

Spectrum and Swiss Cheese: The Digital Dividend in Australia

The DBCDE Green Paper on the digital dividend was issued in January 2010. This paper looks at the background issues associated with delivering a digital dividend in Australia including what a digital dividend is, its value and some of the issues with delivering that value to the public purse.

Introduction

In January 2010, the Department of Broadband Communications and the Digital Economy (DBCDE) issued a discussion paper entitled 'Digital Dividend Green Paper' (the **Green Paper**). The Green Paper describes the digital dividend as the spectrum which will become available as television moves from the simulcast of analog and digital services to digital only. This paper looks at some of the issues which make the digital dividend a challenge to broadcasters, other potential users of spectrum, regulators and the government.

Spectrum is a resource which is used (but not consumed) in the delivery of wireless services. Mobile phones, television, radio and taxi dispatch are examples of services which use spectrum. Spectrum can be thought of using a property analogy. A development site has value that means it might be used for a building but the value remains if the building is demolished and replaced by another. Spectrum is used for the delivery of services but can be re-allocated for a different use at a later point in time. Certain spectrum is more valuable for competing services than other parts of the spectrum (broadly, from 30 MHz to 3 GHz) and this is managed by the Australian Communications and Media Authority (ACMA) as a scarce resource in metropolitan areas. This part of the spectrum is used for broadcasting, mobile telecommunications and other high value services. The Green Paper also uses a property analogy for the scarce resource management by referring to the UHF spectrum used for analog television as 'waterfront property'.

The term 'Swiss Cheese' in the title of this paper reflects the history of the planning of television spectrum. Broadcasting spectrum needs to be planned so that legacy devices can be used to enjoy services in the same way as new ones. When UHF television was introduced in Australia and elsewhere, analog television receivers could not deal with a wanted service on one channel and an unwanted service on the adjacent channel. These receivers were adversely affected by interference on the wanted channel from distant transmitters. As a result, licence areas were planned with at least one but preferably two UHF channels between each wanted service and no co-channel interference from adjacent licence areas. As a result, the mapping of UHF channels in any licence area has many 'gaps' like the holes in a Swiss Cheese. In contrast, digital signals can use adjacent channels and are much less susceptible to co-channel interference.

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This paper examines digital dividend issues by considering the approaches taken in other parts of the world to the digital dividend as well as the Australian issues associated with the 'restack' referred to in the Green Paper. In particular, the paper reviews some of the options under the *Radiocommunications Act 1992* (Cth) (**Radcoms Act**) which may well mean that there needs to be a bespoke legislative regime to deliver a digital dividend in Australia.

The Digital Dividend

Many OECD countries have introduced digital television as a way to deliver broadcast services more efficiently. Unlike analog television which requires one channel to deliver one service, digital television can deliver more than one service on a single channel. In Australia, in metropolitan areas, each of the commercial television broadcasters delivers a high definition service and two standard definition services using a 7 MHz wide channel which would only support a single analog service.

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In common with all countries where digital television has been introduced, there is a period where both analog and digital services are delivered concurrently. Where the same service is delivered in each of analog and digital mode this concurrent broadcasting is known as simulcasting. At the end of the simulcasting period, when the vast majority of viewers have the equipment to watch digital services, the analog service can be switched off (typically referred to as digital switch over or DSO). After the DSO, the analog channels can be used for either other services or new broadcasting services.

In Australia and the USA, the incumbent broadcasters were provided with a loan channel for the period between the simulcast period after the launch of digital and the DSO. However, in other countries (such as the UK), the broadcasters provided services which were then broadcast by multiplex operators. This placed control of spectrum use in the hands of a group which was not itself delivering services (partly to reduce spectrum scarcity as a regulatory issue in broadcasting).

In most countries, the expectation is that the spectrum made available in DSO will be re-allocated for the delivery of what the Green Paper refers to as "new communications services including super-fast mobile broadband". The technology for

this service is expected to be 'long term evolution' (LTE) which is standardised by 3GPP, the same body which standardises the mobile telecommunications systems used in Australia. This re-allocation will normally be done using a price-based allocation (such as a spectrum auction) where the value of the spectrum will be paid to the relevant government.

