

Five-year spectrum outlook 2016–20

The ACMA's spectrum management
work program

OCTOBER 2016



communicating | facilitating | regulating

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- > [Telstra Corporation.](#)

Chairman's message

Welcome to the ACMA's *Five-year spectrum outlook 2016–20*.

The five-year spectrum outlook (FYSO) series has been a key part of the Australian Communications and Media Authority's strategy of consultation and constructive dialogue with industry, consumers and citizens since 2009. Release of the *Five-year spectrum outlook 2016–20* complements the ACMA's program of consultation on specific spectrum issues, public forums such as this year's RadComms conference and program of subject-specific tune-ups.

A central purpose in publishing the FYSO is to provide industry with an annually-updated overview of the ACMA's spectrum management priorities and the issues it sees arising over the near to medium term, and our plans to address them, set out in Part 1.

A new feature of this edition, in Part 2, is the ACMA's 12-month work plan, which assigns milestones and timings to priority spectrum management activities over the 2016–17 financial year.

Over the past year, the ACMA delivered a number of key spectrum initiatives, including:

- > implementation of SPECTRA, the ACMA's new integrated spectrum management system
- > release of its mobile broadband program paper: [Mobile broadband strategy—The ACMA's spectrum management strategy to address the growth in mobile broadband capacity](#)
- > transition of spectrum licences in the 27 GHz band to apparatus licences
- > allocation of 1800 MHz spectrum licences in regional Australia, already leading to new 4G services.

This coming year, implementation of the government's Spectrum Review reforms will require us to consider significant changes to our licensing, device supply schemes, pricing, compliance and enforcement activities and management of broadcasting services. This will have implications for the ACMA's spectrum management functions and the prioritisation of our work.

Part 3 of the *Five-year spectrum outlook 2016–20* focuses on the mobile broadband program with a detailed update on the frequency bands being considered for mobile broadband services. Other areas of focus are the preparatory work undertaken by the ACMA to facilitate access to spectrum in response to technology advances such as 5G, Internet of Things (IoT) and dynamic spectrum access (DSA).

Our approach to spectrum management continues to be shaped by our ongoing experiences, observations and evaluation of the spectrum management environment, both in Australia and across the globe and the ACMA will continue to work with government and stakeholders to build tools and capabilities to ensure that regulation is efficient and appropriate in the face of ever-increasing demand for access to spectrum.

Thank you for taking the time to read the *Five-year spectrum outlook 2016–20*. As always, we are keen to receive your feedback on our proposed work program, to assist us in delivering spectrum management activities consistent with our strategic goal to make communications and media work in the public interest. Please email your comments to spectrumlicensingpolicy@acma.gov.au.

A handwritten signature in black ink, appearing to be 'R. Bean', with a long horizontal flourish extending to the right.

Richard Bean
Acting Chairman

Executive summary

The FYSO is an important component of the ACMA's consultation and planning framework for spectrum management. It provides information on demand pressures for spectrum and other significant challenges arising from the external environment. Publication of the FYSO supports consultation on specific spectrum issues, discussion papers and feedback through the ACMA's RadComms conferences and spectrum tune-ups.

Through these targeted mechanisms, the ACMA strives to engage all stakeholders in a public discussion about the demands on spectrum and prioritisation of spectrum projects. This partnership approach is critical in managing the radiofrequency spectrum.

The ACMA's FYSO provides an annual overview of the ACMA's spectrum management priorities and issues over the near to medium term, and its plans to address them. Stakeholders can use the document to identify when the ACMA expects a particular work program to commence, and to understand the priority applied to particular activities by the ACMA.

In this context, the *Five-year spectrum outlook 2016–20* is provided in four parts.

Part 1 sets out the ACMA's high-level approach to decision-making, how evidence is used to identify priorities and develop work programs, and information on external pressures that affect spectrum management. The key issue for the ACMA will be the extent to which implementation of the Spectrum Review recommendations will affect the ACMA's spectrum management priorities in the future.

Part 1 also includes a discussion of the ACMA's response to the significant issues affecting current and future demand for spectrum with particular emphasis on the mobile broadband. It also discusses the ACMA's preparatory work to facilitate access to spectrum for 5G, IoT and DSA technologies.

Part 2 presents the ACMA's work plan for the 2016–17 financial year, in two parts:

- > in the first part, key priority projects are grouped under three broad themes:
 - > maximising the overall public benefit arising from the use of spectrum
 - > reducing the cost to business arising from regulation
 - > implementing reform outcomes.
- > in the second part, projects and activities are listed in two tables on the following basis:
 - > band-by-band projects
 - > regulatory and service-planning projects.

The ACMA welcomes the Spectrum Review recommendation that the ACMA should provide the minister with an annual work program, prepared in consultation with stakeholders, including key priorities over a three- to five-year time frame. The present measure does not, however, purport to anticipate or pre-empt implementation of this recommendation, which awaits passage of a new Act and any ministerial directions or

requests. In the interim (prior to implementation of the review) however, the Authority would welcome industry engagement and feedback on the format and the increased level of detail provided about each project. The work plan is presented under three broad themes: maximising the overall public benefit arising from use of spectrum; reducing the cost to business arising from regulation; and implementing current reform priorities.

The first theme—maximising the overall public benefit arising from the use of spectrum—reflects the ACMA's Principles for Spectrum Management. This theme provides information on the projects below and explains why they are priority areas of work:

- > implementation of the mobile broadband strategy and work program
- > priority compliance areas (PCAs)
- > spectrum pricing initiatives
- > spectrum allocations
- > regional digital radio rollout
- > AM to FM conversions of commercial radio broadcasting services in selected regional licence areas.

The second theme—reducing the cost to business arising from regulation—reflects the government's better regulation agenda. This theme focusses on the ACMA's program of work to deliver spectrum management tools that will facilitate the capacity for customer self-service.

The third theme—implementing current reform priorities—recognises that the ACMA is responsible for implementing outcomes from major reforms. These are:

- > the government's review of spectrum management
- > implementation of outcomes from the 400 MHz band review
- > updates to the *Australian Radiofrequency Spectrum Plan 2013* to take into account World Radiocommunications Conference 2015 (WRC-15) outcomes.

Part 3 contains the ACMA's mobile broadband strategy update. This is the first mobile broadband annual update to be included in a FYSO. The update outlines each of the projects that fall under the program, with details such as the project phase, work undertaken and next steps.

Part 4 sets out the ACMA's spectrum management work programs it expects to commence, or continue to progress. It represents the ACMA's preliminary thinking on priorities and provides an early opportunity for stakeholders to provide feedback on the ACMA's proposed planning framework.

Issues for comment

The ACMA invites comments on the issues set out in the *Five-year spectrum outlook 2016–20* or any other issues relevant to spectrum demand analysis and strategic direction. Specific questions are featured in the relevant sections of this FYSO and collated below.

Details on making a submission can be found at [Invitation to comment](#) at the end of this document.

Issue for comment: 5G

To assist the ACMA in its considerations about 5G in the context of its broader mobile broadband work program (see Part 3), comment (along with supporting evidence) is sought on the following questions:

1. When, or under what circumstances, would it be appropriate for potential 5G millimetre wave (mmW) bands to progress beyond 'monitoring' in the ACMA's mobile broadband work program?
2. What is the relative priority of investigation of mmW bands versus other potential mobile broadband bands below 6 GHz?
3. What disposition should the ACMA adopt in progressing possible 5G mmW bands? Specifically, is a traditional approach appropriate, where Australia would wait until there were clear signs of a harmonised, widespread ecosystem developing in a band before it was seriously considered domestically? Or should a more proactive approach be adopted that would potentially make available bands very early in a more speculative manner? What are the benefits and risks to each approach?
4. What bands are the most mature in terms of possible early moves on 5G mmW bands?
5. What technical considerations are relevant to possible early moves on 5G mmW bands? For example, what is the minimum contiguous bandwidth considered suitable for individual licences and the industry as a whole? Are some of these considerations flexible in order to support an early move?
6. What spectrum sharing and incumbency considerations will be most relevant to 5G mmW bands (acknowledging that the answer will depend on the specific band under consideration)?
7. Do the mmW bands offer opportunities for new spectrum sharing and/or licensing approaches? If so, what opportunities should be investigated?

Issue for comment: IoT

To assist the ACMA in its considerations on IoT, comment (along with supporting evidence) is sought on the following questions:

8. Are there any spectrum bands that should be further investigated by the ACMA for potential future use for IoT applications? Why? The ACMA in particular seeks views on possible opportunities in the VHF band for IoT.
9. Are there any sectors of industry that require increased engagement from the ACMA regarding spectrum for IoT applications?

Issue for comment: DSA

To assist the ACMA in its considerations on the issues surrounding dynamic spectrum access, comment (along with supporting evidence) is sought on the following questions:

10. When, or under what circumstances, would it be appropriate to move beyond monitoring international regulatory and technical developments and consider implementation of arrangements in Australia?
11. Are there specific industry sectors and applications where DSA is likely to be a candidate for early opportunity for adoption?
12. Are there simple changes that can be made to the regulatory framework that would better allow facilitation of trials of DSA approaches and development of implementation arrangements?
13. Are there any spectrum bands, services and/or applications, in particular that will be, or should/shouldn't be, targeted in Australia for trials or initial implementation of DSA frameworks?

Issue for comment: 5G, IOT and DSA

Are there any impediments or restrictions arising from the regulatory framework that would impact on the deployment of 5G, IOT and DSA?

Issue for comment: The ACMA's approach to the 12-month work plan

The ACMA welcomes feedback on our proposed approach to the development of the 12-month work plan, including its format and content. The ACMA is also keen to receive feedback on the proposed communication channels for notifying stakeholders of progress on and changes to the work plan.

Part 1—
Setting the ACMA's priorities
and annual work program



Introduction

The ACMA is an independent statutory authority within the Australian Government's communications portfolio. One of the ACMA's key responsibilities is to manage the radiofrequency spectrum in accordance with its obligations under the *Australian Communications and Media Authority Act 2005* (the ACMA Act), the *Radiocommunications Act 1992* (the Act) and the *Broadcasting Services Act 1992* (the BSA). The scope of the ACMA's spectrum related role includes planning, allocation and licensing activity, device regulation and compliance.

The communications environment is continually changing and evolving. Demand for access to spectrum by new and increasingly sophisticated wireless technologies and uses continues to put pressure on the spectrum management framework. When making decisions, the ACMA needs to balance this unprecedented growth in demand by new users against the requirements of existing users for ongoing access to spectrum. The ACMA must also strike the balance between government uses of the spectrum¹ and other applications that it may be inappropriate to leave to market forces to address, and its availability for use by the broader community.

For over a decade, the growth in mobile telephony, including the recent rapid rise in mobile broadband traffic, has been a key driver of changes in the demand for radiofrequency spectrum. The ACMA has provided detailed public guidance on its associated strategy and work program because mobile broadband often favours bands that are heavily encumbered for a range of reasons. Therefore, how the ACMA continues to accommodate its future growth will be of interest to other industry sectors and users that value access to fit-for-purpose spectrum.

The ACMA strives to deliver spectrum management activities consistent with the ACMA's strategic goal to make communications and media work in Australia's public interest. The FYSO is an important component of the ACMA's engagement strategy with spectrum users and the community. It complements the ACMA's program of public forums, including the flagship RadComms conferences and subject-specific tune-up events.

Purpose

The FYSO provides an overview of the ACMA's spectrum management priorities over the near to medium term, and the ACMA's plans to address them. It also provides visibility to stakeholders about how the ACMA is directing its resources and which spectrum projects are considered a higher priority.

For the first time, the FYSO will feature a dedicated 12-month plan in which the ACMA identifies milestone tasks and timings for priority spectrum management activities to be completed. This FYSO also includes the ACMA's inaugural detailed update on its mobile broadband work program.

Publication of the FYSO serves a dual purpose—transparency to spectrum users about the ACMA's spectrum management priorities and an avenue for meaningful engagement with stakeholders about the ACMA's approach.

How evidence informs the development of the FYSO

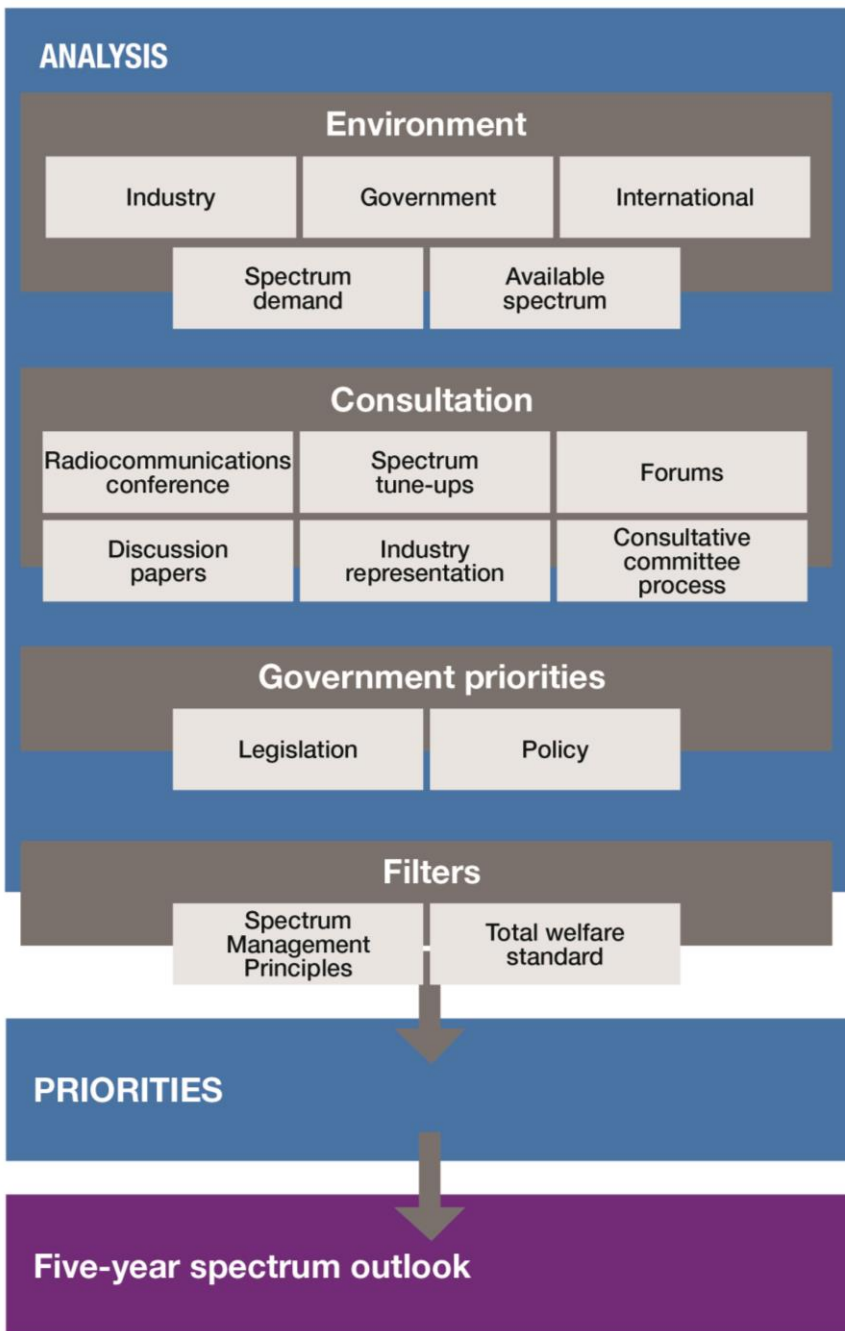
The ACMA scans the domestic and international spectrum environment to identify trends in spectrum use and likely future pressure points on spectrum. While there is an inherent degree of uncertainty in predicting spectrum requirements in future years, consideration of available evidence in advance of the likely pressure points on

¹ Government uses includes defence, emergency and public safety services, and scientific purposes.

spectrum is valuable for two reasons. Firstly, it should ensure that the ACMA’s work priorities are closely linked to actual emerging demand pressures. Secondly, it should provide a greater degree of industry certainty about the ACMA’s priorities and promote dialogue with spectrum users about these priorities.

Figure 1 below represents the ACMA’s demand analysis framework. It illustrates how evidence informs the development of the ACMA’s FYSO. It sets out the different types of information and data the ACMA gathers, and the tests it applies to support its decision-making and regulatory policy development activities.

Figure 1: The ACMA’s spectrum demand analysis framework



Spectrum research program

Research and analysis provides important information for regulatory decision-making in the broader spectrum management environment. The ACMA has identified the following priority research areas related to spectrum management over the next 12 months.

Spectrum and pricing reviews

With implementation of the spectrum and pricing reviews being such a strong focus for the ACMA over the coming year, our research and analysis is being directed towards supporting analysis for the reform of allocation, licensing and pricing arrangements associated with the reviews. The intent of the research will be to assist the ACMA in its implementation of the reviews and will also be used as a vehicle to engage spectrum users in the implementation process.

Highest value use of spectrum

Consistent with the ACMA's [mobile broadband strategy](#), this research will estimate the highest value of use for spectrum bands that are identified as being under consideration for mobile broadband use. It is expected that in 2016–17, the ACMA will release preliminary and/or comprehensive analyses of the highest-value use of the 1.5 and 3.6 GHz bands. This research has previously been identified in the [2015–19 FYSO](#).

AM radio in regional Australia

This project is contributing to an evidence base on the role of AM radio in the contemporary communications environment, including consideration of the value of potential alternative uses of the spectrum.

The ACMA is conducting research to understand the impact of moving from an AM radio platform to FM or other broadcasting technologies such as DAB+ digital or streaming radio. This research is designed to support the second recommendation in the Digital Radio Report (the 2015 Department of Communications Review under section 215B of the BSA and section 313B of the Act), which states the government should give the ACMA responsibility for determining where and when digital terrestrial radio services can commence.

Total welfare standard

Consistent with the spectrum management functions set out in the ACMA Act, the object of the Act is to provide for management of the radiofrequency spectrum in order to achieve a number of goals, including:²

- > maximise, by ensuring the efficient allocation and use of the spectrum, the overall public benefit derived from using the radiofrequency spectrum.

Subject to the statutory framework provided by the Act, the ACMA uses a [total welfare standard](#) as its overarching framework when assessing the optimal approach to individual spectrum management issues. Since 2007, the ACMA has adopted a total welfare standard for use when:

- > the policy and legislative framework provides the ACMA with discretion about the tests it might apply
- > a regulatory intervention might have a significant economic impact on consumers, producers or other stakeholders.

² The object of the Act is to provide for management of the radiofrequency spectrum, to achieve the goals set out in paragraphs 3(a) to 3(h).

When a total welfare standard is applied, the impact of a regulatory proposal on the public interest is measured as the sum of the effects on consumers, producers, government and the broader social impacts on others in the community. A total welfare standard requires that, to the extent possible, all significant benefits and costs arising from a regulatory proposal are given the same weight regardless of the identity of the recipient; and the approach expected to generate the greatest net benefits for the community is the preferred approach. This is consistent with guidance provided by the Office of Best Practice Regulation (OBPR).³ The ACMA recognises that using a total welfare standard approach to assess costs and benefits will often need to take into account both quantitative and qualitative factors.

Principles for Spectrum Management

The ACMA's [Principles for Spectrum Management](#) (the Principles) are designed to provide further guidance about the ACMA's approach to management of the radiofrequency spectrum. They are intended to guide ACMA's management of the radiofrequency spectrum within its existing legislative responsibilities and government policy settings. The key objective of the principles is to maximise the overall public benefit from use of the spectrum.

The Principles are:

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

Application of the Principles to the ACMA's decision-making process is consistent with good regulatory practice. The Principles provide direction that will generally result in welfare being maximised and, together with use of a total welfare standard discussed below, articulate the ACMA's proposed standard approach to spectrum regulation.

Spectrum management decision-making framework

The ACMA is required to make spectrum management decisions and develop subordinate legislation for the purposes of planning, allocation, licensing and pricing. To ensure that these decisions are well-informed, robust and meaningful, the ACMA has developed a spectrum management decision-making framework (the Framework).⁴ This uniform approach to the assessment of relevant information ensures consistency in the ACMA's decision-making and accords with the principles of best regulatory practice.

