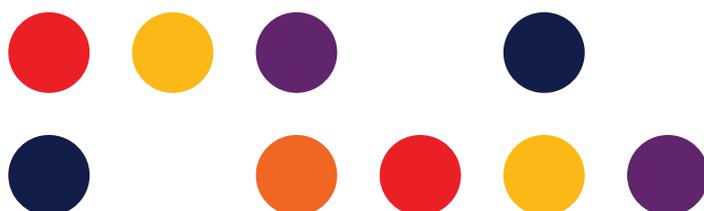


Expiring spectrum licences: stage 2 Information gathering, and views on uses of frequency bands and alternative licence conditions

TPG submission to ACMA

June 2024

Public version



Summary

TPG Telecom Limited (**TPG**) welcomes the opportunity to provide this submission to the ACMA in response to stage 2 of its ongoing consultation on the future of Expiring Spectrum Licences (**ESL**).

TPG's expiring spectrum licences are currently in use and will be in use for the foreseeable future. TPG's past and future investments depend on ongoing access to the licences the subject of the ACMA's consultation.

TPG Telecom considers:

1. Renewal of the ESL for the maximum 20-year licence term would best advance the public interest criteria.
2. Pricing certainty is of high importance. The ACMA should consider the following principles when setting renewal fees:
 - renewal fees should be low given ongoing sustainability challenges faced by the industry;
 - fees should be paid on an annual basis rather than in lump sum payments, and
 - there should be identical pricing structures for technically substitutable spectrum bands.
3. The ESL process is an opportunity to consider alternative fee structures such as scaling licence fees according to a licensee's relevant service revenue or market share. Progressive structures are adopted for other telecommunications levies, such as the Telecommunications Industry Levy and Annual Carrier Licence Charge. A progressive structure would better align with the public interest criteria than a static unit price.
4. TPG does not support moving away from the current approach to licence conditions. However, TPG is not opposed to alternative licence conditions in all circumstances. If the ACMA decided to implement additional conditions, it must ensure renewal fees are discounted to reflect the greater costs imposed on licensees. Notwithstanding, some ESL bands, such as low band spectrum, are uniquely unsuited for sharing between multiple carriers and TPG would oppose imposing certain conditions for these bands.

To address specific requests in the ACMA's consultation paper, this submission is structured as follows:

- **Part A:** TPG's use of the expiring spectrum.
- **Part B:** Assessing licence renewal against the public interest criteria.
- **Part C:** Using licence conditions and payment structures to drive efficient outcomes.
- **Part D:** Assessment of the secondary market for spectrum access.
- **Part E:** Report produced by Analysys Mason regarding renewal processes in other countries.

Part A: TPG’s use of the expiring spectrum

TPG holds licences for the following expiring spectrum:

- 2x15 MHz of national spectrum in the 700 MHz band;
- 2x10 MHz of metropolitan spectrum in the 850 MHz band and 2x5 MHz of regional spectrum in the 850 MHz band;
- 2x5 to 2x30 MHz of spectrum in the 1800 MHz band in different licence regions;
- 2x5 to 2x25 MHz of spectrum in the 2 GHz band in different licence regions; and
- 20 to 60 MHz of unpaired spectrum in the 3.4 GHz band in different licence regions.

Existing use by TPG

TPG currently uses the expiring spectrum in the following manner:

Table 1: Current use of TPG’s ESL spectrum

	Metro (<80% pop coverage)	Regional (80%+ pop coverage)	Technology
700 MHz	Mobile	Mobile (progressively rolled out)	5G
850 MHz	Mobile / IoT	Mobile / IoT	4G
1800 MHz	Mobile	Mobile	4G (upgrade to 5G in future)
2 GHz	Mobile	Mobile	4G (upgrade to 5G in future)
3.4 GHz	Mobile	Mobile (progressively rolled out)	5G

TPG notes all the ESL bands are designated as IMT bands globally and therefore benefit from significant scale advantages.

Expected future use by TPG

TPG plans to use this spectrum in the manner summarised in the following table:

Table 2: Future use of TPG’s ESL spectrum

	<81.4% pop coverage	81.4%-98.4% pop coverage	Rest of Australia (up to 100% geographic coverage)
700 MHz	Mobile 5G – deployed	Used in shared regional RAN – planned from Q1 2025	LEOSat direct to device (D2D) service candidate band

850 MHz	Mobile 4G / IoT – deployed	LEOSat D2D service candidate band	LEOSat D2D service candidate band
1800 MHz	Mobile 5G – to be refarmed from 4G network	Used in shared regional RAN – planned from Q1 2025	LEOSat D2D service candidate band (100% geographic coverage not available per scope of licence)
2 GHz	Mobile 5G – to be refarmed from 4G network	LEOSat D2D service candidate band	LEOSat D2D service candidate band (100% geographic coverage not available per scope of licence)
3.4 GHz	Mobile 5G – deployed	Used in shared regional RAN – planned from Q1 2025	100% geographic coverage not available per scope of licence

Further details are provided in each section below.

Mobile services

All of TPG’s ESL are in use to support almost 6 million subscribers on mobile and fixed wireless services across Australia.

TPG’s resource utilisation across its mobile network is shown in the below box-and-whisker graphs.¹

Figure 1: National network: sector utilisation per quartile [c-i-c starts] [c-i-c ends]

TPG notes:

- 4G low-band uses 850 MHz spectrum;
- 5G low-band uses 700 MHz spectrum;
- 4G mid-band uses 1800 MHz and 2100 MHz spectrum, and will gradually be refarmed to 5G in the future, and
- 5G mid-band uses 3.4 GHz spectrum and will also use TPG’s recently acquire 3.7 GHz spectrum once that is fully deployed.

4G

Figure 1 shows TPG’s 4G capacity utilisation is towards the high end. The top quartile of sectors across TPG’s network are over [c-i-c starts] [c-i-c ends] utilised on both low-band and mid-band spectrum (i.e. 850 MHz, 1800 MHz and 2100 MHz). This is expected given the

¹ The box-and-whisker plots show the distribution of resources used across TPG’s network by radio sector and separated into the ESL bands. Utilisation measure is based on the average of 3-day busy hour traffic on each sector during the week ending 8 April 2024. TPG has deployed its entire stack of spectrum holdings except for 26 GHz (which is being trialled for use for both mobile services and fixed wireless home broadband) and the recently acquired 3.7 GHz spectrum.

maturity of 4G.

TPG expects 4G utilisation on its network will continue to grow given approximately [c-i-c starts] [c-i-c ends] of TPG's mobile sites have not been upgraded to 5G. The general strategy is to progressively upgrade these sites to 5G when a site approaches congestion with the aim to de-load the 4G network by shifting traffic to 5G.

Generally, TPG defines congestion at a cell level as being [c-i-c starts] [c-i-c ends]. When a sector approaches congestion, it is flagged for a capacity upgrade. Where possible, TPG will increase capacity via a technology upgrade. This includes, for example, upgrading a 4G only site to 5G. In some cases, where possible, densification (i.e. building more sites) will be planned and improved radio platforms and features will also be made.

5G

Figure 1 also shows a healthy level of 5G capacity utilisation. Utilisation on both low-band and mid-band is already more than [c-i-c starts] [c-i-c ends] on the top 25% most heavily used sectors. TPG expects this trend to continue, and over the next few years, 5G sites will become congested and require capacity upgrades.

The initial 5G capacity is supported by TPG's 700 MHz and 3.4 GHz holdings (including recently acquired 3.7 GHz spectrum). As congestion starts creeping into the network, TPG intends to progressively refarm 1800 MHz and 2100 MHz holdings (which currently are used to support 4G) to support 5G. TPG will manage this process carefully as it will have implications for 4G capacity needs.

TPG will also look to deploy 26 GHz spectrum to support its 5G network. TPG is currently undertaking trials on how to best deploy this resource.

Over the long-term, opportunities to increase capacity via technology upgrades and refarming spectrum will be exhausted. At that point, additional spectrum resources will be required to support user demand. This is particularly important in dense metropolitan areas where macro cell network densification is nearly impossible to achieve primarily due to difficult planning restrictions and a lack of suitable site locations. Small cell deployment is of insufficient benefit and may still be subject to onerous planning regulations.

In the context of the recently announced network sharing arrangements with Optus, a subset view of utilisation in the 0-81.4% population coverage areas is also useful. This is provided below. TPG notes the trend is identical to the graph show above, and all the matters discussed above are equally applicable.

Figure 2: Metropolitan network (0-81.4% pop coverage): sector utilisation per quartile [c-i-c starts] [c-i-c ends]

In TPG's experience, mobile data consumption has been increasing at a rate of 20-30% per year. While forecasting is an imprecise exercise, all available evidence suggests the historical growth trend will continue. This means not only are TPG's ESL bands required to satisfy demand on a forward-looking basis, but additional capacity will be needed.

The capacity challenge is shared across the mobile industry broadly. All MNOs will need

additional capacity on a forward-looking basis due to increases in user mobile data requirements.

Lastly, 6G will likely start maturing around 2030. Deployment of 6G will likely overlap with ESL fees. If these licence fees are excessive, the mobile industry will be under significant financial pressure and may be unable to deploy 6G as quickly, leaving Australia behind on global standards.

The ACMA should have regard to the likelihood of these upcoming network costs when setting renewal fees to advance the public interest criteria set out in its paper. A cautionary tale is how high spectrum licence fees impacted the rollout of 4G in numerous European countries, resulting in lower service quality, higher prices, and lost economy-wide productivity gains.²

Regional network sharing

On 29 April 2024, TPG and Optus announced a proposed regional network sharing arrangement. Under this arrangement, TPG will gain access to Optus' regional RAN, covering 81.4%-98.4% population coverage area. TPG will contribute its holdings in 700 MHz, 1800 MHz, and 3.4 GHz bands to the shared regional RAN. These bands will be deployed on 2,444 sites in regional areas, which is a significant increase compared to TPG's existing regional grid of approximately 750 sites.

TPG and Optus will maintain separate core networks and RANs outside the 81.4%-98.4% population coverage area. Customers of both TPG and Optus will experience the same level of service quality in the shared regional RAN areas.

The regional network sharing arrangement is expected to be implemented in Q1 2025. From then, TPG's mobile customers will have access to expanded regional coverage, and all users of the shared regional RAN will experience improved quality of service due to the combined spectrum holdings of TPG and Optus. TPG expects this will lead to improved competition in regional markets and superior consumer outcomes compared to the status quo.

