

# Regulation Impact Statement

## Future arrangements for the 2.5 GHz radiofrequency spectrum band and long- term arrangements for ENG

MAY 2011

**Canberra**

Purple Building  
Benjamin Offices  
Chan Street  
Belconnen ACT

PO Box 78  
Belconnen ACT 2616

T +61 2 6219 5555  
F +61 2 6219 5353

**Melbourne**

Level 44  
Melbourne Central Tower  
360 Elizabeth Street  
Melbourne VIC

PO Box 13112  
Law Courts  
Melbourne VIC 8010

T +61 3 9963 6800  
F +61 3 9963 6899

**Sydney**

Level 15 Tower 1  
Darling Park  
201 Sussex Street  
Sydney NSW

PO Box Q500  
Queen Victoria Building  
NSW 1230

T +61 2 9334 7700  
1800 226 667  
F +61 2 9334 7799

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# 1. Introduction

## 1.1. Objectives of the 2.5 GHz review

This Regulation Impact Statement (RIS) discusses options to meet two key objectives set out in the ACMA's review of the 2.5 GHz band:

- > planning the 2500–2690 MHz band (2.5 GHz band) of the radiofrequency spectrum to ensure that the band is deployed for its highest value use, in accordance with the objectives of the *Radiocommunications Act 1992* (the Act)
- > provision of long-term certainty to the free-to-air broadcasters about the ongoing availability of spectrum for television outside broadcasting, including electronic news gathering (ENG).<sup>1</sup>

This RIS includes an assessment of the impact of the canvassed options.

Internationally, the 2.5 GHz band has been identified for use by wireless access services (WAS)<sup>2</sup> and is being increasingly harmonised for WAS across advanced economies. The demand for WAS is growing, both nationally and globally, as it can be used to facilitate the provision of the increasing number of bandwidth hungry applications and to meet the growing citizen and consumer expectation of 'anywhere-anytime' availability of these services. In addition to meeting this growing demand for WAS spectrum, there are also numerous social and economic benefits to be reaped if Australia aligns with harmonised international arrangements of the 2.5 GHz band.

In Australia, the 2.5 GHz band is currently almost exclusively licensed to the three commercial free-to-air television broadcasters and the Australian Broadcasting Corporation (ABC) for ENG. ENG typically involves the rapid, unplanned deployment of radiofrequency video links to cover live sports and news events, generally for short periods. While the 2.5 GHz band has been identified internationally for the deployment of WAS, the provision of ENG services remains important and in the public interest. However, there are alternative arrangements which can be implemented to ensure that ENG services can continue to be provided, while ensuring that Australians enjoy the benefits arising from alignment with international uses of the 2.5 GHz band.

This RIS assesses the impact of the most feasible arrangements to secure the twin objective of meeting the demand for WAS while providing long-term certainty for ENG operators. It follows public consultation beginning in 2006, which sought comment on proposals for the future use of the 2.5 GHz band and on the suitability of several other bands to provide long-term spectrum arrangements for ENG.

The analysis presented in this RIS determines that the preferred way forward—in terms of the optimal balance between costs and benefits to Australian industry, citizens and consumers—is to proceed with the following option to replan the 2.5 GHz band:

- > reallocation of 2500–2570 MHz and 2620–2690 MHz for spectrum licences with technical frameworks that are technology flexible but optimised for WAS
- > conversion of ENG apparatus licences to 15-year spectrum licences on an Australia-wide basis in 2570–2620 MHz (the mid-band gap)

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<sup>1</sup> For the purposes of this paper, ENG is taken as the generic term for all services captured under Television Outside Broadcast Licences (TOBN) which are held by the free-to-air commercial television broadcasters and the ABC in the 2.5 GHz band.

<sup>2</sup> The term 'WAS' encompasses the variety of ways that telecommunications carriers, internet service providers (ISPs) or other service providers deliver a radio connection from an end-user to a core network, usually a public network, such as a public switched telephone network, the internet, or a local/wide area network.

- > ENG access to the following alternative bands:
  - > shared use of the bands 2025–2110 MHz and 2200–2300 MHz
  - > exclusive use of the band 2010–2025 MHz, at least in capital city areas
  - > ENG access to 1980–2010 MHz and 2170–2200 MHz, with the caveat that mobile-satellite services may be introduced into these bands in the future, with ACMA investigating the viability of long-term sharing between ENG and mobile-satellite services.

This option is considered the most appropriate as it best meets the objectives of the review of the 2.5 GHz band.

This RIS also includes a detailed timeline for implementation of the processes that will be undertaken to implement new arrangements in the 2.5 GHz and alternative bands.

## 2. Assessing the problem

### 2.1. The problem

There are a number of problems which are key drivers for reviewing the 2.5 GHz band, including that the current spectrum management arrangements in the band:

- > do not contribute to meeting the projected increase in demand for WAS spectrum
- > do not place Australia in a position to reap the economic and social benefits of international harmonisation of this band for WAS
- > do not provide incumbent broadcasters in the band with long-term certainty
- > could be altered to introduce greater flexibility into the licensing to better enable the spectrum to move to its highest-value use.

#### 2.1.1. Meeting the growing demand for WAS spectrum

WAS, while not being a direct substitute to fixed broadband services, are being deployed globally as an alternative to fixed telecommunications networks, digital subscriber line technologies, cable and satellite. WAS technologies are particularly attractive to service providers who do not have the capacity to build extensive fixed wireline infrastructure. A number of drivers have created increasing pressure to make more spectrum available for WAS, including:

- > increasing demand for broadband and an increasing trend of using wireless technologies to provide broadband services
- > the requirement for greater bandwidth to cater for new services/applications and the citizen/consumer expectation that these services will be available 'anywhere, anytime'
- > international harmonisation of the 2.5 GHz band for WAS
- > the potential benefits to be accrued through economies of scale for equipment that is manufactured for larger international markets
- > the identification of WAS as a key economic enabler.

Consumer demand for mobility and wireless access to broadband is also increasing at a rapid rate and is projected to continue for the foreseeable future. WAS supports a variety of applications, many of which are key economic drivers. In addition, demand for WAS-enabled applications requiring more bandwidth is anticipated to grow in the future, such as:

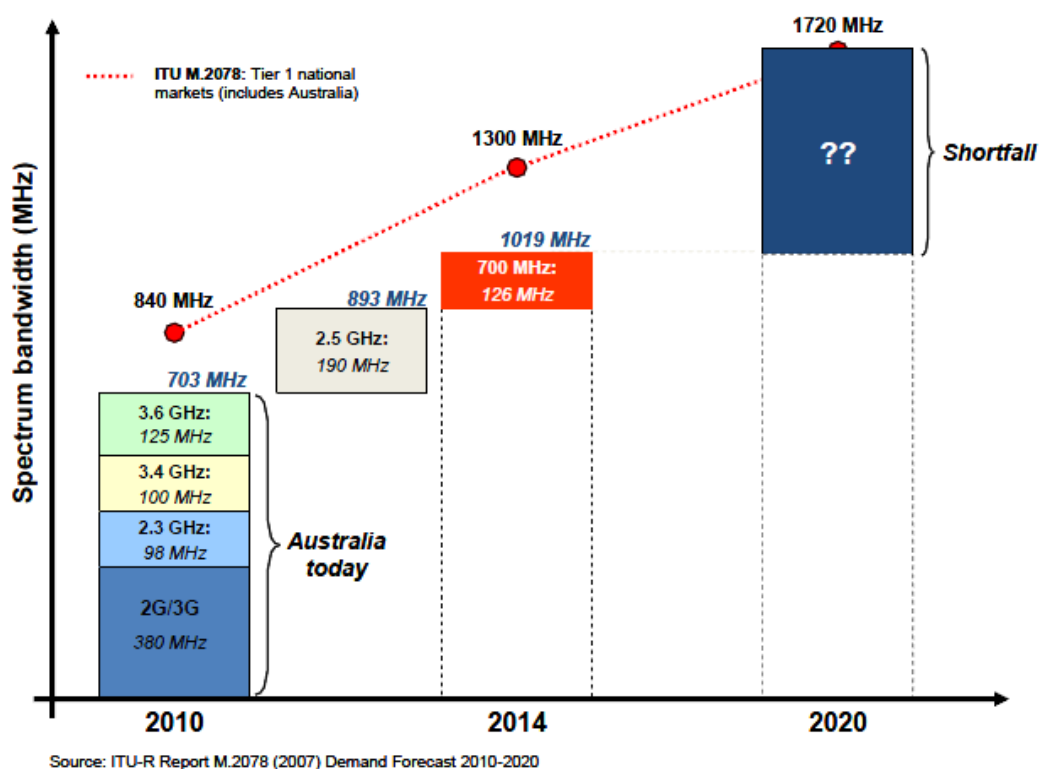
- > the capture and transmission of video and high-resolution photos
- > video telephony and real-time video streaming
- > mobile television
- > multiplayer online gaming
- > peer-to-peer video/ image sharing
- > music downloading
- > telemetry and remote monitoring
- > machine to machine communication
- > location-based services
- > mapping
- > transaction services.

Further, new devices capable of accessing the internet with enhanced features, such as improved cameras, colour screens, battery life and storage capabilities, are becoming increasingly available, which will drive the development of applications.

International Telecommunications Union (ITU) studies analysing the future demand for spectrum to support mobile services predicts a rise in the bandwidth required to support these services. This was represented graphically (see Figure 1) by the Australian Mobile Telecommunications Association (AMTA) in its submission to the ACMA's January 2010 *Review of the 2.5 GHz band and long-term arrangements for ENG*<sup>3</sup> discussion paper (the discussion paper).

Figure 1 Spectrum demand forecast for mobile broadband (2010–2020), based on ITU forecast figures

## Spectrum demand forecast for mobile broadband (2010 – 2020)



Source: AMTA submission to the discussion paper

The graph in Figure 1 clearly demonstrates a growing demand for spectrum bandwidth required to provide WAS. Although some of the spectrum allocated for WAS in Australia is currently unused or under-utilised, the ITU data presented in Figure 1 and other international trends<sup>4</sup> suggest that demand in Australia will continue to rise, so that demand may soon exceed available spectrum. Failure to make spectrum available for WAS in the 2.5 GHz band, places Australia at risk of an excessive shortfall in the amount of spectrum required to meet the projected demand. Such a shortfall would place Australia at risk of missing out on the potential benefits to the economy arising from the availability of WAS; to the detriment of the telecommunications industry, and ultimately, to the detriment of Australian citizens and consumers who would miss out on the diversity in service offerings arising from WAS-enabled applications.

<sup>3</sup> The discussion paper can be accessed online at

[www.acma.gov.au/webwr/assets/main/lib311275/2.5ghz\\_discussion\\_paper\\_ifc01-10.pdf](http://www.acma.gov.au/webwr/assets/main/lib311275/2.5ghz_discussion_paper_ifc01-10.pdf)

<sup>4</sup> Attachment A outlines recent international allocations in the 2.5 GHz band to fixed and mobile (WAS) telecommunications services, indicating a growing demand for WAS on a global scale.



### 2.1.2. Ensuring international harmonisation

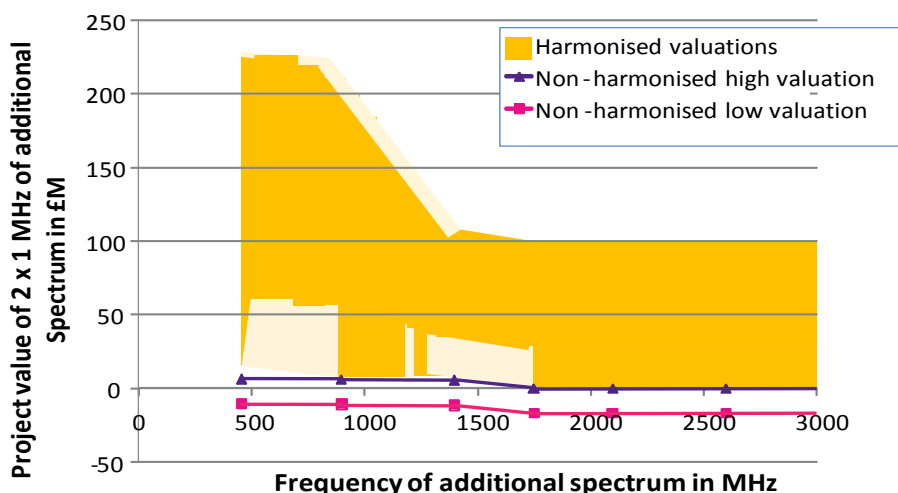
In 2000, the 2.5 GHz band was designated by the ITU for use by nations wishing to implement International Mobile Telecommunications (IMT)—a WAS service. Since the ITU’s designation of the 2.5 GHz band for WAS use, the band has been auctioned in many countries including Singapore, Norway, New Zealand, Sweden, Hong Kong and Finland (see Attachment A).

International use of the 2.5 GHz band for WAS is expected to result in large-scale development and availability of equipment that can operate in that band and which complies with international standards for IMT. This becomes especially important given that Australia is a ‘technology taker’ importing equipment from overseas manufacturers. Allowing use of the 2.5 GHz band for WAS in Australia would benefit various national industry sectors and, ultimately, citizens and consumers, who would enjoy the flow on economic and social benefits from international harmonisation. Such benefits may include lower equipment costs for operators flowing on to benefit consumers in the form of cheaper services.