The Framework is informed by:

- > assessing the spectrum environment through:
 - > monitoring international developments
 - > listening to the needs of industry
 - > awareness of broader government requirements
 - > identification of spectrum demand/supply equation
 - > future needs of incumbents

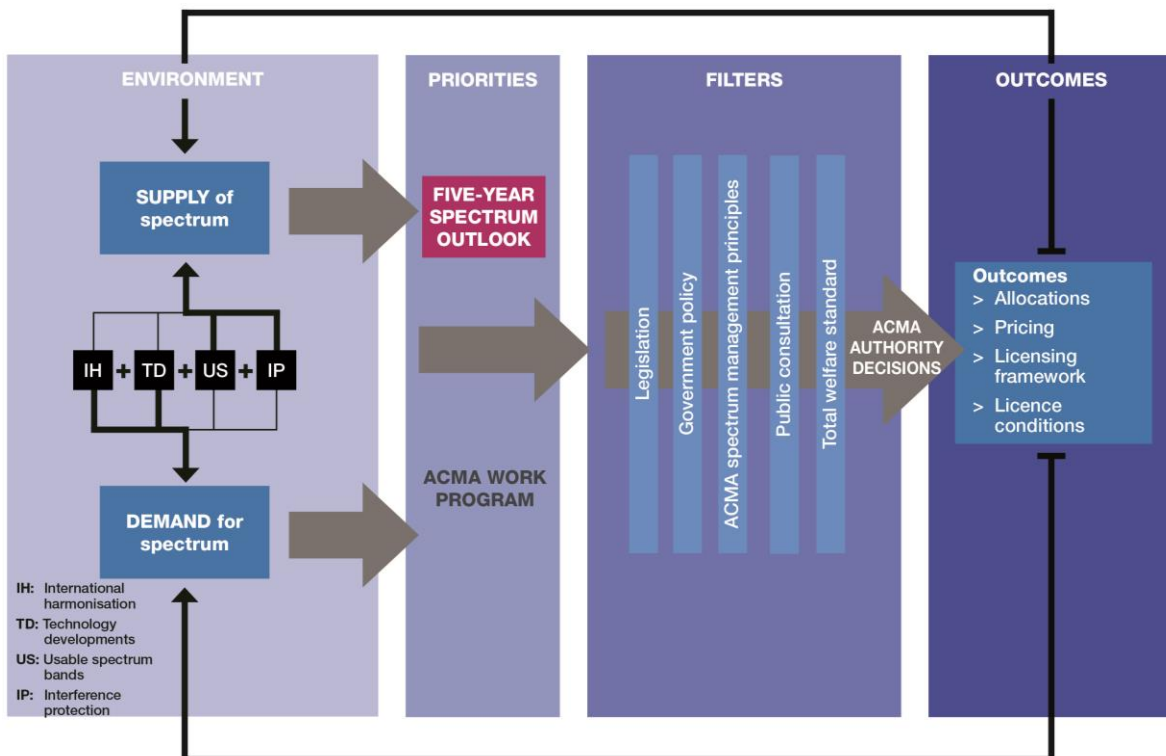
³The OBPR, [The Australian Government Guide to Regulation](#), p. 48, viewed 1 May 2015.

⁴www.acma.gov.au/theACMA/About/The-ACMA-story/Facilitating/decisionmaking-process-fyso-25-1

- > consulting with industry and government via:
 - > the ACMA's annual radiocommunications conference, RadComms
 - > the ACMA's spectrum tune-ups
 - > other radiocommunication forums
 - > ACMA discussion papers
 - > industry representations
 - > submissions to relevant spectrum projects, including the ACMA's FYSO
- > identifying regulatory frameworks via:
 - > relevant legislation
 - > government policies on spectrum
- > applying overarching filters such as:
 - > the Principles for Spectrum Management
 - > the total welfare standard.

Figure 2 illustrates ACMA's spectrum management decision-making framework. This process is designed to ensure that the ACMA has a clear understanding of the technical, economic and social environments governing users and services, which enables the ACMA to implement spectrum-management decisions that address these needs. As indicated by the arrows encircling this diagram, spectrum management outcomes affect the environment and the demand for and supply of spectrum and so in this sense, the process is iterative.

Figure 2: The ACMA's spectrum management decision-making framework



2015–16 activities

In future editions of the FYSO, the ACMA will report on the progress made against the previous 12-month work plan. This will include a discussion on any aspects of the work plan that were not realised. It will also identify any revised priorities and unexpected work that may have contributed to progress against the work plan.

This edition lists the ACMA's spectrum management activities since the 2015–19 FYSO was released in Table 1 below.

Table 1: Completed projects

Work task	Final outcomes
803–960 MHz band reforms	<p>In November 2015, the ACMA released a paper containing decisions on a range of reforms in the 803–960 MHz band. Key decisions arising from the review included:</p> <ul style="list-style-type: none"> > 2 x 15 MHz of 4G-standardised spectrum will be made available for new mobile broadband services from 2024 onwards. This spectrum will come from the 850 MHz 'expansion band', which is lower-adjacent the current 850 MHz 3G band used by Telstra and Vodafone Hutchison Australia (VHA). > Up to 7 MHz (5 or 7 MHz depending on geographic area) will be made available from the 928–935 MHz segment and optimised for new and innovative machine-to-machine (M2M) applications and networks to support the IoT. > Many fixed and land mobile users will be required to change frequencies or cease operation to accommodate the above reforms. The decision paper contained an implementation plan detailing requirements for affected users.
Release of mobile broadband strategy and work plan	<p>Mobile broadband strategy and work plan Strategy for addressing the growth in mobile broadband capacity and an associated February 2016 edition work plan were released on 24 February 2016.</p>
3.4 GHz—revised technical framework	<p>Finalised revision of the technical framework. Multiple offers for re-issue have been made. The new licence term commenced on 14 December 2015.</p>
27 GHz—transition of spectrum to apparatus licences	<p>The Minister for Communications repealed the instrument that designated the 27 GHz band to be allocated by issuing spectrum licences. This had the effect of ceasing restrictions on issuing apparatus licences in the band when the spectrum licences expired on 17 January 2016. The ACMA worked with incumbent spectrum licensees to transition their licences from spectrum licensing to apparatus licences.</p>
400 MHz band—implementation outcomes	<p>Licensees made progress towards 400 MHz band milestone requirements. The ACMA actively informed licensees through public tune-ups, e-bulletins, and presentations at key industry conferences. Staff also met with many stakeholder groups to resolve specific issues, including licensees facing difficulty meeting milestone requirements and negotiated favourable outcomes such as providing additional time, where impact on other licensees was low and overall 400 MHz implementation objectives were still met.</p>

Work task	Final outcomes
	<p>A new Harmonised Government Spectrum Area licensing option was introduced, providing flexibility and administrative streamlining opportunities for government licensees.</p> <p>Coordination procedures for point-to-multipoint services in the 400 MHz band were updated in May 2016 to include a low powered model. See IFC 3/2016 Proposed updates to RALI FX 16 and FX 20.</p>
<p>Satellite Earth station coordination arrangements</p>	<p>Coordination procedures to facilitate the operation of the European Space Agency (ESA) New Norcia Earth station facility:</p> <ul style="list-style-type: none"> > Following public consultation, in January 2016 coordination arrangements were put in place supporting ESA operations in the frequency bands 7145–7235 MHz, 8400–8500 MHz, 25.5–26.5 GHz, 31.8–32.3 GHz and 34.2–34.7 GHz. > In December 2015, arrangement for television outside broadcast services in Perth were updated to include spectrum coordination arrangements for access to parts of the 2025–2110 MHz and 2200–2300 MHz bands for short-duration activities, including launcher tracking and launch and early orbit support. <p>See IFC 27/2015 Coordination arrangements with ESA New Norcia Earth station.</p>
<p>Rollout of SPECTRA</p>	<p>On 31 May 2016, the ACMA switched on the final piece of its new integrated spectrum management tool—the SPECTRA Enterprise Suite or SPECTRA. This brings to a close the multi-year, multi-dimensional initiative to upgrade the ACMA’s spectrum management capabilities.</p> <p>The ACMA now has the infrastructure in place to allow it to continue to support existing planning and licensing arrangements, as well as implement the government’s reform agenda. In its initial implementation, SPECTRA has improved the productivity of ACMA staff, provided accredited persons (APs) with the ability to lodge complete licence applications on behalf of their clients, and allows the ACMA to make the data published in the Register freely available through downloads and APIs, which enables the development of third-party apps and systems. The ACMA continues to work with the software provider to improve the performance of the system.</p>
<p>Planning for rollout of digital radio</p>	<p>The ACMA has been working closely with the radio industry to facilitate the rollout of digital radio into regional areas of Australia.</p> <p>Following the recommendations of the report of a statutory review into digital radio, the ACMA established a joint government-industry Digital Radio Planning Committee. The committee has met four times since September 2015 and is focusing on planning the rollout of digital radio in regional areas where it is economically feasible to do so, starting with the permanent licensing of the Canberra and Darwin trial services.</p> <p>A technical sub-committee has been formed to develop high-level technical planning principles and parameters for the allotment of frequency blocks for the digital radio expansion into regional Australia. The planning principles provide a basis for the planning of DAB+ in regional Australia.</p> <p>The technical sub-committee has been looking at a number of planning scenarios using modelling from both the ACMA and industry. With only 14 MHz of spectrum available for digital radio, careful planning of regional services will be needed to balance the need to provide suitable coverage within markets</p>

Work task	Final outcomes
	<p>while maximising the number of markets that can be planned within the available spectrum.</p> <p>Through the committee, industry has expressed an interest in 39 potential 'early mover' markets, where it may be economically feasible to roll out within the next five years.</p>
<p>Certificate of Proficiency—changes to recognition of qualifications</p>	<p>The ACMA amended the requirements under which marine radio Certificates of Proficiency recognise assessments provided by registered training organisations (RTOs). The Australian Maritime College, the ACMA's delegate for issuing Certificates of Proficiency, will now accept a Statement of Attainment from an RTO as evidence of qualifications to issue a Certificate of Proficiency. Through this initiative, the ACMA is contributing to the government's broader reform program by removing duplication in the training and assessment framework. The ACMA continues to pursue further reform of the qualifications arrangements.</p>
<p>Compliance—LED globe technical standards</p>	<p>The ACMA initiated a technical standards audit program of LED globes in response to the surge in complaints about interference to domestic broadcast television services from LED lighting.</p> <p>The program's objectives were to assess and improve compliance. The ACMA audited over 50 targeted devices supplied by approximately 24 suppliers. Audits were also conducted when LED lighting was the source of interference complaints reported to the ACMA.</p> <p>The overall result indicated that there was no systemic non-compliance.</p> <p>A targeted education and awareness campaign was developed to raise awareness amongst suppliers about the most significant risks and their potential consequences, as well as the overall compliance regime. Together with the Lighting Council of Australia, a video was made that emphasised the risk of unauthorised design changes to LED globes by off-shore manufacturers.</p> <p>This resulted in a significant decrease in the number of confirmed LED cases since this compliance activity was initiated—especially following the ACMA's targeted supplier awareness campaign. Confirmed cases of LEDs causing domestic systems interference decreased from a peak of 74 in 2014 to under 10 in the two most recent quarters.</p>
<p>Compliance—transmitter licensing</p>	<p>The ACMA focused its attention on the areas where systemic compliance issues had been identified. These included:</p> <ul style="list-style-type: none"> > Australian suppliers importing and selling devices configured for overseas markets that would need to comply with the Radiocommunications (Low Interference Potential Devices) Class Licence 2015 (the LIPD class licence). > Radio Frequency Identification Devices (RFIDs) were pinpointed as a significant source of interference to Public Mobile Telephone Networks (PMTS). Operators of non-compliant devices have also been the subject of escalated compliance investigations. > The cases of interference to PMTS networks investigated highlighted a pattern of operators directly importing devices from other jurisdictions, which circumvented regulatory controls, elevating the risk of interference.

Work task	Final outcomes
	<ul style="list-style-type: none"> > Land mobile apparatus licensees with the area-wide special licence condition⁵ were targeted because of the number of investigations conducted during 2014–15. These licensees had authorised third-party users under their licence, but had not appropriately issued the authorisation on the same terms as their land mobile licence. This resulted in interference to other radiocommunications users.
LIPD class licence update	<p>The LIPD class licence was updated in May 2016 to support:</p> <ul style="list-style-type: none"> > new devices, including building material analysis transmitters (stud, wiring and pipework in wall or floor detection devices), in-ground Ultra-wide band (UWB) devices, and radiodetermination transmitters used to measure the thickness of materials or depths in tanks for automated production systems > the removal of a limitation on the minimum bandwidth of digital modulation transmitters to facilitate the use of low data rate M2M wireless internet interconnections. <p>Access information about the consultation on this variation to the LIPD class licence. The next update is anticipated in 12–18 months.</p>

Significant issues affecting spectrum management in Australia

What is the external environment?

The external environment that the ACMA operates within is rapidly changing and evolving. New technologies and services are emerging and demand for access by new services to encumbered spectrum is increasing, along with the complexities associated with implementing appropriate and equitable access arrangements.

Examples of spectrum-enabled technologies whose impact is potentially global and transformative include the Internet of Things (IoT) and 5G mobile broadband technology. Both are discussed in more detail later in this Part.

IoT—‘a global infrastructure for the information society, enabling advanced services by interconnecting (physical and virtual) things based on, existing and evolving, interoperable information and communication technologies’⁶—encompasses a wide range of different wireless applications. Current or potential IoT applications have been identified in fields as diverse as transport and logistics, agriculture, health, resource management and public safety.

5G refers to a family of advanced wireless broadband technologies. Distinctive features of 5G will include the capacity to deliver unprecedented data speeds to and from mobile devices with very low ‘latency,’ that is, the time needed to convey information from one device to another.

⁵ The area-wide special licence condition specifies the geographical area in which the licensee is permitted to operate. This may include a city, state, the whole of Australia or another area. It is a condition of these licences that the licensee—and third-party users operating under the licence—must not cause interference to other users, nor will they be protected if another service interferes with them. The licensees must ensure that authorised third-part users do not cause interference to fixed licence services.

⁶ Recommendation ITU-T Y.2060—[Overview of the Internet of things](#).

While the full range of eventual uses and the rate of penetration and uptake of these technologies is difficult to predict, they will enable seamless access to a range of new and existing services. For example, the flexibility of 5G technology lends itself to a wide range of other uses and industries, including:

- > cloud storage, cloud gaming, video streaming
- > entertainment applications in automobiles, trains and aeroplanes
- > dense wireless sensor networks for smart cities, homes and energy grids
- > wireless links (instead of cable) for industrial applications
- > freight management information systems.

Looking further ahead, the very high wireless data rates and low latency of 5G may suit it to still-maturing applications, such as driverless vehicles—incidentally, another manifestation of the IoT.

The ACMA and stakeholders will need to build capabilities to respond to a number of significant challenges, including:

- > demand for mobile broadband capacity, including the rollout and development of 5G technologies, will lead to continuing demand for additional spectrum
- > certain developments in technology, such as DSA, will require spectrum but at the same time potentially provide solutions to more efficient use of spectrum for services such as broadcasting and land mobile
- > existing services, including broadcasting, satellite, fixed and science services, will require ongoing access to spectrum.

Part 2 of this document provides further discussion on the ACMA's consideration of these issues.

Competing demands for spectrum bands (especially in the lower frequencies) will require the regulator (in consultation with stakeholders) to carefully weigh decisions about the allocation of spectrum. This will include consideration of the needs of incumbent services, together with national safety and security obligations, and passive and sensing uses of spectrum.

The ACMA's analysis of the communications environment, coupled with our research program, will continue to be important in ensuring our understanding of the external environment remains current and allows our priorities to change as we respond dynamically to changing pressures.

International developments/trends—World Radiocommunication Conference (WRC)

A key component of spectrum planning in Australia is participation in the spectrum planning activities of the International Telecommunication Union (ITU). The ITU is the United Nations specialised agency responsible for information and communications technology issues; providing a forum for governments and industry to coordinate global development and regulation of radiocommunication services and satellite services, amongst other things.

The ITU Radiocommunication Sector (ITU-R) plays a key role in the global management of the radiofrequency spectrum. The ITU-R assists in ensuring the rational, equitable, efficient and economical use of the radiofrequency spectrum by all radiocommunications services through carrying out studies and approving recommendations on radiocommunications matters. Where appropriate, decisions made by the ITU-R may flow through into updated Australian spectrum arrangements.

At a regional level, other organisations seek to achieve harmonised views on spectrum planning and radiocommunications issues. From an Australian perspective, the most important of these is the Asia–Pacific Telecommunity (APT), the Asia–Pacific region representative body in the ITU. Others include the Inter-American Telecommunication Commission (CITEL), the European Conference of Postal and Telecommunications Administrations (CEPT), the Arab Spectrum Management Group (ASMG) and the African Telecommunications Union (ATU).

The ACMA and Australian industry participate in international radiocommunications forums to promote Australia’s views and expertise—and to protect Australian interests—in spectrum management, facilitating the competitive provision of services and the efficient use of the radiofrequency spectrum.

Central to these issues is the ITU WRC, held every three or four years. The WRC reviews and revises the [Radio Regulations](#) that govern the international use of the radiofrequency spectrum and the geostationary-satellite and non-geostationary satellite orbits.

The last WRC was held from 2–27 November 2015. Taking account of the outcomes of WRC-15, the ACMA will update the Australian Radiofrequency Spectrum Plan (Spectrum Plan) at the end of 2016. Updates will include the implementation of changes made to the ITU-R Radio Regulations at WRC-15, where appropriate. Implementation of the outcomes of WRC-15, in addition to these changes, will be considered and addressed as necessary.

The next WRC is scheduled for late 2019 (WRC-19). The ACMA oversees extensive industry and stakeholder consultation in preparation for this and other important international radiocommunications meetings. Australian industry and stakeholder involvement is essential in ensuring that the decisions and future development of international radiocommunications regulations serve Australia’s interest. This work is led by the ACMA’s Preparatory Group for WRC-19 (PG WRC-19) and the Australian Radiocommunications Study Groups (ARSGs), which mirror the work of the ITU-R Study Groups. The ACMA chairs the PG WRC-19 and membership includes representatives of both government and industry. The six ARSGs are chaired by a mix of government and industry representatives, coordinated by the ACMA.

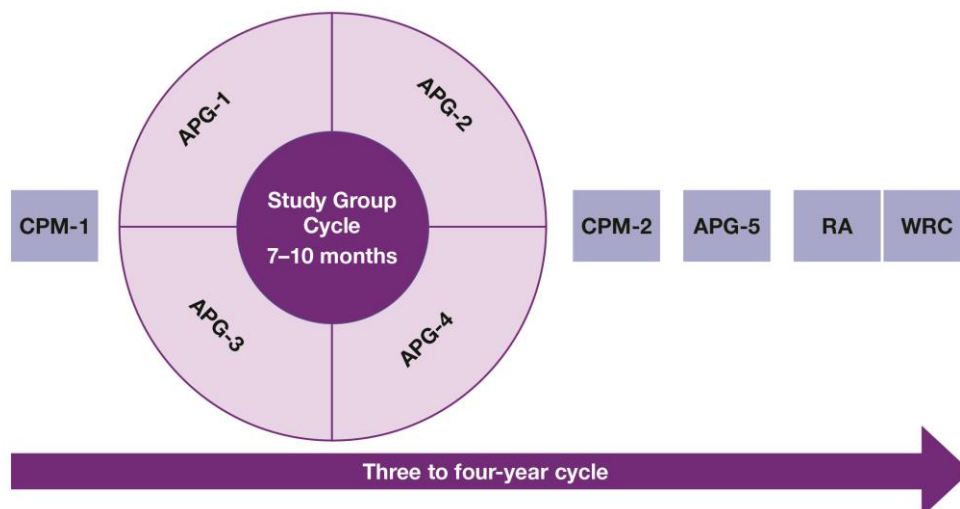
The [WRC-19 Agenda items and responsible ARSG](#) are available on the ACMA website.⁷

An important part in the WRC preparatory process involves the ACMA working closely with APT to achieve a coordinated approach to radiocommunications issues in the Asia–Pacific region. Cooperation within the APT results in Australia’s positions and proposals to a WRC being harmonised with those of other countries in the region, increasing the likelihood of these being considered favourably at the WRC.