The proposed regional network sharing arrangement is a long-term arrangement for an initial term of 11-years with options to extend. As part of the arrangement, Optus will progressively upgrade the mobile sites within the shared regional RAN to 5G. This is expected to be completed by 2030.

If TPG is not offered an opportunity to renew its ESL holdings, it will mean the shared regional RAN would have less capacity, inferior customer experience and less ability to compete in regional markets. This will negatively impact retail and wholesale users (e.g., MVNOs) and would not advance the public interest criteria.

Direct to device services to rest of Australia

A number of LEOSat operators have recently announced plans to launch LEOSat

² See for example: GSMA, *Effective Spectrum Pricing in Europe: Policies to support better quality and more affordable mobile services* (September 2017), available at: <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2018/12/Effective-Spectrum-Pricing-in-Europe.pdf>

constellations and make D2D mobile services available in areas not covered by terrestrial mobile networks.

TPG is aware of two different commercial models LEOSat operators are pursuing:

- In the first model, LEOSat operators partner with existing MNOs and use MNOs' spectrum holdings to provide mobile connectivity to areas where an MNO does not have terrestrial mobile network coverage. This model is similar to a MOCN architecture. One benefit is end-user experience would be seamless as end-users move between terrestrial mobile coverage and LEOSat mobile coverage.
- In the second model, a LEOSat operator will have access to spectrum in their own right or access MNO's spectrum. This model is similar to a domestic mobile roaming arrangement. Like domestic mobile roaming, end-users would drop and reconnect when they move between terrestrial mobile coverage and LEOSat coverage areas.

To fully engage with this opportunity, TPG needs long term access to suitable spectrum with 100% geographic coverage.

[c-i-c starts] [c-i-c ends]

TPG's use case for this technology is focused on:

- providing in-fill coverage to address mobile blackspots that currently frustrate end-users; and
- extending the reach of its mobile network to 100% geographic coverage.

The table below provides TPG's latest understanding of various LEOSat operators' D2D capabilities. The ESL bands of focus from TPG's perspective are highlighted in green.

Table 3: Summary of LEOSat operator capabilities [c-i-c starts] [c-i-c ends]

Of primary suitability are TPG's current FDD 700 MHz and 850 MHz spectrum holdings due to their 100% geographic coverage. It is important to achieve 100% geographic coverage given:

- the significant increase in utility of a mobile network capable of providing 100% geographic coverage over a mobile network that cannot, and
- a mobile network that cannot provide 100% geographic coverage is likely less able to compete for end-users vis-à-vis a mobile network that can.

From a broader telecommunication policy perspective, achieving 100% geographic coverage would enable consideration of a new approach to policies such as the Universal Service Obligation.

In addition, the availability of LEOSat D2D services would improve resilience and enable TPG to provide a truly alternative path for consumers to maintain communications in the event of emergencies impacting local network availability.

Future network investment

Spectrum can only be used with corresponding investment in network infrastructure. To date, TPG has invested billions of dollars of capital into its mobile network. TPG has so far made approximately [c-i-c starts] [c-i-c ends] worth of capital investments in removing 4G Huawei RAN equipment and upgrading TPG's RAN to 5G.

The ACMA must factor in the substantial resources and capital that licensees already spent in delivering world class mobile connectivity to the Australian public. There is also a substantial amount of future network investment required to continue to deliver mobile services that meet consumer expectations.

The ACMA must have regard to the opportunity cost of setting spectrum renewal fees too high, the negative impact high licence fees will have on investment incentives, and on the ability of licensees to attract capital in order to use the spectrum. In short, high spectrum prices have the effect of slowing or reducing investment in the mobile network that would utilise the spectrum.

TPG's network strategy forecasts the following network investment requirements:

- **Complete 5G network upgrade:** excluding the regional network sharing areas, approximately [c-i-c starts] [c-i-c ends] of TPG's mobile sites are still 4G-only. TPG estimates at least [c-i-c starts] [c-i-c ends] capital expenditure is needed to complete its 5G RAN upgrade.
- **Contribution to shared regional RAN:** as part of the arrangement with Optus, TPG will contribute approximately \$1.59 billion in fees to Optus over the term of the agreement. Optus will upgrade the shared regional RAN to 5G by 2030.
- **LEOSat D2D capabilities:** [c-i-c starts] [c-i-c ends]

If TPG does not have certainty of spectrum renewal at reasonable prices, there may be negative implications for some of these future investments.

Impact of renewal costs on industry sustainability

The importance of the ESL spectrum bands is not limited to technological enablement. The access costs have implications for the ability of MNOs to use the spectrum to deliver downstream services.

The ESL process is a prime opportunity to reconsider whether there is a superior way to facilitate access to the ESL spectrum bands. The impact of high spectrum costs imposed on licensees should be a core consideration by the ACMA.

High spectrum costs will amplify the existing structural instability in the industry. If unresolved, this will mean less investment in network infrastructure and in the long run, industry consolidation.

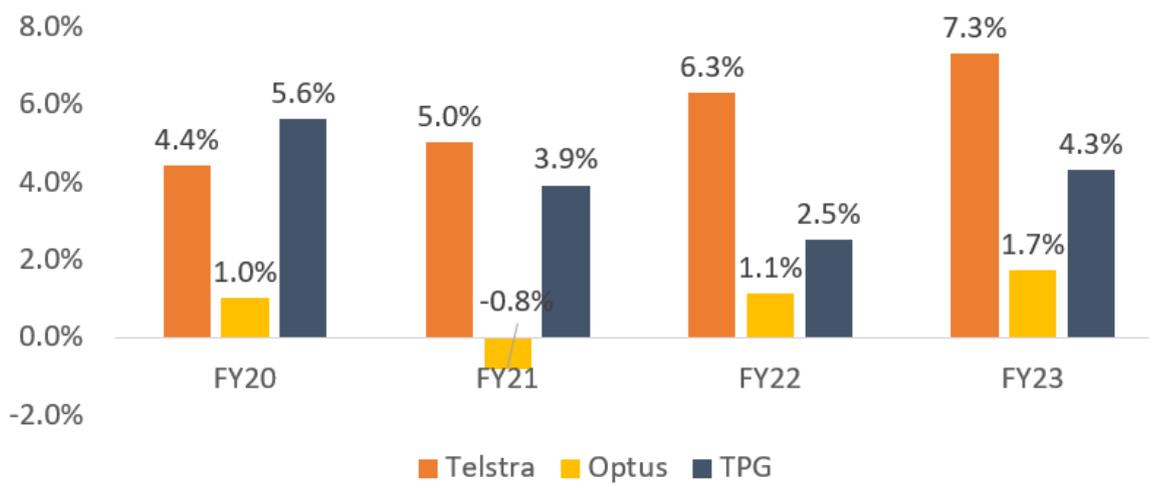
At the heart of the issue is that the MNOs have made, and continue to make, significant investments in mobile infrastructure (e.g., network upgrades, network densification, and

coverage expansion), but MNO revenues have not kept pace with the investment needs.

MNOs have borrowed (and leveraged their businesses) to varying degrees to make these investments, however there is a limit to how much additional debt they can take on and how much financial institutions are willing to lend.

The industry is not making adequate returns relative to the level of investment. This is reflected in the return on invested capital (**ROIC**) for each of the MNOs, which are produced below.

Figure 3: Return on invested capital by operator



Data from Barrenjoey Equity Research TPG Telecom Limited coverage, 24 August 2023. Numbers were annualised to June, based on company disclosures. Pre-merger figures are excluded as they are not like-for-like. This is not an endorsement by Barrenjoey Equity Research.

The weighted average cost of capital (**WACC**) for the telecommunications industry is generally accepted to be between 7% to 8%.

Figure 3 shows TPG and Optus are making returns well below WACC, i.e. TPG and Optus are not making sufficient returns to support the level of investment each is making. Telstra recently announced a ROIC of 7.8% for the December half of financial year 2024, making it the only MNO achieving sustainable returns.

The ACMA must appreciate the significant debt the MNOs have taken on to provide world class mobile services to Australians. These have not been 'paid back'. The ACMA should also appreciate the impact licence costs have on a licensee's ability to make investments in the future, given the difficult financial operating environment.

Part C of this submission provides more detail, including TPG's proposals on licence fee and licence condition considerations.

Part B: TPG’s assessment against the public interest criteria

Part B outlines why offering TPG an opportunity to renew its ESL spectrum for the maximum licence term of 20-years best promotes the public interest criteria.

Overview

A summary is provided in the following table:

Table 4: Summary of TPG’s assessment of renewal against public interest criteria

Summary of TPG’s assessment	
Facilitates efficiency	Certainty of licence renewal will give TPG confidence to continue network upgrades (e.g. from 4G to 5G, and 5G to 6G) leading up to the date of licence expiration. Further, it would give TPG the confidence to pursue LEOSat D2D services to bring mobile service to areas currently without terrestrial mobile coverage, reaching up to 100% geographic coverage.
Promotes investment and innovation	Similar to above, certainty of licence renewal will provide TPG confidence to pursue its network strategy, which will require significant investments. Certain aspects of its strategy will not be possible without the expiring spectrum.
Enhances competition	The purpose of TPG’s network strategy is to provide better user experiences on its mobile network, enabling TPG to compete in downstream markets. Without an opportunity to renew TPG’s ESL spectrum, TPG will have less confidence in making certain investments from now until the expiration of the licences, and less confidence in planning ahead beyond the expiration of the ESL licences. This will have implications from a competition perspective in downstream markets.
Balances public benefits and impacts	<p>There is no better use case for TPG’s expiring spectrum than TPG from a public benefit perspective. Mobile services underpin modern consumer communications and no substitutes can provide Australians a way to stay connected the way mobile services can.</p> <p>Offering TPG an opportunity to renew its ESLs would directly support nearly 6 million Australians who rely on TPG’s mobile and fixed wireless services, every day.</p> <p>There are no negative impacts in offering existing licence holders a chance to renew their ESLs. The ACMA has made alternative spectrum access arrangements available (e.g. AWLs, which are significantly cheaper than spectrum licences) for alternative users and use cases. There is no evidence to suggest these alternative spectrum access arrangements are</p>

	<p>unsuitable or exhausted.</p> <p>Lastly, the secondary market is operating efficiently. TPG provides further information on this aspect in Part D.</p>
<p>Supports relevant policy objectives and priorities</p>	<p>Offering TPG an opportunity to renew its ESL spectrum would best support government’s policy objectives and priorities.</p> <p>Similar to above, there is likely no better use case for TPG’s ESL spectrum. There are no credible alternatives to mobile services that TPG provides to its millions of end-users.</p> <p>Further, offering TPG an opportunity to renew its ESLs would be consistent with the Ministerial Policy Statement.</p>

Further details about each criteria are provided below.