Increased economies of scale resulting from harmonised international arrangements for frequency bands generate significant savings in the cost of network and consumer equipment. This is reflected in the increased value attributed to internationally harmonised spectrum, relative to non-harmonised spectrum as shown in the analysis undertaken by Plum Consulting and illustrated in Figure 2 below.

Figure 2 Increased value attributed to internationally harmonised spectrum, relative to non-harmonised

#### Cellular mobile value based on cost reduction



Source: Plum Consulting, Presentation to the ACMA, January 2010

Figure 2 demonstrates the importance of ensuring that use of the 2.5 GHz band for WAS in Australia is harmonised with international jurisdictions in order to maximise the value of this band for WAS. In light of the value attributed to harmonised international arrangements, the ACMA has reviewed whether the current planning, licensing and pricing arrangements for this band represent the most efficient use of the spectrum in the 2.5 GHz band.

### 2.1.3. proving the current regulatory arrangements for the 2.5 GHz band

Current regulatory arrangements underpinning the allocation of the 2.5 GHz band allow for almost exclusive use of the band by ENG operators. This use of the 2.5 GHz

band is facilitated via the issue of Television Outside Broadcasting (TOBN) apparatus licences with a maximum five year tenure to commercial, free-to-air broadcasters and the ABC for ENG applications. Each TOBN apparatus licence authorises the licensee to operate ENG services in the 2.5 GHz, 7.2 GHz and 13 GHz frequency bands.<sup>5</sup> The TOBN apparatus licence authorises the licensee to deploy an unlimited number of devices on an Australia-wide basis, without the need to register the location of the devices once deployed.

The ACMA may issue an apparatus licence under section 100 of the Act; and may determine by written instrument, the types of apparatus licences that it may issue under section 98 (1) of the Act. As defined in the Radiocommunications (Interpretation) Determination 2000, a television outside broadcast network means a network comprising one or more television outside broadcast stations that are operated:

- (a) under a fixed licence; and
- (b) anywhere in Australia; and
- (c) on more than one frequency specified in the fixed licence.

The annual cost to renew a TOBN apparatus licence in the 2.5 GHz band is \$128,607. These fees do not reflect the increasing value of the band, indicating that it is currently not likely to be allocated to its highest value use. As discussed, international allocations and commentary on the value of the 2.5 GHz band for WAS indicate that demand for access to the band by services other than ENG will increase over time, particularly as equipment for WAS becomes increasingly available due to the economies of scale prompted by international harmonisation. Given that the ACMA is concerned to ensure that the radiofrequency environment is flexible and can adapt to technology and service demands as they arise, regulatory frameworks that only allow a single service type in a frequency band which is subject to high demand would seem to be counter-productive in achieving this goal.

The current TOBN apparatus licence category in the 2.5 GHz band is restrictive and does not provide for selling or leasing of the licence to other parties for uses other than ENG. The licence type and channel arrangements do not allow it to be used for WAS technologies.

The current arrangements in the 2.5 GHz band preclude the market from changing the use of the band without intervention. To avoid the risk of stifling the development of competition and to allow the band to move to its highest value use, the current regulatory arrangements in the 2.5 GHz band need to be made more flexible and in order to do this, the existing licensing arrangements must be reviewed.

#### **2.1.4. Providing long term certainty for incumbent broadcasters**

Since the global identification of the 2.5 GHz band for WAS in 2000, incumbent licensees, operating with apparatus licences that have a maximum duration of five years, have faced ongoing uncertainty about which parts of the radiofrequency spectrum will remain available to them in the long term to meet their ENG needs. That is, whether continued access to the 2.5 GHz band would be provided; or, alternatively, whether relocation to other bands would be required (similar to other international jurisdictions).

ENG operators deliver a range of services including coverage of live news events and of planned sporting and cultural events which benefit all Australians. The kinds of events covered by ENG range from planned news events like Federal and State elections and Anzac Day marches through to major sporting events like the Sydney-to-Hobart yacht race and Bathurst 1000 motor race. ENG operators also provide

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<sup>5</sup> The review of arrangements in the 2.5 GHz band does not include any alteration to arrangements in the 7.2 and 13 GHz bands.

coverage of unplanned events like natural disasters and other emergencies, including provision of material for emergency bulletins, for example of approaching cyclones in the Darwin and Northern Territory regional areas. The services they provide are in the public interest, and the ACMA considers that it is important that their spectrum needs continue to be met.

The ACMA notes that, in submissions to its consultation processes on the future of the 2.5 GHz band, a number of stakeholders have predicted that there will be an increasing demand for spectrum for ENG applications to meet high definition television and 3D television requirements. The ACMA will monitor growth and demand in spectrum requirements for these applications and will undertake a future review of spectrum arrangements in other bands when required.

Reviewing and finalising a domestic response to the global push to utilise parts of the 2.5 GHz band for WAS will put an end to the uncertainty that incumbent ENG licensees have faced.

### 3. Objectives of government action

The review of the regulatory arrangements in the 2.5 GHz band intended to meet two key objectives:

- > planning and allocating spectrum in a manner which maximises the overall public benefit derived from that spectrum by ensuring its highest value use
- > providing long-term certainty for incumbents of the 2.5 GHz band—the free-to-air commercial broadcasters and the ABC.

It is also intended to meet high-level government objectives of:

- > ensuring Australia remains competitive in the global digital community
- > meeting the growing demand for WAS spectrum.

Furthermore, the ACMA seeks to ensure that frameworks in place adhere to the ACMA's five *Principles for spectrum management*<sup>6</sup> (the principles) as far as possible. These principles are:

1. Allocate spectrum to the highest value use or uses.
2. Enable and encourage spectrum to move to its highest value use or uses.
3. Use the least cost and least restrictive approach to achieving policy objectives.
4. To the extent possible, promote both certainty and flexibility.
5. Balance the cost of interference and the benefits of greater spectrum utilisation.

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<sup>6</sup> A full version of the *Principles for spectrum management* can be accessed at: [www.acma.gov.au/WEB/STANDARD/pc=PC\\_311683](http://www.acma.gov.au/WEB/STANDARD/pc=PC_311683)

# 4. Options that may achieve the objectives

## 4.1. Options for consideration

To meet the twin objectives of ensuring that the 2.5 GHz band is planned and allocated in such a way that it can move to its highest value use to derive the maximum public benefit from the use of spectrum, while ensuring incumbent broadcasters continue to have access to spectrum to enable ENG service delivery equivalent to that currently provided, a range of options have been provided for consultation with industry. These options have since been limited by an election commitment made by Deputy Prime Minister, Wayne Swan, in 2010, who stated ‘... a re-elected Gillard Labor Government will also proceed with auctioning the use of the 2.5 GHz band (2500–2690 MHz) spectrum in 2012–13.’<sup>7</sup>

The Impact Analysis provided in Section 5 takes this limitation into account, but to ensure consistency with early consultation on this review, the complete range of options that were provided for consultation are summarised in Box 1.

### Box 1: Five options for review of the 2.5 GHz band

#### Option 1: Status quo

This option involves retaining the existing TOBN apparatus licences to authorise ongoing ENG operations in the 2.5 GHz band.

#### Option 2: Review pricing arrangements

This option involves basing prices for administratively allocated 2.5 GHz spectrum on estimates of the opportunity cost of spectrum.<sup>8</sup> The opportunity cost is the value of the spectrum in the highest value alternative use foregone. In the case of the 2.5 GHz spectrum band, there are competing uses for the band, and consequently the opportunity cost for that spectrum band would be likely higher than the existing administrative incentive pricing.<sup>9</sup>

The adjustment of apparatus licence fees to more accurately reflect the opportunity cost of the spectrum would provide the market with more appropriate price signals than those offered under the current licence fee arrangements. Adjusting licence fees might therefore be expected to increase the incumbents’ incentives to move the band to its highest value use or uses, and may also result in a higher level of spectrum utilisation in the band.

However, in the case of the 2.5 GHz band, adjusting licence fees would be unlikely to enable spectrum to move to its highest value use because it does not alter restrictive licensing parameters and channel arrangements. For this approach to be effective, it would need to be implemented in parallel with other regulatory processes, such as the amendment of existing licensing, channel or band arrangements to increase the flexibility of the 2.5 GHz band overall.

<sup>7</sup> Deputy PM Wayne Swan, August 16 2010, *Updated net budget impact of election policies*, available online at [http://www.alp.org.au/federal-government/news/updated-net-budget-impact-of-election-policies-\(18/](http://www.alp.org.au/federal-government/news/updated-net-budget-impact-of-election-policies-(18/)

<sup>8</sup> Opportunity cost pricing is explained in the ACMA’s recent consultation IFC 12/2009, *Opportunity Cost Pricing of Spectrum: Public consultation on administrative pricing for spectrum based on opportunity cost*, available at [www.acma.gov.au/WEB/STANDARD/pc=PC\\_311707](http://www.acma.gov.au/WEB/STANDARD/pc=PC_311707)

<sup>9</sup> Results from international auctions indicate that WAS operators may value the band more highly than ENG operators (see Attachment F).

### **Option 3: Make current arrangements more flexible**

This option involves implementing strategies to make the current licences used for ENG services more flexible. These could include:

- > removing regulatory restrictions from current TOBN apparatus licences
- > converting the existing ENG apparatus licences to spectrum licences.

In order to provide the market with more appropriate price signals on the value of the 2.5 GHz band, and hence facilitate the spectrum being used for its highest value use, these strategies could also be accompanied by a review of licence fees, as discussed in Option 2 above.

Under this option, incumbent ENG operators would have the opportunity to keep ENG operations within the 2.5 GHz band; or trade part of their spectrum licence and move certain ENG functions to another frequency band. The ACMA understands that conversion would provide ENG operators with sufficient long-term certainty, and that further work to identify alternative spectrum bands would be redundant. This means that the alternative bands, identified in Option 5 below, may not be available in the longer term, for example if ENG operators wished to relocate operations from the 2.5 GHz band at some time in the future.

### **Option 4: Reallocate and issue new spectrum licences**

This option involves re-allocating the entire 2.5 GHz band. This may enable and encourage the band to move to its highest value use or uses, meanwhile balancing the cost of interference and the benefits of greater spectrum utilisation as a result of a more flexible technical framework. This reallocation would be completed via a price based allocation system such as an auction.

However, if any, or all, ENG operators were unsuccessful in obtaining a future spectrum allocation for the entire 190 MHz of the 2.5 GHz band, the ACMA would need to consider transitional arrangements and alternative bands for ENG to operate in if ENG operators were to continue to have access to spectrum to enable ENG service delivery equivalent to that currently provided.

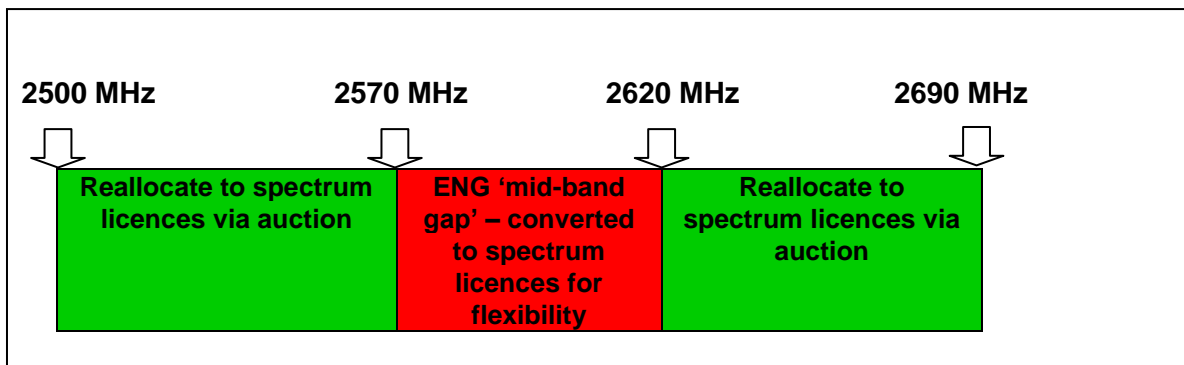
### **Option 5: Combined conversion/reallocation**

This option involves a combination of options three and four above. That is, the ACMA could:

- > convert part of the 2.5 GHz band (50 MHz in total, from 2570 MHz to 2620 MHz—also known as the mid-band gap) for continued ENG operation
- > reallocate the remainder of the band (2 x 70 MHz of paired frequency division duplex (FDD) spectrum from 2500 MHz–2570 MHz and 2620 MHz–2690 MHz) to spectrum licensing to allow for other services to be deployed should they value the band more.

These changes would be in addition to facilitation of ENG access to alternative bands to provide ENG operators with sufficient capacity for continued operation regardless of whether they decide to bid for spectrum in the reallocation process.

The graphic below demonstrates the proposed arrangements for Option 5.



Given that the August 2010 election statement has made a commitment to auction parts of the 2.5 GHz band, this precludes Options 1, 2 and 3 outlined in Box 1. This leaves Options 4 and 5

If ENG operators were unsuccessful at auction under Option 4, then this would create a situation where the Australian community is at risk of losing the social and cultural benefits which arise from access to ENG services. Even if ENG operators were to be partially successful at obtaining spectrum at auction, there still remains the possibility that there would be insufficient spectrum to provide ENG service delivery equivalent to that currently enjoyed by Australians.