Figure 3 below provides an illustration of the WRC cycle. Note the cycle is at the APG-2 stage of planning for WRC-19.

⁷ WRC-19 Agenda items www.acma.gov.au/Industry/Spectrum/Spectrum-planning/International-planning-ITU-and-other-international-planning-bodies/preparatory-group-wrc-19.

Figure 3: WRC cycle



Regulatory reform and the Spectrum Review

On 25 August 2015, the government agreed to implement the recommendations of the Spectrum Review undertaken by the Department of Communications and the Arts (DoCA). The main reforms include:

- > replacing the current legislative arrangements with new legislation that removes prescriptive process and streamlines licensing, for a simpler and more flexible framework
- > better integrating the management of public sector and broadcasting spectrum to improve the consistency and integrity of the framework
- > reviewing spectrum pricing to ensure consistent and transparent arrangements to support the efficient use of spectrum and secondary markets.

DoCA has commenced implementing these reforms with the support of the ACMA. On 10 March 2016, the government released a Legislative Proposals Consultation Paper, which discussed development of a new Radiocommunications Act. The proposals seek to make the spectrum management framework simpler, more efficient and flexible so that it better supports innovation in spectrum use and allows further streamlining of administrative processes. DoCA has also announced plans to conduct supplementary reviews into spectrum pricing and Commonwealth Government spectrum holdings. The ACMA expects to continue to provide advice and feedback to DoCA in relation to this work during the year ahead.

The outcomes of these processes will provide the legislative and policy basis for the ACMA to progress spectrum reforms. For example, the new legislative framework is expected to give the minister the opportunity to communicate strategic priorities to the ACMA in the form of ministerial policy statements. These statements are likely to provide important guidance for the ACMA in relation to a range of spectrum management functions.

The ACMA anticipates undertaking extensive stakeholder engagement on improving spectrum management under the new framework. The ACMA looks forward to the opportunities a new spectrum management framework will provide to more effectively and efficiently manage spectrum for the benefit of all spectrum users in Australia.

Review of the ACMA

On 12 June 2015, the Minister for Communications announcement a review of the ACMA. The review is examining the ACMA's objectives and functions, structure and governance, performance and resourcing to ensure that it remains fit-for-purpose both for the contemporary and future communications regulatory environment. DoCA released an issues paper in July 2015 and a draft report for consultation on 6 May 2016. The ACMA made submissions to the issues paper and draft report. Consultation on the draft report is under review by DoCA.

Further information about the [review of the ACMA](#) is available on DoCA's website.

ACMA's response to demand and new technologies

Addressing current and future demand

The ACMA continues to critically evaluate the demand and need for spectrum across all sectors to better understand the complex and dynamic interaction of social, economic and technical factors that will drive spectrum requirements.

Part of the ACMA's role is to gain an understanding of the critical drivers of future spectrum demand, and the likely impact of these drivers may have on the economy. These drivers are both varied and connected, and can materialise domestically and internationally. The ACMA uses research and analysis to pull these many inputs together to help make informed policy choices.

There is widespread recognition that mobile broadband services are an economic enabler and that the provision of these services, technologies and applications in the wider community is in the public interest. The expectation of end-users for access to services exhibiting increased speed and data allowance puts pressure on network operators to meet demand and leads to requests from operators for access to greater amounts of spectrum.

While this document considers and encourages discussion on a range of spectrum related topics, it acknowledges that a key focus is the ACMA's analysis of current and future demand for a particular use—mobile broadband. This is because demand for spectrum for this use has been the major driver for changes in highest-value use across a wide range of bands for many years now, with many national administrations around the world planning on the basis that this is likely to continue. It is anticipated that further spectrum will be needed to accommodate growing demand for various broadband applications and mobile data. WRC-19 will be considering options for new frequency allocations suitable for mobile broadband (such as Wi-Fi), including identification of spectrum suitable for 5G mobile broadband services.

Over the next few years, further pressure will be placed on the ACMA's existing capability to respond flexibly to new spectrum management challenges. The ACMA will continue to investigate and explore options to reform its regulatory toolkit to meet these challenges.

Mobile broadband strategy and work program

The spectrum management implications of the growth in demand for mobile broadband capacity continue to be critical issues for the ACMA. Mobile broadband spectrum management is one area the ACMA has, for a number of years, provided detailed public guidance on its associated strategy and work program.

In understanding and addressing mobile broadband growth, it is important to note that increases in mobile broadband capacity are enabled by three main factors:

- > access to additional spectrum or improved use of existing spectrum
- > use of increasingly efficient technologies
- > deployment of appropriate network infrastructure and topologies.

The evidence suggests Australia currently has sufficient spectrum available for mobile broadband services in the short to medium term. However, long lead-times for making additional spectrum available, and the importance of international harmonisation, mean that the ACMA will press ahead with work in this area. To that end, the ACMA released the discussion paper [Beyond 2020—A spectrum management strategy to address the growth in mobile broadband capacity](#) (Beyond 2020) on 10 September 2015. The paper sought industry feedback on the ACMA's medium- and longer-term planning approaches to address rising demand for mobile broadband services.

On 24 February 2016, the ACMA released its [Mobile broadband strategy—The ACMA's spectrum management strategy to address the growth in mobile broadband capacity](#). This was accompanied by an associated [Mobile broadband work program—February 2016 update](#) and a [summary of and response to submissions received to Beyond 2020](#).

The ACMA has a number of mobile broadband planning projects at various stages of consideration for access to additional spectrum. Part 2 of this document contains a project update on the aspects of the ACMA's mobile broadband work program that will be implemented over the next 12 months.

As part of its mobile broadband strategy, the ACMA committed to providing annual updates to the mobile broadband work program. In fulfilment of this commitment, the October 2016 update of the mobile broadband work program is at Part 3 of this document.

While demand for mobile broadband services has been the greatest driver of change of highest value use of spectrum in recent decades, other services continue to require access to spectrum, some at increasing and some at decreasing levels. New technologies including 5G, IoT and DSA are expected to have an effect on the demand for spectrum for various services.

The ACMA has commenced a program of preparatory work to facilitate access to spectrum for these technologies, which is discussed in the sections below. In addition to providing context and observations, the ACMA also poses specific questions on each of these areas of focus. Feedback on these matters will assist the ACMA's consideration and inform its next steps.

5G

With the successful establishment and relatively high take-up of 4G technologies, industry stakeholders are now looking towards the development of 5G services in the next progression of wireless technologies.

In February 2016, the ACMA released the occasional paper [5G and mobile network developments—Emerging issues](#). The paper examines 5G mobile developments and the opportunities that this evolution in mobile technology offers to the Australian community through increased use of mobile broadband and M2M communication. In the paper, it was identified that enabling the next phase of mobile network development is likely to require the ACMA's attention in a number of areas, including supporting the international harmonisation of spectrum arrangements to provide economies of scale for manufacturers and provide flow-through benefits to Australian

consumers arising from lower device costs. These activities have been factored into the ACMA's mobile broadband strategy and work program.

The 5G ecosystem is developing and definitions are still fluid. However, there appear to be a number of defining objectives for 5G that distinguish it from previous developments; including very low latency and data rates of 1–10 Gbps.⁸ In addition, integral to 5G is expected to be an 'anytime, anywhere, anyone and anything' capability, which is expected to play a role in supporting multiple device M2M communications and a wider deployment of the IoT in Australia.⁹ From a spectrum perspective, 5G appears certain to use (though not exclusively) large contiguous bandwidths (hundreds of MHz or more) in millimetre wave (mmW) bands.¹⁰

International spectrum harmonisation and technology standardisation, as well as corresponding international deployments, are at an early stage. International spectrum harmonisation via the IMT framework within the ITU-R and technology standardisation within the 3GPP are underway. However, these are not expected to conclude for some time (late 2019 for IMT work at WRC-19 and mid 2018 for finalisation of 3GPP Release 15).¹¹ 3GPP is envisioning deployment of phase 1 standardised 5G (Release 15) in mid-2020.² However, prior to formal standardisation and deployment, there are a number of trials planned around the world in the short and medium term, including in the United States, Korea, China, Russia and Sweden. Telstra has indicated plans to conduct trials in Australia during the 2018 Commonwealth Games.¹²

Beyond trials, there is also consideration in some administrations of early spectrum decisions on 5G, including possible full scale deployments. This includes the FCC's early identification of the 27.5–28.35 GHz, 37–40 GHz and 64–71 GHz bands for 5G. In addition, the European Commission released its [5G Action Plan](#), in which they state:

The Commission will work with Member States and industry stakeholders towards the voluntary establishment of a common timetable for the launch of early 5G networks by the end of 2018, followed by the launch of fully commercial 5G services in Europe by the end of 2020.

The EC has also flagged the 3.4–3.8 GHz band as a good candidate for early 5G and is also investigating early moves on mmW spectrum options in 24.25–27.5 GHz, 31.8–33.4 GHz and 40.5–43.5 GHz.¹³

While there is a focus on dedicated high frequency mmW spectrum bands for 5G, there has been some interest in the use of lower frequency bands, including the 2.3 GHz¹⁴, 2.5 GHz¹⁵, 3.5 GHz and 3.6 GHz bands. The 2.3 GHz, 2.5 GHz and 3.5 GHz bands are already available for use for mobile broadband services in Australia and could feasibly be used for early deployment of 5G or pre-standard 5G in Australia. The 3.6 GHz band is included in the initial investigation stage of ACMA's mobile broadband work program.

⁸ GSMA Intelligence, [Understanding 5G: perspectives on future technological advancements in mobile](#), December 2014, p. 6.

⁹ ACMA, [The Internet of things and the ACMA's areas of focus—Emerging issues in media and communications. Occasional paper](#), November 2015, p. 9.

¹⁰ Strictly speaking, millimetre waves (or mmWs) span 30 to 300 GHz (i.e. a wavelength of 1 cm to 1 mm), however in the current 5G context, mmW bands in consideration span from around 24 GHz up to 86 GHz.

¹¹ www.3gpp.org/images/presentations/optimised_poster.pdf

¹² <http://exchange.telstra.com.au/2016/02/22/five-world-class-mobile-technologies-coming-your-way/>

¹³ https://circabc.europa.eu/d/a/workspace/SpacesStore/1a40dd19-c8a8-4ed0-bc9c-6cc5a7755f7d/RSPG16-031Final_Opinion_5G_for_public_consultation.pdf

¹⁴ [Spectrum Challenges for 5G](#), Eric Fournier, Chairman, Electronic Communications Committee.

¹⁵ [Paving the Road to 5G](#), Sprint news release, 3 June, 2016.

As a general proposition, the ACMA avoids establishing spectrum management arrangements that are limited to a specific technology type. In other words, the ACMA aims to be technologically flexible. This technological flexibility not only provides scope for the use of a broad range of technologies, but also, ideally, the opportunity for spectrum users to migrate to newer technologies without regulatory intervention. However, it is noted that some view 5G as 'revolutionary rather than evolutionary' and that it will therefore require access to spectrum not currently used for mobile broadband services.

To that end, the ACMA's mobile broadband work program will continue to be updated to account for developments surrounding spectrum for 5G. The current early state of 5G means that there is little hard information available to inform the ACMA's thinking on spectrum management decisions. Accordingly, 5G mmW bands are at the 'monitoring' stage of the ACMA's mobile broadband work program. Specifically, this includes bands being studied under WRC-19 agenda item 1.13 and other bands being considered that are outside of the WRC agenda item in the United States and Korea (it is noted that the bands being contemplated in Europe are a subset of those listed under agenda item 1.13).

What's next?

The ACMA will continue to support industry in the development of 5G, including facilitating trials consistent with the ACMA's [guidelines on the trial of new radiocommunications technologies](#). The ACMA notes that some of the mmW bands being considered for 5G have relatively low incumbency and potentially manageable co-existence challenges. It may, therefore, be relatively simple to facilitate industry trials in appropriately chosen bands and locations.

The ACMA will continue to engage with stakeholders via the established international preparatory process to develop Australian positions, and where appropriate, contributions on WRC-19 agenda item 1.13 regarding spectrum harmonisation for IMT/5G.

More broadly, via the ACMA's contingency planning model for consideration of additional spectrum for mobile broadband services, Australia is well positioned to monitor and respond to early 5G developments outside of ITU harmonisation work. The ACMA recognises there are a number of factors that mean it may be appropriate for some 5G mmW bands to rapidly progress beyond the formal monitoring stage in the ACMA's mobile broadband work program. For example, recent FCC announcements have provided the first firm 5G regulatory decisions in a major market that may trigger a viable ecosystem development. This will be a turning point in the 5G spectrum debate, providing the first concrete outcomes that create the possibility for detailed, informed consideration of bands in Australia.

Recognising that these developments may occur rapidly, the ACMA will engage with industry prior to the next annual update of the ACMA mobile broadband work program to discuss possible progression of 5G mmW bands beyond the monitoring stage. The appropriateness and timing of any such actions will depend heavily on the availability of adequate information for the ACMA and industry to develop informed opinions on the matter. In addition, careful consideration of other spectrum management activities, including those within the mobile broadband space, will need to be given to the priority of this issue.

An important consideration in any such discussion would be: what is the most appropriate approach for Australia and the ACMA to adopt in the development of 5G spectrum arrangements in the mmW bands? For example, is a conventional or traditional approach appropriate, whereby Australia would wait until there were clear signs of a harmonised, widespread ecosystem developing in a band before it was

seriously considered domestically? Or should a more proactive approach be adopted that would potentially make available bands very early in a more speculative manner? There are clearly benefits and risks associated with each approach and these would depend strongly on the band being considered.

Complementary to this discussion on 5G in the mmW bands, and as outlined in the [mobile broadband work program](#) section of the FYSO, the ACMA will be releasing a paper on the 3.6 GHz band that will investigate the possibility of using the band for mobile broadband purposes. Given the increasing worldwide interest in this band for early 5G deployment, this near-term ACMA action supports early consideration of spectrum for 5G in Australia. To assist the ACMA in its considerations on this issue in the context of its broader mobile broadband work program (see Part 3), comment (along with supporting evidence) is requested on the following questions:

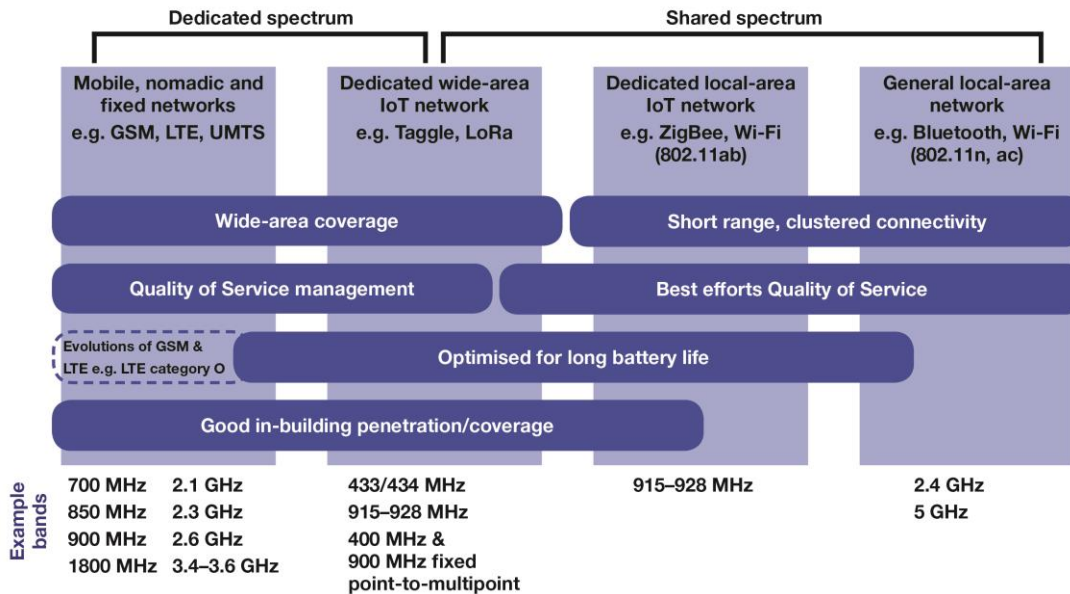
1. When, or under what circumstances, would it be appropriate for potential 5G mmW bands to progress beyond 'monitoring' in the ACMA's mobile broadband work program?
2. What is the relative priority of investigation of mmW bands versus other potential mobile broadband bands below 6 GHz?
3. What disposition should the ACMA adopt in progressing possible 5G mmW bands? Specifically, is a traditional approach appropriate, where Australia would wait until there were clear signs of a harmonised, widespread ecosystem developing in a band before it was seriously considered domestically? Or should a more proactive approach be adopted that would potentially make available bands very early in a more speculative manner? What are the benefits and risks to each approach?
4. What bands are the most mature in terms of possible early moves on 5G mmW bands?
5. What technical considerations are relevant to possible early moves on 5G mmW bands? For example, what is the minimum contiguous bandwidth considered suitable for individual licences and the industry as a whole? Are some of these considerations flexible in order to support an early move?
6. What spectrum sharing and incumbency considerations will be most relevant to 5G mmW bands (acknowledging that the answer will depend on the specific band under consideration)?
7. Do the mmW bands offer opportunities for new spectrum sharing and/or licensing approaches? If so, what opportunities should be investigated?

Internet of things (IoT)

The IoT is one of a number of developing wireless applications that require access to radiofrequency spectrum for operation. In November 2015, the ACMA released an occasional paper, [The Internet of Things and the ACMA's areas of focus](#), which explored Australia's state of readiness for IoT and areas where the ACMA can further facilitate IoT developments. The paper identified spectrum as an infrastructure and device enabler for IoT.

Given the diverse range of uses and users of IoT, these applications are being deployed across a broad range of radiofrequency bands under a mixture of spectrum authorisation protocols. This is illustrated in Figure 4.

Figure 4: Spectrum available for IoT applications



Source: ACMA, based on Ofcom model 2015, updated for Australian spectrum band plans.

In many cases, there is radiofrequency spectrum already available for use for IoT applications. For example, because IoT applications using ‘commons’ spectrum do not require individual licensing, they can be rolled out now provided they comply with the technical requirements that are in place. A further example is IoT applications on networks using spectrum that is already licensed, such as existing cellular networks. These applications can and are being deployed in a range of bands within the existing regulatory framework, in cooperation with existing licensees.

Given the huge diversity of users and uses of IoT, there is no one simple solution to spectrum access for all of these applications. IoT is trending towards requiring access to a range of different bands under a range of access protocols, from dedicated spectrum to ‘commons’ spectrum, and options in between. Therefore, the ACMA is monitoring developments in IoT to ensure that all relevant spectrum arrangements take into account these emerging applications. While facilitating international harmonisation is a key goal of the ACMA’s spectrum management, the different spectrum arrangements between Australia and other regions and individual countries mean that not all overseas solutions can be adopted in Australia.

For low power, low data rate communications specifically geared towards IoT applications using the 900 MHz band, as part of the implementation of the ACMA’s review of the 803–960 MHz band, the ACMA has taken steps to make new spectrum available to support a range of applications, including M2M applications such as automation, switching, metering and control. While permanent arrangements in this new band are not set to be in place until 2021, early access will be considered on a case-by-case basis, subject to compatibility with incumbent services and compliance with the conditions of those permanent arrangements.

In a second initiative, class licensing arrangements for existing spectrum in the ‘commons’ part of the 900 MHz band (915–928 MHz) were recently updated to better facilitate the use of low data rate M2M wireless internet interconnections.

What's next?

The ACMA is working with industry to raise awareness and examine adequacy of spectrum arrangements for IoT. The IoT Alliance Australia (IoTAA) was established in February 2016 and officially launched in July 2016 to shape the regulatory and collaborative framework to harness the opportunities generated by the IoT for Australian industry. The IoTAA grew from the Communications Alliance IoT think tank, established in June 2015. The IoTAA includes six work streams across key IoT enablers and inhibitors, including a work stream on spectrum.

