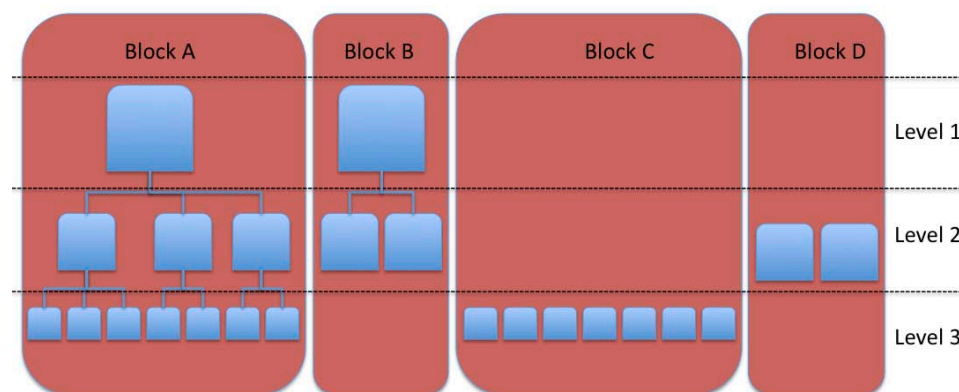
The SMR-HPB extends the SMR to allow bidding not just on single items (licences or lots of spectrum), but also on packages of items. In this auction format the packages parties can bid on are set by the auctioneer prior to the commencement of the auction.

This is one way to provide a solution to the exposure problem. In a package auction, bidders can make sure they either win the entire package or nothing at all.

The SMR-HPB was developed by the Federal Communications Commission (FCC) for the 700 MHz auction. Blocks are divided into ‘lots’ at any or all of one, two or three ‘tier levels’. Each lot represents the right to use spectrum in a defined geographic area. Lots at the higher tier levels (tier 1 lots or tier 2 lots) may alternatively be referred to as packages, as they cover the same geographic area as a group of lots at the next lowest tier. Note that under the FCC rules, bidders may simultaneously submit bids in the same block at more than one tier level but such bids are necessarily mutually exclusive.

A simple example tier structure is provided in Figure 5. In this case, we suppose that Block A is available at all three tiers, Block B at tiers 1 and 2 only, block C at tier 3 only and block D at tier 2 only.

Figure 5 Example tier structure



Source: DotEcon, *Auction formats: rules, implementation and performance, Report for the ACMA, June 2010.*

Allowing parties to bid on packages the SMR-HPB provides a way to reduce the exposure problem, but it introduces other issues. It is only likely to result in an efficient allocation if the packages reflect bidders’ preferences. This requires that the auctioneer has good information about bidders’ preferences prior to the auction and that it is possible to construct appropriate packages. Inefficiency may arise where bids are made on a large package to mitigate exposure risk, despite the bidder placing no or low value on some elements of the package.

Smaller bidders face a further coordination issue: the threshold problem. Consider a package that has received a bid, and where other bidders wish to bid on elements of the package. Each bidder has an incentive to understate their willingness to pay, hoping that the other bids increase enough to break the threshold of the package bid.

Combinatorial clock auction (CCA)—Standard CCA and the Simplified CCA

In a CCA, bidding can occur for packages as well as individual licences. Bidders can determine what packages they would like to bid on, and how much they are willing to pay for different types of packages or individual licences.

The price is determined by an auction 'clock'. Each category of lots to be sold has its own clock indicating its current price. In the Australian context, a given category of lots is likely to correspond to frequencies available for a given geographic location. As such, parties will be bidding for generic lots in the first part of the auction, with a subsequent assignment phase to determine where in the band the bandwidth acquired by each successful bidder is located.

In each round, a bidder is asked to indicate for each category the quantity of lots desired at the current price. At the end of the round, the auctioneer adds up the individual bids and reports the demand for each product. The price is then increased on any category with excess demand.

This process is repeated until there is no excess demand in any category. As the clock prices increase in increments, there can be outcomes where the auction reaches a point where demand is less than supply for some lots, as bidders adjust their demand in response to the clock prices. In order to address the issue, and ensure that parties can bid for a number of different combinations of licences, different types of clock auctions have been developed. The ACMA refers to two possible approaches as the Standard CCA and the Simplified CCA (discussed below).

The Standard CCA and the Simplified CCA both minimise the risk of frequency fragmentation, and the exposure risk. However, both can become unworkably complex for the auctioneer and bidders if there are a large number of different categories of lots.