Moreover, of the alternative bands which have been identified as being suitable for ENG operation, none are readily able, whether alone or in combination, to support airborne operations where ENG transmitters are fitted to helicopters without technical restrictions. Airborne operations are necessary for many ENG operations, ranging from coverage of the Sydney-to-Hobart yacht race to coverage of natural disasters like the Queensland floods, and the ACMA therefore considers that preservation of capacity for operations of this nature is important. The ACMA therefore considers that Option 5 best meets the stated objectives of meeting the growing demand for WAS spectrum and allowing the spectrum to move to its highest value use, while providing ENG incumbent operators with long term certainty.

#### 4.2. Reallocation and conversion

Option 5 is consistent with stakeholder submissions to the discussion paper, which reiterates this is the preferred approach and the most appropriate way forward in the review of the 2.5 GHz band. This option will include:

- > reallocation of 2500–2570 MHz and 2620–2690 MHz for spectrum licences, at least in major metropolitan areas, with technical frameworks that are technology flexible but optimised for WAS
- > conversion of ENG apparatus licences to 15-year spectrum licences on an Australia-wide basis in 2570–2620 MHz (the mid-band gap)
- > ENG access to all the identified alternative bands:
  - > shared use of the bands 2025–2110 MHz and 2200–2300 MHz
  - > exclusive use of the band 2010–2025 MHz, at least in capital city areas
  - > ENG access to 1980–2010 MHz and 2170–2200 MHz, with the caveat that mobile-satellite services may be introduced into these bands in the future, with ACMA investigating the viability of long-term sharing between ENG and mobile-satellite services.

This option offers the opportunity to realise the potential benefits of harmonisation of the 2.5 GHz band for WAS, while still ensuring the ongoing availability of suitable spectrum for ENG operations. Implementing this option will involve the development of sharing and coordination arrangements between users of the alternative bands. These arrangements will be facilitated by the ACMA through the development of a band plan and will require ongoing coordination between licensees operating in the bands. The

development of sharing and coordination arrangements between users in the alternative bands and the minimisation of any clearance arrangements are intended to ensure that those services can continue to operate in the alternative bands wherever possible. Such an approach also recognises the social and economic value of the range of services provided by licensees currently operating in the alternative bands. The ACMA therefore considers that the approach to the future of the 2.5 GHz band represents a balance between the needs and concerns of all involved stakeholders.

#### **4.2.1. Methods for reallocation**

To achieve reallocation of the upper and lower frequency ranges (2 x 70 MHz) of the 2.5 GHz band, the ACMA plans to auction spectrum licences. It is anticipated that the use of such a market-based mechanism will facilitate the movement of the spectrum to its highest-value use, as licences will be allocated to the party that values the spectrum most.

Spectrum licences are technology flexible, allowing licensees to choose how they wish to deploy devices within their spectrum space, the nature of the service they wish to deliver, and the technology that they use (further information on apparatus and spectrum licensing is available at Attachment B). Spectrum auctions are irregular events because of the extensive planning, consultation and preparation involved and are most often used where there is strong competition for scarce spectrum with a high commercial value. Auctions are considered to be a transparent price-based method for allocating the spectrum within a particular band in discrete parcels known as spectrum lots, which are defined by geographic area and frequency bandwidth. The combination of frequency bandwidth and geographic area is termed spectrum space.

A successful bidder may acquire a number of lots at auction. The buyer can combine or aggregate any contiguous lots to form broader spectrum spaces of greater utility. These aggregated lots can be used in accordance with technical conditions specified in the technical framework underpinning the spectrum licence so that any technology or service can be operated within the spectrum space, depending on its size and shape, so long as it doesn't interfere with neighbouring services and operates in accordance with the access [licence conditions](#).

Technical frameworks seek to minimise negotiation necessary between adjacent licensees for the management of in-band and out-of-band interference in most circumstances.

A technical framework is crafted using three regulatory elements:

- > licence core conditions, which are mandatory requirements made under section 66 of the Act
- > a Determination of Unacceptable Interference for the purpose of device registration, made under section 145 of the Act
- > Radiocommunications Advisory Guidelines made under section 262 of the Act.

The licence core conditions and the determination of unacceptable interference are used to keep significant levels of emissions within the spectrum space of the licence. In addition, advisory guidelines provide a framework for the management of interference with specific devices. Furthermore, potential spectrum licensees are expected to take expert technical and other advice necessary to remain informed of possible effects on their proposed services.

The benefits of this licensing arrangement are discussed further in Section 5.

Regardless of the person to whom spectrum licences are reallocated, there is no additional regulatory burden expected to affect individuals or the community as a result of reallocation in the band.



#### **4.2.2. Methods for conversion**

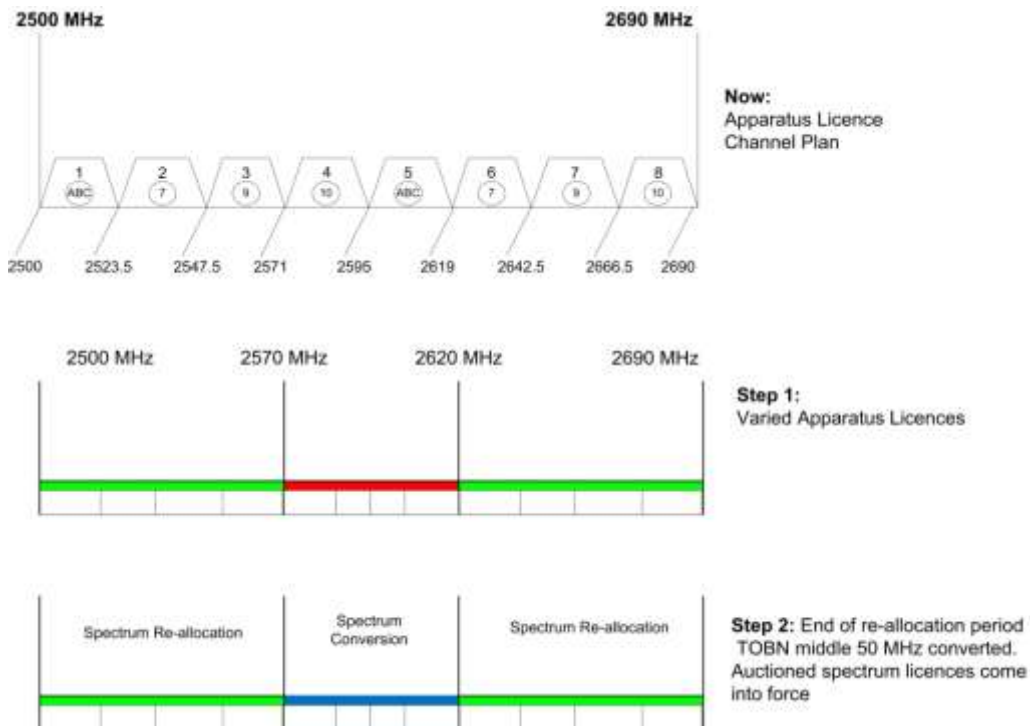
To achieve conversion from apparatus licenses to spectrum licences, new technical frameworks will be developed, which will allow for ENG operations in the 2.5 GHz band to be reduced to the mid-band gap. This also includes allowing for bands of restricted use (commonly referred to as guard bands by industry) to be placed on either side of the mid-band gap to avoid interference with or from adjacent WAS operations. The precise timing of conversion will be finalised through ongoing consultation with affected stakeholders.

The legislated process to convert an apparatus licence to a spectrum licence requires that the new spectrum licence essentially replicates the conditions of the apparatus licence that it replaces. The changes to apparatus licences are necessary because the existing channelling arrangements in the 2.5 GHz band are inconsistent with the proposed spectrum allocations arising from the 2.5 GHz review.

The current channel arrangements in the 2.5 GHz band were implemented when 190 MHz of spectrum was available to four TOBN licensees. Following conversion and reallocation of the band, 50 MHz (within the 2.5 GHz band) will be made available to TOBN licensees and 2 x 70 MHz will be reallocated. It should be noted that the decision on how these 70 MHz blocks of spectrum will be divided for auction is to be made by the ACMA at a later date as part of the auction preparations, and may require a further RIS. The channel arrangements must be altered to ensure that TOBN licensees can operate effectively within the 50 MHz mid-band gap. While the current arrangements provide each broadcaster with two channels, the proposed arrangements call for smaller channels. This is demonstrated in Figure 3.

Conversion from apparatus licences to spectrum licences is a necessary step to allow for greater flexibility and to facilitate long-term certainty for ENG operators. This is discussed in detail in Section 5.

Figure 3 Steps required for conversion of apparatus licences to spectrum licences



#### 4.2.3. Methods for alternative band arrangements

Spectrum in alternative bands is necessary for ENG operators to continue to provide an equivalent level of service to what is currently delivered. The costs and benefits of these particular alternative bands for ENG are discussed further in Section 5. To enable the introduction of ENG operations successfully into the identified alternative bands, a number of sharing and coordination arrangements will need to be developed between incumbent licensees in the bands and ENG operators. This will include:

- > development of appropriate protection arrangements for earth stations
- > development of arrangements for enabling sharing of spectrum between ENG and Defence aeronautical mobile telemetry
- > consideration of the extent of any necessary clearance of fixed links<sup>10</sup>
- > consideration of adjacent band coordination requirements.

The arrangements outlined above will require the development of appropriate licence conditions in some cases. In the case of any fixed link clearance, the ACMA would develop, consult on and publish a band plan to give effect to the clearance processes. Any fixed link clearance requirements are envisaged to be specified under a formal band plan, made under section 32 of the Act. The ACMA will release a draft band plan for formal consultation with industry, as required under section 33 of the Act. It is anticipated that a band plan will be finalised in late 2011, allowing for coordination requirements between licensees to be finalised and published by mid-2012.

<sup>10</sup> In accordance with the *Australian Radiofrequency Spectrum Plan*, a fixed link, or fixed service, is defined simply as “a radiocommunication service between particular fixed points”. This definition encompasses a range of point-to-point and point-to-multipoint radiocommunications services.

#### **4.2.4. Reallocation and conversion against the principles**

As earlier mentioned, the option to reallocate and convert the 2.5 GHz band best meets the ACMA's *Principles for spectrum management*. Each of the principles is measured against the objectives of the preferred approach below.

##### *Principle 1—Allocate spectrum to the highest value use or uses*

As assessed against the spectrum management principles, the proposed option meets the principle of allocating spectrum to the highest value use. Spectrum in the 2.5 GHz band that is subject to reallocation will be allocated via a price-based allocation of spectrum licences with a flexible technical framework. This will allow the entities who value the spectrum most highly to acquire the licences.

In those sections of the 2.5 GHz band which will be subject to conversion, the use to which the band is allocated is not directly altered. The ACMA considers that provision of 50 MHz of spectrum in the 2.5 GHz band to the commercial free-to-air broadcasters and the ABC for ENG operation is an important element of the overall proposal to provide ongoing certainty to these incumbent licensees. As noted earlier, none of the alternative bands are readily able to support airborne operations without technical restrictions. The ACMA considers that access to such spectrum is important for ENG operation; it ensures coverage not only of sporting events like the Sydney-to-Hobart yacht race, but of national emergencies like the Black Saturday bushfires in February 2009 and the Queensland floods in January 2011.

The ACMA therefore considers that the arrangements are largely consistent with the first of the principles.

##### *Principle 2—Enable and encourage spectrum to move to its highest-value use or uses*

The highest-value use of a band may change over time, for example, due to evolving technologies. In order to maximise the overall public benefit that is derived from use of the spectrum, it is desirable to allow the use of spectrum to change quickly and easily, ideally without the need for delay that can be imposed by regulatory intervention.

Spectrum in the 2.5 GHz band, which is subject to reallocation or conversion, would be subject to a flexible technical framework that would allow spectrum use to change over time, if a higher-value use emerges. The ACMA therefore considers that the reallocation and conversion arrangements meet this principle.

##### *Principle 3—Use the least cost and least restrictive approach to achieving policy objectives*

The ACMA considers that reallocation and conversion in the 2.5 GHz band will allow the objectives of the review to be achieved, and will minimise restrictions on both licensees and future band use. The ACMA acknowledges that any change from current arrangements imposes some additional costs on incumbent licensees in the band, but considers that these are outweighed by the benefits accruing from the provision of certainty about long-term arrangements. Moreover, the retention of part of the 2.5 GHz band for use by the current licensees via conversion of their apparatus licences in the mid-band gap to spectrum licences also assists in minimising possible costs. The ACMA therefore considers that the arrangements are consistent with Principle 3.

##### *Principle 4—To the extent possible, promote both certainty and flexibility*

The ACMA considers that the introduction of 15-year technology-flexible spectrum licences via reallocation and conversion in the 2.5 GHz will provide both certainty and flexibility for licensees. The reallocation period will also provide certainty of ENG tenure and minimises any disruption to licensees, while providing certainty for new licensees in terms of network planning. Those arrangements are therefore consistent with Principle 4.

*Principle 5—Balance the cost of interference and the benefits of greater spectrum utilisation*

The ACMA considers that the introduction of 15-year, technology-flexible spectrum licences via reallocation and conversion in the 2.5 GHz will provide licensees with considerable discretion in terms of how they use the band. However, the technical framework for the licences will impose some restrictions to avoid levels of interference that could impose significant costs on adjacent licences and this places some limits on the extent of spectrum utilisation.

# 5. Impact analysis

In this section the impact analysis for the preferred option of reallocation and conversion is considered in detail, identifying the likely affected stakeholders, and the costs and benefits for each part of the proposed arrangements for the 2.5 GHz band.

## 5.1. Risks, costs and benefits

The following information considers the cost benefit analysis associated with the different components of Option 5 including reallocation, conversion and the alternative bands. A summary of this analysis is provided in a table at the end of this section.