The ACMA is an observer on the Executive Council of the IoTAA and chairs the spectrum work stream of the IoT Alliance. The aim of this work stream, which includes a range of IoT stakeholders, is to address the spectrum settings and licensing needs for IoT generally, with a focus on spectrum for low bit rate wireless services, such as low power, wide-area applications.

Studies on the technical and operational aspects of radio networks and systems, as well as spectrum needed, including possible harmonised use of spectrum to support the implementation of narrowband and broadband machine-type communication infrastructures, will also be undertaken in preparation for WRC-19. The Director of the Radiocommunication Bureau will report on this study as part of his overall report to WRC-19. WRC-19 will then decide on the next appropriate action. The ACMA intends to monitor this work and engage with stakeholders through the usual international preparatory process to develop Australian positions on these matters.

The ACMA will continue to monitor developments in IoT to ensure that spectrum arrangements are appropriate to account for emerging applications and trends. For example, the ACMA is considering opportunities for IoT in the future review of the VHF band.

To assist the ACMA in its considerations on IoT, feedback (along with supporting evidence) is sought on the following questions:

8. Are there any spectrum bands that should be further investigated by the ACMA for potential future use for IoT applications? Why? The ACMA in particular seeks views on possible opportunities in the VHF band for IoT.
9. Are there any sectors of industry that require increased engagement from the ACMA regarding spectrum for IoT applications?

Dynamic spectrum access (DSA)

Spectrum sharing is fundamental to effective spectrum management and a key tool in maximising the benefits achieved through use of the spectrum resource. The ACMA, like all national spectrum managers, consistently advocates the sharing of spectrum in an effort to maximise the overall public benefit derived from use of the spectrum. As with all forms of resource sharing, spectrum sharing requires some degree of compromise between multiple spectrum uses (that is, services or applications) or users (individual licensees) accessing the shared spectrum.

Traditionally, spectrum sharing has largely focused on static approaches that establish co-existence arrangements defined through fixed geographic and spectral boundaries. It has been far less common to use dynamic spectrum sharing approaches, sometimes referred to collectively as DSA or dynamic spectrum management, that take advantage of time-based changes in spectrum usage and therefore availability. DSA relies on the ability of secondary users¹⁶ to be aware of their environment in order

¹⁶ In this context, a secondary user is a user that has lower priority compared to a primary user under a DSA arrangement (i.e. it is not primary and secondary as defined in ITU Radio Regulations Article 5).

to access spectrum, while co-existing with primary users/uses of the band. At this stage, three major techniques to enhance a device's awareness of its surroundings have been identified: geolocation with database look up, sensing, and beacon transmissions. These techniques can be used to make use of spectrum 'white space', where secondary users take advantage of intermittent, occasional or itinerant use by primary users. Services can be geographically variable but relatively slow-changing, like in a frequency band used by broadcasting services, or have relatively high levels of temporal availability that is constantly changing, like in a frequency band used by land mobile services.

Limited use of DSA in the past is in part due to technological limitations and user expectations. As such, regulatory frameworks have not been widely developed to facilitate spectrum sharing through DSA. In effect, the complexity and compromises that are customarily associated with more dynamic spectrum-sharing arrangements has meant that these approaches have not, on balance, been considered appropriate in an attempt to achieve more efficient use of the spectrum.

Internationally, DSA frameworks have been developed to allow certain devices to operate on a licence-exempt basis ([white space devices in the USA](#)¹⁷ and in the [UK](#))¹⁸. More recently, a framework for access on a licensed basis has been approved for [TV white space devices in the UK](#).¹⁹ The CEPT has developed the concept of Authorised Shared Access (ASA)²⁰. This was followed by the development of a [Licensed Shared Access \(LSA\)](#)²¹ spectrum management framework for the 2300–2400 MHz band based on DSA, with the first LSA trials in France.²² 3GPP has released a standard introducing a DSA scheme named [Licensed Assisted Access \(LAA\)](#)²³ for LTE, combining use of licensed and unlicensed spectrum in the 5 GHz band to deliver the next generation of mobile services. Similarly, a DSA framework has been developed for [the 3550–3700 MHz band in the USA](#)²⁴ for incumbent, licensed and licence-exempt users, while Ofcom has started consultation to investigate more intense sharing techniques based on [DSA in the 3800–4200 MHz band](#).²⁵

Although an increasing number of the DSA frameworks have been proposed or introduced by overseas spectrum regulators, domestic opportunities for full-scale deployment of DSA techniques and regulatory approaches have not yet presented themselves. The ACMA will continue to monitor international regulatory and technical developments, and implement DSA arrangements when and where appropriate. For example, the ACMA recently adopted a dynamic sharing framework in the 3400–3600 MHz band between terrestrial wireless broadband and Defence radar systems. While this framework does not specify the use of dedicated spectrum databases or sensing, it did explicitly allow for dynamic access to the spectrum by Defence radar systems in

¹⁷ www.ecfr.gov/cgi-bin/text-idx?SID=64bfd1445831a34d710caca4028c2cd6&mc=true&node=pt47.1.15&rgn=div5#sp47.1.15.h

¹⁸ <http://stakeholders.ofcom.org.uk/consultations/white-space-coexistence/statement>

¹⁹ <http://stakeholders.ofcom.org.uk/consultations/manually-configurable-wsds/>

²⁰ LSA and ASA are concepts that allow spectrum that has been licensed to another user to be used by more than one entity in areas or at times when it is not being used by the incumbent or primary user.

²¹ www.erodocdb.dk/Docs/doc98/official/pdf/ECCREP205.PDF

²² Information on LSA implementation and developments in European countries is available at www.cept.org/ecc/topics/lisa-implementation/.

²³ www.3gpp.org/news-events/3gpp-news/1628-rel13

²⁴ www.fcc.gov/rulemaking/12-354

²⁵ <http://stakeholders.ofcom.org.uk/binaries/consultations/opportunities-for-spectrum-sharing-innovation/summary/condoc.pdf>

a way that protects deployed broadband systems but does not mandate Defence to protect areas without operating broadband systems.²⁶

The ACMA is engaging with academic institutions, such as the University of Technology Sydney, regarding DSA and related technology advances.

What's next?

The ACMA will continue to investigate and pursue, where practical, opportunities for new and innovative forms of spectrum sharing, especially DSA approaches, to provide greater flexibility of spectrum use. Most recently, the ACMA articulated the investigation of new spectrum-sharing approaches in its [mobile broadband strategy](#), released in February 2016.

However, in line with Principle 5 of the Principles of Spectrum Management—*to balance the cost of interference and the benefits of greater spectrum utilisation*—the ACMA will carefully assess these new sharing techniques and regulatory approaches to determine if the increased spectrum utility delivered by DSA is, on balance, worth the resulting cost, complexity and compromises. The ACMA expects that while DSA opportunities will increase over time, there will remain a role for more traditional spectrum-sharing arrangements.

To assist the ACMA and industry in gaining experience and confidence with these new techniques, technologies and regulatory approaches, and consistent with its [guidelines on the trial of new radiocommunications technologies](#), industry is invited to discuss with the ACMA opportunities to facilitate trials of DSA in Australia. The ACMA believes that appropriately engineered and located trials are feasible and offer the chance to learn about ongoing DSA opportunities.

To assist the ACMA in its considerations on the issues surrounding dynamic spectrum access, comment (along with supporting evidence) is sought on the following questions:

10. When, or under what circumstances, would it be appropriate to move beyond monitoring international regulatory and technical developments and consider implementation of arrangements in Australia?
11. Are there specific industry sectors and applications where DSA is likely to be a candidate for early opportunity for adoption?
12. Are there simple changes that can be made to the regulatory framework that would better allow facilitation of trials of DSA approaches and development of implementation arrangements?
13. Are there any spectrum bands, services and/or applications, in particular that will be, or should/shouldn't be, targeted in Australia for trials or initial implementation of DSA frameworks?

²⁶ See Section 3.1, clause (4) of [Radiocommunications Advisory Guidelines \(Managing Interference to Spectrum Licensed Receivers — 3.4 GHz Band\) 2015](#) and Section 3.10 of [RALI MS 39 – Frequency coordination and licensing procedures for apparatus licenced public telecommunications services in the 3.5 GHz band](#).

Part 2—
The ACMA's work plan 2016–17



The ACMA's approach to the 12-month work plan

Part 2 sets out the ACMA's spectrum management work plan for the 2016–17 financial year. As discussed in Part 1, the ACMA identifies work priorities through application of its spectrum demand analysis framework. The projects and activities in the work plan evolve from these priorities. Although there is a degree of certainty about the priorities and identified project timings in the work plan, it will be an organic document. It is not intended that the work plan will remain static, but rather, it will be adjusted in accordance with shifts in priorities and extrinsic factors such as the government's priorities overall and, in particular, spectrum reform.

Over the 12-month period, the ACMA will continue to review its priorities in the expectation that events such as the implementation of the government's spectrum reforms and new demand pressures for spectrum through advances in technology will affect the work program.

If variations to the work plan are required within the period of the FYSO, the ACMA proposes to notify stakeholders about these changes, and the reasons why they were made, through updates on our website. The ACMA also proposes to conduct a tune-up specifically on the progress of the work plan during this first 12 months. Future editions of the FYSO will report on achievements against the previous work plan.

The ACMA welcomes feedback on our proposed approach to the development of the 12-month work plan, including its format and content. The ACMA is also keen to receive feedback on the proposed communication channels for notifying stakeholders of progress on and changes to the work plan.

The ACMA's work plan

The ACMA's 12-month work plan is presented in two parts:

- > in the first part, key priority projects are grouped under three broad themes
- > in the second part, projects and activities in two tables are listed on the following basis:
 - > band-by-band projects
 - > regulatory and service-planning projects.

Key priority projects

The ACMA has identified 10 key priority projects in which work will either commence, continue or be completed over the next 12 months. These are the areas where the ACMA expect peaks in both workload and focus to occur.

The projects are grouped under three themes, as shown in Table 2 below. The themes reflect the framework that guides the ACMA's prioritisation of spectrum management work:

- > The first theme—maximising the overall public benefit arising from the use of spectrum—reflects the ACMA's Principles for Spectrum Management.
- > The second theme—reducing the cost to business arising from regulation—reflects the government's better regulation agenda. This is consistent with the government's objective to remove the impediments to regulation by increasing productivity from innovation and the digital economy.
- > The third theme—implementing current reform priorities—recognises that the ACMA is responsible for implementing outcomes from major reforms.

Table 2: The ACMA’s key priority projects

Theme	Key priority projects
Maximising the overall public benefit arising from use of spectrum	Implementation of the mobile broadband strategy and work program
	Priority compliance areas
	Spectrum pricing initiatives
	Spectrum allocations
	Regional digital radio rollout
	AM to FM conversions of commercial radio broadcasting services in regional licence areas
Reducing the cost to business arising from regulation	Customer self service
Implementing current reform priorities	Spectrum Review implementation
	Implementing outcomes from the 400 MHz band review
	Update to the Australian Radiofrequency Spectrum Plan

Theme—Maximising the overall public benefit arising from use of spectrum

Implementation of the mobile broadband strategy and work program

Background

Addressing the growth in demand for mobile broadband capacity has been a headline issue in the ACMA’s spectrum management work program since its inception in February 2006. While traditionally the search for additional spectrum for mobile broadband services has been focused on frequency bands below around 4 GHz, recent international interest has extended into higher frequency bands well above 6 GHz.

The ACMA is of the view that supporting the continued growth of mobile broadband services would promote the object (section 3) of the Act, including the maximisation of the overall public benefit derived from using the radiofrequency spectrum, and would be consistent with the Principles. However, as required under the Act and the Principles, the ACMA’s spectrum management decisions in support of mobile broadband need to be balanced with the impacts on other spectrum users.

Project phase

The mobile broadband work program includes several mobile broadband planning projects at various stages of consideration. The following implementation activities will be undertaken over the next 12 months.

Table 3: Next steps—implementation of the mobile broadband strategy and work program

Work task/activity	Stage/phase	Project	Timing
Release of discussion paper to further progress consideration of the 1.5 GHz and 3.6 GHz bands	Initial investigation	Mobile broadband work program	Q4, 2016
Consult on an appropriate re-farming mechanism and reform timetable for the 890–915 MHz/935–960 MHz band	Re-farming	Implementation of the outcomes of the 803–960 MHz band review	Q4, 2016
Observe and analyse bands identified in the monitoring stage of the process for consideration of additional spectrum suitable for mobile broadband services (including international engagement on bands as appropriate) on an ongoing basis	Monitoring	Mobile broadband work program	Ongoing

Priority compliance areas

Background

The purpose of the priority compliance area (PCA) program is to direct the ACMA’s compliance resources towards identified compliance problems and areas of highest risk. PCAs address cases of harmful interference that are of high risk to spectrum utility, or of high risk to public safety or the public interest.

Establishing PCAs means that the ACMA has forward-looking and fit-for-purpose compliance strategies that address the highest-risk issues. PCAs are reviewed annually. As part of the annual review process this year, the ACMA consulted directly with industry about its compliance priorities through an industry tune-up titled *Setting our compliance priorities*. The ACMA will continue to engage with industry in this way and this will form part of the PCA review process in future years.

PCAs are set based on evidence from intelligence-gathering mechanisms, analysis and risk assessment. The specific activities implemented for each PCA are dependent on the issue and appropriate compliance response. The ACMA prefers to use non-regulatory measures, such as education and awareness, to prevent non-compliance. Where appropriate, regulatory measures (auditing, monitoring and enforcement) are applied to ensure compliance. By using a tailored approach, the ACMA is able to extend its regulatory reach in an effective and targeted way.

The ACMA also continues to investigate and respond to high-risk issues (for example, prohibited devices such as mobile phone jammers and unlicensed mobile phone repeaters) that fall outside these priority areas on a case-by-case basis.

[PCAs for 2016–17](#) were published on the ACMA website in July 2016.

Table 4: Next steps—PCAs

Work task/activity	Stage/phase	Project	Timing
Interference management	Finalisation	PCA	June 2017
Customer cabling compliance	Finalisation	PCA	June 2017
Transmitter licensing compliance with a focus on services operating in segment 'Y' of the 400 MHz band	Finalisation	PCA	June 2017
Annual review of PCAs and consultation with industry	Preparation	PCA	Q1, 2017

Spectrum pricing initiatives**Background**

All apparatus and spectrum licensees are affected by the pricing or taxation of spectrum. Taxation is one of the suite of management tools used by the ACMA to promote the efficient use of spectrum.

In response to the recommendations of the Spectrum Review, the government has announced a spectrum pricing review to be conducted by DoCA. As noted in the final report of the Spectrum Review, prices charged for spectrum will need to be reviewed to ensure that they are appropriate for the new legislative and licensing arrangements. DoCA will report to government on the outcomes of its review, and it is expected that new pricing arrangements will be implemented to coincide with the commencement of the new licensing system.

The ACMA's program of spectrum pricing development work will need to take into account the reforms to the licensing system once the outcomes of the pricing review are known. For example, the ACMA expects to commence review of the apparatus licence taxation arrangements associated with television outside broadcast services, following the government's response to the pricing review.

Table 5: Next steps—spectrum pricing initiatives

Work task/activity	Stage/phase	Project	Timing
The ACMA is currently undertaking consultation on proposals concerning the apparatus licence taxation arrangements for satellite services in the Ka-band Consideration of the responses to the consultation process and making appropriate arrangements for those changes	Consultation on the proposed tax arrangements	Apparatus licence tax arrangements for satellite services in the Ka-band	Q1, 2017

Work task/activity	Stage/phase	Project	Timing
Monitoring levels of congestion in high density areas of the 400 MHz band If required, consideration of third increment toward a new opportunity cost base licence tax rate for services in high density areas of the 400 MHz	Monitoring levels of congestion in high density areas	Opportunity cost based pricing in high density areas of the 400 MHz band	Q1, 2017

Spectrum allocations

Background

The ACMA has a number of possible forthcoming price-based allocations under consideration, and in recognition of this, has acquired a simple clock auction (SCA) capability to support its existing simultaneous multi-round ascending (SMRA) auction system. An SCA is much like an English Open Outcry (EOO) auction, where all lots can be open for bidding at the same time, or they can be offered in sequence in a simple ascending-bid process. Each lot closes when there are no further bids on that lot. The SCA methodology combines the simplicity of the EOO auction format with additional functionality enabled by an electronic platform. An SCA format formalises the process by which prices increase and how much time bidders are given to place bids. In an SMRA auction, on the other hand, bidders can switch between lots in each round, and all lots are offered at the same time—that is, simultaneously. All lots remain open for bidding until the end of the auction.

The ACMA is currently working on developing one or more allocations of unallocated lots. This is expected to include unsold lots from the 2013 allocation of the 700 MHz band (the ‘digital dividend’ auction), from the recent regional 1800 MHz band auction and from the original 2 GHz band auction. Any future 2 GHz band allocation is also likely to include any lots that are not reissued as part of the expiring spectrum licence process currently underway. The ACMA expects that an allocation of the 700 MHz band unsold lots might occur in quarter 2, 2017. If that is the case, then the other auctions would not occur before quarter 4, 2017 at the earliest. However, this timing is contingent on decisions about arrangements for, and the relative priority of, all allocations.

Possible longer-term allocation processes include those for the 850 MHz, 1.5 GHz and 3.6 GHz bands, with some of these bands in the initial investigation stage for consideration of re-farming, and others in the final re-farming stage; and potentially the 900 MHz band, noting that no decisions have yet been taken on whether re-farming is the most appropriate way forward for this band.

It is too early to predict the timing of these potential future allocations:

- > A future LTE allocation of 2 x 15 MHz has been identified in the 850 MHz band, however decisions on whether it should be allocated in whole or in part await clarification of the government’s response to the Productivity Commission’s 12 January 2016 report on Public Safety Mobile Broadband. The spectrum is also subject to lengthy clearance processes.
- > As decisions on the availability of spectrum in the 900 MHz, 1.5 GHz and 3.6 GHz bands have not yet been taken, the timing of, and arrangements for, possible allocation of these bands has yet to be considered.

However the ACMA notes that there may be economic arguments for simultaneous allocation of any two or more of these bands if they come to market. Under multiband scenarios, an allocation system that allows package bidding—such as a combinatorial clock auction or an SMRA auction with package bidding—may be desirable. The ACMA, therefore, considers that there a range of important matters to be considered and resolved, including appropriate allocation methodologies, before arrangements for any allocation of these bands could be finalised.

The ACMA expects to continue to undertake public consultation on arrangements for possible allocation processes.

Table 6: Next steps—spectrum allocations

Work task/activity	Stage/phase	Project	Timing
Allocation of the unsold regional 1800 MHz lots	Preparation	Allocation	First half 2017—however this timing is contingent on decisions about arrangements for and the relative priority of other allocations, in particular the 700 MHz band unsold lots which, at the time of publication of this FYSO, are currently subject to government consideration.
Allocation of unsold 700 MHz lots	Government consideration	Allocation	To be provided once the timing and resource implications of any government decision on allocation of the lots are clear.
Allocation of unsold 2 GHz, 2.3 GHz and 3.4 GHz band lots	Scoping	Allocation	To be provided once the timing and resource implications of any government decision on allocation of the unsold 700 MHz lots are clear.
Allocation of spectrum in 850 MHz, 1.5 GHz and 3.6 GHz bands	Scoping	Possible allocation	To be provided. The availability of spectrum allocation is still subject to future planning decisions.

Regional digital radio rollout

Background

The ACMA has been asked by the minister to facilitate the rollout of digital radio in regional Australia, starting with the permanent licensing of the Canberra and Darwin trial services. Please refer to [AM radio in regional Australia](#).