While TPG does not believe it necessary, the ACMA could retain ongoing oversight of the use of the ESLs (assuming they are renewed and retained by the existing licensees) by implementing certain licence conditions. The ACMA’s paper refers to ongoing network or service obligations and ‘use it or lose it/share it’ type obligations.

If the ACMA were to proceed with alternative licence conditions, it should recognise there would be costs imposed on licensees. These costs are not only monetary, but may manifest in opportunity costs, for example, constraining an MNO’s business or network strategy.

Therefore, the ACMA needs to consider how these types of trade-offs are reflected in how licences access fees are set and reflect the inherently lower value of the licence. Further submissions on this aspect are made in **Part C**.

Facilitates efficiency

Renewal of the ESL best promotes efficient use of the spectrum. TPG has continuously refarmed spectrum from 2G to 3G to 4G and is currently in the process of upgrading its entire mobile network to 5G. It is expected a similar process will occur when 6G becomes viable later this decade.

Further, existing licensees have worked together to ‘defrag’ a number of the ESL bands to make them more efficient from a useability perspective. There is still more work to be done, particularly in the 3.4 GHz band. TPG’s detailed comments on secondary market matters are made in **Part D**.

Without the certainty of continuing long-term access to TPG’s expiring spectrum, TPG will have less confidence in making network investments, and engaging in defragmentation processes between now and the expiration of those licences. TPG will also have less confidence in advancing long-term network strategies, such as committing to long term commercial arrangements with LEOSat providers. All these programs will provide significant downstream benefits to consumers from increasing the utility of the ESL spectrum and expanding coverage.

In Part A of this submission, TPG set out its network strategy on how the ESL spectrum would

be used, if renewed in metropolitan (i.e. 0-81.4% population coverage areas), in regional areas (i.e. 81.4%-98.4% population coverage areas) and parts of Australia currently without terrestrial mobile coverage.

TPG has provided utilisation information which shows TPG's 4G mobile network is heavily utilised; with the top [c-i-c starts] [c-i-c ends]. TPG also provided utilisation information, showing adoption of TPG's 5G network and the available capacity being consumed by end-users. [c-i-c starts] [c-i-c ends]

Over the next few years, TPG expects 4G utilisation will plateau and decrease over time. Concurrently, 5G network utilisation will increase as more end-users adopt it.

TPG plans to progressively refarm 1800 MHz and 2100 MHz spectrum to support the existing 700 MHz and 3.4 GHz spectrum carrying TPG's 5G traffic. This will necessarily involve investments in RAN equipment. If TPG does not have certainty of access to ESL spectrum, the decision to upgrade sites and refarm spectrum to more efficient uses will be delayed or reduce in scope.

In addition, the recently acquired 3.7 GHz spectrum may become stranded as their utility will be impacted by whether TPG's existing 3.6 GHz spectrum (acquired in 2019) is also in-use.

Over the next 5 years, TPG expects MNOs to adopt D2D technologies by partnering with LEOSat operators. To maximise the use of this rapidly maturing technology, TPG will need access to national spectrum that has 100% geographic coverage. Therefore, it is vital TPG is offered long-term access to the 700 MHz and 850 MHz spectrum, as this would enable TPG to provide a consumer service with 100% geographic coverage, while addressing blackspot issues by providing in-fill coverage at network edges. TPG anticipates the regionalised 1800 MHz and 2100 MHz spectrum will be used to provide in-fill coverage.

There are likely no alternative users for the ESL spectrum that would match the breadth and efficiency TPG can achieve from the continued use of the ESL spectrum. There are no alternative users or use cases that can support the millions of Australians that rely on mobile services day to day as efficiently.

Promotes investment and innovation

Offering TPG the opportunity to renew its ESL spectrum would best promote investment and innovation.

TPG's intended future use of the ESL spectrum is detailed in Part A of this submission. This provides the ACMA confidence the relevant bands would be put to their best use if TPG was offered the opportunity to renew.

If TPG is not offered the opportunity to renew its holdings, TPG's plans would be put in jeopardy. Specifically, TPG's capacity needs in areas where there is terrestrial mobile network coverage would be unmet, leading to the loss of service continuity, service degradation and consumer detriment. If TPG is not able to renew its low band spectrum holdings, it would put at risk its ability to offer 100% geographic coverage to its consumers via D2D technologies in areas beyond existing terrestrial mobile network coverage.

The sooner TPG has certainty on its ESL spectrum renewal, the quicker TPG can proceed

with implementing its network plans. This is especially important between now and when ESL spectrum expires. If TPG does not have confidence its critical spectrum bands will be renewed, it may have to consider delaying, reducing the scope, or abandoning certain investment decisions.

An example of this is the remaining 4G-only sites in TPG's network. In the 0-81.4% population coverage areas (i.e. the metropolitan markets not subject to the TPG-Optus regional RAN sharing arrangement), approximately [c-i-c starts] [c-i-c ends] of TPG's metro sites are 4G only. Given these sites are not yet upgraded, TPG has not deployed 700 MHz and 3.4 GHz spectrum on those sites.

TPG's existing plan is to continue to progressively upgrade these remaining 4G-only sites as the 4G sectors become congested. If TPG does not have certainty over continuing access to its ESL spectrum bands (which includes TPG's 700 MHz and 3.4 GHz spectrum), then TPG may delay these upgrades until it becomes clear what spectrum it would have access to. The sooner TPG has certainty, including certainty over the cost of continued access, the sooner TPG can have the confidence to upgrade those sites.

In the recently announced network sharing areas (i.e. 81.4%-98.4% population coverage areas), a schedule to upgrade to 5G has been agreed between TPG and Optus. The intent of the arrangement is that the shared RAN will be completely upgraded to 5G by 2030.

On a longer-term horizon, TPG anticipates it will need to make plans to upgrade its mobile network to 6G. TPG expects this would likely start to occur around 2030 given historic trends on how quickly successive generations of mobile technologies are commercialized.

Lastly, TPG notes commentary suggesting the ESL process be used to support private LTE networks by siphoning away ESL spectrum from existing users. This is shortsighted and can lead to inefficient outcomes by risking spectrum dead zones, thereby reducing the overall utility of spectrum. In TPG's experience, private networks use spectrum in a very localised form and these locations cannot be well known ahead of time, it is therefore more efficient for MNO's to make broad geographic use of spectrum and enter into commercial arrangements with 3rd parties for their specific requirement when and where the need arises. Furthermore, the ACMA has made AWLs/apparatus licences readily available for these types of applications in a range of bands. It is unclear how the current approach is insufficient for alternative downstream use cases/users.

Enhances competition

Competition in mobile markets is multifaceted. There are variations between how operators compete and consumer preferences when comparing metropolitan and regional/rural areas. In metropolitan areas there are 3 carriers providing comparable coverage and quality of coverage. Consumers benefit from the ability to choose from a range of service providers (both MNOs' own brands and MVNOs). This is not the case in regional/rural areas where Telstra dominates given its substantially larger mobile coverage (for which it has received significant public funding to build).

As a number of regional stakeholders and witnesses to the Parliamentary inquiry into Co-

investment in Multi-carrier Regional Mobile Infrastructure³ and the ACCC's Regional Mobile Infrastructure Inquiry⁴ have attested, beyond the metropolitan areas, there is a lack of choice. Telstra is often the only provider, even though it also suffers from coverage issues.

The government has played a hand in distorting competition in regional markets by granting the majority of funding from co-funding programs to Telstra. Approximately 80% of all Federal Mobile Blackspots Program sites delivered to date have been awarded to Telstra, and 96% of all mobile category funding under the Regional Connectivity Program to date has been awarded to Telstra. Telstra has used this funding to entrench its dominance in regional markets.

The recently announced regional RAN sharing arrangement between TPG and Optus could address some of the structural issues. The shared regional RAN will combine a number of ESL spectrum bands and non-ESL spectrum bands, so that both TPG and Optus customers can enjoy a premium experience in the 81.4-98.4% population coverage areas.

If TPG is not offered an opportunity to renew its ESL spectrum, customers on TPG's and Optus' networks (totalling approximately 15.9 million subscribers) will be negatively impacted. This will have downstream impacts on competition in the relevant mobile markets for both retail and wholesale customers.

In areas where there is no terrestrial mobile coverage, TPG's continued access to its 850 MHz and 700 MHz spectrum is critical given these are the only suitable LEOSat D2D candidate bands with 100% geographic coverage that TPG has access to.

The maturation of LEOSat D2D technologies holds the promise of a step change in improving competition beyond metropolitan areas. It does this in two ways:

- 1) Firstly, D2D technologies can provide immediate in-fill coverage so that users can stay connected even in existing blackspots not serviced by terrestrial mobile networks. This is expected to close the significant coverage difference between Telstra and other MNOs to some extent and enable a more level playing field for rival mobile networks to compete for regional customers and for public co-funding opportunities.
- 2) Secondly, and perhaps more importantly, D2D technologies enable MNOs to 'ladder up' investments in ways that is currently nearly impossible to do. Because D2D technologies provide a relatively thin but wide-area coverage, an MNO can build scattered terrestrial mobile infrastructure in regional and rural areas without concerns of creating isolated coverage islands with limited utility. Put in different words, D2D technologies enable MNOs to be more effective at extending terrestrial mobile infrastructure as MNOs may not need to build contiguous coverage in order to maximise the utility of individual mobile sites. The benefits of this will only become apparent in hindsight given terrestrial mobile infrastructure takes a relatively long time to build.

³ See Standing Committee on Communications and the Arts, *Inquiry into co-investment in multi-carrier regional mobile infrastructure*, <https://www.aph.gov.au/Mobilecoinvestment>.

⁴ See ACCC, *Regional mobile infrastructure inquiry 2022-23*, <https://www.accc.gov.au/inquiries-and-consultations/regional-mobile-infrastructure-inquiry-2022-23>.