Standard CCA

The Standard CCA format was developed for recent UK spectrum auctions, and has subsequently been adopted for 2.6GHz awards in Austria, Denmark and the Netherlands.

The Standard CCA format has two stages:

- > The principal stage, when it is determined how many generic lots each bidder wins in each category of lots. The principal stage consists of two phases of bidding:
 - > primary rounds
 - > the supplementary bids round.
- > The assignment stage, when it is determined where the generic lots won by each bidder in the principal stage are located in the relevant bands.

The primary rounds follow a clock format. In each primary round, bidders bid on a single package of lots by nominating the number of lots in each category that they wish to buy at current round prices. The bid amount for such a package is the sum of current round prices of the lots included in that package. If there is excess demand for lots in a category, the price for this category is increased for the next primary round. The primary rounds end when there is no excess demand in any category.

In each round, bidders cannot submit a primary bid for a package with greater eligibility than their package in the previous round. This rule prevents bidders from hiding their demand in the early part of the auction.

After the primary rounds, there is a second phase of bidding in the principal stage, referred to as the supplementary bids round, in which bidders have the opportunity to express demand for all possible packages of lots, subject to the eligibility constraints created by their primary round bids.

At the end of this process, a winner determination process (WDP) is used to identify the highest value combination of bids, and these are the winning bids. To date, a 'second price' rule has always been used to determine payments, based on the principle that each winning bidder and group of winning bidders should pay the minimum necessary to defeat any possible coalition of other winners and losing bidders.

Finally, a third phase of bidding, a sealed bid assignment round, is required to allow bidders to express a preference for where they would like to be located in the band and assign specific frequencies.

Simplified CCA

The Simplified CCA is also implemented with generic lots in each category in the principal stage of the auction. If required, specific frequency blocks can be assigned to winning bidders in an assignment stage. The same comments about grouping lots into categories made for the Standard CCA apply here.

The winner determination process is also similar to that used for the Standard CCA, so this format may also become unworkable complex when there are a large number of categories of lots.

In any given round, bidders may submit:

- > a single primary bid, which is a bid for a package of lots at the prevailing round prices
- > multiple secondary bids, which are bids for packages of lots at prices less than the prevailing round prices.

Primary bids in any round that is not the last round are automatically redesignated as secondary bids, and remain valid unless replaced by a higher bid for the same package by the same bidder.

As with the Standard CCA, bidders cannot submit a primary bid for a package with greater eligibility than their package in the previous round. This rule prevents bidders from hiding their demand in the early part of the auction.

At the end of each round, the auction manager will determine if a further round is required, based on the level of aggregate demand across all primary bids submitted in that round. A further round is required if:

- > the aggregate demand for lots in one or more categories exceeds the supply of lots or
- > the WDP does not produce a solution that ends the allocation stage (the allocation stage can only end if no primary bids are displaced by secondary bids or there is a tied bid).

Finally, a second phase of bidding, a sealed bid assignment round, is required to assign specific frequencies—this uses the same procedure as the standard CCA.

Appendix B—International trends in digital dividend policy

International trends may influence the direction that Australia takes in reallocating the digital dividend. The ACMA is monitoring international developments in relation to the realisation of digital dividends in overseas countries. In particular, it is looking to the varying approaches to the allocation of digital dividend spectrum whilst it develops its allocation procedures and plans.

Switchover internationally

The transition from analog to digital television broadcasting platforms is occurring in a significant number of other developed countries. As in Australia, this has resulted in a digital dividend becoming available and governments in these countries are now facing the task of planning its allocation and use.

A key part of realising the benefits of digital dividend spectrum is for countries to identify the range of frequencies able to be reallocated as a result of the transition to digital broadcasting. For many countries, their potential dividend is most likely to become available within UHF spectrum. This band has been identified for analog television broadcasting use by international agreement and has been implemented widely across the globe for this purpose. As a result, the UHF band is likely to be most affected in numerous countries when analog broadcasting ceases.

In 2007, a new international regulatory framework was devised for UHF spectrum. It aims to assist countries to plan their digital dividend and coordinate their spectrum management plans with other countries. This framework was formulated through the ITU, a specialised agency within the United Nations that is responsible for the global coordination of radiofrequency spectrum at the most recent meeting of the World Radiocommunications Conference (WRC-07).