Table 7: Next steps—regional digital radio rollout

Work task/activity	Stage/phase	Project	Timing
Planning committee to confirm markets for roll out in next five years	Scoping	Regional digital radio rollout	Ongoing
Planning committee to consider options developed by technical sub-committee and determine an overall planning approach for regional digital radio rollout, including the prioritisation of markets and the technical compromises that are required to ensure every market can be served	Scoping	Regional digital radio rollout	To be completed by end Q4, 2016
Consultation on draft allotment plans/digital radio channel plans for Canberra and Darwin to allow for permanent licensing	Initial implementation	Regional digital radio rollout	Q4, 2016
Develop a series of indicative allotment plans that will form the basis on which each Digital Radio Channel Plans (DRCPs) will be based	Implementation	Regional digital radio rollout	Ongoing from Q1, 2017
Consultation on DRCPs to facilitate the regional rollout of digital radio	Implementation	Regional digital radio rollout	Ongoing from Q2, 2017

AM to FM conversions of commercial radio broadcasting services in selected regional licence areas

Background

The ACMA will release a discussion paper for consultation about its draft approach to AM to FM conversions. With almost no exceptions, the ACMA has historically refused to countenance AM to FM conversion of existing AM commercial radio services. At issue is whether this policy should be relaxed to allow considering of the conversion option in some smaller regional markets, where there is no independently-controlled FM competitor that bought FM band spectrum at auction that would be unfairly disadvantaged by conversion to the clearer-sounding FM medium. Once the approach is finalised, the ACMA will consider requests for AM to FM conversion in selected regional areas.

In January 2015, Commercial Radio Australia (CRA) proposed to the minister that regional commercial radio broadcasting licensees should be able to convert from AM

to FM radio services. CRA proposed that the conversions should only be available to commercial radio licensees in solus regional licence areas. In these markets, there is only one incumbent commercial licensee holding both the AM and the FM commercial radio broadcasting licences.

In consultation with CRA, the ACMA has grouped the 33 licence areas into broad geographic areas according to CRA’s preferred priority order. An industry consultant will undertake the technical planning—firstly undertaking some pilot studies before working through the requests for conversions in the 29 licence areas where finding a suitable FM frequency will be more difficult.

Government priorities

In February 2016, the minister agreed in principle to the industry proposal and requested the ACMA give priority to undertaking the planning work necessary to convert AM commercial radio to FM in these selected regional markets

Table 8: Next steps—AM to FM conversions of commercial radio broadcasting services in selected regional licence areas

Work task/activity	Stage/phase	Project	Timing
Consultation on a revised approach to AM to FM conversions that will permit conversions of commercial radio broadcasting services in single licence, non-competitive markets	Initial implementation	AM to FM conversion in selected regional commercial radio licence areas	Q4, 2016
Consultation on proposals for AM to FM conversions in the first four markets where the ACMA has identified as being ‘easy’ in terms of finding a suitable frequency for conversion: Remote WA (Exmouth, Paraburdoo, Tom Price), Karratha, Port Hedland and Broken Hill	Implementation	AM to FM conversion in selected regional commercial radio licence areas	Q4, 2016 (draft LAP variations for these first four areas are to be consulted on at the same time as the revised approach)
Finalisation of the ACMA’s revised approach to AM to FM conversion in single licensee non-competitive regional licence areas and LAP variation request in the four ‘easy’ markets	Implementation	AM to FM conversion in selected regional commercial radio licence areas	Subject to consultation responses, Q4, 2016 – Q1, 2017
Completion of pilot studies of LAP variation requests for AM to FM conversions for the markets where finding a suitable frequency will be more difficult	Scoping	AM to FM conversion in selected regional commercial radio licence areas	Ongoing
Consideration of the other 29 LAP variation requests for AM to FM conversion	Scoping	AM to FM conversion in selected regional commercial radio licence areas	Ongoing from Q2, 2017

Theme—Reducing the cost to business arising from regulation

Customer self service

Background

The ACMA's new spectrum management suite of tools has provided the platform for the ACMA to begin development of customer self-service capacity. When fully implemented, the online portal will allow licensees, or their representatives, to be able to electronically manage their licence holdings with the ACMA. The facility will allow licensees to apply for new licences and renew, transfer, vary or surrender existing licences through the submission of information through the online portal. Licensees will also be able to manage their customer details online.

Government priorities

This project contributes to the government's broader regulatory reform agenda under the red-tape reduction program by providing significant benefits for licensees. One of these benefits will be access for licensees, or a third-party manager, authorised by a licensee, to manage renewals online without receiving renewal notices from the ACMA. This is particularly useful to customers with large numbers of licences or customers who change address on a regular basis, such as travellers using marine radio. Other benefits include the ability to update contact person and address details online, the ability to lodge applications to vary or surrender licences online, and enhancing customers' ability to make payments online.

Project phase

The first phase of this project is complete with the delivery of a suite of forms made available to APs through the AP portal in July 2016.²⁷ At the same time online forms were made available for access by licensees through the ACMA website, which allow licensees to easily apply to surrender or transfer licences and update contact details.

Actions/Project timing

The project is in its initial phase of delivery, with the first online forms delivered for use by APs in July 2016.

Table 9: Next steps—customer self service

Work task/activity	Stage/phase	Project	Timing
Device registration and 900 MHz station registration online forms	Implementation	Customer self service	Q3, 2016
XML payload form available for APs	Development of form	Customer self service	Q4, 2016
Apparatus licence application forms available to licensees	Development of forms	Customer self service	Q1, 2017

²⁷ The forms made available are surrender, change of contact details, creation of new customer identification, antenna and site registration, and apparatus licence application.

Theme—Implementing reform priorities

Spectrum Review implementation

Background

The government's Spectrum Review found that a more flexible approach to spectrum management is necessary to meet the challenges of evolving technology and increasing demand for spectrum access. The review also found current administrative arrangements are complex and impose unnecessary costs on users.

The government has agreed to implement the three main recommendations made by the Spectrum Review.

Project phase

The government is currently implementing the Spectrum Review recommendations in close consultation with the ACMA. On 10 March 2016, the government released a Legislative Proposals consultation paper on the proposed approach to drafting key provisions in a new Radiocommunications Act. DoCA has also announced plans to review spectrum pricing and public spectrum holdings.

The ACMA expects the implementation of the new radiocommunications legislation will be progressed over a number years, ensuring an orderly transition to the new arrangements can be worked through with affected parties.

Impact of the Spectrum Review on the ACMA's work program

The Spectrum Review reforms will have implications across the ACMA's spectrum management functions, with changes expected in areas including licensing, pricing, compliance and enforcement, device supply schemes and management of broadcasting and public spectrum. It is also likely that the ACMA's work program will be affected in ways that are not predictable at this point in time.

Early on, the ACMA expects the main focus will be on implementing transitional arrangements and establishing improved systems for the licensing and allocation of spectrum, with other activities likely to include changes to pricing stemming from the government's spectrum pricing review, the introduction of new graduated compliance and enforcement measures and more streamlined equipment rules. As experience with the new framework grows, the ACMA expects to facilitate further opportunities for reform; for example, for spectrum users to be more involved in spectrum management. The review suggests developments such as these will be achieved through greater use of market principles and mechanisms in spectrum management.

Actions

The ACMA's planning and timetabling of the work involved in implementing the reforms will reflect the scheduling and outcomes of related processes, including:

- > the drafting of the new Radiocommunications Bill (and related transitional provisions)
- > the spectrum pricing review
- > the review of government spectrum holdings
- > the drafting of ministerial policy statements identifying the government's strategic priorities for certain aspects of spectrum management
- > stakeholder consultation.

The ACMA will be responsible for developing and administering the arrangements for spectrum management under the new Act. Initially, this will involve giving practical effect to transitional provisions intended to provide certainty and predictability in

relation to existing licences and licensing processes underway at the time the new legislation comes into effect.

The ACMA's work plan for implementing the reforms will be developed in close consultation with stakeholders. The Spectrum Review recommends that the ACMA produce an annual work program clearly setting out its priorities for spectrum management over three to five years, with a focus on the upcoming 12 months. A draft ACMA annual work plan is expected to be released for public consultation during the transition to the new Act, outlining much of the work to operationalise the new legislation over the following years.

Project timing

The ACMA expects the work of implementing the new radiocommunications legislation will be progressed over a number years.

Table 10: Next steps—Spectrum Review implementation

Work task/activity	Stage/phase	Project	Timing
Working with DoCA on the draft Radiocommunications Bill	Minister to release exposure draft Radiocommunications Bill	New Radiocommunications Act	In accordance with DoCA timelines
Advice to department on associated reviews on pricing and Commonwealth holdings	Minister to report back to Cabinet on outcomes of pricing review, review of Commonwealth holdings	Departmental reviews of spectrum pricing and Commonwealth government spectrum	In accordance with DoCA timelines
Planning for anticipated ACMA Spectrum Review implementation program	Program identification	ACMA Spectrum Review implementation program	Ongoing

Implementing outcomes from the 400 MHz band review

The new 400 MHz band arrangements provide opportunities for more effective use of the band and facilitate the implementation of a nationally-harmonised and interoperable system of government radio networks. Advances in government radio interoperability are leading to considerable efficiency gains in resource use and availability, particularly during natural disasters such as bushfires and floods.

The 400 MHz implementation began in 2011 with the release of a new 400 MHz band plan. It detailed a staged implementation approach consisting of three key milestones²⁸:

- > Milestone 1: Reduce bandwidth in high- and medium-density areas and within 100 kilometres of these areas²⁹, reduce power of some systems and clear certain parts of the 400 MHz band to prepare for future milestones.

²⁸ Detailed information is available at www.acma.gov.au/Industry/Spectrum/Spectrum-projects/400-MHz-band.

²⁹ These areas are defined in the Apparatus Licence Fee Schedule available at www.acma.gov.au/theACMA/About/Making-payments/Apparatus-licence-fees/apparatus-licence-fees-acma.

- > Milestone 2: Move to a 10 MHz frequency split and harmonise government services in parts of 450–470 MHz.
- > Milestone 3: Harmonise remaining government services in the rest of the band.

Project phase

As at mid-2016, the project is approximately half complete, with Milestone 3 underway in high- and medium-density areas and within 100 kilometres of these areas, and Milestone 2 underway in low- and remote-density areas.

Action

The next step of the project is to implement Milestone 3, which runs through 2019, for licensees in low- and remote-density areas. Stakeholder support, engagement and awareness-raising activities will continue in the interim.

Table 11: Next steps—implementing outcomes from the 400 MHz band review

Work task/activity	Stage/phase	Project	Timing
Transition of Milestone 2 'exceptions'	Milestone 2	400 MHz implementation	Dec 16 – Jun 17
Transition commenced	Milestone 3	400 MHz implementation	December 2017
Stakeholder support, engagement and awareness programs	All	400 MHz implementation	Ongoing

Update to the Australian Radiofrequency Spectrum Plan

Background

The ACMA has commenced the process of updating the *Australian Radiofrequency Spectrum Plan 2013* (Spectrum Plan) to take account of changes arising from the ITU WRC-15.

The Spectrum Plan, which is prepared under section 30 of the Act, divides the Australian radiofrequency spectrum into frequency bands and specifies the general purposes for which the bands may be used. The aim of the Spectrum Plan is to provide a comprehensive framework within which many types of services are able to operate, in part by preventing harmful interference between services. It includes (among other things) the ITU treaty-level Radio Regulations' Table of Allocations and the Australian Table of Allocations.

The Spectrum Plan is updated every three or four years, following each ITU WRC, to ensure it reflects changes to the Radio Regulations agreed at the previous WRC. The last WRC was held from 2–27 November 2015. Consequently, the references in the Spectrum Plan to the Radio Regulation Table of Allocations (and consequently the Australian Table of Allocations), and the International Footnotes, will become outdated on 1 January 2017.

The process leading to ratification of the changes agreed at WRC is being undertaken by DoCA and will be subject to a separate process.

The 2013 Spectrum Plan is the current version and can be found on the ACMA website.

Table 12: Next steps—update to the Spectrum Plan

Work task/activity	Stage/phase	Project	Timing
Implementation of changes made to the ITU-R Radio Regulations at WRC-15 as appropriate	Preparation of consultation documentation	Release of 2017 Spectrum Plan	January 2017

Band-by band projects 2016–17

Frequency range	Work task	Outline	Priority	Expected completion time frame
174–230 MHz	Planning for rollout of digital radio in regional areas of Australia	Planning for digital radio services outside mainland state capitals will be informed by the considerations of the Digital Radio Planning Committee for Regional Australia, as recommended by the DoCA Digital Radio Report. The government expects the committee to give priority to the permanent licencing of digital radio services in Canberra and Darwin.	High	Possible in 2017, however, the time frame for completion will be informed by the deliberation of the Digital Radio Planning Committee for Regional Australia and the passage by parliament of any necessary minor legislative amendments
403–520 MHz	400 MHz implementation changes	Licenses to make changes as per Milestone 2 requirements (RDA/LDA) and Milestone 3 requirements (HDA/MDA).	High	Mid-2017
803–960 MHz	Outcomes of the review of the band 803–960 MHz	Implement outcomes of the band review. Implementation plan contained in the decision paper . 2016–17 will include transition of single frequency and studio-to-transmitter links to new arrangements (completion date mid-2019). Separate from the implementation, a preferred approach on a potential reconfiguration method for the 890–915/935–960 MHz band is expected to be released by the end of 2016.	High	Staged implementation to mid-2024

Frequency range	Work task	Outline	Priority	Expected completion time frame
1427–1518 MHz	Potential future use by mobile broadband	This band is in the <i>initial investigation</i> stage of the process for consideration of additional spectrum for mobile broadband services. The 1.5 GHz band was identified for IMT at WRC-15. The ACMA expects to recommence consideration of this band for domestic use for mobile broadband later in 2016, with the release of a discussion paper.	High	Late 2017/early 2018, contingent on consultation outcomes
1710–1712.5 MHz and 1805–1807.5 MHz (paired) 1770–1775 MHz and 1865–1870 MHz	Available spectrum in the 1800 MHz band—spectrum licences	Between November 2015 and February 2016, the ACMA held an auction of spectrum in the frequency ranges 1725–1785 MHz and 1820–1880 MHz in regional Australia. Six lots were left unsold: one each in Tasmania, western New South Wales, southern Queensland and Western Australia, and two in central Queensland. The ACMA has commenced preparation to allocate the 1800 MHz unsold lots via auction in 2017.	High	Expected Q4 2017
1900–1920 MHz 1920–1980 MHz 2110–2170 MHz (paired)	Expiring spectrum licence process in 2 GHz band	The ACMA has commenced the reissue process and/or reallocation of the spectrum licences in the 1920–1980 MHz and 2110–2170 MHz frequency range in accordance with the Act. In addition, the ACMA is in discussions with incumbent licensees on the possibility of consolidating spectrum holdings in the band. Spectrum licences in the 2 GHz band expire on 11 October 2017.	High	Q2 2017

Frequency range	Work task	Outline	Priority	Expected completion time frame
5850–5925 MHz (5.9 GHz band)	Cooperative – Intelligent Transport Systems (C-ITS)	<p>Development of spectrum access and licensing arrangements to facilitate the introduction of C-ITS.</p> <p>The ACMA released a draft class licence and paper for C-ITS in the 5.9 GHz band in August 2016. The comment period closes in September 2016, with a view to having regulatory arrangements in place by 1 January 2017.</p>	Medium	2016
19.7–20.2 GHz and 29.5–30.0 GHz	Development of regulatory arrangements supporting Earth stations in motion (ESIMs)	<p>The ACMA has commenced the process of implementing regulatory arrangements for ESIMs communicating with geostationary space stations in the fixed-satellite service in accordance with ITU Resolution 156 (WRC-15).</p> <p>See IFC 12/2016 Regulatory arrangements for stations in motion.</p>	Medium	Q4, 2017

Regulatory and service-planning projects 2016–17

Work task	Outline	Status	Priority	Expected completion time frame
Australian Radiofrequency Spectrum Plan	The ACMA is considering changes to the <i>Australian Radiofrequency Spectrum Plan 2013</i> as a result of changes made to international frequency allocations at WRC-15.	Active	High	Planned release of 1 January 2017
Review of taxation arrangements for Ka-band spectrum for satellite use	<p>The ACMA has previously flagged a review of apparatus licence taxation arrangements for satellite services.</p> <p>The ACMA's review will focus on the Ka-band and will include a review of the basis of the taxes, and the application of the generalised tax formula to satellite services.</p> <p>The ACMA commissioned a report by Plum Consulting about apparatus licence taxation arrangements. The ACMA has received this report and expects to consult on a range of proposals. Lessons learned in this review</p>	Active	Medium	Review to be completed in Q2, 2016

Work task	Outline	Status	Priority	Expected completion time frame
	may be carried over to other satellite bands in future.			
Methodology for implementing opportunity cost pricing in appropriate bands	In January 2010, the ACMA decided to consider the use of opportunity cost pricing for annual fees for administratively allocated spectrum. Reviews of taxation arrangements will normally be aligned with major licensing, planning and allocation processes conducted by the ACMA. This will allow the ACMA to focus its resources to projects that have a high priority across the agency. The first will be the 400 MHz band review.	Active	Medium	The ACMA expects to make announcements about the taxation arrangements for high-density areas of this band in 2016–17. Further consultation about high-density areas will be undertaken over the next three years.
Mobile phone jammer trial at Goulburn Correctional Complex	The ACMA has facilitated a trial of mobile phone jammers at the Goulburn Correctional Complex, NSW. A trial at Goulburn Correctional Complex will allow all stakeholders to assess the interference risk of a mobile phone jammer in a correctional facility in a medium-density area. The ACMA conducted public consultation on this proposal in May–June 2016.	Active	Medium	Likely to commence in the 2016–17 financial year
Mobile phone jammer trial at Lithgow Correctional Centre	Since 2013, at the request of Corrective Services NSW (CSNSW), the ACMA has facilitated a trial of mobile phone jammers at Lithgow Correctional Centre in NSW. The aim of this trial is to assess whether the benefits of the use of mobile phone jammers in correctional facilities can be realised without the risk to the operation of mobile phone networks.	Active	Medium	Ongoing—trial is extended to November 2018
LIPD class licence	The LIPD class licence was remade in May 2016 to include updates to support new devices. The ACMA is monitoring emerging technology developments for consideration of possible future reviews and updates to the class licence and conditions for operation, frequency bands and radiated power limits.	Active	Medium	Ongoing—next update anticipated in 2017
SPECTRA warranty changes	Ongoing program of work to enhance and improve SPECTRA over the warranty period.	Active	High	August 2017

Work task	Outline	Status	Priority	Expected completion time frame
Review of arrangements of 5 GHz RLANs	Investigation into potential new and/or updated arrangements for 5 GHz RLANs with the view to determining potential for future update to the LIPD class licence.	Active	Medium	Q1, 2017
Review of frequency coordination in fixed satellite services	Review of frequency coordination requirements between apparatus-licensed microwave fixed point-to-point links and Earth stations in the fixed satellite services communicating with geostationary satellite in the 6 and 6.7 GHz fixed point-to-point bands.	Active	Medium	Q1, 2017
Implementation of Spectrum Review outcomes	Development of the policy framework to implement the government's Spectrum Review outcomes when the new arrangements are in place.	Active	High	Ongoing
Licence area planning (LAP) process review	<p>The ACMA is considering options to reduce the cost and complexity in broadcasting licence planning.</p> <p>In the short term, the ACMA will remake the ACMA's Broadcasting Services (Technical Planning) Guidelines 2007 (TPGs) in 2016–17 because (regardless of the outcomes of the Spectrum Review) there will still be a need for transitional arrangements</p>	<p>Inactive—LAP review</p> <p>Active—TPGs</p>	Medium	<p>Any proposals for LAP reform process are subject to the scope and application of the Spectrum Review initiatives of government.</p> <p>TPGs are due to sunset on 1 October 2017.</p>
Broadcast service planning: Licence Area Plans (LAPs), Television Licence Area Plans (TLAPs) and DRCPs	<p>The ACMA responds to requests to vary LAPs, TLAPs and DRCPs to enable changes to existing transmissions, provide new transmissions extending or improving coverage, or to include new services.</p> <p>The ACMA has 33 requests for conversion of commercial radio services from the AM band to the FM band, which are likely to constitute the majority of this work.</p>	Ongoing work program	Medium	Ongoing
APs support	Continued development of advice and supporting material; improving structure and content of supporting material on the ACMA website.	Active	Medium	Ongoing
Sunsetting instruments	The <i>Legislation Act 2003</i> (LA) provides a regime (known as sunsetting) for the automatic repeal of regulations and other legislative instruments after 10 years, unless action is taken to exempt them. Over the months and years ahead, the ACMA, like all other Commonwealth departments and	Ongoing work program	High	Ongoing