TPG believes the impact on competition in mobile markets is the most relevant issue for the ACMA to consider under this criterion. There may be arguments to consider competition between different use cases or users for the spectrum, however the magnitude of impact pales in comparison to relevant mobile markets given the number of end-users the ACMA's decision would impact.

Balances public benefits and impacts

TPG has deployed all of the ESL spectrum it holds. TPG has set out in Part A how it currently uses the ESL spectrum and its intentions for the ESL spectrum it holds in metropolitan, regional and rural areas in Australia.

TPG, via its various brands, provides mobile and fixed wireless services to almost 6 million Australian consumers. In this context, it is clear offering TPG an opportunity to renew its spectrum holdings would best promote the public interest given how many Australians rely on the connectivity made available by TPG.

In the counterfactual where TPG is not able to renew any of the spectrum bands, there will necessarily be a degradation in the services it is able to offer. Furthermore, if TPG is not able to renew its 850 MHz and 700 MHz spectrum, its longer-term network strategy would suffer and consequently a number of the ACMA's public interest objectives will suffer.

For example, a limited TPG means downstream competition would suffer in the short and long term, in metropolitan and especially in regional areas. Without competition, consumers will pay more for less. There are also implications for the ability of the industry to attract ongoing investments.

Supports relevant policy objectives and priorities

TPG understands this criterion generally relates to improving connectivity in regional and rural areas. It also specifically relates to improving connectivity in currently underserved communities, including First Nation communities.

To date, TPG's participation in regional and rural markets have been limited due to entrenched industry structure, ownership of legacy infrastructure, and limiting government policy. It is TPG's expectations that it will start to play a larger role in those markets once the regional RAN sharing arrangement is implemented and with the introduction of LEOSat D2D coverage.

As the third entrant, it is difficult to mount a business case to expand terrestrial mobile coverage in 'thin' regional and rural markets on a standalone basis. Telecommunications policy has not lowered the barriers for challenger networks to enter and expand in regional / rural areas. Indeed, co-funding programs have helped cement Telstra's regional network dominance by funnelling the majority of public funding to Telstra.

Regulations have not modernised and remain ineffective. For example, the facilities access regulatory regime in Australia has never been utilised for access to mobile tower sites. Co-location rates in regional/rural markets are well below what is expected.

As set out in the MPS, the ACMA should have regard to the broader communications environment and must not in this process ignore the above context.

TPG has attempted to find cheaper and more effective means of expanding its regional coverage by way of infrastructure sharing. In addition, TPG expects LEOSat D2D technologies will augment terrestrial mobile network coverage and enable a step-change to the benefit of consumers in regional / rural markets.

TPG’s position on the application of the MPS is addressed below. The MPS is the most relevant policy directly about the ESL spectrum and the process and is most relevant in the context of this criteria.

Table 5: TPG’s position regarding the MPS

TPG’s position	
Supporting service continuity for end users, particularly where no alternative service is available	Nearly 6 million customers rely on TPG’s mobile network for mobile and fixed wireless home broadband services. If TPG were not able to renew its ESL spectrum, it would negatively impact those customers. It would also have a negative impact on TPG’s future network plans such as LEOSat D2D services to provide 100% geographic mobile coverage and the regional shared RAN with Optus. This will lead to significant consumer detriment.
Facilitating opportunities for new entrants and use cases, including for low earth orbit satellites	TPG has already put in place plans to leverage the developing LEOSat D2D technologies. Ideally, TPG would be able to offer 100% geographic coverage using this technology. However, doing so will depend on continuing long-term access to 850 MHz and 700 MHz spectrum as these are the only spectrum bands covering 100% of Australia TPG has access to.
Connectivity and investment in regional areas to deliver improved services to end users	<p>The ESL spectrum will enable TPG to pursue its network plans, which has a major regional focus.</p> <p>TPG has entered into a regional RAN sharing arrangement with Optus, which will see TPG and Optus pool a number of ESL spectrum and share RAN in 81.4%-98.4% population coverage areas.</p> <p>Under this arrangement, TPG’s regional mobile network coverage will more than double to approximately 1 million square kilometres of coverage. The quality of the shared regional RAN will be better than either TPG or Optus can achieve alone, due to the pooling of spectrum and other network resources.</p> <p>Separately, TPG hopes to be in a position to be able to offer 100% geographic mobile coverage by partnering with LEOSat operators.</p> <p>All of these plans will be to the benefit of end-users and will be at risk if TPG is able to renew its ESL spectrum licences.</p>

Promote competition	Please see above given this criterion is identical to one of the ACMA's public interest criteria.
Capacity for sustained investment and innovation	Please see above given this criterion is identical to one of ACMA's public interest criteria.

Part C: Licence conditions and fee structure as mechanisms to promote better outcomes and support the public interest

The ACMA paper indicates the ACMA will consider whether spectrum licence conditions should be amended as part of the ESL process.

TPG does not support introducing licence conditions such as those flagged in the ACMA's paper. However, if the ACMA were to proceed to do so, it should recognise the significant trade-offs and adjust licence fees accordingly.

The ACMA must acknowledge the unique geography of Australia, and past and present policy decisions that have resulted in Telstra's dominance in telecommunications markets. To the extent that it sets alternative licence conditions, it should have regard to other policy benefits Telstra enjoys (such as receiving the majority of Mobile Blackspot Program funding to date). Stronger obligations should apply to Telstra relative to other licence holders.

The ACMA should also be alive to unintended consequences of introducing novel licence conditions. For example, an MNO could use 'use it or lose/share it' conditions to circumvent spectrum competition limits if those conditions are poorly implemented.

Overall, TPG's view is the benefits of introducing licence conditions are likely to be very minor compared to the risks. These risks are real, as recent experiences in some European countries demonstrate. For example, Germany opted to set-aside 5G spectrum for private network use but saw little uptake and foregone country wide productivity improvements that would be achieved if that set-aside spectrum were allocated to mobile use.⁵

TPG provides an Analysys Mason report in **Part E** which studies examples of renewal processes undertaken in other countries, including where special licence conditions utilised. TPG hopes this report can assist the ACMA in its considerations.

TPG notes the key conclusions of Analysys Mason are:

- The ACMA's public interest criteria are broadly aligned with objectives applied in other countries in the context of licence renewals.
- Licence renewal best meets those public interest criteria in Australia.
- Licence fees should not be excessive in order to enhance network investment.
- Licence fees for technically substitutable spectrum should be consistent.
- There are international examples where alternative fee structures, such as annual payments, can drive efficient outcomes.

⁵ See GSMA, *The Impact of Spectrum Set-Asides on 5G* (June 2023), available at: <https://www.gsma.com/connectivity-for-good/spectrum/wp-content/uploads/2023/06/Spectrum-Set-Asides-Germany.pdf>.

- There are international examples where licence conditions that enhance investments or consumer experience can promote the public interest criteria, as long as they do not distort competition.

TPG agrees with the key conclusions of the Analysys Mason report. In particular:

- Offering the existing licensees an opportunity to renew their spectrum for the maximum 20-year term will best promote the public interest criteria.
- Any condition restricting the free usage of spectrum licences hampers their utility and can lead to inefficient outcomes.
- Licence fee is another variable available to the ACMA to promote the public interest criteria.

TPG addresses these in more detail below.

Licence conditions

The ACMA paper provides examples of other countries that have adopted spectrum licence conditions such as 'roll-out obligations', 'use it or lose it' and 'use it or share it'.

These types of conditions may appear innocuous, however their implementation and downstream impacts must be carefully considered. This is particularly true in a country the size of Australia where network deployment costs are high and take a long time to implement. Public subsidies have been largely given to Telstra, which has resulted in a distorted market structure.

These conditions are also not immune to gaming behaviour. For example, a licensee may build out sites in a strategic manner to satisfy licence conditions rather than to improve customer experience. This type of strategic behaviour will not lead to efficient use of spectrum, nor would it promote efficient investments, and will result in significant opportunity costs.

The ACMA paper flagged a mixture of conditions can be used, for example, population coverage requirements with service quality requirements (e.g. x% of population with 5G). Or third parties may apply for a secondary licence in areas not used by the primary licence holder if the primary licence holder has not met build out requirements. Increasing the complexity of conditions may increase the cost of administration/audit without necessarily achieving the desired outcomes.

While TPG does not support the ACMA implementing these types of licence conditions, TPG is not opposed to them in all conditions, with the caution that they must be considered carefully. For example, low band spectrum is naturally difficult to partition along geographic lines for different users. TPG would oppose introducing conditions in low band spectrum.

One recent example, which TPG would support being adopted by the ACMA, is the 2023 assignment process in New Zealand. The government granted 3.4 GHz band spectrum to Spark, 2Degrees and One New Zealand on very generous financial terms. In return, all three MNOs agreed to an accelerated 5G roll-out and to improve rural connectivity.

TPG would support the ACMA adopting a similar initiative, where operators are offered licence renewal on very generous financial terms in return for licensees committing to upgrading to 5G.

One way this could be implemented in the Australian context is the ACMA could suspend payment requirements for a number of years to promote investment outcomes leading to improved competition and user benefits downstream.

The misaligned starting dates of the ESL licences provide an opportunity to do this. The ACMA could align starting dates of all new ESL licences to 2032. Where there is a gap between an ESL, for example those expiring in 2028 and a 2032 start date, the ACMA could issue short term apparatus licences to cover the gap. The ACMA could charge a small nominal fee for these stop-gap apparatus licences in return for build out or service obligations by licensees. Aligning the starting and expiring dates for all the renewed spectrum licences also has the added benefit of promoting administrative flexibility in future expiring spectrum processes.

This approach would alleviate significant financial burden from the MNOs by recognising the renewal period overlaps with significant infrastructure investments MNOs are expected to have to make during the period.

TPG would welcome further engagement with the ACMA on what those obligations, and financial terms for licence renewal, could be. TPG would support service level standards, such as a requirement to provide 5G services or upgrade sites in return for financial considerations. Finally, the design of such requirements must take into consideration the proposed regional network sharing arrangement between TPG and Optus, such that neither are disadvantaged.

Licence fee

The Ministerial Policy Statement states “*where appropriate ... the ACMA will need to consider the broader communications environment within which these licences exist*”.

The broader communications environment is particularly important when considering the appropriate level of licence fees.