### 5.1.1. Reallocation: Creating international harmonisation and making more spectrum available to meet the growing demand for WAS

The ACMA proposes to reallocate the outer bands of the 2.5 GHz band, specifically 2500–2570 MHz and 2620–2690 MHz, via spectrum licences that are technology flexible, but optimised for WAS. This will involve relocation of the incumbent apparatus licensees from these parts of the band, making the spectrum available for allocation via price-based allocation of 15-year spectrum licences.

#### *Dependencies/risks*

This step is dependent on the Minister for Broadband, Communications and the Digital Economy (the minister) making a reallocation declaration for these parts of the 2.5 GHz band, in accordance with section 153B of the Act. Should a spectrum reallocation declaration be made by the minister, the reallocation period must be at least two years. During this period, the incumbent apparatus licensees may continue to operate their service. At the end of the reallocation period, the apparatus licensee must vacate the spectrum, or come to a commercial agreement with the new spectrum licensee to continue operation.

This step is also dependent on availability of the identified alternative bands for ENG operation. The ACMA considers that fixed links in the alternative bands may require two years to relocate; therefore if arrangements have been identified by late 2011, then any necessary fixed-link relocation could be expected to have occurred by late 2013. Once any necessary fixed-link relocation had been completed, then ENG relocation from the 2.5 GHz band could be finalised. The ACMA does not intend to establish arrangements which would preclude earlier ENG relocation, but the ACMA's preliminary view is that, to avoid disruption to ENG operation, it may not be possible to finalise ENG relocation until mid-2014. To provide sufficient time for a staged ENG relocation to occur after fixed link clearance, the ACMA considers that the reallocation period should not end before mid-2014. The ACMA considers that there is a risk of disruption to ENG operation if sufficient time is not provided for relocation. Such disruption to ENG services would manifest itself in negative flow-on effects to the community as a whole. These risks and dependencies are recognised by the ACMA, and will be mitigated as far as possible, as outlined in the cost/benefit analysis.

It should also be noted that the timing for relocation has taken into account that potential WAS operators are keen for an allocation of the 2.5 GHz band as early as possible to enable them to begin to plan their networks. The finalisation of arrangements in the alternative bands may take several years and deferring commencement of any process to enable reallocation of parts of the 2.5 GHz band until those arrangements are in place would potentially delay any price-based allocation by a number of years.

It would be desirable to conduct a staged migration of ENG operations from the 2.5 GHz band to the alternative bands. This would enable ENG operators to commence

using some alternative bands in some geographic locations, before final arrangements have been implemented in all bands and all geographic areas. This aims to mitigate the risk of disruption which may occur if ENG licensees attempt a single move into all alternative bands, while minimising, as far as possible, the delay to deployment of WAS.

#### *Costs/benefits*

The main cost of reallocation is incurred by existing apparatus licensees operating in the outer bands who will be required to relocate. Affected stakeholders include all free-to-air commercial broadcasters and the ABC, who hold licences, as well as some Pay TV operators and affiliated ENG service providers who utilise the band via third party agreements with the licensees. It should be noted that these third party operators, the free-to-air commercial broadcasters and the ABC are all able to participate in any price-based allocation in the 2.5 GHz band should they wish to do so.

However, the ACMA also recognises the range of broader benefits to Australian society arising from ENG services and considers that the preservation of capacity for operations of this nature is important, and has made a range of alternative bands available. There is expected to be a requirement to establish sharing and coordination arrangements in some bands, but the ENG operators will have access to spectrum to continue to provide the same level of service delivery. The costs and benefits of alternative band arrangements and the long-term certainty provided to ENG operators is explored in further detail in the latter part of this section.

Other potential costs to ENG operators may include re-tuning equipment or investing in new equipment in order to operate in the identified alternate bands or even to reduce their operations in the 2.5 GHz band to the mid-band gap. Submissions received by the ACMA from the broadcasting industry have noted that investment in new equipment would be necessary; as well as factory modification and additional antennae. The costs quoted ranged greatly from \$75,000 for the cost of new equipment for a freelance camera operator to \$9–\$11 million for the ABC. The costs to each of the other three 2.5 GHz band TOBN licensees—Channels 7, 9 and 10—would seem likely to be in the order of those costs quoted by the ABC. However, the ACMA does not know how many third party users operate in the band, since their arrangements are with the TOBN licensees rather than with the ACMA.

While it is noted that ENG operators may incur costs as a result of the changes to arrangements in the 2.5 GHz band, it should also be noted that extensive consultation with stakeholders has taken place over a number of years regarding these issues. In light of the ACMA's extensive consultation processes, ENG operators would have anticipated changes to the regulation of the band, and in preparation for this, may have purchased equipment with the capacity to operate in alternate bands. In addition, it should not be ruled out that many ENG operators may have needed to purchase new equipment, depending on its age, regardless of whether the reallocation proceeded. Additionally, the majority of affected equipment is common across relevant bands, meaning the impact could be minimised to retuning equipment and retraining some staff.

Some ENG operators also raised the issue of compensation in their submission and the ACMA takes note of comments from current TOBN licensees who indicated they would seek compensation for the costs associated with any relocation to the alternative bands. In addition, a number of third party users who operate in the 2.5 GHz band also indicated in submissions that they would be unable to remain in business unless they received compensation for costs associated with operating in the alternative bands. The ACMA stresses that questions of compensation are not matters for the ACMA but rather for the government. However, the ACMA emphasises that the implementation phase of the review will be characterised by ongoing consultation with all affected parties.

The risk of interference to ENG operations and neighbouring WAS operations in the 2.5 GHz band has been noted by the ACMA. This would manifest itself as a cost to the licensee exposed to unacceptable levels of interference, as well as to the recipients of the services – Australian citizens and consumers. The ACMA has strategies in place to avoid unacceptable levels of interference. These include mandating technical frameworks in licence conditions to the nominated spectrum space.

The main benefit of this option is that which will be delivered to the Australian community as a whole, through the expected introduction of WAS in the 2.5 GHz band. The benefits of this are twofold: it will allow Australia to realise the economic benefits arising from international harmonisation; and it will also help to meet the growing consumer and commercial demand for WAS. Together, these benefits have the flow-on effects of securing greater choice for Australian consumers and stimulating national competitiveness in the global digital economy. The other main beneficiary in the creation of greater WAS spectrum capacity are the potential licensees of the outer bands (2 x 70 MHz), probably telecommunications operators, who are expected to be using the spectrum to make more mobile telephony and broadband services available to the public. Given that estimates of the direct contribution of mobile telecommunications to the Australian economy were estimated to be in the order \$6.7 billion or 0.61 percent of total GDP in 2008–09,<sup>11</sup> the benefits of introducing WAS in the 2.5 GHz band are considered to outweigh the cost of reallocation incurred by the ENG operators,

Should the minister decide to reallocate the band and the Australian market follows international trends (see Attachment A) then WAS will emerge as the highest value use for the 2.5 GHz band. Benefits include:

- > availability of harmonised equipment for use on the 2.5 GHz band to the greatest extent possible, and the resultant economies of scale
- > greater diversity and lower cost of services to consumers
- > international interoperability and roaming.

The indirect, or flow-on, benefits of mobile telecommunications are even greater than the industry's direct contribution, with indirect benefits estimated to be in the order of \$10.7 billion<sup>12</sup> estimated for 2008–09. With greater spectrum made available to support mobile telecommunications and broadband services, the industry's contribution to the Australian economy is expected to grow. Access Economics predicts that an environment that enables the effective deployment of such services will add an estimated 1.5% to Australia's GDP within a few years, and over ten years, inject a boost of \$80 billion and an additional 70,000 jobs into the economy.<sup>13</sup>

Further to the economic benefits expected through making more spectrum available for WAS, there are also numerous social benefits. Mobile services provide greater connectivity, which provides an array of benefits, such as those identified by AMTA in its submission, including greater connectivity for remote communities, educational

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<sup>11</sup> Access Economics, *Economic Contribution of Mobile Telecommunications in Australia*, in Australian Mobile Telecommunications Association, *Submission to the ACMA Review of the 2.5 GHz band and long-term arrangements for ENG*, 19 March 2010, p. 11, [http://www.acma.gov.au/webwr/\\_assets/main/lib311275/ifc01-2010\\_amta.pdf](http://www.acma.gov.au/webwr/_assets/main/lib311275/ifc01-2010_amta.pdf)

<sup>12</sup> Access Economics, *Economic Contribution of Mobile Telecommunications in Australia*, in Australian Mobile Telecommunications Association, *Submission to the ACMA Review of the 2.5 GHz band and long-term arrangements for ENG*, 19 March 2010, p. 12, [http://www.acma.gov.au/webwr/\\_assets/main/lib311275/ifc01-2010\\_amta.pdf](http://www.acma.gov.au/webwr/_assets/main/lib311275/ifc01-2010_amta.pdf),

<sup>13</sup> IBID, p 12

benefits, greater social networking and communication between families and friends and greater capacity for user-generated content.<sup>14</sup>

On the whole, given these substantial benefits that will accrue to the Australian community as a result of allowing the introduction of WAS in the 2.5 GHz band, it is considered that the cost arising from the necessary relocation of ENG operators is outweighed by these benefits.

#### **5.1.2. Conversion: Increasing the flexibility of regulation**

As discussed in Section 4, the ACMA plans to convert the current apparatus licenses held by ENG operators in the mid-band gap, specifically, 2570–2620 MHz, into spectrum licences. This ultimately aims to achieve greater flexibility in licensing and to facilitate the movement of spectrum to its highest-value use if that changes over time.

##### *Dependencies/Risks*

This step of the 2.5 GHz band review is related to the reallocation process. The technical frameworks for the reallocated licences and that for the converted spectrum licences are interdependent because they will share a spectral boundary. This requires that the technical framework for the converted licences are developed in parallel with the technical framework for the reallocated licences.

The precise timing of conversion is a matter for ongoing consultation with the ENG operators. However, it is highly desirable for all spectrum licences in the 2.5 GHz band to have a common expiry date. If all licences in the band are to have the maximum 15-year end dates, as stipulated by the Act, then converted licences should have the same start date as licences acquired through a price-based allocation. The ACMA will carry out ongoing consultation to secure this outcome.

##### *Costs/benefits*

There will be some costs incurred by the incumbent ENG operators as a result of the conversion process. These costs may involve those arising from retuning equipment to restrict ENG operations to the mid-band gap. Establishing the precise cost of this is not a straightforward task, as each of the incumbent licensees possesses equipment of different capabilities and at various stages of its life span. A further cost arising from conversion is the spectrum access charge, essentially the conversion fee for new spectrum licences. The exact fee is yet to be determined, but it replaces the payment of 15 years worth of apparatus licence fees with the added benefit of allowing for greater flexibility.

In addition, the technical framework requires that a guard band be placed between the frequency division duplex (FDD) and time division duplex (TDD)/ENG allocations to minimise interference. Consultation with stakeholders revealed a general preference for guard bands to be located in spectrum other than the spectrum the respondent would be using, reflecting the concern that the presence of a guard band would diminish the spectrum capacity and flexibility. After consultation, the ACMA has determined that in order to maximise the greatest net benefit, it is necessary to follow a harmonised band plan allowing technical parameters for WAS spectrum to coincide with international standards. This places the guard bands between FDD and TDD blocks in the 2.5 GHz band, within the TDD mid-band gap. Although this has an effect on the ENG operators using the mid-band gap, the overall net benefit will be maximised by ensuring the technical framework for WAS in Australia is harmonised with international plans. As discussed, this will improve economies of scale in production, and consequently lower equipment costs for operators and lower cost services for consumers can be provided.

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<sup>14</sup> IBID p 13



Although these costs will be incurred by the ENG operators, there are many benefits for ENG operators that arise from the conversion process. As previously discussed, the conversion from apparatus licences to spectrum licences will authorise the licensee to use a parcel of spectrum space for a period of up to 15 years. This means that licensees will have an adequate amount of time to invest in infrastructure to deploy services, and a sufficient amount of time to earn a return on their investment. The positive implications of this for businesses are extensive; spectrum licensees can change their service over time in response to commercial realities and respond more quickly to technological innovation without having to seek government approval, consequently reducing regulatory and administrative burden. The technology flexibility afforded through a spectrum licence ensures that, should a higher value use for the spectrum emerge in the future, there are no regulatory restrictions in place to impede the spectrum from moving to this use.

These arrangements also ensure continued, unencumbered use of a contiguous block of spectrum by ENG operators, albeit a lesser amount than available under current arrangements. The ACMA received submissions from a range of stakeholders suggesting that licences for the mid-band gap be allocated on an open and competitively neutral basis. However, the ACMA is of the view that the net benefit to the Australian community will be maximised by ensuring that ENG operators have continued access to this spectrum to provide a service that is of significant value. In addition, the overall long-term flexibility of regulation will be increased, aligning with the *Principles for spectrum management* and the objectives of the Act, to the benefit of ENG operators.

### **5.1.3. Alternative band arrangements: Creating long-term certainty for ENG operators**

This step intends to create new arrangements to allow ENG operators access to spectrum in alternative bands, given that access to spectrum in the 2.5 GHz band will be confined to the mid-band gap. As mentioned earlier, in addition to access to the mid-band gap in the 2.5 GHz band, the alternative bands that will be made available for ENG operation are:

- > shared use of the bands 2025–2110 MHz and 2200–2300 MHz
- > exclusive use of the band 2010–2025 MHz, at least in capital city areas
- > ENG access to 1980–2010 MHz and 2170–2200 MHz, with the caveat that mobile-satellite services may be introduced into these bands in the future, with the ACMA investigating the viability of long-term sharing between ENG and mobile satellite services.