Work task	Outline	Status	Priority	Expected completion time frame
	agencies, will need to respond to the 'sunsetting' requirements of the LA.			
Review of established spectrum planning, assignment and coordination frameworks	<p>The ACMA undertakes an ongoing review of technical spectrum planning framework. This activity is primarily focused on frequency assignment and coordination frameworks (as specified in spectrum licensing technical frameworks and in apparatus licensing coordination requirements). The appropriateness of spectrum embargoes is also considered.</p> <p>The objective is to ensure the currency of the spectrum planning framework and ensure that the various supporting documents are reflective of current technologies and operational practices.</p>	Active	Medium	Ongoing
Review of spectrum planning framework documentation	<p>As spectrum management is becoming increasingly more complex, the ACMA intends to review the spectrum planning framework documentation, with the objective of ensuring that the documentation:</p> <ul style="list-style-type: none"> > provides clarity and consistency of approach > provides improved accessibility and usability of supporting documentation > facilitates, where appropriate, the opportunity for increased industry involvement in the development process. 	Active	Medium	Ongoing
Technical support to enquiries on spectrum arrangements	Technical support in responding to enquires on established spectrum arrangements for radiocommunications services, including wireless microphones, television outside broadcasting, devices authorised by the LIPD class licence, land mobile and microwave fixed point-to-point links.	Active	Variable depending on issue	Ongoing
Technical input to spectrum policy	Technical support for consideration of policy requests, including consideration of applications for scientific apparatus licences.	Active	Variable depending on issue	Ongoing
Monitoring of overseas biomedical telemetry arrangements	Monitoring of development in overseas biomedical telemetry arrangements (e.g., USA 1.1 GHz, 1.3 GHz) for consideration of possible future reviews and possible updates to the LIPD class licence.	Active	Low	Ongoing

Work task	Outline	Status	Priority	Expected completion time frame
Monitoring development in use of ESIMs	Monitoring of development in the use of Earth stations in motion for consideration of possible future reviews and development of future regulatory arrangements beyond arrangements being developed to implement ITU Resolution 156 (WRC-15)	Active	Medium	Ongoing
Management of satellite systems coordination	Assessment of new and management of the coordination and notification of new and existing Australian satellite systems in accordance the process the ACMA sets out in its Australian procedures for coordination and notification of satellite systems document. This includes: <ul style="list-style-type: none"> > assisting Australian satellite operators with ongoing satellite coordination negotiations with other administrations > assessment of new notices related to progress of existing Australian satellite networks > filing of new Australian satellite networks > supporting international administration-level satellite coordination meetings with other Administrations. 	Active	Medium	Ongoing
Monitoring trends in space-based communications	Monitoring of trends in space-based communications systems for consideration of possible future reviews and updates to regulatory policies and procedures supporting the satellite filling and coordination process, and licensing of space-based communications system in Australia.	Active	Low	Ongoing
Monitoring emerging space-based technologies	There are a number of emerging space-based technologies and applications (for example nanosats/cubesats and ESIMs). The ACMA is monitoring developments in these areas for consideration of possible future reviews and updates to arrangements for space-based communications systems.	Active	Medium	Ongoing
Australia's engagement in international fora	The ACMA manages and contributes to Australia's participation in international and regional radiocommunication and spectrum fora such as the ITU-R and WRC and the Asia-Pacific Telecommunity Preparatory Group for WRC and Asia-Pacific Telecommunity Wireless Group. This includes development of contributions to the meetings and management of Australian	Active	High	Ongoing—albeit matters in association with the next WRC will culminate at the time of the conference in October 2019

Work task	Outline	Status	Priority	Expected completion time frame
	delegations and preparation of delegation briefs for meetings.			
Management of Australia's domestic preparation for WRC and international engagement at technical meetings	The ACMA manages a series of industry advisory groups on international radiocommunication issues. These groups provide valuable insight to industry interests on matters in support of the above work task.	Active	Medium	Ongoing
IoT and M2M requirements	The IoT and M2M communications is emerging as area of interest. The ACMA is monitoring developments and engaging with industry domestically and internationally to determine appropriate arrangements are developed as necessary. The ACMA is an observer on the IoT Alliance Australia (IoTAA) Executive Council and also chairs the spectrum Work Stream of the IoTAA.	Active	Medium to high	Ongoing
Government spectrum planning and management	The ACMA maintains a day-to-day planning, management and liaison role to support access to spectrum by government agencies, such as Defence and public safety and security agencies. This includes licensing and regulatory support for specific requirements that are difficult to accommodate within existing legislative and regulatory frameworks.	Active	Medium	Ongoing
Investigation and advice on wide spread TV reception difficulties	Between 2010 and 2014, the terrestrial TV transmissions in Australia underwent a series of transformations with the switchover to digital-only TV and retune of many digital TV transmissions to clear the UHF 'digital dividend' spectrum. The ACMA maintains a limited capacity to investigate widespread TV reception problems, focusing its strategy on informing viewers of the importance of having an optimised antenna system for reliable TV reception. The ACMA may investigate, and provide public information about any sufficiently widespread TV reception problem it becomes aware of. The ACMA has developed a TV reception information hub on its website.	Active	Medium	Ongoing
The ACMA's support to radiofrequency spectrum	As part of their risk management strategy, the organisers of the major events in Australia may request the assistance and services of the ACMA to provide regulatory	Active	Variable	Ongoing

Work task	Outline	Status	Priority	Expected completion time frame
management for major events	support and interference management for communications used in the lead-up to the event and during its staging. These services are provided on a full cost-recovery basis.			

Part 3—
Mobile broadband work
program: October 2016 update



To assist in providing transparency to its work related to mobile broadband capacity growth and greater certainty to all spectrum holders, the ACMA has articulated and adopted a transparent spectrum management planning process for the consideration of additional bands for mobile broadband, as stated in its [mobile broadband strategy](#) (Strategy 2). In doing this, the ACMA has broken its process of repurposing a band into three broad stages—initial investigation, preliminary replanning and re-farming.³⁰ These stages are preceded by an initial ‘monitoring’ stage, where it is determined whether consideration of a particular band should progress further. Although the ACMA maintains a general awareness across all bands, those included in this stage are monitored closely. A more detailed explanation of each of these stages is available in the ACMA’s [mobile broadband strategy](#) paper.

As part of its mobile broadband strategy, the ACMA undertook to include an updated mobile broadband work program on an annual basis that would form part of the ACMA’s FYSO. The updated work program for mobile broadband spectrum planning projects is contained in Table 1. This table outlines where each of these projects is positioned within the overall process (the stages) and identifies those frequency bands that are at the *monitoring* stage. The table also provides a summary of the work undertaken to date and the likely next steps. A more detailed overview of the reasoning for the status of each band in Table 1 is provided in the proceeding sections.

³⁰ Under the Act, the minister and the government have a policy-making role that is independent of the ACMA.

Table 13: Status of current mobile broadband spectrum planning projects

Stage	Current mobile broadband spectrum planning projects	Activity to date	Next steps
Monitoring	600 MHz (520–694 MHz)	Internal monitoring of international developments in the 600 MHz band, including informal discussions with other regulators including FCC on the US incentive auctions.	Continue to monitor international developments in the 600 MHz band. Follow outcomes of US incentive auctions.
	3.3 GHz (3300–3400 MHz)	Internal monitoring of international developments in the 3.3 GHz band.	Continue to monitor international developments. Consideration of engagement in international studies.
	4.9 GHz (4800–4990 MHz)	Internal monitoring of international developments in the 4.9 GHz band.	Continue to monitor international developments. Consideration of engagement in international studies.
	Bands being studied under WRC-19 agenda item 1.16: 5150–5350 MHz, 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz	The Australian preparatory process for WRC-19 has commenced and ACMA staff attended the first meeting of Working Party 5A for the WRC-19 cycle in May 2016.	Continue to monitor international developments. Consideration of engagement in international studies via the appropriate ARSG and agenda item coordination group on issues/bands of interest to Australia. ACMA attendance at ITU-R Working Party 5A meetings, as appropriate.
	Bands being studied under WRC-19 agenda item 1.13: 24.25–27.5 GHz, 31.8–33.4 GHz, 37–40.5 GHz, 40.5–42.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47–47.2 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz	The Australian preparatory process for WRC-19 has commenced and ACMA staff attended the first meetings of ITU-R Task Group 5/1 in May 2016.	Continue to monitor international developments. Consideration of engagement in international studies via the appropriate ARSG and agenda item coordination group on issues/bands of most interest to Australia. ACMA attendance at ITU-R Task Group 5/1 meetings, as appropriate. Possible 5G bands for early implementation in Australia will be considered.

Stage	Current mobile broadband spectrum planning projects	Activity to date	Next steps
	<p>Bands being considered internationally for 5G:</p> <p>Bands announced for early implementation of 5G³¹: <u>US</u>: 27.5–28.35 GHz, 37–40 GHz and 64–71 GHz</p> <p>Additional bands being considered internationally for 5G³²: <u>US</u>: 24.25–24.45 GHz, 24.75–25.25 GHz, 31.8–33.4 GHz, 42–42.5 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 71–76 GHz, 81–86 GHz as well as bands above 95 GHz</p> <p><u>Korea</u>: 24.25–29.5GHz, 31.8–33.4 GHz and 37–40.5 GHz</p>	Monitoring of developments in these bands including identification of bands and development of arrangements for use.	Continue to monitor developments in these bands, including monitoring the finalisation of arrangements and the timing of the release of bands earmarked for early implementation.
Initial investigation	1.5 GHz (1427–1518 MHz)	Internal analysis and preparation of public discussion paper. Monitoring of international developments.	Commence consideration of the band domestically with a discussion paper on both the 1.5 GHz and 3.6 GHz bands expected later in 2016. Consideration of engagement in international studies via the appropriate ARSG and agenda item coordination group on issues of most interest to Australia. ACMA attendance at ITU-R Working Party 5D and AWG meetings, as appropriate.
	2 GHz (1980–2010/2170–2200 MHz)	Monitoring of international developments.	Consideration of engagement in international studies via the appropriate ARSG and agenda item coordination group on issues of most interest to Australia. ACMA attendance at ITU-R Working Party 5D meetings, as appropriate. Further work on this band will be considered towards the second half of 2017

³¹ Note: 37.0–40 GHz and 66–71 GHz are also being considered under WRC-19 agenda item 1.13

³² Note: 24.25–27.5 GHz, 37.0–40.5 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz and 66–71 GHz are also being considered under WRC-19 agenda item 1.13.

Stage	Current mobile broadband spectrum planning projects	Activity to date	Next steps
	3.6 GHz (3575–3700 MHz)	Internal analysis and preparation of public discussion paper. Monitoring of international developments.	Commence consideration of the band domestically with a discussion paper on both the 1.5 GHz and 3.6 GHz bands expected later in 2016. Consider options to review the arrangements in the broader 3400–3700 MHz band. Consideration of engagement in international studies via the appropriate ARSG on issues of most interest to Australia. ACMA attendance at ITU-R Working Party 5D meetings, as appropriate.
Preliminary replanning	None	–	–
Re-farming	Spectrum available for the licensing of mobile broadband services	The ACMA is assessing options and possible timing for the allocation of any unsold lots in bands subject to spectrum licensing.	<i>Unsold spectrum licence lots:</i> Monitor demand and determine when it is appropriate to allocate the spectrum. <i>Apparatus licences:</i> first-in-time over-the-counter licence application processes usually apply.
	850 MHz expansion band (809–824/854–869 MHz)	Commitment to make available from 2024.	Implementation of reforms identified in decision paper has commenced (due for completion in 2024). This includes clearance of 850 MHz expansion band for 2024 release.
	900 MHz (890–915/935–960 MHz)	Ongoing liaison with incumbent licensees.	Public paper detailing options for reconfiguration into 5 MHz licence blocks expected to be released in Q3, 2016.

Monitoring

Table 14 below outlines the bands currently in the *monitoring* stage, as well as the status of the bands against some of the key considerations that have led to their inclusion at the *monitoring* stage. These considerations include (but are not always limited to):

- > *Domestic interest*—interest has been expressed from Australian proponents for consideration of the use of the band for mobile broadband services.
- > *International spectrum harmonisation (IMT/RLAN identification)*—the band is identified in Article 5 of the Radio Regulations for International Mobile Telecommunications (IMT) or the band is under consideration at WRC-19 for such an identification. Alternatively, the band is identified for use by RLANs.
- > *Technology standardisation (for example, 3GPP and IEEE)*—standardised arrangements for mobile broadband that have been or are being developed.
- > *Potential or evolving ecosystem*—an equipment ecosystem exists for devices to generate economies of scale for equipment and roaming benefits, alternatively there are indications that such an ecosystem could develop over time.
- > *Regional group interest*—there is interest in this band from regional organisations such as CEPT, CITELE and APT.
- > *Other relevant issues*—where applicable.

An additional set of bands has been added to the monitoring stage since the February 2016 update of the mobile broadband work program. These are bands being considered for 5G use by the US and Korea, in addition to those identified for investigation as part of WRC-19 agenda item 1.13.

Note that the process for consideration of additional spectrum for mobile broadband services relates to the domestic re-planning process. For bands being considered within international fora such as the ITU, the ACMA will, where appropriate, engage with stakeholders via the international preparatory process to develop Australian positions on relevant issues. Where appropriate, this international engagement can include participation in relevant studies, for example.

Table 14: Frequency bands at the *monitoring* stage within the process for consideration of additional spectrum for mobile broadband services

Band	Domestic interest	International spectrum harmonisation (IMT/RLAN identification)	Technology standardisation (e.g. 3GPP, IEEE etc.)	Potential or evolving ecosystem	Regional group interest	Other relevant issues
600 MHz	Yes	Yes	No	Yes	No	The US and 13 other countries have identified for IMT
3.3 GHz	Yes	Yes	Yes (WiMAX)	Yes	No	46 countries have identified for IMT
4.9 GHz	Yes	Yes	Yes (RLAN)	Yes	No	RLAN standards across part of the band
WRC-19 agenda item 1.16 bands	Yes	Potential (WRC-19 agenda item)	Yes (RLAN)	Yes	Yes	Increased demand for RLAN spectrum RLAN standards across some of these bands
WRC-19 agenda item 1.13 bands	Yes	Potential (WRC-19 agenda item)	No	–	Yes	Significant interest world-wide
Bands announced internationally for early implementation of 5G	Unknown at this stage	No	No	Yes	No	In the US, the FCC has announced these bands will be released for 5G in the US
Additional bands being considered internationally for 5G	Unknown at this stage	No	No	Yes	No	Korea and the US are considering additional bands for 5G outside the WRC process

600 MHz (520–694 MHz)

At WRC-15, all or part of the 600 MHz band was identified for IMT by the Bahamas, Barbados, Belize, Canada, Colombia, the US, Mexico, Micronesia, the Solomon Islands, Tuvalu, Vanuatu, Bangladesh, Maldives and New Zealand. The band is being allocated or considered for allocation in countries such as the US and Canada.

There is support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. Mobile broadband interests have argued that the

ACMA could take a more proactive interest in the band. This view is encouraged by the outcomes of WRC-15 and the push by the Federal Communications Commission (FCC) in the US to conduct incentive auctions in the band. In addition, the Radio Spectrum Policy Group (RSPG) of the European Commission (EC) has also provided a [long-term strategy for the future of the UHF band](#), which suggests the band remain available for broadcasting services until at least 2030. It also recommends that the band should be available for downlink-only broadband services on a secondary basis. This outcome is reflected in the [EC's inception assessment](#), but a final decision is still pending.

The 600 MHz band is currently used by digital television services in Australia and is available for some services under the [Radiocommunications \(Low Interference Potential Devices\) Class Licence 2015](#).

Consistent with the Australian Government's interest in considering the potential for long-term availability of the television 'sixth channel' for non-broadcasting uses and whether there is the possibility of a second digital dividend³³, this band will continue to be monitored by the ACMA, while noting Australia's current use of the band for terrestrial broadcasting of digital television.

Developments since February 2016

The FCC incentive auction began on 29 March 2016. Bidding in the reverse auction began on 31 May 2016 and concluded on 29 June 2016. The forward auction began on 16 August 2016, with 62 applicants qualified to participate.³⁴

In February 2016, ITU-R Working Party 5D commenced revision of Recommendation ITU-R M.1036-5 on Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 470–698 MHz. Working Party 5D is aiming to complete the revision in late 2017.

The AWG has a work plan to develop a recommendation on frequency arrangements for the 470–698 MHz band. The current proposal is to finalise the work in late 2017.

Next steps

Given the outcome of WRC-15 and ongoing work internationally, the ACMA will continue to monitor international developments in the 600 MHz band. In particular, the outcomes of the incentive auction process underway in the US will be of key interest.

The ACMA will also engage with industry and the government regarding technological evolution of terrestrial digital television, including DVB-T2 and HEVC. Adoption of these technologies is likely to be a pre-requisite for any future reallocation of broadcasting spectrum for non-broadcasting uses, though it is also key to the more efficient use of spectrum by the television industry itself. Both the government and the ACMA have emphasised the availability of 'sixth channel' spectrum for trialling the new standards.

³³ Minister of Communications Malcolm Turnbull's speech to RadComms 2014, available at www.malcolmturnbull.com.au/media/radcomms-2014-spectrum-in-the-age-of-digital-innovation.

³⁴ Information available on the [FCC website](#).

3.3 GHz (3300–3400 MHz)

At WRC-15, the 3300–3400 MHz band was identified for IMT by a number of countries including 33 African countries, Argentina, Colombia, Costa Rica, Ecuador, Mexico, Uruguay, Cambodia, India, Lao PDR, Pakistan, Philippines and Vietnam (noting a primary mobile allocation was also made in Papua New Guinea). Notably there was also strong interest from China in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band, noting that this band is already a WiMAX profile band, which has been deployed in some countries.³⁵

The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

- 3 to further study operational measures to enable the coexistence of IMT and radiolocation service in the frequency band 3300–3400 MHz;
- 4 to develop an ITU-R Recommendation providing technical and operational measures regarding adjacent band compatibility between IMT systems operating below 3400 MHz and FSS Earth stations operating above 3400 MHz;
- 5 to further study adjacent band compatibility between IMT in the frequency band 3300–3400 MHz and radiolocation service below 3300 MHz, in particular unwanted emissions of IMT systems in this frequency band;
- 6 to develop harmonized frequency arrangements for the frequency bands 3300–3400 MHz and 4800–4990 MHz for operation of the terrestrial component of IMT, taking into account the results of the sharing studies;

There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. The 3300–3400 MHz band is currently allocated on a primary basis to the radiolocation service worldwide. In Australia, the radiolocation service in this band is designated to be used principally for the purposes of defence and national security via footnote AUS101A of the Spectrum Plan. The Department of Defence is normally consulted in considering non-defence use of this service.

Developments since February 2016

In February 2016, ITU-R Working Party 5D commenced revision of Recommendation ITU-R M.1036-5 on Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 3300–3400 MHz. Working Party 5D also commenced studies as called for in Resolution **223 (Rev. WRC-15)** on:

- > operational measures to enable the coexistence of IMT and radiolocation service in the frequency band 3300–3400 MHz
- > technical and operational measures regarding adjacent band compatibility between IMT systems operating below 3400 MHz and FSS Earth stations operating above 3400 MHz
- > adjacent band compatibility between IMT in the frequency band 3300–3400 MHz and radiolocation service below 3300 MHz.

Working Party 5D is aiming to complete these work items by late 2017.

The AWG has a work plan to develop a recommendation on frequency arrangements for the 3300–3400 MHz band. The current proposal is to finalise the work in late 2017.

³⁵ WiMAX networks in India, Medicine Industry News and Marketplace, June 19 2006, www.wimax-industry.com/ar/7c.htm.

Next steps

Given the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 3.3 GHz band.

Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered as part of the ACMA's international engagement processes.

4.9 GHz (4800–4990 MHz)

At WRC-15, the 4800–4990 MHz band was identified for IMT by a number of countries including Uruguay, Cambodia, Lao PDR and Vietnam. Notably, there was also strong interest from China and Japan in identifying the band for IMT. This suggests that a viable ecosystem could develop for mobile broadband systems in this band.