For example, if the ACMA sets high spectrum licence fees, then it would not promote investments nor advance competition. If the ACMA were to require lump sum payment terms then smaller MNOs would be relatively worse off compared to Telstra, with consequences in downstream markets.

More broadly, TPG agrees with conclusions of the Analysys Mason report (a copy is provided in **Part E**), in particular:

- licence fees should not be excessive and the ACMA should have a bias towards setting fees too low rather than too high, and
- technically similar spectrum should have identical pricing structures. For example, low band spectrum should be priced identically whether it is 700 MHz or 800 MHz. Parity considerations also apply to mid-band spectrum.

One international example which TPG wishes to highlight, as detailed in the Analysys Mason report in Part E, is how Ofcom in the UK uses an annual licence fee approach which can be adjusted to reflect changes in spectrum value on an ongoing basis. Of course, such discretion should be tempered as it may have implications for licence holders' investment incentives.

The Analysys Mason report outlines a number of potential trade-offs to consider if the ACMA were to adopt this approach. The key paragraph on page 24 of the report is reproduced below.

- **Fee-setting that includes periodic review:** A system whereby there is only an upfront price paid by MNOs for spectrum access can eliminate any reflection of changes in spectrum value in price over time. Although this provides MNOs with greater certainty, it can result in sub-optimal spectrum allocations as market conditions evolve. To combat this, some NRAs (such as Ofcom in the UK) have implemented annual licence fees which are periodically reviewed as a means to assist in reducing emerging discrepancies with market value (as mentioned in Section 3.3). This may be a sound approach in some cases, however, there is a risk that periodic reviews may lag behind market requirements and introduce administrative inefficiencies. A lack of certainty as to what the evolving liability associated with any particular mobile spectrum licence will be in future years can also be counterproductive for MNOs and can potentially deter investment and inhibit trade. It should be noted that although Australia has a relatively small annual spectrum licence tax used to cover the cost of spectrum management, this is not comparable to the use of annual licence fees in the UK, which are set at Ofcom's estimation of the full market value of the spectrum.

The ACMA's usual approach when determining prices is to set an indicative \$/MHz/pop price. This is, for example, the approach when setting starting prices for spectrum auction. An indicative \$/MHz/pop would enable licence holders to form a view about their potential renewal costs.

TPG urges the ACMA to consider whether an alternative progressive licence fee structure could better advance the public interest criteria.

On a relative basis, a fixed \$/MHz/pop unit price significantly favours Telstra and undermines competing operators' ability to make network investments and engage in pro-competitive market activities. When compared to mobile service revenue (i.e. the economic benefit MNOs derive from the use of spectrum), it is clear Telstra under-contributes. Based on publicly available data, Telstra contributes only 40% of all spectrum licence fees paid by the three MNOs but captured 56% of all mobile service revenue in FY23. The opposite is true for smaller MNOs like TPG.

The competitive playing field for customers is also unfair. Telstra's market dominance is partly due to being heavily subsidised by the public. This distorts the market structure and lessens the capacity and incentives of competing MNOs to make investments.

Telstra has received almost all of the public subsidies under the Mobile Blackspot Program and significant funding under the Regional Connectivity Program to buildout and expand its regional mobile network. This allows it to claim network superiority and charge end-users a price premium.

As previously stated in this submission, to date:

- Telstra has captured nearly 80 per cent of all Federal Mobile Blackspots Program funding by site count according to ACCC data.⁶
- Telstra has also captured 96 per cent of all mobile category funding under the Regional Connectivity Program.⁷

From 2018-2023, a substantial number of mobile sites Telstra delivered in regional and remote areas received Mobile Blackspot Program funding according to ACCC data, as illustrated in Table 6 below.⁸

Table 6: Regional and rural sites delivered by Telstra

ABS geography designation	Sites built from 2018-2023	Total MBSP sites as of 2023	MBSP/all sites built from 2018-2023
Inner Regional	426	233	55%
Outer Regional	366	343	94%
Remote	109	108	99%
Very Remote	215	110	51%

Given the above context, it would be reasonable for the ACMA to consider whether a variable fee structure, where licensees pay a licence fee that scales to their market position, would better promote the public interest criteria.

Such a charging framework could be designed so that licence holders pay an annual fee over the term of the licence. The annual fee could be calculated based on a \$/MHz/pop unit price that increases or decreases according to, for example, a licensee's mobile service revenue or a licensee's proportionate share of total market SIOs.

The ACMA could set a minimum and maximum \$/MHz/pop value to ensure that licence holders are appropriately incentivised to maximise the utilisation of the spectrum.

From a legislative instrument drafting perspective, the ACMA would describe a formula rather than a fixed \$/MHz/pop figure.

TPG believes that a variable annual licence fee may be superior to a static \$/MHz/pop licence

⁶ ACCC, *Mobile Infrastructure Report 2023* (November 2023).

⁷ TPG analysis based on published results of Regional Connectivity Program rounds 1, 2 and round 2 Other Projects.

⁸ ACCC, *Mobile Infrastructure Report 2023* (November 2023), tables 17, 18, 40, 41.

fee structure. A number of advantages come to mind:

- The ACMA does not need to predict the future value of the spectrum given the potential for licences to be issued for 20-year terms. A scaling fee structure mitigates the risk of setting licence fees too low or too high for any individual licensee.
- The Australian public can participate on the 'upside' of any economic value generated by the use of this public resource.
- A scaling annual access fee would better promote competition and investment incentives by ensuring smaller competing networks have a modest relative advantage over Telstra, but still need to make relatively greater investments or enhance retail pricing in order to attract customers from Telstra.
- Finally, a scaling fee structure recognises the substantial amount of public subsidies that Telstra has received to date, which helped to cement Telstra's market position.

The practical outcome of this dynamic approach is Telstra would pay relatively more compared to a static \$/MHz/pop approach, and TPG and Optus would pay relatively less compared to a static \$/MHz/pop approach.

There are examples of such progressive charging structures. For example, contributions to the Telecommunications Industry Levy and Annual Carrier Licence Charge are based on eligible revenues. Market participants also contribute to the Regional Broadband Scheme, according to the number of services they have in operation. Indeed, a progressive income tax underpins a significant part of the Australian taxation system.

Part D: TPG's assessment of the secondary market for spectrum access

The ACMA has requested information from prospective alternative licensees on whether they have sought access to spectrum through other means and, if so, whether those attempts were successful, partially successful, or unsuccessful.

TPG provides the following information to assist the ACMA with its consideration of views from prospective alternative licensees and the secondary market overall.

There are instances where the ACMA could facilitate greater defragmentation (e.g. with respect to the C-band). However, given the clear examples of successful secondary trading, TPG considers the secondary market is facilitating the movement of spectrum to the most economically efficient and productive ends, supported by regulatory oversight.

While TPG has not granted every request for spectrum trading or third-party authorisations, there is a clear basis for TPG not doing so. Given commercial sensitivities, in some instances TPG has not been in a position to provide full reasons for declining requests to third parties.

The information provided in this section demonstrates that the secondary market for spectrum is functioning appropriately.

Spectrum trading with Pivotel

[c-i-c starts] [c-i-c ends]

Spectrum trading with Telstra

[c-i-c starts] [c-i-c ends]

In February 2022, TPG also enter into a proposed spectrum authorisation agreement in relation to certain spectrum bands under a Multi-Operator Core Network agreement with Telstra. However, the agreement was not approved by the Australian Competition Tribunal and did not proceed.

In February 2021, TPG and Telstra entered into an agreement to mutually defragment parts of the spectrum in the 1800 MHz and 2100 MHz bands through variations to the relevant spectrum licences.

Spectrum trading with Optus

On 29 April 2024, TPG announced a proposed Multi-Operator Core Network (**MOCN**) agreement with Optus. The MOCN includes a spectrum authorisation for sharing of a range of spectrum bands, including ESL spectrum bands.

Spectrum trading with Dense Air

In August 2021, TPG agreed to acquire 3.6 GHz spectrum holdings from Dense Air, through the acquisition of all the share of the Australian subsidiary of Dense Air Limited. In exchange, Dense Air acquired TPG's 2.6 GHz spectrum holdings. In 2022, TPG also agreed to acquire

26 GHz holdings from Dense Air.

Other spectrum trading activities

We have observed other instances of spectrum trading in the secondary market.

This includes:

1. Telstra's acquisition of Dense Air's local operations in November 2023. Media reports note Telstra confirmed this structure was a means to acquire Dense Air's 2.6 GHz spectrum.
2. Optus and NBN trading small amounts of spectrum in the 3.4-3.8 GHz frequency range in parts of Perth, Outer Sydney, Outer Adelaide, Outer Canberra and Outer Brisbane in November 2023.

Part E: Analysys Mason report

[Attached]



Report for TPG Telecom Limited

Regulatory approach to expiring spectrum licences in Australia

Author(s): Mark Colville, Shahan Osman, Sabre Konidaris

Date: 23 February 2024

Ref:8884809719-85

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Annex A Analysys Mason team member profiles

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1 Executive summary

This report has been produced by Analysys Mason on behalf of TPG Telecom Limited, and examines the regulatory approach to expiring spectrum licences in Australia.

Numerous mobile spectrum licences are expiring within the next decade and consultation of relevant stakeholders is ongoing

The Australian Communications and Media Authority (ACMA) started a consultation process in May 2023 in preparation for the expiry of mobile spectrum licences across a number of key bands between 2028 and 2032. Under the existing legal framework, the ACMA is able to renew licences (with either the same or modified core conditions) or refuse renewal applications in favour of another option, such as administrative reassignment or an auction-based approach.

The ACMA has also defined five proposed public interest criteria (“facilitates efficiency”, “promotes investment and innovation”, “enhances competition”, “balances public benefits and impacts” and “supports relevant policy objectives”) that will be used to assess licence renewal options, and has laid out other key features of a proposed four-step consultation process. This process allows industry to provide information and feedback, which, in turn, will be used to inform decisions on renewals.

Licence renewal is the approach that best meets the ACMA’s policy objectives

Given the market context and the ACMA’s public interest criteria (and other policy objectives), licence renewal appears to be the optimal relicensing approach. Licence renewal is preferred because it provides greater certainty compared to auction-based reassignment and there is no evidence to suggest that an administrative reassignment (to change the distribution of licensed mobile spectrum) is beneficial. Licence renewal can stimulate investment and innovation (by providing greater certainty to licensees), whilst enabling the ACMA to exercise some control over the spectrum assignment to meet other objectives, such as promoting efficiency, competitiveness and public benefits.