United States

The United States completed its DSO in June 2009. The country had planned that the digital dividend would be delivered as spectrum sold using a price-based allocation. The United States decided that the digital dividend would be made available as early as possible (that is, re-allocated on an encumbered basis). The United States achieved this by allocating the 'loan' channel, to the extent feasible, in the lower UHF channels away from the identified digital dividend spectrum. The United States identified a digital dividend of 108 MHz from 698 to 806 MHz. However, the Federal Communications Commission planned the spectrum auctions to deliver 84 MHz for purely commercial use and reserved some spectrum with a licence condition that the acquirer would need to provide public safety services, as well as commercial services, as a condition of the acquisition of that spectrum. In practice, the public safety obligation (and the associated deployment obligations) meant that the reserve for the spectrum that was subject to the licence condition was not met at the January 2008 auction. However, the rest of the auction raised nearly US \$19 billion with the two largest wireless telecommunications providers, Verizon and AT&T bidding US \$16 billion between them. The United States' auction was for paired spectrum and each of Verizon and AT&T have 12 MHz paired for their services.

The DSO occurred on 12 June 2009. This was a delay from the originally scheduled 17 February 2009 to allow for the distribution of vouchers under a scheme which gave terrestrial television only households the opportunity to have two digital set top boxes subsidised. Verizon plans to deliver high speed broadband service by the end of 2010 using USB dongles and expects to deliver handsets in 2011.

Australia is proposing a 126 MHz digital dividend

Europe

Australia has a different channel arrangement for UHF television compared with the United States (where television channels are 6 MHz wide) and Europe (where they are 8 MHz wide). The Europeans are standardising on a digital dividend of 72 MHz (790 MHz to 862 MHz). The European approach is to split this 72 MHz to permit a 1 MHz 'guard band' with the television channel at 782 – 790 MHz (channel 60) and to have 30 MHz paired available for post-DSO services and the balance of 11 MHz for broadcast wireless use known in the UK as 'program making and special effects' (PMSE). The major use of PMSE spectrum is by broadcasters for wireless microphones.

The European approach recognises that 30 MHz paired, even if there are shared networks, will not deliver the types of services that are expected to maximise the value of the spectrum. As a result, the digital dividend will include the auction of spectrum in the 2.6 GHz band. Broadly, LTE will likely use a combination of UHF and 2.6 GHz spectrum. The French regulator, ARCEP, has indicated that it will hold the auction processes for UHF and 2.6 GHz spectrum concurrently. This approach will be adopted by Germany (subject to operator litigation) and, as a consequence

of such litigation by a number of operators, in the United Kingdom. The Netherlands and Belgium are following the approach taken in Hong Kong and auctioning the 2.6 GHz band first.

Asia

The harmonised digital dividend in Asia will be the same as in the United States. That is, 108 MHz between 698 MHz and 806 MHz. However, it is not clear that this lowest common denominator of digital dividend will be used in all countries. There are two issues that influence this. In many Asian countries (as in Australia), there is mobile telecommunications spectrum in both the 850 MHz band and the 900 MHz band. As a result of this, the spectrum between 806 MHz and 820 MHz may well be suitable for allocation as part of a digital dividend. The second issue is that in many countries, 698 MHz is in the middle of television channel 49. If the digital dividend were to include channel 49, then the digital dividend would start at 694 MHz. That is, although there is a harmonised 108 MHz digital dividend, it is likely that many countries will adopt 694 MHz – 820 MHz. As a practical matter a 126 MHz digital dividend is a more likely outcome.

Australia

Australia, with its unique 7 MHz UHF channel plan and the use of both 850 MHz and 900 MHz for mobile telecommunications, is proposing a 126 MHz digital dividend in the Green Paper. This will encompass the spectrum from 694 MHz to 820 MHz or Australian television channels 52 to 69. Australia also has a second issue with the digital dividend which was not faced in Europe. This is that the 2.6 GHz band is used by broadcasters for electronic news gathering (ENG). As a result, both the spectrum clearances required for the delivery of LTE services adversely affect the commercial and national television broadcasters.

The Green Paper does not provide an indication of when an auction for the digital dividend spectrum might be held. However, if DSO occurs at the end of 2013 as is planned in Australia, then it may well be that the digital dividend spectrum will be used for non-broadcasting services from early in 2014. This would be consistent with managing spectrum as a scarce resource.

The value of the digital dividend

A common technique used to be able to compare spectrum sold at auction on a global basis is to express the price paid in a currency by reference to the amount of spectrum auctioned and the population for which it is to be used. This is expressed as price per MHz per pop where per pop means *per capita* or per head of population. Although this is a rather crude basis for comparison, it is widely used. In the United States, the price per MHz per pop was \$US1.34 on average. In the UK, Ofcom has estimated that the value of the 72 MHz dividend is £2 - £3 billion or a mid-point price per MHz per pop of 56 pence. At March 2010 exchange rates, this would suggest that the Australian digital dividend might be worth in the vicinity of \$1 per MHz per pop or \$1.5 billion if only the mainland state capital cities were considered.