The frequency range 698–960 MHz was identified for international mobile telecommunications (IMT) purposes in Region 2 (the Americas). A different frequency range, 790–960 MHz, was identified for IMT in the international ITU Region 1 (Europe, Russia, Africa and part of the Middle East) and Region 3 (Australia, Asia and part of the Middle East). These parameters do not define individual countries' digital dividend spectrum or commit member states to allocate IMT in these nominated bands. However, they provide a guide to coordinate and harmonise spectrum bands for similar use and are influencing countries' decisions regarding their digital dividend plans.

Digital dividend allocations and uses overseas

International trends and learnings will inform the ACMA about the approaches that may be applied to the Australian spectrum environment. For example, one of the ACMA's priorities, in order to discharge its spectrum management responsibility of encouraging efficient use of radiocommunications technologies, is to strive for harmonisation of the digital dividend spectrum band within Region 3.

A harmonised band would help to create a large international regional market that equipment manufacturers could design their products for more cheaply by taking advantage of economies of scale. As a net importer of telecommunications technology and equipment, Australia would benefit from lower technology costs if it were connected to such a market. The local public and industry would also benefit from closer international compatibility of mobile telecommunications services by enabling easier roaming capabilities for handsets.

Asia

Region 3, which includes Australia, is less unified in identifying a common digital dividend band. Countries within this group also vary in the extent of their digital dividend allocation plans. Japan intends to allocate 60 MHz of UHF spectrum above 710 MHz for non-digital broadcasting purposes, while New Zealand has indicated that it will allocate 112 MHz between 694 and 806 MHz to be available for mobile telecommunications. A number of countries in the Asia–Pacific region, including China, Korea, India, Bangladesh and Papua New Guinea, have also identified all or part of the 698–790 MHz band for implementation of IMT.

Countries in Region 3, including Australia, have recently negotiated a harmonised digital dividend at the AWF. The impact of these negotiations on the final configuration of Australia's digital dividend is discussed in Chapter 2 of this paper.

The US

The US was the first country to allocate its digital dividend. It identified 108 MHz of available spectrum between 698 MHz and 806 MHz (referred to as the '700 MHz band') in the UHF broadcasting band. The major proportion of this new band was allocated in a spectrum auction that concluded on 18 March 2008. Most licenses were purchased to deploy mobile and wireless communications services, however part of the dividend was also allocated for public safety-related systems.

Canada

Canada, which is also in ITU Region 2, has nominated the frequency range 698–806 MHz for its digital dividend. Canada is currently considering its plans for allocating its dividend, including potential uses for the band. Part of this spectrum is likely to be used for public safety systems, harmonised with the US along the border. Canada is also contemplating enabling access to 700 MHz band for uses such as mobile telecommunications, however no final decision will be made by the Canadian Government before further public consultation.

Europe

In Europe, the progress of individual countries to allocate their digital dividends is also varied. Germany identified 72 MHz in the 790–862 MHz range ('the 800 MHz band') and held an auction on 20 May 2010 to allocate this spectrum to new licensees. Spectrum in this band was configured such that it was suitable for the deployment for a variety of electronic communications services. The winning bidders were all mobile telecommunications service providers.

In Europe, the European Commission (EC) is strongly promoting the adoption of a harmonised sub-band among Member States for use by high speed mobile telecommunications, rather than high-power broadcasting services. The harmonisation issue is of particular importance in Europe due to the close physical proximity of countries in this region. The EC's objective is to avoid harmful interference between Member States and to reap the greatest benefit from the European digital dividend. The EC has nominated 72 MHz in the frequency range 790–862 MHz, consistent with the ITU band identification, and has adopted a set of technical conditions for countries willing to agree to implement the harmonised sub-band.⁹² These technical conditions lay out common rules by which Member States should implement mobile wireless communications if they decide to comply with the harmonised sub-band. However, countries in the European Union are not yet obliged to take this up.

⁹² European Commission decision 2010/267/EU, *Harmonised technical conditions of use in the 790–862 MHz frequency band for terrestrial systems capable of providing electronic communications services in the European Union*, 6 May 2010.

<http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32010D0267:EN:NOT>

A number of EU countries, including the UK, France, Germany, Spain, Finland and Sweden have committed to the EC harmonised sub-band and have identified the 800 MHz band for electronic communications services. Austria, the Netherlands, the Czech Republic, Slovenia and Ireland have also indicated that they are likely to adopt the EC plan.