The objectives within the ACMA’s proposed public interest criteria appear to broadly align with globally observed policy objectives. Other objectives that are commonly defined by national regulatory authorities (NRAs) include transparency and fairness. The ACMA should likewise consider these as part of its approach for the upcoming process.

Global case studies suggest that it could also be beneficial for the ACMA to consider annualising spectrum licence fees instead of requiring upfront payment,¹ and for renewed licences to be offered on a long-term basis. Charging spectrum fees on an annual basis and ensuring the spectrum trading framework remains well-functioning will allow for flexibility in future assignment and continue to promote efficiency. A reliable long-term view of spectrum holdings, so long as licence conditions are

¹ We note that the separate annual spectrum management tax is already applied in this way.

met and the market remains broadly stable, increases investor confidence, resulting in investment into new technologies, quality-of-service improvement and network expansion. Annual rather than upfront spectrum fees would also smooth out operators' cashflows over time, with a potential (although not guaranteed as it is not the only factor in making investment decisions) upside in relation to investment capabilities.

Optimal relicensing outcomes should result in fair and consistent pricing, which is not excessive and enhances investment to benefit consumers

The ACMA recognises that spectrum pricing is critical and aims to apply an effective pricing framework to support the licence renewal process. In the pursuit of technical and economic efficiency, the ACMA should consider the impact of its pricing decisions on market participants and the public interest.

There are difficulties associated with accurately estimating the market value of spectrum given ever-changing market conditions. The ACMA should avoid setting excessively high spectrum prices, both because there is a risk of overshooting the true market value (with asymmetric and negative consequences relative to setting prices below market value), and because high prices are not necessary to promote efficiency since the existence of spectrum trading means that mobile network operators (MNOs) already face the opportunity cost of their spectrum.²

The ACMA should also be mindful of potential undesirable outcomes from possible links between higher spectrum pricing and both decreased network investment and higher retail prices.

Global case studies suggest that facilitating lower spectrum prices for licence holders (e.g. in the form of additional price concessions) in exchange for coverage or investment requirements could be beneficial for achieving policy objectives. In the Australian context, these coverage or investment obligations could promote expansion to underserved areas, and spur competition in those areas. Any approach taken related to such commitments should, however, account for the unique geography of Australia and the unique circumstances of market participants to avoid distorting competition.

The ACMA should also ensure that pricing is consistent across different spectrum bands, accounting for substitutability of use. As an example, although sub-1GHz spectrum bands are broadly technically equivalent, past auction results in Australia show a significant pricing discrepancy between the 700MHz (band 28) and 850MHz (band 26) bands. Conversely, in Europe, the 800MHz band (band 20) was auctioned across the continent a decade ago and the prices paid for this were much higher (on average) than the technically equivalent 700MHz band (band 28), which was auctioned more recently, as shown in Figure 1.1 (noting there may be some exceptions, such as auction prices in Sweden).

We are also of the view that Australia's pricing of spectrum in the 3.4-4.0GHz range (the ACMA is still assigning additional spectrum at the higher end) should be aligned much more closely with spectrum in

² i.e. MNOs have the ability to generate revenue from the sale of their spectrum licences to a more efficient user, if one exists.

the 2300MHz (and potentially the 2500MHz) band(s) than past auction prices in Australia would suggest (see Figure 1.2), as these bands are, to a large extent, technically substitutable for 5G use cases.

Figure 1.1: Normalised³ spectrum pricing benchmarks (Western Europe) from 700MHz and 800/850MHz auctions [Source: Analysys Mason’s Spectrum Auction Tracker, 2024]

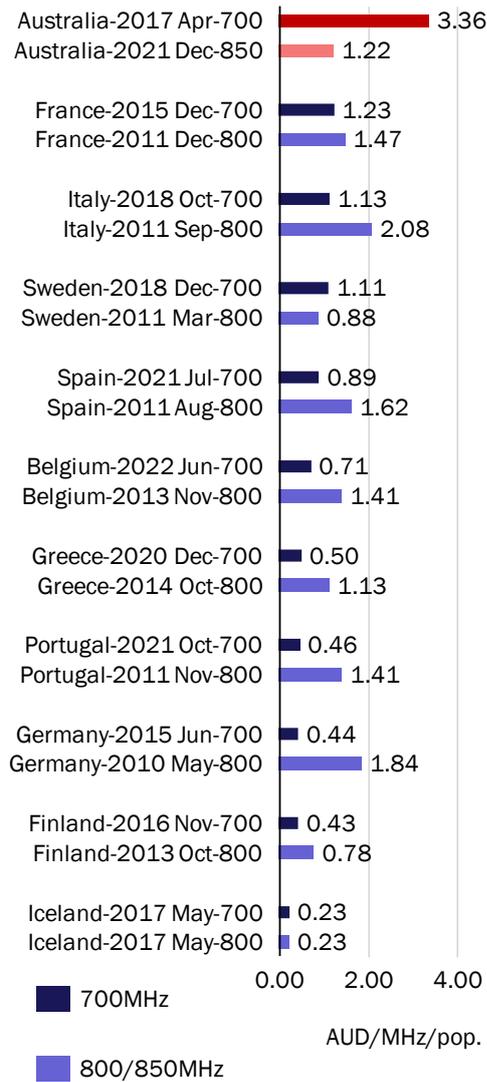


Figure 1.2: Normalised³ spectrum pricing for Australian spectrum bands [Source: Analysys Mason’s Spectrum Auction Tracker, 2024]



We agree with the ACMA’s proposal to undertake a synchronous consultation across multiple spectrum bands, as this approach should assist in harmonising the way in which band prices are set. In our view, the use of past auction prices to infer forward-looking spectrum value is potentially unreliable, and historical auction pricing by band in Australia appears, in some cases, to not accurately reflect the relative value of different bands. Relative pricing of different bands should be reflective of differences

³ Normalising to a licence duration of 20 years, assuming a 6% weighted average cost of capital (WACC) and adjusting to 2023 real terms. Annual licence fees are included where applicable.

in forward-looking value and not simply of differences in the amount paid in (different) auctions historically.

The spectrum pricing framework should also be developed and applied in such a way that promotes a high degree of transparency and fairness. The ACMA's focus on extensive consultation of relevant stakeholders should help to facilitate this.

Summary of recommendations

Based on the findings described above, our main recommendations to the ACMA are as follows:

- Relicensing method:
 - public interest criteria proposed by the ACMA seem appropriate; 'transparency' and 'fairness' should also be considered as key objectives
 - licence renewal is the most suitable approach for the Australian market context, especially given the ACMA's policy objectives
 - it would be beneficial for this renewal to incorporate a long-licence term and for spectrum fees to be charged on an annual basis to provide certainty for MNOs, as well as flexibility to help maximise efficiency.
- Pricing:
 - excessively high spectrum prices are not necessary to promote efficiency and should be avoided due to the potential for market distortions, sub-optimal spectrum allocations, investment disincentives and upward pressure on retail prices
 - attaching investment commitments to licences (in exchange for lower prices for spectrum) may be suitable in some situations, as long as distortion to competition is avoided
 - spectrum prices should reflect relative differences in the forward-looking value of each spectrum band and where different spectrum bands have comparable value, their pricing should also be comparable
 - the ACMA should ensure that all decisions on spectrum licence renewal and pricing are made in a transparent and fair manner.

2 Numerous mobile spectrum licences are expiring within the decade and consultation of relevant stakeholders is ongoing

The purpose of this report is to discuss the regulatory approach to expiring spectrum licences in Australia, addressing some of the broader conceptual issues at a reasonably high level. The Australian Communications and Media Authority (ACMA) is in the early stages of its own proposed process.

This introductory section provides relevant context that frames our arguments and considerations throughout the remainder of the report. We touch on key information concerning the upcoming expiry of mobile licences (referencing the existing regulatory framework) and discuss the significance of previous licence expiry processes. We also provide an overview of the ACMA's proposed relicensing approach and highlight the features most pertinent to the remainder of the report. In Australia, spectrum licences across a number of key bands currently supporting mobile services are due to expire between 2028 and 2032. In preparation for this, the ACMA began a consultation in May 2023 to inform the process for determining future arrangements for these expiring spectrum licences (ESLs).

In previous ESL processes (i.e. those taking place between 2013 and 2017), many ESLs were renewed, meaning that original licensees continued to make use of their licences after initial expiry. The Minister for Communications (the 'Minister') played a key role during these processes, including defining the relevant public interest criteria used to make renewal decisions, and the formula used to calculate spectrum access charges for licences in each band.

Moving forward, the process for ESLs needs to account for new provisions introduced by the amendment in 2020 of the Radiocommunications Act 1992. As a result of this amendment, the ACMA, rather than the Minister, is now largely responsible for managing ESLs. The ACMA is responsible for considering the public interest, making decisions on licence renewals (including the terms and conditions of renewed licences) and fixing spectrum access charges for renewed licences upon receipt of valid licence renewal applications.

Most of the spectrum licences that are due to expire between 2028 and 2032 do not include renewal application period statements,⁴ meaning that renewal applications may only be made from two years before the expiry date at the earliest. There are two exceptions – the 850MHz downshift licence⁵ and the 3.4GHz band – for which the ACMA has defined exact dates from which renewal applications can be made. The earliest renewal application dates, and licence expiry dates for licences due to expire between 2028 and 2032 are shown in Figure 2.1 below.

⁴ These specify the period in which the licensee can apply for renewal (if a licence includes a renewal statement, a renewal application period statement must be included).

⁵ Commencing 1 July 2024, 2 x 1MHz of spectrum was allocated to enable spectrum licences in the 850MHz original band to be shifted down by 1MHz, aligning these licences with internationally harmonised LTE bands and introducing a 1MHz guard band between the original 850MHz band and the 900MHz band.

Figure 2.1: Renewal application dates for expiring licences [Source: ACMA, May 2023]

Band	Earliest date of renewal application	Licence expiry date
850MHz (original band)	18 June 2026	17 June 2028
850MHz (downshift licence)	18 June 2026	17 June 2028
1800MHz	18 June 2026	17 June 2028
2.5GHz	1 October 2027	30 September 2029
2.5GHz (mid-band gap)	1 October 2027	30 September 2029
700MHz	1 January 2028	31 December 2029
2.3GHz	25 July 2028	24 July 2030
3.4GHz (incl. new 3.4GHz licences)	14 December 2028	13 December 2030
2.0GHz	12 October 2030	11 October 2032

The ACMA, in line with the amended Act, has three broad options for determining what to do with a licence when a renewal application is received.