#### *Dependencies/Risks*

The main issue with the alternative band arrangements is that ongoing coordination with incumbent licensees in the bands is required to avoid unacceptable levels of interference. There are a number of incumbent apparatus licensees in these bands, including the Department of Defence, the space science industry, fixed links licensees (mainly Telstra), and potentially in the future, mobile satellite service operators. Use of the spectrum in a manner that allows ENG service delivery equivalent to that currently provided using the 2.5 GHz band, while avoiding interference to incumbent licensee's operations, relies on agreed sharing and coordination arrangements between incumbent licensees and ENG operators.

Relocation of ENG operations to these bands is dependent on some fixed-link clearance. The ACMA will minimise the extent of any fixed-link clearance and will consult with industry on the proposed band plan. Fixed link licensees will be given sufficient time, approximately two years, to relocate once the band plan has been finalised and will be responsible for the costs associated with relocation. Once necessary fixed-link relocation has been completed, then ENG relocation from the 2.5

GHz band can be finalised, which may not be possible until mid-2014. This is also subject to consultation with affected stakeholders.

Depending on frequency of operation, clearance will be required for fixed links within 150–300 km of capital cities and the eastern seaboard. This approach would provide for ENG operation in the high demand areas around capital cities, while preserving fixed link operation in regional and remote areas where wireless approaches are more cost effective than alternatives.

There are also a number of dependencies and risk mitigation strategies for why these bands were chosen as the most appropriate alternative bands for ENG operation. The selection of these bands was based on an assessment of arrangements that would maximise net benefits. The radio propagation characteristics of these bands are not dissimilar to those in the 2.5 GHz band. This means that if ENG operators relocated to them from the 2.5 GHz band, significant changes in operating practices would not be required, which in turn acts to minimise relocation costs.

In identifying the alternative bands, the ACMA also considered international arrangements for ENG operation. In general, frequencies that are used internationally for ENG operation, and which are comparable to the 2.5 GHz band, tend to be in the frequency ranges 2000–2500 MHz and 3400–3600 MHz. In Australia, however, bands above the 2.5 GHz band are used by services whose characteristics are such that sharing with ENG operation is not possible and the ACMA considers that clearance of the existing services is not feasible. For example, the frequency range 2700–3400 MHz is used for radiolocation services by organisations such as Airservices Australia, the Department of Defence and the Bureau of Meteorology. The ACMA does not consider that the development of sharing arrangements between these services and ENG is feasible.

Segments of the 3400–3700 MHz band are either subject to spectrum licensing or apparatus licensing arrangements with technical frameworks and coordination criteria optimised for WAS. This band is also being considered internationally for designation for mobile broadband services. One of the key objectives of this review is to provide certainty to the commercial free-to-air broadcasters and the ABC about long-term spectrum arrangements for ENG operation; the ACMA considers that the introduction of ENG operations into bands which may soon be internationally designated for mobile broadband services would only continue the uncertainty that arose due to the international harmonisation for WAS in the 2.5 GHz band.

The range 3700–4200 MHz is used for Fixed and Fixed–Satellite Services (FSS) and the ACMA considers that sharing in this band between these services and ENG is unlikely to be technically possible. Although fixed links could be relocated, it is not clear which other bands might be suitable for the operation of FSS. In any case changes in arrangements for these services would have substantial lead times which would not provide certainty for ENG operators.

In the frequency ranges below 2500 MHz, the bands 2302–2400 MHz, 1900–1980 MHz, 2110–2170 MHz and 1710–1785/1805–1880 MHz are all subject to spectrum licensing. In addition, the range 2400–2483.5 MHz is used for WiFi; therefore only 1980–2110 MHz and 2170–2300 MHz are capable of providing the quantity of spectrum required to allow provision of ENG service delivery which is equivalent to that currently provided.

#### *Costs/Benefits*

The costs to existing licensees in this step of the 2.5 GHz review include those arising from relocation of some fixed-links currently operating in these bands. Relocation options for fixed links include relocating to the 6, 7.5, 10, 13 or 15 GHz fixed link bands. Relocation of existing fixed links requires:

- > *Survey and design of replacement link on an appropriate new frequency*  
Work must be carried out to redesign links based on local terrain, meteorological conditions and the required traffic to be carried. At present, the ACMA is not aware of what these costs will be.
- > *New transmitters to replace existing transmitters*  
Each new transmitter requires the purchase of new radios, new antennas and waveguide. Approximately 170 transmitters<sup>15</sup> will require replacement at approximately 130 sites, at an estimated cost of \$50,000 each, including labour and the cost for a new licence.
- > *Reinforcement of existing antenna towers at some sites*  
Moving to frequencies above 2.1 and 2.2 GHz requires using heavier, solid antennas instead of lighter, grid-style antennas. Therefore, there is the possibility that existing antenna towers will need reinforcement to cope with the increase in weight and forces applied due to wind. As with previous clearances, it is assumed that fifty percent of sites require reinforcement at a cost of approximately \$50,000 per site. Total cost of reinforcement at all sites is estimated at \$3 million.
- > *Installation of new antenna towers on existing sites*  
It is possible that the existing antenna towers will be at maximum load due to a high number of antennas already mounted to them. In this case, a new antenna mast will have to be erected on the existing site to accommodate additional antennas. As per previous clearances, it is assumed that twenty-five percent of sites will require a new tower to be installed. The cost for a new tower on an existing site is estimated at \$100,000 for a total cost of \$3 million.
- > *Installation of new antenna towers on new sites*  
In some cases, the propagation characteristics of new link frequencies will be such that they cannot make the existing path length. Here, a new site must be established somewhere in between to act as a repeater. A new site must be located and established, with erection of a new antenna tower with two complete sets of radiocommunications equipment. It is estimated that 25 new sites will be required, at a cost of approximately \$300,000 each. This includes equipment and installation costs but excludes any ongoing costs such as site leasing. It should be understood that this cost will vary depending on whether the new site is in an urban, suburban or more remote location.

Excluding any administration costs, the ACMA estimates that the total cost of relocating fixed links from a 300 km radius from capital cities is approximately \$22 million.

The benefit of clearing fixed links in areas where ENG operation will be most intense is that it will give ENG operators the capability to deploy rapidly to cover breaking news events without dealing with the complexity of any frequency coordination procedures. The time scales required for such coordination procedures are incompatible with the quick response times required by ENG services. This is especially relevant when the geographic location of a news story changes as events develop. Furthermore, as earlier mentioned, the ACMA has taken the steps necessary to ensure that fixed link relocation is minimised to the extent possible.

There is also some cost to ENG operators to use spectrum in these alternative bands. ENG operations typically consist of:

- > ENG collecting receive stations (collection station)
- > ENG mobile vehicle stations (news vans)
- > ENG wireless cameras
- > ENG helicopters

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<sup>15</sup> Based on a 300 km clearance radius from capital cities

Each of these will require some or all of their components to be replaced to enable operation in the 2.1 and 2.2 GHz bands.

There are thirty-three known collection station sites Australia-wide in capital city areas with an undetermined number of receivers at each site. At each collection station, antennas will need to be added or replaced, along with filters, block down converters and steerable directional antennas.

Each broadcaster has a number of mobile vehicle stations. Down converters will have to be replaced, as well as the mast mounted antenna and radiofrequency unit. Dual-band operation of vehicle station transmitters, that is transmission in both the 2.1-2.2 GHz and 2.5 GHz, is not possible given the configuration and limited size of the vehicles. Separate equipment would be required for each band. Many ENG wireless cameras would require complete new transmitter units, although some existing brands are capable of tuning across a wide frequency range, including from 2.5 GHz to 2.1-2.2 GHz.

Except in the mid-band gap of the 2.5 GHz band, ENG helicopters will likely require new wider-band receive antennas and block down converters. On the transmit side, an additional radiofrequency transmitter will be required to cover the new band while simultaneously existing alongside the 2.5 GHz transmitter. A new steerable antenna will also likely be required. There are a number of third-party operators, such as non-broadcaster production companies, utilising wireless cameras and helicopters that would also be required to convert equipment.

Transition may be complicated by the fact that the broadcasters cannot take systems offline for long to make changes. They need to be able to maintain capabilities in order to cover unpredictable news events. Installation of and commissioning of new equipment involves some non-technical aspects. ENG collection stations, for example, are often located on the top of large buildings in the CBD. Safe access to a site can take time to organise. With helicopters, installation of new equipment requires recertification for airworthiness.

In areas surrounding Perth and Canberra, it is likely that ENG services will have to coordinate with earth stations at Gngalara, New Norcia and Tidbinbilla. This is to both avoid interfering with earth station receivers and receiving interference from earth station transmissions. This coordination will introduce some overhead to ENG and earth station operations. Good working relationships along with a well planned coordination procedure will ensure that the level of overhead remain manageable.

Recognising the importance of earth stations and the crucial role they play in the work of the Australian space science industry and the national interest role of the Department of Defence, the ACMA seeks to increase the net benefit of the alternative band arrangements by allowing incumbents to remain in these bands, where interference can be avoided through sharing and coordination arrangements. The approach has sought to recognise the benefits of the space science industry to the Australian community and has ensured that the arrangements for the 2.5 GHz review minimise the impact on earth stations, which are part of multibillion dollar operations producing positive flow-on benefits to the nation. This minimised disruption can be considered another benefit in the impact analysis of the review, with a positive outcome for the space science industry, the Department of Defence, and Australian citizens.

The ACMA will seek to maximise the overall net benefit of this step in the 2.5 GHz band review, through providing ENG operators with access to the alternative bands to allow for continued access to spectrum necessary to deliver a significant service to the Australian public, while minimising disruption to incumbent licensees.

## **5.2. Summary**

The range of costs and benefits associated with the implementation of the review of the 2.5 GHz band is summarised in Table 1 below.

**Table 1: High-level band-by-band analysis of affected stakeholder groups**

Frequency range (MHz)	Planned action	Main stakeholders	Issues under consideration
2500–2570 and 2620–2690	Reallocation of 2x70 MHz of spectrum. It will involve relocation of the incumbent apparatus licensees from these parts of the 2.5 GHz band, making them available for WAS through the price-based allocation of 15-year spectrum licenses.	Existing licensees: commercial free-to-air broadcasters and the ABC, currently utilising these bands for ENG.	Reallocation of broadcasters from the outer bands into the mid-band gap and identified alternative bands. This process will involve changes to current ENG arrangements, and future operation will include, in some bands, a requirement of coordination and sharing arrangements with non-ENG users. However, mid-band gap and alternative band arrangements are intended to ensure that sufficient spectrum is available for the provision of ENG delivery equivalent to that currently provided. The existing apparatus licensees are free to participate in any price-based allocation of spectrum licences in this segment of the 2.5 GHz band.
		Potential licensees: likely telecommunications operators. Planned technical arrangements will create technology flexible spectrum licenses optimised for WAS.	The planned reallocation is expected to benefit the mobile telecommunications industry in Australia. It will provide the industry with the opportunity to expand business models, increasing the diversity in services offered to consumers. There are also benefits to the economy arising from equipment availability due to international harmonisation of the band for WAS. The cost for potential spectrum licensees will be the cost required to secure access to these bands through the planned price-based allocation process.

Frequency range (MHz)	Planned action	Main stakeholders	Issues under consideration
		Community: Australian citizens and consumers	<p>The impact on Australian citizens and consumers is a balance between the increased competitiveness in the mobile telecommunications industry afforded by WAS, and access to news/sports etc provided through ENG which is of significant public interest. Given that there are alternative arrangements in place for ENG and services will continue to be provided, there is little risk to the community by opening up these bands for WAS. Rather, there will be numerous benefits to Australian citizens and consumers through the resultant increased availability in competitive mobile telecommunications service offerings, as well as the benefits of international harmonisation in this band, such as global roaming. In addition, price-based allocation will allow the market to determine the highest value use of the spectrum, maximising the overall benefit to the public through higher spectrum costs to consolidated revenue.</p>
Mid-band gap: 2570–2620	Conversion of apparatus licenses to technology flexible 15-year spectrum licences, optimised for ongoing ENG use or Time Division Duplex (TDD) WAS.	Existing licensees: commercial free-to-air broadcasters and the ABC, currently utilising these bands for ENG.	<p>The main benefit of this step is the long-term certainty afforded to incumbent broadcasters through 15-year spectrum licences and the retention of exclusive use of spectrum in this band. Furthermore, should a higher value use of the spectrum emerge, the new licensing arrangements will provide the benefit of being flexible enough to allow for a change in use of the spectrum. That is, the broadcasters will own a valuable asset that they could let, share or sell as the market allows and their interests dictate.</p> <p>Furthermore, international auction results have signified that the mid-band gap is not as valuable for TDD WAS use as the 2 x 70 MHz segments on either side, indicating that a higher value use has not been precluded by assigning the mid-band gap spectrum for ENG use.</p>