The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

- 6 to develop harmonized frequency arrangements for the frequency bands 3300–3400 MHz and 4800–4990 MHz for operation of the terrestrial component of IMT, taking into account the results of the sharing studies;
- 7 to study the technical and regulatory conditions for the use of IMT in the frequency band 4800–4990 MHz in order to protect the aeronautical mobile service;

There is some support from domestic mobile broadband interests in pursuing this band for mobile broadband in Australia. However, the ACMA is not aware of any significant interest in this band by regional bodies such as CEPT, CITELE or APT.

The 4800–4990 MHz band is currently allocated on a primary basis for the fixed and mobile services in Australia. The fixed and mobile services in this band are designated to be used principally for the purposes of defence and national security as defined in footnote AUS101A of the Spectrum Plan. The Department of Defence is normally consulted in considering non-defence use of these services.

The 4950–4990 MHz band is also allocated to the radio astronomy service on a primary basis under footnote 443 of the Spectrum Plan.

At WRC-03, the 4940–4990 MHz band was identified to support public safety services in Regions 2 and 3 for use by government agencies responsible for the provision of defence, national security, law enforcement and emergency services.³⁶ A number of countries, including Australia, have implemented arrangements in the 4940–4990 MHz band for this purpose. This is principally to support high-speed localised coverage around an incident or event. The [Radiocommunications \(Public Safety and Emergency Response\) Class Licence 2013](#) outlines arrangements for the use of this band, which allows public safety agencies to enhance their ability to perform public safety activities and provide significant flexibility in deployment during emergency response and disaster recovery activities. The 4940–4990 MHz is also included in IEEE standard 802.11y Public Safety WLAN.

Developments since February 2016

In February 2016, ITU-R Working Party 5D commenced revision of Recommendation ITU-R M.1036-5 on Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified

³⁶ In accordance with ITU-R Resolution 646.

for IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 4800–4990 MHz. Working Party 5D also commenced studies as called for in Resolution **223 (Rev. WRC-15)** on the coexistence conditions between IMT and aeronautical mobile service in the band frequency band 4800–4990 MHz. Working Party 5D is aiming to complete these work items by late 2017.

The AWG has a work plan to develop a recommendation on frequency arrangements for the 4800–4990 MHz band. The current proposal is to finalise the work in late 2017.

Next steps

Given the outcomes of WRC-15, and the potential for economies of scale to develop for equipment, the ACMA will continue to monitor international developments in the 4.9 GHz band.

Possible engagement (including through contributions) in international studies as outlined in Resolution **223 (Rev. WRC-15)** will be considered as part of the ACMA's international engagement processes.

Bands being studied under WRC-19 agenda item 1.16

WRC-19 agenda item 1.16 is to consider issues related to wireless access systems, including radio local area networks (WAS/RLAN), in the frequency bands 5150–5350 MHz (to enable outdoor usage), 5350–5470 MHz, 5725–5850 MHz and 5850–5925 MHz, while ensuring the protection of incumbent services including their current and planned use.

There is strong interest from the US and the United Kingdom (UK) to investigate use of the 5350–5470 MHz band for RLANs. Europe has indicated interest in investigating use of the 5725–5850 MHz band for RLANs. Arrangements already exist in Australia for RLANs in the 5150–5350 MHz band (low power indoor use only) and the 5725–5850 MHz band. The ACMA has also received requests to review existing Australian arrangements to align with US arrangements.³⁷ The 5150–5350 MHz and 5725–5850 MHz bands are also included in the IEEE 802.11 series of standards for WLAN. There are no arrangements in place for RLANs in the 5350–5470 MHz and 5850–5925 MHz bands in Australia.

Numerous countries around the world, including Australia, have or are considering identifying the 5850–5925 MHz band for Intelligent Transport Systems (ITS). The ACMA is facilitating trials in Australia, while considering the implementation of future arrangements for ITS.

Developments since February 2016

In May 2016, Working party 5A commenced work towards WRC-19 agenda item 1.16. Australia submitted a contribution to this meeting to provide the regulatory background to the operation of WAS/RLANs in the 5150–5250 MHz segment. A work plan for studies was developed and text for the report to the conference preparatory meeting was commenced. In addition, working documents towards preliminary draft new Reports were created on:

- > possible additional mitigation techniques to facilitate sharing between RLAN systems and incumbent services
- > technical characteristics and operational requirements of WAS/RLAN in the 5 GHz frequency range

³⁷ Most recently in an industry submission to a 2015 consultation on proposed changes to the low interference devices class licence (see [IFC 32/2015](#)).

- > use of aggregate RLAN measurements from airborne and terrestrial platforms to support studies under WRC-19 agenda item 1.16
- > sharing and compatibility studies of WAS/RLAN in the 5 GHz frequency range.

Working Party 5A is aiming to finalise these reports by mid-2018.

Next steps

The ACMA intends to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.16. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia, as determined through the WRC-19 agenda item 1.16 coordination group. The ACMA also aims to have representatives attend ITU-R Working Party 5A meetings, as appropriate.

Bands being studied under WRC-19 agenda item 1.13

WRC-19 agenda item 1.13 is to consider identification of frequency bands for the future development of International Mobile Telecommunications (IMT), including possible additional allocations to the mobile service on a primary basis. This agenda item is widely acknowledged to be focussing on spectrum harmonisation requirements for 5G mobile broadband technologies.

The frequency bands to be considered under this agenda item are 24.25–27.5 GHz, 37–40.5 GHz, 42.5–43.5 GHz, 45.5–47 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 66–76 GHz and 81–86 GHz, which have allocations to the mobile service on a primary basis; and 31.8–33.4 GHz, 40.5–42.5 GHz and 47–47.2 GHz, which may require additional allocations to the mobile service on a primary basis.

There is strong interest on this issue domestically and internationally, particularly in Region 3 countries such as South Korea, Japan and China.

There are wide and varied ranges of incumbency and co-existence issues associated with each of these bands, which will need to be considered if the bands were to be investigated domestically for mobile broadband in the future.

Developments since February 2016

In May 2016, Study Group 5 confirmed the establishment of Task Group 5/1 (TG 5/1_ to address WRC-19 agenda item 1.13 and the corresponding Terms of Reference ([CA/226 \(Annex 9\)](#)). The scope, structure and a work plan were developed at the first meeting of TG 5/1 in May 2015. The next meeting of TG 5/1 will be conducted after 31 March 2017 to ensure that information on parameters and propagation models has been provided by contributing groups.

In its [draft opinion on spectrum related aspects for next-generation wireless systems \(5G\)](#), released 14 June 2016, the Radio Spectrum Policy Group³⁸ (RSPG) stated that considerations of bands above 6 GHz for 5G should be limited to the bands listed in WRC-19 agenda item 1.13 in order to strengthen the global harmonisation opportunities. In particular, they believe this work should focus on the frequency bands proposed by Europe, in particular the bands 24.5–27.5 GHz, 31.8–33.4 GHz and 40.5–43.5 GHz. The RSPG also noted its intention to identify which one of these could

³⁸ The Radio Spectrum Policy Group (RSPG) is a high-level advisory group that assists the European Commission in the development of radio spectrum policy.

be harmonised in Europe for early implementation (that is, before WRC-19). Responses to the draft opinion were released on 14 September 2016.³⁹

However, a number of other organisations internationally are considering frequency bands outside those listed for consideration in WRC-19 agenda item 1.13 for the next generation of IMT, which is discussed further below.

Next steps

The ACMA intends to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on WRC-19 agenda item 1.13. When appropriate, it will develop individual positions on each of the bands being studied and potentially contribute to international sharing and compatibility studies on issues/bands of most interest to Australia as determined through the WRC-19 agenda item 1.13 coordination group. The ACMA also aims to have representatives attend ITU-R Task Group 5/1 meetings, as appropriate.

The ACMA will monitor developments in Europe and other regions/countries (such as the US) with regard to possible early implementation bands for 5G. The feasibility of early implementation in Australia will depend on factors such as the location, type and number of incumbent services in the band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely.

Bands being considered internationally for 5G

In July 2016, the FCC in the US announced that the 27.5–28.35 GHz, 37–38.6 GHz, 38.6–40 GHz and 64–71 GHz bands will be made available for licensed, unlicensed and shared use for future IMT services.⁴⁰

The FCC also released a Further Notice of Proposed Rule Making considering the bands 24.25–24.45 GHz, 24.75–25.25 GHz, 31.8–33.4 GHz, 42–42.5 GHz, 47.2–50.2 GHz, 50.4–52.6 GHz, 71–76 GHz, 81–86 GHz, as well as bands above 95 GHz for future IMT services.⁴¹

Korea is also continuing its support of investigations of the frequency ranges 24.25–29.5 GHz, 31.8–33.4 GHz and 37–40.5 GHz.⁴²

Figure 5 shows a comparison of the frequency bands under study in WRC-19 agenda item 1.13, with those either identified or being investigated for 5G in the US and Korea. As shown in the figure in aqua, the frequency ranges 27.5–28.35 GHz, 64–66 GHz and frequencies above 95 GHz are not being considered under WRC-19 agenda item 1.13. Those bands with 45-degree line pattern fill have been identified for 5G in the US.

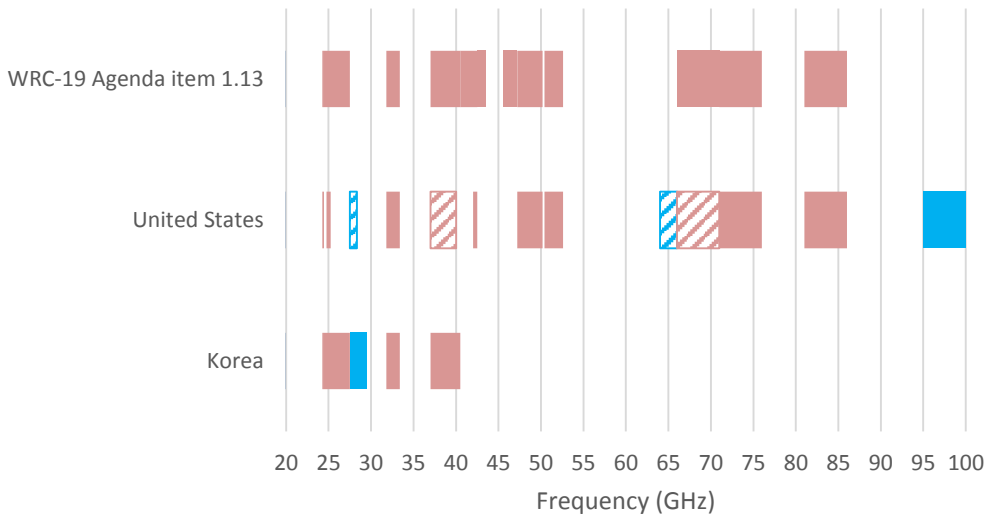
³⁹ More information is available on the RSPG website at <http://rspg-spectrum.eu/2016/09/responses-to-the-public-consultation-on-5g-published/>.

⁴⁰ Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](#).

⁴¹ Report and Order and Further Notice of Proposed Rulemaking, [FCC 16-89](#).

⁴² Contribution to WRC-15, [Revision 1 to Document 102\(Add.24\)](#), Korea (Republic of).

Figure 5: Frequency bands identified and under consideration for future IMT under WRC-19 agenda item 1.13 and in the US and Korea (segments in aqua are not being considered under WRC-19 agenda item 1.13, segments with 45-degree line pattern fill have already been identified for 5G)



Given the status of these countries as technology-developing nations, and the advanced nature of their consideration of these frequency bands outside the scope of WRC-19 agenda item 1.13, it is appropriate to add these frequency bands to the *monitoring* stage of the process for the consideration of additional bands for mobile broadband.

Next steps

The ACMA will monitor international developments on all bands being considered or already identified internationally for 5G/IMT. However, it is noted that one of the elements of the ACMA’s spectrum management strategy to address the growth in mobile broadband capacity is engagement in international deliberations to influence the development of domestically suitable internationally-harmonised spectrum options.

As mentioned in the previous section, the ACMA will monitor international developments with regard to possible early implementation bands for 5G. The feasibility of early implementation in Australia will depend on factors such as the location, type and number of incumbent services in a band, whether adequate interference management (or sharing) frameworks can be developed, and whether the development of economies of scale are likely.

Initial investigation

Bands that are in the *initial investigation* stage of the process for consideration of additional spectrum for mobile broadband services are the 1.5 GHz, 2 GHz and the 3.6 GHz bands.

1.5 GHz band (1427–1518 MHz)

The ACMA released *Planning for mobile broadband in the 1.5 GHz mobile band* in May 2012 to gather further information on issues related to the potential use of the

1427.9–1510.9 MHz band for mobile broadband services.⁴³ This paper noted that up to 2 x 35 MHz (1427.9–1462.9 MHz and 1475.9–1510.9 MHz) of FDD spectrum, or up to 90 MHz (1427–1518 MHz) of TDD or unpaired mobile downlink (UMD) spectrum, could potentially be released from the 1.5 GHz band for mobile broadband services.

Since that time, at WRC-15, the entire 1427–1518 MHz band was harmonised for IMT within regions 2 and 3, while Region 1 identified 1427–1452 MHz and 1492–1518 MHz via regional footnotes. In Region 1, only African and Arab states identified the 1452–1492 MHz range (CEPT did not identify this band due to an ongoing dispute with RCC countries over the protection of Aeronautical Mobile Telemetry services). The following text was also included in the *invites ITU-R* of Resolution **223 (Rev. WRC-15)**:

1. to conduct compatibility studies in order to provide technical measures to ensure coexistence between MSS in the frequency band 1518–1525 MHz and IMT in the frequency band 1492–1518 MHz;
2. to develop harmonized frequency arrangements to facilitate IMT deployment in the frequency band 1427–1518 MHz, taking into account the results of sharing and compatibility studies;

The ACMA notes that an additional outcome of WRC-15 was Resolution **761 (WRC-15)**. This resolution invites the ITU-R to conduct, in time for WRC-19, the appropriate regulatory and technical studies, with a view to ensuring the compatibility of IMT and the broadcasting-satellite service (BSS) (sound) in the frequency band 1452–1492 MHz in regions 1 and 3, taking into account IMT and BSS (sound) operational requirements.

Domestically, the ACMA has also identified that the impact on aeronautical telemetry services and fixed services, including the Digital Radio Concentrator System (DRCS), which will need to be considered in any re-farming considerations.

As referred to in Resolution **223 (Rev. WRC-15)**, some satellite industry representatives have also pointed out that compatibility with mobile satellite services (MSS) operating above 1518 MHz needs to be considered.

There is strong support domestically from mobile broadband representatives for progressing the re-farming of this band.

Developments since February 2016

In February 2016, ITU-R Working Party 5D commenced revision of Recommendation ITU-R M.1036-5 on Frequency arrangements for implementation of the terrestrial component of International Mobile Telecommunications (IMT) in the bands identified for IMT in the Radio Regulations (RR). The draft revision includes arrangements for the frequency band 1427–1518 MHz. Working Party 5D also commenced studies as called for in Resolution **223 (Rev. WRC-15)** on:

- > coexistence between MSS in the frequency band 1518–1525 MHz and IMT in the frequency band 1492–1518 MHz
- > compatibility of IMT and broadcasting-satellite service (sound) in the frequency band 1452–1492 MHz in regions 1 and 3.

Working Party 5D is aiming to complete these work items by late 2017.

The AWG has a work plan to develop a report on frequency arrangements for the 1427–1518 MHz band. The current proposal is to finalise the work in late 2017.

⁴³ Available on the [ACMA website](#).

Next steps

The ACMA will continue to monitor and engage with stakeholders via the usual international preparatory process to develop Australian positions on studies under Resolution **223 (Rev. WRC-15)** and Resolution **761 (WRC-15)**, and other international issues related to the 1.5 GHz band, such as possible new band plans. This could involve the submission of contributions to the ITU and AWG as appropriate.

Considering recent developments (WRC spectrum harmonisation outcomes and momentum in Europe), the ACMA expects to recommence consideration of this band for domestic use for mobile broadband later in 2016. This will include the release of a joint discussion paper on this frequency band and the 3.6 GHz band, which will progress consideration of both bands under the *initial investigation* stage.

Following joint consideration in this initial discussion paper, the 1.5 GHz and 3.6 GHz band may progress through the process for the consideration of potential bands for re-allocation to mobile broadband at different rates, depending on resources and priorities.

2 GHz (1980–2010 MHz and 2170–2200 MHz)

As an outcome of the review of the 2.5 GHz band⁴⁴, the ACMA developed arrangements to support the introduction of television outside broadcast (TOB) in the frequency ranges 1980–2010 MHz and 2170–2200 MHz on an interim basis. In March 2012, the [Television Outside Broadcast \(1980–2110 MHz and 2170–2300 MHz\) Frequency Band Plan 2012](#) (TOB Band Plan) was made. The frequency ranges remain subject to Embargo 23⁴⁵ to support TOB and future replanning activities.

Regulatory measures supporting the MSS in the 1980–2010 MHz and 2170–2200 MHz bands in Australia are included in the TVOB Band Plan. In Australia, there are currently no space or space receive apparatus licences issued⁴⁶ in this frequency range.

Representatives of satellite interests have indicated their concern regarding the potential for interference from mobile broadband services if they are deployed in the frequency bands 1980–2010 MHz and 2170–2200 MHz. Inmarsat and Omnispace have indicated that they have (or plan to deploy) new 2 GHz band MSS services in the near future. Specifically, Omnispace has expressed an interest in providing services in Australia. Satellite industry representatives have also suggested that services similar to those to be provided by Inmarsat's proposed satellite (Europasat) can be expected to be deployed in Australia as part of an international footprint in the future.

The frequency bands 1980–2010 MHz and 2170–2200 MHz are already allocated to the mobile service and subject to a global IMT identification via footnote 388 of the Spectrum Plan. In Resolution **212 (Rev. WRC-15)**, it is noted that these frequency bands are available for use for both the terrestrial component of IMT and the satellite component of IMT.

The ITU has defined IMT channel arrangements for the frequency bands 1980–2010 MHz and 2170–2200 MHz. These can be found in ITU-R Recommendation M.1036.⁴⁷ In order to include the new arrangements in ITU-R Recommendation M.1036, it was agreed in Resolution **212 (Rev. WRC-15)** to invite study on the possible technical and operational measures to ensure coexistence and compatibility between the terrestrial

⁴⁴ Refer to www.acma.gov.au/theACMA/25-ghz-band-review.

⁴⁵ Available from the [ACMA website](#) and last revised September 2013.

⁴⁶ RRL extraction 23 June 2016.

⁴⁷ Available on the ITU-R website at www.itu.int/rec/R-REC-M.1036/en.

component of IMT (in the mobile service) and the satellite component of IMT (in the mobile-satellite service) in the frequency bands 1980–2010 MHz and 2170–2200 MHz. These bands are directly adjacent to the existing 2.1 GHz band used for terrestrial mobile voice and broadband services. This work will be conducted as part of WRC-19 agenda item 9.1.1.

The ACMA notes that the work of the ITU on this issue will focus on co-existence of terrestrial and satellite use of the band across international borders, but acknowledges that this work may provide some useful information on how these bands could be shared between uses and users on a geographic basis domestically.

The ACMA has made the 1980–2010 MHz and 2170–2200 MHz bands available for use by TOB services on a temporary basis. RALI FX21 and Embargo 23 indicate that future use of these bands is under consideration as part of the work considering future spectrum requirements for mobile broadband. For these reasons, these bands are only available for use by TOB services while further investigation is undertaken on the long-term use of these bands.

Developments since February 2016

In February 2016, ITU-R Working Party 5D developed a work plan and commenced studies on technical and operational measures to ensure coexistence and compatibility between the terrestrial and satellite components of IMT in the frequency bands 1980–2010 MHz and 2170–2200 MHz in different countries, in response to WRC-19 agenda item 9.1 (issue 9.1.1).

Next steps

The frequency bands 1980–2010 MHz and 2170–2200 MHz will be retained at the *initial investigation* stage. The ACMA will consider further work on this band towards the second half of 2017.

The ACMA will also continue to monitor and, where appropriate, engage with stakeholders via the usual international preparatory process to develop Australian positions on international issues related to the frequency bands 1980–2010 MHz and 2170–2200 MHz, particularly in relation to work conducted as part of WRC-19 agenda item 9.1.1.