- The first option, **renewal**, involves authorising the same parts of the spectrum band in the same geographical areas as the expiring licence, although conditions other than spectrum access might differ.
- The second option, **renewal with changed core conditions** (or partial renewal) provides a variation on the first option, as the specific parts of the spectrum band, geographical areas and conditions other than those related to spectrum access, may all differ.
- The third and last option available to the ACMA is to **refuse** to renew the licence. If a renewal is refused, the ACMA has discretion to administratively reassign spectrum or to follow an auction-based approach. Under this option, the ACMA may also decide to change the technological use of the spectrum.

The ACMA is also required to account for policy priorities set out by the government in the process of making decisions on ESLs. Some of these have been set out in various settings, including:

- A ministerial policy statement (MPS) that is currently under consideration (the Minister is aiming to decide on whether to issue the MPS by the end of April 2024). A letter⁶ sent by the Minister to the ACMA regarding this potential MPS indicates that policy priorities could include supporting

⁶ Page 2, paragraph 1, <https://www.acma.gov.au/sites/default/files/2023-12/Correspondence%20from%20Minister%20Rowland%20to%20the%20ACMA%20Chair%20-%20MS23-004424.pdf>

service continuity for consumers; opportunities for new entrants and use cases; connectivity and investment in regional areas; competition and capacity for sustained investment and innovation.

- A ministerial statement of expectations from December 2022⁷ related to expectations of the ACMA generally, including promoting long-term public interest derived from spectrum, supporting policies related to regional, rural and remote Australia, promoting investment, innovation and new technology adoption, as well as safeguarding consumer interests.
- An MPS from February 2022⁸ on spectrum specifically in the 3.4–4.0GHz band, regarding a need to support deployment of new technologies including 5G, a range of use-cases, investment in digital connectivity in regional Australia, and promoting competition.

2.1 In May 2023, the ACMA published a consultation paper on its proposed approach to ESLs, and in December 2023, a finalised framework after considering responses from various stakeholders

The responsibilities of the ACMA regarding the management of spectrum, which aim to promote the public interest derived from spectrum use, are set out in the ACMA Act of 2005. In general, the ACMA compiles evidence from technical studies, stakeholder responses to consultations and quantitative information, to inform spectrum planning processes and decision-making.

The finalised framework released in December 2023 sets out a four-stage approach that the ACMA is using to manage the process for spectrum licences expiring between 2028 and 2032. The first stage (consulting on and finalising the process) is already complete, having started in May 2023 and ended in December 2023. The fourth and final stage (on renewal and application decision-making) is scheduled to start in 2025 and last until 2032. The timeframes and activities associated with each stage of the process are detailed in Figure 2.2 below.

⁷ Page 2, paragraph 5, <https://www.infrastructure.gov.au/sites/default/files/documents/acma-statement-of-expectations-2022.pdf>

⁸ Federal Register of Legislation - Radiocommunications (Ministerial Policy Statement – 3.4–4.0 GHz) Instrument 2022

Figure 2.2: ACMA four-stage approach to expiring spectrum licences [Source: ACMA, December 2023]

	Stage 1 - complete (Q2 and Q4 2023)	Stage 2 (Q1 2024)	Stage 3 (Q4 2024)	Stage 4 (2025–2032)
Key activity	Consult on (Q2) and finalise (Q4) process	Finalise process and gather information	Consult on ACMA preliminary views	Renewal application and decision-making
Key aims	<ul style="list-style-type: none"> Initiate stakeholder engagement Develop/consult on proposals for the licence expiry process, public interest criteria and approaches to considering use Finalise the process in response to stakeholder submissions and affirm public interest criteria 	<ul style="list-style-type: none"> Request and receive information from stakeholders on relevant issues, including feedback on resilience and temporary disaster responses Give initial views on spectrum band use and alternative licensing conditions (provide additional context/confidence to stakeholders) 	<ul style="list-style-type: none"> Consider broader and licence-specific matters/issues to inform spectrum planning (across all bands at same time) Provide initial view on future spectrum arrangements (covering use cases, license conditions, spectrum pricing, allocation options etc.) 	<ul style="list-style-type: none"> Outline preferred views and policy for the relevant spectrum Review and finalise policy changes for the relevant band in the period prior to renewal application Receive renewal applications and decide on the allocation

The May 2023 document on the consultation process presented some key factors, including proposed public interest criteria that would help guide decision-making, approaches for valuing and determining associated payments for spectrum, and the approach to examining use under existing licences. The December 2023 document containing the finalised framework explains the public interest criteria in greater detail.

The finalised public interest criteria are similar to those used by the Minister in the previous ESL process, with “investment and innovation” and “competition” cited in both cases, and “facilitating efficiency” in the new consultation being similar to “promoting the highest value use of the spectrum” from the previous process. Meanwhile, “consumer convenience” and “determining the appropriate rate of return for the community” from the previous process have been replaced by the less precise “balances public benefits and impacts” and “supports relevant policy objectives” in the new consultation. On the whole, these considerations are not dissimilar to those used in other jurisdictions, as discussed further in Section 3.1.

For the current consultation, the ACMA has yet to present a definitive approach on pricing issues and does not propose releasing views on pricing until Stage 3 (Q4 2024). While the ACMA has not yet established a preferred approach to valuation, the December 2023 document indicates that cost recovery-based pricing is seen as unlikely to promote the efficient use of spectrum.

The previous ESL process involved the Minister specifying an AUD/MHz/population formula for calculating spectrum access charges for licences in each band. Meanwhile, the May 2023 consultation document regarding the current process merely includes several initial observations on a potential approach for valuing spectrum associated with ESLs. It states that work will be done to develop

valuations for these bands, which could be used to derive formulas similar to the ones used in the previous ESL process in the event of renewal, or other approaches should the spectrum be re-allocated or made available under different arrangements. These include auction avoidance pricing, public interest pricing and other, more specific, licence conditions (e.g. some licences in the 1800MHz band are restricted to services for rail safety).

The consultation also states that the existing use of ESLs can be examined to determine if current arrangements are efficient and to inform decisions to be made during the ESL process. It also sets out several dimensions to consider regarding current incumbent use of spectrum. These include considering overall spectrum utilisation; breakdowns in different types of geographical areas; use cases for the spectrum; service coverage to end-users; the level of investment made over the licence duration and whether spectrum use supports service or technology innovation. In addition, the December 2023 finalised framework explains that the international and domestic spectrum management and technology environment (and associated trends) should support sustained and widespread spectrum use. The ACMA is particularly interested in patterns of long-term unused or under-utilised spectrum, and is therefore intending to consider valid reasons for limited existing ESL use, as well as future licensee plans for the spectrum.

Of note, is that the ACMA has already begun examining processes used in other countries to measure and gauge service coverage.⁹ Specifically, the ACMA references standardised propagation modelling and the use of coverage checkers to effectively compare service providers. This indicates that the ability of operators to demonstrate success in meeting their service coverage objectives is likely to be a strong proponent for licence renewal in the upcoming process.

The ACMA acknowledges that there may be synergies between service coverage and other dimensions of use, such as overall spectrum utilisation. The December 2023 letter from the Minister explicitly requests that the ACMA considers the use of roll-out obligations for coverage purposes (among other alternative licencing conditions). Furthermore, the ACMA's strong emphasis on service coverage in its documentation may also suggest that some form of investment/coverage obligations are likely to be included in any licence renewal or spectrum allocation conditions. Accordingly, it is clear that examining existing use from the perspective of service coverage is likely to be a key measure of the potential public impact of any options under consideration.

⁹ We note that service coverage and spectrum utilisation are not quite the same thing. For example, spectrum may technically be utilised in a given area without there being coverage of some (or any) services across the whole of that area. In particular, coverage of data services may diminish at a certain distance from the cell, beyond which only basic voice services may be available (and eventually no service at all). Nonetheless, the area in which the spectrum is being utilised (and could not therefore be used by another operator without causing harmful interference) may be greater.

2.2 This report discusses broader conceptual issues associated with ESLs, drawing from international experience to make recommendations for the upcoming process in Australia

The remainder of this report consists of three sections. These sections introduce and explain our arguments regarding spectrum relicensing in Australia and translate them into recommendations for the ACMA. The sections are as follows:

- **Section 3:** analyses the ACMA's policy objectives, compares these to regulatory objectives commonly observed in other markets, and concludes that licence renewal is likely to be the approach that best meets these objectives.
- **Section 4:** examines the properties of good spectrum assignment outcomes, specifically with regard to setting spectrum prices and enhancing investment or consumer experience. It concludes that a good overall approach would be to avoid setting spectrum fees at excessive levels, consider whether fees might be further reduced to help achieve other public interest criteria (e.g. through imposing coverage or investment commitments) and ensure that fees are set in a consistent manner across the different spectrum bands, reflecting the underlying technical characteristics of the bands.
- **Section 5:** provides a summary of our key recommendations to the ACMA based on the arguments presented in Section 3 and Section 4.

Finally, **Annex A** contains profiles of all members of the Analysys Mason team who have contributed to the writing of this report.

3 Licence renewal is the approach that best meets the ACMA's policy objectives

This section discusses how the ACMA's policy objectives and public interest criteria should be considered when deciding the optimal spectrum relicensing approach for each band and makes the recommendation that licence renewal represents the best overall approach for meeting these objectives in the context of the Australian market.

- Section 3.1 addresses the relevance and validity of the ACMA's public interest criteria, with reference to regulatory objectives observed globally. We recommend two further policy objectives that the ACMA should ensure it considers.
- Section 3.2 considers the merits and disadvantages of three main relicensing options (licence renewal, auction-based reassignment, and administrative reassignment), in terms of associated trade-offs between the ACMA's policy objectives/public interest criteria.
- Section 3.3 considers the broader Australian market context and references insights from international examples in support of our recommendations for the optimal policy (which we consider to be a form of licence renewal).

Overall, we consider the ACMA's public interest criteria to be appropriate, but suggest that transparency and fairness should also be key considerations. In our view, a licence renewal approach best fulfils the ACMA's public interest criteria and other policy objectives given the maturity of the Australian market and the existing regulatory framework.