Frequency range (MHz)	Planned action	Main stakeholders	Issues under consideration
Alternative bands:	Relocation of ENG operations to alternative bands, in coordination with existing apparatus licensees in each band.		
2025–2110 and 2200–2300	Shared ENG access with incumbents	Existing licensees: space science industry, Department of Defence, fixed link licensees	<p>These bands are currently utilised by earth stations and for defence aeronautical mobile telemetry systems, as well as for fixed link operation. ENG operators will coordinate with incumbents in these bands to allow for shared use of the bands to avoid interference. This will require greater administrative efforts by all parties to achieve coordination, but will allow ongoing operation of ENG services as well as incumbent services through shared use of the bands. In particular, the ACMA notes the sensitivity of earth stations operating in Canberra and Perth due to their close proximity to capital cities, where ENG usage of spectrum is relatively high and this will be taken into account in technical planning to manage their protection issues.</p> <p>It is likely that fixed links will be required to clear from areas of anticipated ENG operation. Depending on frequency of operation clearance will be required for links within 150–300 km of capital cities and the eastern seaboard. The Perth earth station is to relocate to New Norcia (approximately 100 km north of Perth). Proposals will be developed with ongoing consultation with affected parties with a view to limit disruption to the minimum necessary to support the introduction of ENG services.</p>



<b>Frequency range (MHz)</b>	<b>Planned action</b>	<b>Main stakeholders</b>	<b>Issues under consideration</b>
		Potential licensees (in addition to existing licensees): free-to-air broadcasters and the ABC	ENG operators have the benefit of access to spectrum in lieu of the 2.5 GHz outer band spectrum which will be used primarily for WAS. Although this will require greater coordination efforts, through negotiation with incumbents, than was the case in the contiguous block of 2.5 GHz spectrum, it will allow for ongoing delivery of ENG services.
2010–2025	Exclusive ENG use of the band, at least in capital cities	Existing licensees: fixed links	There are a number of fixed links operating in this band, which will require coordination or clearance. However, operation of ENG in this band will only have minimal effect on existing services as services operating in this band typically overlap the 2025–2110 MHz band. As such, coordination or clearance issues here will be resolved when developing arrangements for the 2025–2110 MHz band; that is, there are no additional impacts arising from the introduction of ENG services into this band than would occur with introduction into only 2025–2110 MHz
		Potential licensees: free-to-air broadcasters and the ABC	Same issues apply here as outlined above for the 2025–2110 MHz and 2200–2300 MHz bands.
1980–2010 and 2170–2200	ENG access with the caveat that mobile-satellite services may be introduced in the future	Existing licensees: fixed links	Same issues as above for fixed link licensees, which again, will be resolved through ongoing consultation with licensees and minimal fixed linked clearance. The majority of links in this band are in regional and remote areas and the ACMA does not expect significant clearance or coordination issues here; that is, there are no additional impacts arising from the introduction of ENG services into this band than would occur with introduction into only 2025–2110 MHz

Frequency range (MHz)	Planned action	Main stakeholders	Issues under consideration
		<p>Potential licensees: Mobile satellite services, free-to-air broadcasters and the ABC</p>	<p>This band has been designated by the ITU for Mobile Satellite Services (MSS) in the future. The ACMA considers that this band is suitable for ENG at least on an interim basis. Further investigation into the long-term use of this band for ENG will be undertaken should MSS be introduced in Australia in the future. Again, the broadcasters have the benefit of maintaining access to spectrum to provide ENG in the near to medium term future with the possibility of normal consultation processes on options for future use if the need arises.</p>

# 6. Consultation

## 6.1. Consultation process

The review of the 2.5 GHz band is characterised by extensive public consultation to date. Consultation on spectrum requirements to support the increasing demand for access to WAS began in February 2006. In response to national and international wireless communication market trends, the ACMA released a public discussion paper to gauge demand for future broadband wireless access services and identified several frequency bands with the potential to support future broadband wireless access services, including the 2.5 GHz band.

Subsequently, after consideration of stakeholder responses, the ACMA announced in October 2008 that it intended to review the 2.5 GHz band to ensure that it could be planned and allocated to allow maximisation of the overall benefit derived from use of the spectrum. This was the objective of the consultation. The ACMA sought comment on a range of options for the future pricing, planning and licensing arrangements for the 2.5 GHz band and on the suitability of several other bands to provide long-term spectrum arrangements for ENG.

To assist in consideration of these issues, the ACMA released the discussion paper titled *Review of the 2.5 GHz band and long-term arrangements for ENG*<sup>16</sup> in January 2010. The discussion paper aimed to:

- > identify how the band should be planned and allocated so that it accords with its highest value use
- > identify long-term arrangements for incumbent ENG licensees in the band.

The ACMA received a total of 42 submissions in response to this discussion paper, from a variety of stakeholder groups including:

- > the telecommunications sector
- > incumbents in alternative bands
- > ENG licensees
- > pay television, production companies and equipment suppliers.

Respondents were invited to articulate their views on each of the proposed options and steps outlined for the review of the band. In the 42 submissions received in response to the discussion paper, the majority of comments were broadly accepting of the ACMA's decision to review current arrangements for the 2.5 GHz band. However, almost all submissions had at least some concerns with the ACMA's preferred view, and the space and satellite industries opposed consequential changes to current arrangements in the alternative bands.

Generally, the concerns expressed by submitters can be divided along industry lines:

### *Telecommunications industry*

The telecommunications industry was supportive of the ACMA's decision to review arrangements in the 2.5 GHz band and *generally* supported the ACMA's preferred approach. The industry however did express concern regarding the ongoing timing of the review. In particular, the sector expressed a desire for auction of and access to the 2.5 GHz band to occur as soon as possible, and for the allocation process to be closely aligned to, if not in tandem with, the 700 MHz allocation.

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<sup>16</sup> The full discussion paper the *Review of the 2.5GHz band and long term arrangements for ENG* can be found at: [http://www.acma.gov.au/WEB/STANDARD/pc=PC\\_312013](http://www.acma.gov.au/WEB/STANDARD/pc=PC_312013)

### *Free-to-air television industry*

Incumbents: The incumbent 2.5 GHz licensees – the free to air commercial broadcasters and the ABC – all expressed a strong preference for current arrangements in the 2.5 GHz band to be retained, although acknowledged the growing consumer demand for WAS and the spectrum required to meet that demand. They also recognised the international harmonisation of 2.5 GHz for WAS. However, the incumbents all emphasised the social benefits ENG provides the Australian community and the subsequent need to retain equivalent spectrum access to maintain current services. They expressed concern that the identified alternative bands may not provide them with those requirements or adequate protection from interference. Additionally, they were all of the view that no decisions on 2.5 GHz should be made until all issues surrounding the alternative bands have been resolved.

Contracted ENG Operators: Current ENG licensees outsource some of their ENG collection and production work to smaller, specialised operators. In general this sector re-emphasised those concerns expressed by the incumbent ENG licensees. However, in addition, many of these operators also emphasised that should ENG operations be required to move to alternative frequency bands, they would not be able meet the estimated associated costs.

### *Pay television industry*

While the commercial free-to-air broadcasters and the ABC hold the licences to operate ENG services in the 2.5 GHz band, the band is also used by third party operators including the pay television sector, production companies and equipment suppliers. This use is under third party agreements with the current ENG licensees. In submissions the pay television sector sought formal ENG access arrangements equivalent to those being offered to the current ENG licensees in the 2.5 GHz band and the identified alternative bands. The ACMA notes however that the requirements outlined by the pay television industry in their submissions tend to be for spectrum for planned events, rather than for the rapid, unplanned deployment that characterises the ENG undertaken by the free-to-air broadcasters. The pay television sector also argued that any new arrangements in the 2.5 GHz band, or the identified alternative bands, should be enabled via apparatus licences allocated on an open and competitively neutral basis.

### *Space and satellite industries*

The space and satellite industries (including relevant Australian Government agencies) generally objected to the ACMA's preferred approach. Both sectors particularly objected to the potential for ENG induced interference and lack of coordination in the identified alternative bands. This concern is particularly related to earth station protection in the following locations:

- > Perth, Western Australia:
  - Landsdale – approximately 17 km north of Perth central business district
  - New Norcia – approximately 100 km north of Perth
  - Mingenew – approximately 320 km north of Perth
- > Canberra, Australian Capital Territory:
  - Tidbinbilla – approximately 17 km south-west of Canberra
- > Alice Springs, Northern Territory
- > Hobart, Tasmania.

A number of submissions from the satellite industry also raised the case for allocations of the 2.5 GHz band to be made to satellite services identified for Region 3 by the ITU.

### *Identified alternative band incumbents*

All incumbents in the identified alternative bands for ENG operation have expressed varying levels of concern about potential interference, or sharing and coordination

arrangements that would need to be negotiated through technical liaison group processes. The Department of Defence expressed particular concern regarding spectrum remaining available for current and future defence capabilities.

#### *Wider industry*

The wider industry – technology developers, manufacturers, distributors and other interested parties – were generally supportive of the ACMA’s preliminary view for the 2.5 GHz review. They were generally in favour of national licences for mobile telephony and broadband at 2.5 GHz and expressed a desire for auction of and access to the relevant blocks of 2.5 GHz to occur as soon as possible, and for the allocation process to be closely aligned to, if not in tandem with, the 700 MHz allocation. They did, however, express some concern about the identified alternative bands for ENG operation, particularly in relation to interference potential and a need for adjacent band coordination.

In response to the concerns raised by stakeholders, the ACMA released a paper in October 2010, titled *Review of the 2.5 GHz band and long-term arrangements for ENG—Response to submissions*.<sup>17</sup> In the response to submissions, the ACMA considered, in turn, each of the concerns expressed by stakeholders. For example, the ACMA took the view that the development of all arrangements in the alternative bands might take several years so to defer commencement of any processes to enable reallocation of parts of the 2.5 GHz band until those arrangements are in place would potentially delay any price-based allocation by a number of years. The ACMA adopted the position that it is necessary to commence all processes in parallel.

The ACMA also considered that access to the mid-band gap is a key platform of the solution which will enable provision of long-term certainty to the current incumbents of the 2.5 GHz band. Consequently, the ACMA will proceed with conversion of existing licences to spectrum licences rather than allocation of apparatus licences on an open basis. Since the release of the Response paper, the ACMA has also announced that it will proceed with arrangements to hold a combined auction of licences in the 700 MHz and 2.5 GHz bands.

The Response paper also included presenting a detailed timeline for each step of the 2.5 GHz review to alleviate the concerns of industry stakeholders. The ACMA’s stance on maximising the benefits of utilisation of the spectrum through balancing the need for ENG and WAS, to the benefit of the Australian people, was also reiterated, and the rationale behind each of the steps further emphasised to stakeholders.

In addition to this formal consultation, the ACMA emphasises its commitment to conducting ongoing consultation with all affected parties as each step of the 2.5 GHz review progresses.

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<sup>17</sup> Full response paper and stakeholder submissions can be accessed at:  
[http://www.acma.gov.au/WEB/STANDARD/pc=PC\\_312013](http://www.acma.gov.au/WEB/STANDARD/pc=PC_312013)

## 7. Conclusion and recommended option

As discussed, the option considered most likely to achieve the objectives of 2.5 GHz review is that which recommends a combination of conversion and reallocation of the 2.5 GHz band. This option is considered the most appropriate as it best meets the objectives of the review of the 2.5 GHz band, namely to facilitate the 2.5 GHz band moving to its highest value use, thus maximising the overall public benefit derived from the spectrum. Simultaneously, it will provide suitable long-term spectrum arrangements and certainty for ENG operators. Furthermore, this option also meets the limitations imposed by the August 2010 election commitment and is consistent with the Act and the ACMA's *Principles for spectrum management*.

If implemented, this path forward would see the ACMA convert part of the 2.5 GHz band—50 MHz in total, from 2570 MHz–2620 MHz, or the mid-band gap—for continued ENG operation, and reallocation of the remainder of the band—two lots of 70 MHz of paired FDD spectrum from 2500 MHz—2570 MHz and 2620 MHz—2690 MHz—to spectrum licensing to allow for other services, such as WAS, to be deployed.

The ACMA would also facilitate ENG access to alternative bands to provide ENG operators with sufficient capacity for continued operation regardless of whether they decide to bid for spectrum in the reallocation process.

The ACMA could use a market-based mechanism—an auction—to allocate spectrum licences in the upper and lower portions of the 2.5 GHz band. While ENG operators would not be precluded from participating in such an auction, in the event ENG operators are not awarded spectrum licences through this process, the ACMA has ensured continued ENG operation in the 2.5 GHz band, and will also allow access to appropriate alternative bands. These bands, when combined with access to the 2.5 GHz mid-band gap, would provide ENG operators with sufficient capacity for continued ENG and planned event services to equivalent standards enjoyed by the Australian public at present. Concurrent to this, the demand for WAS will be met to allow for growth in mobile telecommunications and broadband applications and services, ultimately to the benefit of the Australian public.

## 8. Implementation and review

### 8.1. Timeframes

The implementation of the review of the 2.5 GHz band is comprised of a number of highly interdependent steps, which will be monitored on an ongoing basis and reviewed to enable an efficient and complete transition. As discussed, the transition has been broken down to a number of stages, each of which will involve informal and formal consultation, where appropriate. Table 2 summarises the steps and indicative time frames.