3.6 GHz (3575–3700 MHz)

In November 2009, the ACMA released arrangements for fixed and mobile broadband services in the 3575–3700 MHz band in regional and remote Australia. At the time, the band was not released in capital cities (except Hobart) to preserve future planning options within these areas.

Since that time, the band was considered under WRC-15 agenda item 1.1, resulting in an IMT identification in the 3600–3700 MHz band in Canada, Colombia, Costa Rica and the US. In addition, ECC Decision 11(06)⁴⁸ identifies the band for fixed/mobile broadband applications within Europe. Such interest in the Americas and Europe suggests that a viable mobile broadband ecosystem could soon develop in the band.

At WRC-15, Australia also added its name to existing footnotes in the ITU Radio Regulations identifying the 3400–3600 MHz band for IMT. This band is now identified for IMT in regions 1 and 2 and numerous Region 3 countries.

⁴⁸ Available on the European Communications office (ECO) website at www.erodocdb.dk/Docs/doc98/official/pdf/ECCDEC1106.PDF.

There are some fixed-satellite service Earth stations operating in the 3.6 GHz band, including installations in Perth and Sydney. Consequently, representatives of satellite interests have queried the justification for identifying the 3600–3700 MHz band for mobile broadband. Their main concern is the potential for interference from mobile broadband services and belief that this cannot be practically managed when both services operate on the same (or close frequency) in the same area. Satellite representatives have also indicated that given the outcomes of WRC-15, there appears to be little demand for mobile systems above 3600 MHz globally.

Representatives of fixed and mobile broadband interests have indicated their support for progressing the 3.6 GHz band to the *re-planning* stage. They also indicated that since the 3400–3575 MHz band is already available for fixed/mobile broadband, utility of the band for mobile broadband would be further increased if the 3575–3700 MHz band was made available and licences across the entire range were subsequently defragmented. This would require a broader review of the entire 3400–3700 MHz band, taking into account the rights of existing spectrum licence holders.

Developments since February 2016

In its [draft opinion on spectrum related aspects for next-generation wireless systems \(5G\)](#), RSPG stated that it considers the 3400–3800 MHz band to be the primary band suitable for the introduction of 5G use in Europe, even before 2020, which are generally supported in [submissions](#). RSPG noted that this band is already harmonised for mobile networks, and consists of up to 400 MHz of continuous spectrum, enabling wide channel bandwidth. They also noted that this band has the possibility to put Europe at the forefront of the 5G deployment.

Next steps

Considering recent developments (WRC spectrum harmonisation outcomes and momentum in the US and Europe), the ACMA expects to recommence consideration of this band for domestic use for mobile broadband later in 2016, and release a joint discussion paper on this frequency band and the 1.5 GHz band, which will progress consideration of both bands under the *initial investigation* stage.

Following joint consideration in this initial discussion paper, the 1.5 GHz and 3.6 GHz band may progress through the process for the consideration of potential bands for re-allocation to mobile broadband at different rates, depending on resources and priorities. The ACMA sees benefit in pursuing a review of the arrangements in the broader 3400–3700 MHz band to improve its utility, contingent on progress in the 3.6 GHz band.

Preliminary replanning

There are currently no bands in the *preliminary replanning* stage of the process for consideration of additional spectrum for mobile broadband services.

Re-farming

Bands that are currently in the *re-farming* stage of the process for consideration of additional spectrum for mobile broadband services are detailed below. In these cases, the band has been re-farmed or the decision has been made to re-farm the band to mobile broadband services, and final technical frameworks and re-allocation instruments have been or are being prepared.

Spectrum available for the licensing of mobile broadband services

There are numerous bands where the *re-farming* stage has occurred and spectrum is available for mobile broadband services. The following bands have spectrum available under either spectrum licence or apparatus licence arrangements:

- > *700 MHz*: 2 x 15 MHz (733–748/788–802 MHz) available Australia-wide via spectrum licensing
- > *1800 MHz regional*: six 2 x 5 MHz lots available in various regional areas via spectrum licensing
- > *1800 MHz remote*: available via site-based apparatus licensing
- > *2.1 GHz metropolitan*: numerous 2 x 5 MHz lots available in the capital cities of Adelaide, Brisbane, Darwin, Hobart and Perth via spectrum licensing
- > *2.1 GHz regional/remote*: available via site-based apparatus licensing
- > *2.3 GHz*: numerous lots available in regional and remote areas via spectrum licensing
- > *3.4 GHz*: numerous lots available in metropolitan and major regional centres via spectrum licensing
- > *3.5 GHz*: available via site-based apparatus licensing
- > *3.6 GHz Regional/Remote*: available via site-based apparatus licensing.

Developments since February 2016

From 6 May to 10 June, the Minister for Communications and the Arts consulted on a draft direction to the ACMA to allocate 2 x 10 MHz of this spectrum to Vodafone Hutchison Australia (VHA). The outcomes of the consultation are yet to be made public.

Next steps

For bands subject to spectrum licensing, the ACMA will monitor demand and determine when it is appropriate to allocate the spectrum.

For bands subject to apparatus licensing, except those frequencies and areas subject to an embargo, first-in-time over-the-counter licence application processes usually apply.

850 MHz expansion band (809–824 MHz and 854–869 MHz)

In November 2015, the ACMA released its *Long-term strategy for the 803–960 MHz band* decision paper, signalling an end to the review of this band and commencement of a long-term implementation plan to put those decisions into effect. One of the key decisions arising from the review was that 2 x 15 MHz of 4G-standardised spectrum will be made available for new mobile broadband services from 2024 onwards. This spectrum will come from the 850 MHz ‘expansion band’, which is lower-adjacent to the current 850 MHz 3G band used by Telstra and VHA.

Developments since February 2016

The project is now in an *implementation* phase, which is largely geared towards the clearance/relocation of incumbent services operating in the 850 MHz expansion frequencies earmarked for mobile broadband. The implementation plan is contained in the decision paper and the ACMA has established an implementation team to ensure that the milestones of the plan are reached with minimal disruption.

As part of this process, in July 2016 a new RALI (FX 22) was put in place to facilitate the transition of single frequency fixed links (SFFLs) and studio-to-transmitter links (STLs) to the new arrangements and further incremental updates will be made to this and other instructions as the implementation phase progresses.

Next steps

The implementation plan set out in the decision paper contains various milestones for the transition to long-term arrangements by incumbent services. No decision has been made on how or when the 850 MHz expansion band will be allocated.

900 MHz (890–915 MHz and 935–960 MHz)

A reconfiguration of licensing in the 900 MHz ‘GSM’ band (890–915/935–960 MHz) into 5 MHz FDD blocks, as well as a related proposal to implement a 1 MHz downshift of the 850 MHz band (to maximise the utility of the adjacent 900 MHz GSM band), was originally proposed under the review of the 803–960 MHz band, however no decisions have yet been taken on these reforms. While these reforms remain critical objectives for the ACMA, the fact that these issues are ‘self-contained’ to the existing three licensees (Telstra, Optus and VHA) allows the ACMA to deal with them in isolation to the implementation of those broader reforms to the 803–960 MHz band detailed in the paper.

Developments since February 2016

The ACMA has been consulting directly with the relevant industry stakeholders to bring about the changes to the 900 MHz GSM band, specifically looking at the potential for re-farming the band into 5 MHz licence blocks (currently apparatus licenced in either 8.4 or 8.2 MHz FDD pairs). It is intended that a public paper that describes the applicable reform options will be released in Q3, 2016.

Next steps

A decision on an appropriate re-farming mechanism and reform timetable for this band is expected to be made by the end of the 2016 calendar year.

Part 4—
Projected work program
2017–20



Purpose

Part 4 presents the ACMA's projected work program for 2017–20 in two schedules. The purpose of the projected work program is to provide a basis for meaningful engagement about the ACMA's current work priorities. The known future projects provide a starting point for the ACMA and industry considering the status of other spectrum-related work as it arises.

The projected work program

The ACMA develops and publishes a five-year spectrum management work program on an annual basis. In addition to the 2016–17 work plan in Part 2, the ACMA has identified a program of work for the period 2017–20. This is work that the ACMA expects to commence, or continue to progress, over that period of time. The information is divided into two schedules:

- > Schedule 1 is a list of projects or activities on a band-by-band basis, listed in ascending frequency order
- > Schedule 2 lists the regulatory or service-based projects that, given the activity's broad-ranging impact (such as spectrum pricing activities) may span a number of bands or services.

Development of the projected work program

Stakeholders should consider the projects identified in the work program as the ACMA's response to increasing pressures on spectrum demand and availability. The projects and programs outlined in schedules 1 and 2 represent the ACMA's preliminary thinking on its priorities for the period 2017–20.

As stated in earlier sections of the FYSO, the ACMA's priorities are regularly reviewed and, in particular, may change as the ACMA is required to shift its focus on implementing the government's spectrum reforms.

Importantly, the projected work program for 2017–20 does not reflect all the work the ACMA undertakes in radiocommunications issues. For example, many activities that would be considered 'business as usual', including responding to requests from stakeholders resulting in minor changes to the existing regulatory arrangements.

The ACMA received 10 submissions in response to its 2015–19 FYSO, with submissions closing on 18 December 2015. Submissions covered a range of matters, including the spectrum needs or requirements of individual submitters, and suggestions for matters the ACMA might wish to consider in positioning future publications. The ACMA considered these submissions when developing its projected work program.

Consultation for spectrum management changes

The ACMA publishes the projected work program to give information to industry, government and community groups about planned spectrum management activities that can assist them in providing the ACMA with views about likely future pressures on spectrum management over the 2017–20 period.

The ACMA stresses that consultation with interested parties about planned spectrum management work and related changes will be an ongoing feature of its regulatory functions. The work program is a living document that the ACMA reviews annually to ensure its relevance to current trends in radiocommunications. This will include regular updates of the time frames, and priorities for each task and project to ensure they reflect current demand.

**Schedule 1:
Band-by-band work program**



2017–20

Frequency range	Work task	Outline	Priority	Expected completion time frame
45–52 MHz 56–70 MHz 85–108 MHz 137–144 MHz	VHF broadcasting service bands (BSB)	Spectrum in these bands has been vacated following the switch-off of analog television. The VHF BSB review will examine potential future uses for these bands, including potential use for the IoT. Subsequent projects will be needed to implement arrangements for any new uses of the bands.	Medium	TBA as Spectrum Review proposals may affect this work.
174–230 MHz	Complete digital radio planning and licensing for Canberra and Darwin	Planning for digital radio services outside mainland state capitals will be informed by the considerations of the Digital Radio Planning Committee for Regional Australia, as recommended by the DoCA Digital Radio Report. The government expects the committee to give priority to the permanent licencing of digital radio services in Canberra and Darwin.	Medium	Possible in 2017. However, the time frame for completion will be informed by the deliberation of the Digital Radio Planning Committee for Regional Australia and the passage by parliament of any necessary minor legislative amendments.
403–520 MHz	400 MHz implementation changes	Licensees to make changes as per Milestone 3 requirements (RDA/LDA).	High	End 2019
803–960 MHz	Review of the band 803–960 MHz	Continuation of the multi-staged implementation of outcomes of the band review. Implementation plan contained in the decision paper .	High	Mid-2024
1900–1920 MHz	2 GHz band	The 1900–1920 MHz band was not included in the minister's class of service determination and licensees indicated they were not interested in re-issue of their licences as spectrum licences. The ACMA therefore intends to allow these licences to expire. Once expired, the associated spectrum licence space will revert to an apparatus licencing regime.	Medium	Subject to international developments in the band.

Frequency range	Work task	Outline	Priority	Expected completion time frame
		<p>Spectrum licences in the 2 GHz band expire on 11 October 2017.</p> <p>The ACMA intends to review the international developments in the band to determine the most appropriate future arrangements to implement.</p>		
1980–2010 MHz and 2170–2200 MHz	<i>Band review:</i> Potential future use by mobile broadband	These bands are currently available on an interim basis for TOB and were identified as candidate bands for mobile broadband in <i>Towards 2020</i> . The ACMA will further consider this band under the ACMA’s mobile broadband strategy (noting potential interest in access to the band (in some geographic areas) for mobile satellite service applications is possible).	Low to medium	Subject to mobile broadband strategy.
2700–3100 MHz	<i>Regulatory assessment:</i> Assignment coordination difficulties between radar operators	The ACMA is working with Defence, Airservices Australia and the Bureau of Meteorology to consider improved arrangements for radiolocation and radionavigation services in these bands. This has included establishment of a domestic radar technical working group.	Low	
3575–3700 MHz	Potential future use by mobile broadband	This band is in the <i>initial investigation</i> stage of the process for consideration of additional spectrum for mobile broadband services. Parts of the 3.6 GHz band were identified for IMT at WRC-15. The ACMA expects to recommence consideration of this band for domestic use for mobile broadband later in 2016 with the release of a discussion paper.	High	Late 2017/early 2018, contingent on consultation outcomes.

Schedule 2: Regulatory and service-planning work programs



2017–20

Work task	Outline	Priority
Implementation of Spectrum Review outcomes	Development of the policy framework to implement the government's Spectrum Review outcomes when the new arrangements are in place	High
Infrastructure park	The ACMA is undertaking research and analysis into the development of a type of 'private park' to be made available for smart infrastructure.	Medium
Taxation arrangements for TOB services	The ACMA has previously committed to reviewing the apparatus licence taxation arrangements associated with TOB services. This review is expected to commence in 2016 and is expected to be concluded in early 2017–18.	Medium
Whitespace	Whitespace is a colloquial term used to describe 'unused' television channels and has traditionally been used by wireless microphones. There is now interest in whitespace for use by Wi-Fi-like systems. The ACMA is monitoring developments in this area. Implementation of the recommendations of the Spectrum Review may assist in the development of new regulatory approaches that would assist in the introduction of such technologies.	Medium
Review of spurious emissions	The ACMA has identified potential ambiguities and inconsistencies in how spurious emission limits are defined and how interference from spurious emissions is managed for devices operating under spectrum and apparatus licences in Australia. A combined review of these arrangements is therefore considered appropriate.	Medium

Invitation to comment

The ACMA invites comments on the issues set out in the *Five-year spectrum outlook 2016–20* or any other issues relevant to spectrum demand analysis and strategic direction.

Making a submission

- > **Online submissions**—submissions can be made via the comment function or by uploading a document. The online consultation page provides details.
- > **Submissions by post**—can be sent to:
 - The Manager
 - Spectrum Licensing Policy Section
 - Spectrum Management Policy Branch
 - Australian Communications and Media Authority
 - PO Box 78
 - Belconnen ACT 2616

The closing date for submissions is COB, Friday 20 January 2017.

Electronic submissions in Microsoft Word or Rich Text Format are preferred.

Enquiries

- > Consultation enquiries can be emailed to spectrumlicensingpolicy@acma.gov.au.
- > Media enquiries can be directed to Emma Rossi on 02 9334 7719 or by email to media@acma.gov.au.

Effective consultation

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

Publication of submissions

In general, the ACMA publishes all submissions it receives. The ACMA prefers to receive submissions that are not claimed to be confidential. However, the ACMA accepts that a submitter may sometimes wish to provide information in confidence. In these circumstances, submitters are asked to identify the material over which confidentiality is claimed and provide a written explanation for the claim.

The ACMA will consider each confidentiality claim on a case-by-case basis. If the ACMA accepts a claim, it will not publish the confidential information unless authorised or required by law to do so.

Release of submissions where authorised or required by law

Any submissions provided to the ACMA may be released under the [Freedom of Information Act 1982](#) (unless an exemption applies) or shared with various other government agencies and certain other parties under Part 7A of the [Australian Communications and Media Authority Act 2005](#). The ACMA may also be required to release submissions for other reasons including for the purpose of parliamentary processes or where otherwise required by law (for example, under a court subpoena). While the ACMA seeks to consult submitters of confidential information before that

information is provided to another party, the ACMA cannot guarantee that confidential information will not be released through these or other legal means.

Privacy

The [Privacy Act 1988](#) imposes obligations on the ACMA in relation to the collection, security, quality, access, use and disclosure of personal information. These obligations are detailed in the [Australian Privacy Principles](#).

The ACMA may only collect personal information if it is reasonably necessary for, or directly related to, one or more of its functions or activities.

The purposes for which personal information is being collected (such as the names and contact details of submitters) are to:

- > contribute to the transparency of the consultation process by clarifying, where appropriate, whose views are represented by a submission
- > enable the ACMA to contact submitters where follow-up is required or to notify them of related matters (except where submitters indicate they do not wish to be notified of such matters).

The ACMA will not use the personal information collected for any other purpose, unless the submitter has provided their consent or the ACMA is otherwise permitted to do so under the Privacy Act.

Submissions in response to this paper are voluntary. As mentioned above, the ACMA generally publishes all submissions it receives, including any personal information in the submissions. If a submitter has made a confidentiality claim over personal information that the ACMA has accepted, the submission will be published without that information. The ACMA will not release the personal information unless authorised or required by law to do so.

If a submitter wishes to make a submission anonymously or use a pseudonym, they are asked to contact the ACMA to see whether it is practicable to do so in light of the subject matter of the consultation. If it is practicable, the ACMA will notify the submitter of any procedures that need to be followed and whether there are any other consequences of making a submission in that way.

Further information on the Privacy Act and the ACMA's privacy policy is available at www.acma.gov.au/privacypolicy. The privacy policy contains details about how an individual may access personal information about them that is held by the ACMA, and seek the correction of such information. It also explains how an individual may complain about a breach of the Privacy Act and how the ACMA will deal with such a complaint.

Appendix A—Acronyms and abbreviations

Acronym	Definition
3GPP	3 rd Generation Partnership Project
5G	Fifth generation wireless technology
AM	Amplitude modulation
APT	Asia–Pacific Telecommunity
ARSG	Australian Radiocommunications Study Group
ARSMG	Arab Spectrum Management Group
ATU	African Telecommunications Union
BSA	<i>Broadcasting Services Act 1992</i>
BSB	Broadcasting services bands
BSS	Broadcasting-satellite service
CEPT	European Conference of Postal and Telecommunications Administrations
CITEL	Inter-American Telecommunication Commission
C-ITS	Cooperative – Intelligent Transport Systems
CRA	Commercial Radio Australia
DAB	Digital audio broadcasting
DoCA	Department of Communications and the Arts
DRCP	Digital Radio Channel Plan
DRCS	Digital Radio Concentrator System
DSA	Dynamic spectrum access
ESA	European Space Agency
ESIM	Earth station in motion
FSS	Fixed satellite service
Gbps	Billions of bits per second
GSM	Global System for Mobile communications

Acronym	Definition
FCC	Federal Communications Commission
FDD	Frequency division duplex
FM	Frequency modulation
GHz	Gigahertz
HDA	High density area
HEVC	High Efficiency Video Coding
IEEE	Institute of Electrical and Electronics Engineers
ITS	Intelligent Transport Systems
ITU	International Telecommunication Union
ITU-R	ITU Radiocommunication Sector
IMT	International Mobile Telecommunications
IoT	Internet of things
IoTAA	IoT Alliance Australia
ITS	Intelligent transport systems
LAP	Licence area plan
LDA	Low density area
LED	Light-emitting diode
LA	<i>Legislation Act 2003</i>
LIPD	Low interference potential devices
M2M	Machine-to-machine
MDA	Medium density area
MHz	Megahertz
mmW	Millimetre wave
MSS	Mobile satellite services
OBPR	Office of Best Practice Regulation
PCA	Priority compliance area
RALI	Radiocommunications Assignment and Licensing Instruction

Acronym	Definition
RCC	Regional Communications Council
RDA	Remote density area
RLAN	Radio Local Area Network
RR	ITU Radio Regulations
RSPG	Radio Spectrum Policy Group
SFFL	Single frequency fixed links
STLs	Studio-to-transmitter links
TDD	Time division duplex
TLAP	Television licence area plan
TOB	Television outside broadcast
TPG	Technical Planning Guidelines
UHF	Ultra high frequency
UMD	Unpaired mobile downlink
UWB	Ultra-wideband
VHF	Very high frequency
WAS	Wireless access service
WiMAX	Worldwide Interoperability for Microwave Access
WRC	World Radiocommunication Conference

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