The mechanics of delivering the digital dividend

In order to actually deliver the digital dividend, the UHF spectrum used for television broadcasting will need to be cleared and the services will need to be provided on a channel in the range 28 – 51. Although digital set top boxes sold in Australia have the capability to 're-scan' to find new or moved services, it is rare that this re-scan can occur without manual intervention from the viewer. There is a technical solution to avoid re-scan-

ning, if each of the television broadcasters carry digital information about the others. However, this has not been required in Australia and is unlikely to be implemented before the DSO. There is an opportunity for the ACMA to require the delivery of service information as an output of its inquiry into the use of parental lock-out in terrestrial television set top boxes, but this outcome is far from assured.

At the same time that the Green Paper was released for discussion, the ACMA issued a discussion paper entitled 'Review of the 2.5 GHz band and long-term arrangements for ENG'. This indicates that the ACMA is considering that 190 MHz of spectrum in the 2.6 GHz band may be made available to a price-based allocation (and likely for LTE services). However, in common with the Green Paper, the ACMA discussion paper was silent on timetable to allocation.

Broadcasting Services Bands

One issue that Australia has in managing the digital dividend, and which is discussed in more detail below, is the fact that spectrum used for broadcasting services is managed in a manner which is distinct from other spectrum. Certain spectrum is designated as 'broadcasting services bands' (**BSB**) spectrum. This is used primarily for the delivery of broadcasting services. The BSB include the spectrum used for AM, FM and digital radio as well as the VHF and UHF spectrum used for television. The 2.6 GHz band is not in the BSB. The Australian approach to commercial, national and community broadcasting has been to 'staple' an apparatus licence (a form of spectrum use right) to the broadcasting services licence. As a result, the licence area plan (analog) and digital channel plan (digital) processes have been conducted from 1992 to 2005 by the Australian Broadcasting Authority (**ABA**) and more recently the ACMA in a fashion that is different from the approach taken in managing spectrum for other services. Spectrum for other services has been managed by the Spectrum Management Agency (1992 – 1997), the Australian Communications Authority (1997 – 2005) and the ACMA from 2005.

2.6 GHz spectrum

As mentioned above, the 190 MHz of spectrum used by the broadcasters for ENG in the 2.6 GHz band and potentially forming part of the spectrum used for the deployment of LTE is not in the BSB. The issue with this spectrum is also made more complicated by the licence type. Broadly, there are three forms of spectrum use right in Australia. One is the spectrum licence, typically issued for 15 years and which is defined by the boundary conditions of operation. The second is the apparatus licence, typically issued for one year and which is technologically deterministic. The final type is the class licence which is also technologically deterministic but for which no licence fee is paid (and for which there is no claim in the case of interference). There is an option in respect of apparatus licences to pre-pay up to five years in advance. This option was exercised in February 2008 by a number of commercial broadcasters and the ABC so that the 2.6 GHz band is encumbered until February 2013.

The restack

When the ABA planned the allocation of digital television channels in preparation for the launch of digital television in metropolitan areas in January 2001, it was not asked to consider the use of the BSB for services other than television. As a result, the planning for digital television was more concerned with ensuring the availability for new services (at the time, two channels of datacasting and subsequently Channel A and Channel B). The planning did not anticipate that channels 52 – 69 would not be

available for television in the future. As a result, Australia faces a 'restack'. In the restack, the digital services which currently use channels above channel 51 will need to be moved below channel 52. As a practical matter, this will require users to re-scan for services and it is likely that the new digital channel (below channel 52) and the old digital channel (above channel 51) will need to operate concurrently for a period of time in order for viewers to have time to conduct the re-scan. This concurrent operation will impose costs on the broadcasters (duplication of transmitters and electricity usage) and will require a significant public awareness campaign.

Why the restack is so limited elsewhere

In contrast to Australia, the United States did not require a restack. The digital channel planning was conducted with the expectation that a digital dividend would be declared. Similarly, Ofcom had planned for a digital dividend in the UK and the only restack issue was that the UK had originally envisaged a smaller digital dividend (channels 63 – 68) than the European harmonised channel 61 to 69. Ofcom had reserved channel 69 for PMSE. The solution in the United Kingdom was to restack channels 61 and 62 to channel 39 and 40 (which had been previously cleared along with channel 38) and allocate channel 38 to PMSE. Most other European countries have also planned for the 72 MHz digital dividend in advance of digital channel allocation which makes the restack a particularly acute problem in Australia and a peripheral issue elsewhere.