**Table 2: proposed consultation and implementation time frames for the 2.5 GHz review**

Stage	Details	Status	Indicative timeframe
<b>Consultation</b>			
1	<b>WAS consultation process</b> Two papers released, one seminar Review of submissions Review of international developments/trends Investigation of options Decision on way forward	Completed	2006–2008
2	<b>Announcement on consultation outcomes and further work</b> Targeted stakeholder consultation Consideration of potential band for long-term ENG Consideration of appropriate regulatory arrangements, including licensing and allocation options	Completed	2009
3	<b>Public consultation process</b> Release of public discussion paper Industry tune-up on content of discussion paper Analysis of Submissions	Completed	January–September 2010
4	<b>Way forward announcement</b> Release of <i>Response to Submissions</i> paper Announcement of decision on way forward	Completed	October 2010
<b>Implementation</b>			
5	<b>Reallocation processes—2.5 GHz band</b> Consultation on precise areas to be reallocated Consultation on draft reallocation recommendation Development of technical frameworks in consultation with industry Development of draft licences Consultation on price-based allocation instruments Price-based allocation	Proposed	Commence now

6	<b>Conversion processes—2.5 GHz band</b> Consultation on draft designation recommendation Consultation with licensees on draft conversion instrument Development of technical frameworks in consultation with licensees Development of draft licences Consultation on conversion plan Conversion	Proposed	Commence now  Conclude late 2012/early 2013
7	<b>Alternative band arrangements</b> Development of sharing and coordination arrangements in consultation with industry Consultation on draft band plan(s) for clearance of fixed links Band plan Development of licensing arrangements Completion and publication of sharing and coordination arrangements	Proposed	Commence now  Conclude late 2011/early 2012 By mid-2012
8	<b>Relocation of ENG to identified alternative bands</b> Any necessary relocation of fixed links Gradual relocation of ENG services to identified alternative bands	Proposed	By late 2013 By mid-2014

Note: Indicative timeframe does not apply to Perth where ENG operations are expected to continue in the 2.5 GHz band until after the anticipated earth station relocation at the end of 2015.

## 8.2. Implementation steps

### 8.2.1. Segmentation of the 2.5 GHz band and conversion of mid-band gap

To facilitate the recommended segmentation, the ACMA could undertake the following three-stage process facilitated by regulatory power:

- A. Amend existing TOBN licences to re-channel the frequency range 2570–2620 MHz (the mid-band gap) on an Australia-wide basis to incumbent ENG operators; the details of those licences to be resolved separately in consultation with ENG operators and any other interested parties.
- B. Issue an apparatus licence to ENG operators, for the remaining 2 x 70 MHz and recommend that the minister reallocate the bands under spectrum licences.
- C. Recommend that the minister convert the mid-band gap to spectrum licensing under Part 2.2 of the Act. Spectrum licences for the mid-band gap would be issued for a maximum period of 15 years, giving the incumbent ENG operators continued access to a part of the 2.5 GHz band and providing certainty of tenure.<sup>18</sup>

The three main processes required to achieve this and their impact on industry and the general public have been discussed in detail in Section 5.

The preferred option is sufficiently flexible to adapt to various situations and circumstances. With regards to reallocation, applicants in the auction will be competing for spectrum licences which are suitable for various purposes; however, due to international auction results and Australian consultation responses, it is expected that the 2 x 70 MHz spectrum offered will be used principally to deploy WAS.

<sup>18</sup> Alternate bands would also be arranged for continued ENG use in consultation with affected parties.



### 8.2.2. Alternative band arrangements: 2025–2110 MHz and 2200–2300 MHz bands

There are a significant number of issues that need to be considered before ENG can be supported in the 2025–2110 MHz and 2200–2300 MHz bands. The minimum estimated timeframe before the bands are available for ENG in capital cities is two to three years, which is the anticipated time for clearance of fixed point-to-point links once consultation commences. In Perth, earth station coordination issues mean the band may not be available for ENG use for five years or longer.

In consultation with ENG operators and other interested parties, the following approach is proposed for the transition to any new arrangements for ENG:

- > Completion of technical studies on interference between ENG and existing services. This will include the ACMA consulting with interested parties on results of studies and implications for accommodating ENG and existing services; for example, discussions on fixed point-to-point link clearance requirements.
- > Amendments to RALI FX 3 to include channel arrangements for the operation of ENG in the 2025–2110 MHz and 2200–2300 MHz bands.
- > Development of a legislative band plan providing for operation of ENG in the bands 2025–2110 MHz and 2200–2300 MHz, and supporting clearance of fixed point-to-point links.
- > Development and implementation of coordination rules and technical restrictions for management of ENG/IMT band edge interference, with consequential amendments to spectrum licensing technical frameworks.
- > Development and implementation of coordination and technical restrictions for management of interference between ENG and fixed links, ENG and Earth stations, ENG and aeronautical mobile telemetry, and ENG and radio astronomy services.
- > Revision of the *2.1 GHz Band Frequency Band Plan 2002*<sup>19</sup> to support ENG operation in the 2076–2111 MHz band.
- > Revision of Embargoes 23<sup>20</sup> and 41<sup>21</sup> to reflect ENG usage.
- > A transition timeline based on availability of alternative spectrum.

### 8.2.3. Alternative band arrangements: 2010–2025 MHz band

In consultation with ENG operators and other interested parties, the following approach is proposed for the transition to any new arrangements for ENG:

- > Introduction of arrangements in parallel with arrangements for the 2025–2110 MHz band.
- > Amendments to RALI FX 3 to include channel arrangements for operation of ENG in the 2010–2025 MHz band in regional and remote areas.
- > Development of a legislative band plan providing for operation of ENG in the band 2010–2025 MHz.
- > Revision of the *1900–1920 MHz and 2010–2025 MHz Bands Frequency Band Plan 2004*<sup>22</sup> to support operation of ENG in the 2010–2025 MHz band.
- > Revision of Embargo 38<sup>23</sup> to reflect ENG usage.
- > Reviewing and revising the technical and licensing framework for ENG to remove any impediments to the spectrum moving to its highest value use. For example,

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<sup>19</sup> See 2.1 GHz Band Plan on the ACMA website at [www.acma.gov.au/WEB/STANDARD/pc=PC\\_2570](http://www.acma.gov.au/WEB/STANDARD/pc=PC_2570)

<sup>20</sup> See [www.acma.gov.au/webwr/radcomm/frequency\\_planning/spectrum\\_embargoes/emb23.pdf](http://www.acma.gov.au/webwr/radcomm/frequency_planning/spectrum_embargoes/emb23.pdf)

<sup>21</sup> See [www.acma.gov.au/webwr/radcomm/frequency\\_planning/spectrum\\_embargoes/emb41.pdf](http://www.acma.gov.au/webwr/radcomm/frequency_planning/spectrum_embargoes/emb41.pdf)

<sup>22</sup> See [www.acma.gov.au/WEB/STANDARD/pc=PC\\_2574](http://www.acma.gov.au/WEB/STANDARD/pc=PC_2574)

<sup>23</sup> [www.acma.gov.au/webwr/radcomm/frequency\\_planning/spectrum\\_embargoes/emb38.pdf](http://www.acma.gov.au/webwr/radcomm/frequency_planning/spectrum_embargoes/emb38.pdf)

developing a technology-flexible framework that supports both ENG and IMT services in the band.

- > Consideration of the allocation of spectrum licences in metropolitan and some identified regional areas, and the allocation of apparatus licences in other regional and remote areas.
- > A transition timeline based on availability of alternative spectrum.

#### **8.2.4. Alternative band arrangements: 1980–2010 MHz and 2170–2200 MHz bands**

Dependent on the outcome of consultation with ENG operators and other interested parties, the following approach could be used for the transition to any new arrangements for ENG:

- > Introduction of arrangements in parallel with arrangements for the 2010–2025 MHz, 2025–2110 MHz, and 2200–2300 MHz bands.
- > Amendments to RALI FX 3 to include channel arrangements for operation of ENG in the 1980–2010 MHz and 2170–2200 MHz bands.
- > Development and implementation of coordination rules and technical restrictions for management of ENG/IMT band edge interference, with consequential amendments to spectrum licensing technical frameworks.
- > Development and implementation of coordination and technical restrictions for management of interference between ENG and fixed links (predominantly undertaken in work for the bands 2025–2110 MHz and 2200–2300 MHz).
- > Development of a legislative band plan providing for operation of ENG in the bands 1980–2010 MHz and 2170–2200 MHz.
- > Revision of the MSS Band Plan to support operation of ENG in the 1980–2010 MHz and 2170–2200 MHz bands.
- > A transition timeline based on availability of alternative spectrum.
- > Investigation into the viability of long-term sharing between ENG and mobile-satellite services.

#### **8.2.5. Reallocation of parts of the 2.5 GHz band to spectrum licensing**

In order to facilitate the reallocation of part of the 2.5 GHz band to spectrum licensing the ACMA would need to make a reallocation recommendation to the minister under section 153F of the Act, which recommends that parts of a radiofrequency band be reallocated by issuing spectrum licences. Within 180 days of receiving this recommendation, the minister may make a reallocation declaration under section 153B of the Act, declaring that parts of the spectrum are subject to reallocation.

Under section 153B(4) of the Act, 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. The declaration must also specify a reallocation deadline. This deadline must be at least 12 months before the end of the reallocation period.

During the reallocation period and before the reallocation deadline, the ACMA must allocate new spectrum licences. This is usually done by a price-based system, as discussed below. At the end of the reallocation period, if the incumbent licensees have not acquired a licence at auction, they must vacate the band, or negotiate new arrangements with the new licensees.

Under section 153E of the Act, the minister must not make a spectrum reallocation declaration, unless during the previous 180 days, the ACMA has given the minister a recommendation under section 153F.

Before giving the minister such a recommendation, the ACMA must under section 153G(1) of the Act, prepare a written notice stating the terms of the draft reallocation declaration and inviting potentially-affected apparatus licensees to provide written comments. If a potentially-affected licensee provides written comments to the ACMA, the ACMA must have regard to those comments in preparing its final recommendation to the Minister.

A written notice will be released for the purpose of inviting comments under section 153G(1) from potentially affected apparatus licensees and a copy of the notice will be advertised nationally.

### 8.2.6. Price-based allocation processes

In accordance with subsection 60(1) of the Act, regarding procedures for allocating spectrum licences, the ACMA must determine, in writing, the procedures to be applied in allocating spectrum licences either by auction, or by tender, or by allocation for a predetermined price or negotiated prices.

Spectrum licences are generally offered at auction for spectrum where demand exceeds supply. The development of these licences generally has long lead times. If the auction does not result in the sale of all spectrum space (or lots) on offer, then residual auctions may be staged for the remaining lots. Where there is a single applicant for spectrum space, then the ACMA can negotiate sale of the licence to the applicant at the reserve price.

Section 153L of the Act provides that the ACMA must allocate spectrum licences in accordance with a Marketing Plan prepared under section 39A. The Marketing Plan may indicate:

- > the procedures to be followed for issuing spectrum licences
- > the timetable for issuing spectrum licences, how the spectrum will be apportioned among licensees
- > whether any spectrum will be reserved for public or community services
- > the conditions that may be included in the licences to be issued.

An outline of the processes involved in reallocation is provided below in Table 3.

**Table 3: Main steps for the reallocation process for 2.5 GHz, under the Act**

Reference to the Act	Steps involved
Section 153(F)/(G)	The ACMA consults on draft reallocation recommendation; and
Section 153(F)	ACMA makes reallocation recommendation to minister
Section 153(B)	Minister makes spectrum reallocation declaration
	ACMA develops and consults on:
Section 39A	Marketing plan
Section 40	Consultation
Section 60	Allocation determination
Section 32	Technical framework
Section 60(10)	Minister may direct ACMA to impose competition limits—includes consultation with ACCC.

In accordance with section 39A and section 60	ACMA invites parties to register to bid at auction
In accordance with section 39A and section 60	ACMA conducts auction
Section 62	ACMA issues new licences

### 8.3. Assessing the effectiveness of the ACMA's option

The scope of changes arising from the 2.5 GHz review are complex and often interdependent with other steps in the process. The ACMA will seek to conduct ongoing consultation with affected stakeholders; before, during and after changes take place. While the ACMA will evaluate the arrangements in the 2.5 GHz band as a whole, each of the steps of the review include in built measures to allow for feedback and precaution to ensure that each phase can be completed efficiently. This includes regular interaction with stakeholders to measure the impact of changes.

Furthermore, the review of the 2.5 GHz band within itself promotes as far as possible the market determining the highest value use of the spectrum. Through the allocation of 15-year spectrum licences, regulatory intervention will be minimised, with markets aiding the spectrum to move to its highest value use. This is one of the tenets of efficient spectrum management.

## 9. Attachments

### Attachment A: International comparisons of use and revenue from the 2.5 GHz band<sup>24</sup>

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Completed auctions (from most recent)										
Colombia	43 677 372	28 May – 4 June 2010	Fixed services	50 MHz FDD (2 x 25 MHz): Fixed and mobile telecommunications services	800 million (Colombian peso)	0.0195	\$AUD 475,748	2.1785	Total – only FDD auctioned	N/A
Germany	82 329 758	20 May 2010	N/A	190 MHz for mobile telecommunications – service neutral licences. FDD 2500 – 2570	€344,295,000	0.0288	\$AUD 513,684,697.05	0.0328	\$AUD 402.1 million approx	\$AUD 14.2 million approx

<sup>24</sup> In Australia the 2.5 GHz band is taken as the frequency range 2500-2690 MHz. This frequency range is sometimes referred to internationally as the 2.6 GHz band.

<sup>25</sup> All population data (except Australia) taken from *Countries of the World – CIA World Factbook* Website 13 September 2010. All population figures (except Australia) correct as of website population figure update on 15 January 2010. See <http://www.theodora.com/wfb/>. Australian population data taken from *Australian Bureau of Statistics Population Clock* see <http://www.abs.gov.au/ausstats/abs@.nsf/0/1647509ef7e25faaca2568a900154b63?OpenDocument>.

<sup>26</sup> Conversions calculated with currency exchange data taken from <http://www.x-rates.com/cqi-bin/hlookup.cgi> on 15 September 2010.

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Denmark	5 500 510	10 May 2010	N/A	MHz and 2620–2690 MHz: 14 blocks of 2x5 MHz (paired) TDD 2570–2620 MHz: 10 blocks of 5 MHz (unpaired)						
				190 MHz: 50 MHz TDD 140 MHz FDD Service designation still pending. All licences will be service and technology neutral. However, it is likely to be used for mobile broadband, in line with EU designation.	1.01 billion (Danish krone approx)	0.1696	\$AUD 192,323,230.40	0.1840	\$AUD 190 million approx	\$AUD 1 million approx
Netherlands	16 715 999	26 April 2010	N/A	FDD spectrum sold at auction	€2,627,000	0.0016	\$AUD 3,766,093.47	0.0017	Total – only FDD	Unsold.

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Finland	5 250 275	November 2009	N/A	(TDD blocks were unsold): 130 MHz for mobile services: 2x25 MHz paired (existing operators) 2x40 MHz paired (reserved for new entrants) 60 MHz unpaired (reserved for new entrants)	€3,797,800	0.0050	\$AUD 6,199,186.92	0.0062	sold.	
				190 MHz: 50 MHz TDD 140 MHz FDD No licence exceeds 50 MHz: Service designation still pending. All licences will be service and technology neutral. However,						\$AUD 4.2 million approx

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
United States				it is likely to be used for mobile broadband, in line with EU designation.						
	307 212 123	30 October 2009 (of available spectrum in the 2.5 GHz band)	Broadband radio services and Educational broadband services	Educational broadband services will remain indefinitely in the band. All available broadband radio services spectrum was auctioned – there were 10 winners and 61 licences were issued for terrestrial fixed, mobile and broadband services.	\$19 426 600 (US dollars).	N/A	\$AUD 21,361,295.10	N/A	N/A	N/A
Hong Kong	7 055 071	22 January 2009	Broadband wireless access	90 MHz of FDD spectrum for mobile and	\$ 1.5 billion (Hong Kong dollars)	0.3113	\$AUD 294,792,000	0.4643	\$AUD 240 million	N/A



Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Sweden	9 059 651	May 2008	N/A	broadband – including LTE applications 190 MHz – all licences technology and service neutral: 50 MHz TDD 140 MHz FDD	approx) 2,099,450,000 (Swedish krona)	0.1686	\$AUD 371,537,567.05	0.2158	approx \$AUD 341 million approx	\$AUD 28 million approx
New Zealand	4 213 418	December 2007	N/A	215 MHz (including spectrum in the 2.3 GHz band that was auctioned simultaneously) for WiMAX and cellular type services: 2.5 GHz band allocations: 65 MHz TDD 80 MHz FDD	\$4,374,333 (New Zealand dollars - including 2.3 GHz revenue)	0.0036	\$AUD 3,799,055.72 (including 2.3 GHz revenue)	0.0042 (including 2.3 GHz revenue)	\$AUD 1.7 million approx (excluding 2.3 GHz revenue)	\$AUD 1 million approx (excluding 2.3 GHz revenue)
Norway	4 660 539	November 2007	N/A	190 MHz – all licences technology and	227,881,000 (Norwegian kroner)	0.0424	\$AUD 45,753,035.66	0.0517	\$AUD 16.9 million	\$AUD 30 million approx

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Taiwan	22 974 347	January 2007	N/A	service neutral: 110 MHz TDD 80 MHz FDD	Auction price determined on allocated percentage by which annual WiMAX services revenue must be multiplied and paid by the licensee.	N/A	N/A	N/A	approx	N/A
				180 MHz (six 30 MHz licences) for WiMAX.					N/A	
Japan	127 078 679	N/A – spectrum allocated nationwide by government without charge over a	N/A	190 MHz for fixed, wireless broadband and WiMAX services	N/A	N/A	N/A	N/A	N/A	N/A

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/MHz/population	Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Singapore	4 657 542	period from 2007–2008.								
		May 2005	N/A	90 MHz for WiMAX (auctioned simultaneously with an additional 50 MHz of the 2.3 GHz band, also for WiMAX).	\$9,840,000 (Singaporean dollars - including 2.3 GHz revenue)	0.0116	\$AUD 7,708,478.88 (including 2.3 GHz revenue)	0.0118 (including 2.3 GHz revenue)	N/A	N/A
Mexico	111 211 789	N/A – last auction closed in 1998 where licences were sold with 20 year tenure.	MMDS, but with fixed and mobile services capability.	Requests for MMDS licence extension have been denied in the band. Government has signalled its intention to steer the band towards 3G and 4G service provision.	N/A	N/A	N/A	N/A	N/A	N/A

Auctions currently intended

Country	Approximate population <sup>25</sup>	Date of auction (past or intended)	Current allocation	Intended band plan and/or services for reallocation	Revenue raised (total – in original currency)	Total revenue/ MHz/ population		Total revenue raised (\$AUD conversion) <sup>26</sup>	Total revenue in \$AUD/MHz/ population	Total bid for FDD spectrum in \$AUD	Total bid for TDD spectrum in \$AUD
Brazil	198 739 269	Before 30.9.2011 with designation announced before 31.12.2012	MMDS	WiMAX or LTE with MMDS concessions in specified geographic areas in the 2500–2510 and 2620–2630 MHz channels of the band.		N/A	N/A	N/A	N/A	N/A	N/A
Australia	22 450 000 September 2010	TBA	Electronic news gathering	140 MHz for wireless access services (FDD spectrum) 2500–2570 MHz; and 2620–2690 MHz 50 MHz for continued electronic news gathering (TDD spectrum) 2570–2620 MHz		N/A	N/A	N/A	N/A	N/A	N/A
Spain	40 525 002	TBA	No use currently recorded.	190 MHz auctioned with a mix of national and regional licences which would be technology-neutral and valid until 2030: 2 x 70 MHz FDD; and 1 x 50 TDD		N/A	N/A	N/A	N/A	N/A	N/A

## **Attachment B: Regulatory mechanisms assisting spectrum management**

Successful spectrum planning promotes technically efficient use by managing interference and minimising the amount of spectrum denied to other users. To manage the risk of interference and still permit simultaneous use, radio receivers generally need to be adequately separated in frequency or in geographic distance from undesired transmissions. The frequency/ distance separation relationship depends on the characteristic of the services concerned and on the propagation characteristics of the frequency band. It is necessary for the ACMA to establish and codify these relationships to enable efficient use of the band to be made and the risk of interference to be addressed in the optimal way.

The technical framework required to manage interference and enable efficient use of the spectrum includes specifying criteria in licensing documents, equipment standards and frequency coordination procedures. As part of its spectrum planning activities, the ACMA develops frequency coordination procedures and licensing documents and participates in standards development. The primary spectrum planning documents released by the ACMA are outlined below.

### **Spectrum plan**

The *Australian Radiofrequency Spectrum Plan* (the plan) is the highest level domestic technical document showing the allocation of bands to various types of services. It may be compared to a town plan subdividing land into zones where certain activities are permitted. As well as providing the first layer of spectrum resource allocation, there is a degree of interference avoidance built into the service allocation relationships and associated regulations.<sup>27</sup>

The plan is drawn from and largely aligned with the Radio Regulations of the International Telecommunication Union (ITU). The Radio Regulations are revised every few years at World Radiocommunication Conferences. The last conference was held in Geneva in 2007. Outcomes from this conference were implemented in a new version of the Radio Regulations published in 2008. The ACMA takes conference outcomes into account when releasing a new plan at the same time.

### **Band plans**

A band plan specifies the purposes for which a band or bands may be used, and may provide for the reservation of parts of the spectrum for public or community services. Frequency band plans are legal instruments and are prepared for parts of the spectrum where there is a clear need arising from government policy initiatives or community demand. Administrative band plans, or channel plans, serve a similar purpose to frequency band plans, but are not legally binding instruments. They provide a policy basis for band usage. Both types of plan may prescribe usage and specify channelling arrangements for specified frequency bands.

### **Radiocommunications Assignment and Licensing Instructions**

Radiocommunications Assignment and Licensing Instructions (RALIs) are a further important tool in Australian spectrum management and provide guidance on specific spectrum access arrangements. Details such as permitted frequency channelization, antenna performance characteristics and coordination arrangements are often prescribed in RALIs.

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<sup>27</sup> The Plan is available free online at [http://www.acma.gov.au/WEB/STANDARD/pc=PC\\_2713](http://www.acma.gov.au/WEB/STANDARD/pc=PC_2713). Printed copies of the Plan can be purchased from the ACMA.

## Technical Standards

In some circumstances the ACMA may mandate technical standards for equipment operated in certain bands. These standards are usually developed by Standards Australia<sup>28</sup>.

## Radiocommunications licensing framework

Consistent with the Act, the ACMA has three licence regimes available to authorise the operation of radiocommunications:

1. Apparatus licensing;
2. Spectrum licensing; and
3. Class licensing.

The key characteristics of the three licensing regimes are outlined below.

### Spectrum Licences

A spectrum licence authorises a licensee to use for a period of up to 15 years a parcel of spectrum space: that is, a particular frequency band within a particular geographic area. Spectrum licences are generally offered at auction for spectrum for which the demand greatly exceeds supply. The development of these licences generally has long lead times. Where auctions do not result in complete sale of all spectrum space (or lots), then residual auctions may be staged for the remaining lots. Where there is a single applicant for spectrum space, then the ACMA can negotiate sale of the licence to the applicant at the reserve price.

Spectrum licensing offers a technology-flexible, market-oriented approach to managing the radio frequency spectrum. Spectrum licensees can change their service over time in response to commercial realities and respond more quickly to technological innovation without having to seek government approval.

Provided that the operation adheres to the core licence conditions and the technical framework established for the band by the ACMA, licensees can choose how they deploy devices within their spectrum space, the nature of the service they wish to deliver, and the technology that they use. The technical framework of a spectrum licence contains emission limits referred to as core conditions, determinations regarding unacceptable levels of interference, and advisory guidelines.

These licences are also tradeable in the open market and can be amalgamated, divided, or re-assigned, in part or in whole, to third parties, subject to ongoing compliance with the ACMA's interference management framework. They can be sold or leased out to third parties, as a whole or in part, based on geographic area, bandwidth or both. A licensee can extend the geographic coverage or bandwidth of their licence by acquiring an adjacent spectrum licence from another licensee. In this case the two spectrum licences may be combined into one new licence.

### Apparatus licences

Under the apparatus licence system, there are 16 transmitter licence types and five receiver licence types. In order to facilitate the development and implementation of appropriate licensing procedures, including the application of licence conditions and fees, different kinds of radiocommunications applications are separately identified within the various licence types as individual licensing options usually related to kinds of services or stations or uses.

Features of the apparatus licensing system include:

- > broad apparatus licence categories;

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<sup>28</sup> For information, visit the Standards Australia website at [www.standards.org.au](http://www.standards.org.au).

- > an equitable and transparent approach to apparatus licence fees;
- > apparatus licence terms of up to five years, in conjunction with a licensing system which gives payment options for licence fees;
- > the option, for apparatus licensees who seek terms for longer than one year, of paying the total amount of the licence fee at the time the licence is issued or by annual instalments;
- > transfer of an apparatus licence between parties; and
- > the application of licence tax exemptions and concessions that are available to individuals and organisations providing emergency or safety of human life functions.

Apparatus licenses are typically issued over-the-counter on receipt of an application on a first-come-first-served basis.

### Class Licensing

Class licensing, sometimes referred to as the ‘public park’ or ‘spectrum commons’ approach, allows users to operate devices in designated segments of spectrum on an uncoordinated and shared basis. Users must operate devices in accordance with specified parameters that typically include frequency bands, radiated power limits and out-of-band emission levels. Technical and operational conditions may also be specified. Australia’s class licensing regimes has some similarities to the unlicensed or licence-exempt spectrum concepts used in other countries.

Users do not have to apply to the ACMA to operate in class-licensed bands and no fees are payable.<sup>29</sup> However, devices do not receive interference protection and are not coordinated in terms of location and numbers of devices in operation. Anyone can operate any number of devices, anywhere, as long as they abide by the conditions of the class licence. Interference management in class-licensed bands relies largely on the ‘level playing field’ approach where all users are subject to the same limitations on radiated power and frequency range. Generally class licensing is used where there is a low potential for interference, for example, for devices which use low power.

Public park spectrum may provide greater flexibility for users and can increase efficiency and innovation by lowering barriers to entry for small operators and new applications. On the other hand it may also give rise to ‘the tragedy of the commons’, whereby high levels of use can reduce the quality of service and make the bands inappropriate for some services.

The *Radiocommunications (Citizen Band Radio Station) Class Licence 2002* (the Class Licence) authorise the operation of citizen band (CB) radios in the 400 MHz band on a ‘public park’ or ‘spectrum commons’ basis. Many users satisfy their radiocommunications requirements with CB radio operated in accordance with the conditions in the Class Licence. However, for many others, the risk of interference is too great, especially in high spectrum use areas, to make this option viable.

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<sup>29</sup> Some class licences authorise the operation of user terminals that communicate with apparatus licensed devices by service providers. In these cases, the services providers pay a licence fee for the apparatus licensed device but there is no direct charge by the ACMA for access by users to the spectrum.