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Issues to be faced

In order to be able to deliver the digital dividend, the ACMA will need to be able to clear the 126 MHz of spectrum of channels 52 to 69. In order to maximise the value of this spectrum, the 2.6 GHz band will likely need to be made available in a similar timeframe to the digital dividend spectrum. This latter issue is much less complex and spectrum has been re-allocated from apparatus licensed use to spectrum licensed with a price-based allocation on a number of occasions in the past (typically associated with spectrum now used for telecommunications services such as mobile phones).

One significant complexity of the digital dividend in Australia is the fact that the relevant spectrum lies in the BSB. The Green Paper asserts that the Minister "has authority ... to change the designation of spectrum that makes up the broadcasting services bands". It is not certain that the current legislative drafting delivers this authority to the Minister. This final section examines some of the issues which arise from the Radcoms Act.

BSB issues and s 31

Section 31(1) of the Radcoms Act permits the Minister, after consulting the ACMA, to designate a part of the spectrum as being primarily for broadcasting purposes and refer it to the ACMA for planning. There are no express provisions which would permit the Minister to 'un-designate' BSB spectrum. This would not normally be an issue except that section 31(7) goes on to make clear that the designation is not a legislative instrument. That is, it is not clear that the Minister could un-designate the spectrum use.

An alternative approach might be for the ACMA to decide to manage the spectrum differently from BSB. Section 31(2) pro-

vides that the ACMA may make a written determination that licences, or specified kinds of licences, can be issued in specified circumstances in relation to that part of the spectrum, or in relation to a specified part or parts of that part of the spectrum. But this is conditioned by section 31(3):

In making or varying a subsection (2) determination, the ACMA must:

- (a) promote the objects, and have regard to the matters, described in section 23 of the Broadcasting Services Act 1992; and*
- (b) promote the object of this Act, to the extent this is not inconsistent with paragraph (a).*

That is, there is an unusual provision under which the objects of the *Broadcasting Services Act 1992* (Cth) 'trump' the objects of the Radcoms Act.

Digital Radio

Perhaps the easiest re-designation of BSB would be to use the BSB for the delivery of a broadcasting service. This occurred when television channel 9A, which cannot be used for the delivery of television to receivers in Australia as it is 6 MHz wide rather than the usual 7 MHz, was planned for digital radio. This led to the amendments made to section 31 of the Radcoms Act in 2007 which created a bespoke BSB regime for digital radio. It created a new subsection, section 31(1A), which permitted the Minister to designate spectrum for digital radio. The same amendments assumed that an un-designation power was specifically required and this was provided as section 31(1C) of the Radcoms Act. However, this sub-section only permits the un-designation of digital radio spectrum. That is, the parliament did not create a greater un-designation authority for the Minister when it was able to do so during the digital radio amendments.

Spectrum licensing the digital dividend

In order to maximise the value of licences at a price-based allocation, the certainty associated with 15 year spectrum licences will be expected by bidders for the right to use the digital dividend. This yields an additional problem for the current legislation.

There are two processes for converting spectrum to licensed spectrum. If the spectrum is encumbered, it is provided under section 153B of the Radcoms Act and under section 36 if the spectrum is unencumbered. Both of these approaches require the preparation of a marketing plan (under section 39 for unencumbered spectrum and section 39A for encumbered spectrum). However, section 39A requires that the spectrum is subject to a spectrum reallocation declaration. There is no mechanism for BSB to be subject to a spectrum reallocation declaration and there is no other express power to make plans for encumbered spectrum.

Conclusions

The Australian digital dividend is likely to be 126 MHz and has the potential to raise about \$1.5 billion for the public purse. However, for historical spectrum planning reasons, Australia will be faced with a complex restack during which television broadcasters will need to deliver concurrent and identical services on two separate digital channels. This restack problem has not affected other countries to the extent that it will affect Australia.

The Green Paper issued by DBCDE assumes that the Minister has sufficient powers under the Radcoms Act to 'un-designate' spectrum which is currently planned for broadcasting away from the broadcasting services bands. It is not clear that this

power is available and the fact that the introduction of digital radio (using the BSB for a broadcasting service) required a bespoke legislative regime suggests that amendments to the Radcoms Act will be required to deliver the digital dividend.

The highest price in a price-based allocation of spectrum is likely to be obtained if the 2.6 GHz band is auctioned at the same time as the digital dividend. This causes broadcasters a double blow as 2.6 GHz is used for electronic news gathering and the digital dividend is used for broadcasting. Although the ACMA has been looking at 2.6 GHz for some years, it still permitted the commercial broadcasters and the ABC to acquire apparatus licences such that the 2.5 GHz spectrum will be encumbered until 2013.

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Australia faces a 'restack'. As a practical matter, this will require users to re-scan for services and is likely to require a significant public awareness campaign