3.1 Appropriate policy objectives should form the basis for determining the regulatory approach to ESLs; the ACMA's public interest criteria are broadly aligned with objectives applied in other countries

The ACMA's public interest criteria include considerations that largely align with common regulatory objectives observed globally

As discussed in Section 2.1, the ACMA has defined five public interest criteria that it intends to use to assess relicensing options. Reassuringly, these appear to broadly align with several key policy objectives typically defined by national regulatory authorities (NRAs) globally.

Criterion 1 – Facilitates efficiency: the ACMA frames this criterion using the concepts of productive, allocative and dynamic efficiency¹⁰ when allocating spectrum. A focus on efficiency through these lenses appears to be a sound approach, consistent with the approach followed by most NRAs. Notably,

¹⁰ Productive efficiency refers to achieving the most output for least input/cost. Allocative efficiency refers to a spectrum allocation that generates the greatest benefit to society. Dynamic efficiency refers to an approach that maintains productive and allocative efficiency over time.

the December 2023 finalised framework explains that, in addition to point-in-time efficiency, a focus on long-term efficiency will also be considered when assessing instances of historically underutilised spectrum.

Efficient spectrum markets are typically characterised by market-driven approaches to the initial assignment of spectrum (e.g. auctions), with subsequent assignments of the spectrum maintaining efficiency, as well as a trading framework that supports a relatively frictionless transfer of spectrum between market participants. Operators that use a given spectrum licence less efficiently should be incentivised to relinquish the spectrum licence to an operator that could make more efficient use of it (subject to any competition concerns – see Criterion 3). Such markets exhibit numerous benefits, including substantially reduced barriers to entry (discussed further under Criterion 3).

The inclusion of this criterion aligns with the Minister’s request (December 2023 letter) for the ACMA to consider the use of ‘use-it-or-lose-it/share-it’¹¹ licensing conditions to achieve more efficient spectrum use. Accordingly, we agree that the use of a combination of measures to promote efficiency is appropriate, and should be a high priority for the ACMA.

Criterion 2 – Promotes investment and innovation: the ACMA has included this criterion because investment and innovation can encourage productive and dynamic efficiency, increase spectrum utilisation, improve service quality and coverage, and result in the provision of new services and technologies. In our view, an effective relicensing approach should indeed encourage operator investment in network improvement, including coverage expansion, roll-out of next-generation technologies and quality of service improvements. The December 2023 finalised framework specifies that innovation pertains not only to new technologies, but also business and deployment models, investment strategies, partnerships, and the novel use of established technologies. Notably, this criterion aligns with the Minister’s request for the ACMA to consider using roll-out obligations to achieve broader coverage.

Based on our knowledge of typical NRA policy objectives, a key element of this objective should be ensuring service continuity across licence periods, since achieving minimal service disruption for consumers is a key priority. As the level of operator investment tends to correlate positively with remaining licence duration, greater certainty of licence renewal, and earlier confirmation of such a decision, will likely stimulate investment.

Criterion 3 – Enhances competition: the ACMA takes a firm position against anti-competitive outcomes, for example in the form of insufficient spectrum availability, holding imbalances and deterrence of market entry. This aligns with a common stance in support of competitive outcomes by NRAs globally, and, as such, we agree that the final spectrum distribution should indeed promote a competitive telecoms market. A competitive market can typically be characterised by fair opportunities to acquire spectrum and enter the market, among other considerations. The ACMA also suggests that promotion of long-run competition might, in some circumstances, justify some degree of spectrum

¹¹ Requiring licensees to meet a minimum level of ‘use’ of the spectrum or else fully/partly relinquish usage rights.

underutilisation or an imbalance in the spectrum holdings of incumbents in the short-run (as a trade-off).

Notably, this ACMA criterion seems to be heavily inter-related to Criteria 1 and 2. For example, the ACMA consultation document states that “a healthy and competitive market can enhance... public benefit by putting pressure on licensees to invest in infrastructure and make efficient use of the spectrum”.¹² This suggests a high degree of cohesion between the ACMA’s public interest criteria, which seems logical.

Criterion 4 – Balances public benefits and impacts: this criterion seeks to balance the relicensing option’s costs to the public and industry with the potential longer-term benefits. This criterion appears to capture sentiments around market efficiency addressed by Criterion 1 above, however, including this as a separate criterion could indicate that the ACMA places significant weight on outcomes that balance current and future outcomes (in terms of benefits and risks) for the public. The ACMA’s December 2023 finalised framework explains that public benefit can include, for example, the facilitation of social cohesion, an informed society, and the mobility of goods and people.

Criterion 5 – Supports relevant policy objectives: the ACMA included this criterion to ensure that the relicensing option accounts for other applicable government objectives when forming views on the public interest. The criterion appears to be a means to achieve broader policy alignment with objectives stated in past government documents (as discussed at the end of Section 2.1), and is therefore understood to capture any other relevant considerations set out by government.

In the context of relicensing, some regulators make reference to other policy objectives and considerations that are not explicitly identified in the ACMA’s public interest criteria

In addition to the ACMA’s five public interest criteria, it is our view that ‘**transparency**’ and ‘**fairness**’ should also be considered. The licensing approach should be transparent, inclusive and neutral. This means that any regulatory bias/caprice should not factor into decision-making and that equal opportunities should be afforded to all relevant market participants throughout the spectrum assignment procedure. Ultimately, this promotes a spectrum reassignment process that is as fair as possible. We acknowledge that transparency is a key focus of the ACMA’s December 2023 finalised framework, suggesting that it is a highly relevant policy objective even if not explicitly referenced in the public interest criteria.

The additional considerations of transparency and fairness pertain more to the assignment approach and its execution than the outcomes themselves. Considering them in relation to the policy framework acknowledges the link between process and outcome, which is discussed further in Section 3.3.

Other NRAs have occasionally found it useful to retain some level of discretion to alter spectrum assignments to serve the public interest, for example, by enabling the redistribution of spectrum for use by another technology or to facilitate market entry (by assigning required spectrum to a new entrant)

¹² Page 20, paragraph 4, https://www.acma.gov.au/sites/default/files/2023-05/expiring_spectrum_licences_consultation_paper.pdf

within a reasonable amount of time. This approach has been commonly observed in jurisdictions that have permitted administrative reassignment (see Section 3.2), such as France, Japan and New Zealand.

It should be noted, however, that an ongoing right for the NRA to reassign spectrum (with limited notice to operators) could hamper investment. In this context, the Radiocommunications Act in Australia also does not explicitly provide the ACMA with an ongoing right to reassign licenced spectrum, instead framing licence suspensions and revocations in relation to criminal offences against the Act.

Given the high stakes of licence reassignment, it is imperative that regulators decide on a spectrum reassignment approach only after carefully evaluating their policy objectives / criteria, assessing the extent to which these objectives are currently being met and considering how different potential approaches could affect the achievement of these objectives in the future.

3.2 The relicensing option proposed by the ACMA for the upcoming ESL process is best characterised as a licence renewal approach, which appears best suited to the Australian context

When it comes to ways to manage ESLs, there are typically three different options that are weighed against policy objectives

The relicensing approach taken will have different advantages and disadvantages (trade-offs) with respect to the achievement of the policy objectives discussed in Section 3.1. Common spectrum licence renewal strategies observed globally include licence renewal regimes, administrative reassignment and auction-based reassignment.

- **Option 1 – Licence renewal:** this relicensing option can take the form of perpetual licences or (explicit) licence renewals and is typically carried out on the basis of pre-formulated renewal conditions that licensees must strictly adhere to. Such conditions might include public welfare considerations and the requirement of a generous revocation notice period for operators (to ensure fairness). Some jurisdictions have attached further conditions based on the local context, such as coverage obligations, in return for more favourable licence terms (e.g. fee concessions/discounts upon achievement of coverage milestones, as discussed further in Section 4.2).
 - Perpetual licences can take the form of a truly indefinite licence term, or technically being a finite licence with a requirement for renewal, but where there is a high expectation of such renewal. Licence renewals have many similar properties to perpetual licences but provide less certainty (lower expectation of renewal) due to the higher potential for amended licence conditions.

- Licences may be renewed for a fixed-term or transition to a rolling basis at expiry. The latter allows for the suspension/revocation or amendment of the licence at more regular intervals as specified in the terms and conditions of the new licence. The UK provides an example of the use of a rolling basis licence, whereby after the initial licence term it is common for a switch to a rolling basis with annual licence fees and a revocation notice period of five years.¹³
 - Although the ACMA has issued fixed term licences up to this point (which are the subject of the ongoing consultation), a renewal could (conceptually) issue new fixed-term licences (potentially with altered terms and conditions), or move to a rolling contract structure
- **Option 2 – Auction-based reassignment:** This relicensing option can be executed through a partial or full auction. In a partial auction, an NRA reclaims and then auctions incumbents’ ‘non-essential’ spectrum, guaranteeing that the incumbent has the option to retain its ‘essential’ spectrum. In a full auction, all expiring licences are auctioned freely to all interested parties, typically with new licence start dates aligned to the sequential expiry of the existing licences. Licence expiry dates are sometimes harmonised (postponing a full auction), which is often the case when preparing auctions for spectrum across multiple bands. It has also been common practice in full auctions for NRAs to grant incumbents the first right of purchase of their previous holdings at auction-determined prices.
 - **Option 3 – Administrative reassignment:** spectrum assignment and pricing are at the full regulatory discretion of the NRA under this option. These decisions are typically guided by an assessment of operators’ ability to provide additional investment, coverage or quality of service among other such criteria.

The degree to which each relicensing option is likely to meet the ACMA’s public interest criteria and additional policy framework objectives (discussed in Section 3.1) is outlined in Figure 3.1.

¹³ This provides Ofcom, the UK NRA, with greater discretion to alter spectrum assignments after the initial licence term.

Figure 3.1: Summary evaluation of spectrum licence renewal options in terms of policy objectives [Source: Analysys Mason, 2024]

Relicensing option	Strategy	ACMA public interest criteria					Additional objective
		Facilitates efficiency	Promotes investment and innovations	Enhances competition	Balances public benefits and impacts	Supports relevant policy objectives	Transparency and fairness
Licence renewal	Perpetual licences	50%	100%	50%	50%	50%	25%
	Renewal on a rolling basis	25%	50%	50%	25%	50%	50%
Auction-based re-assignment	Renewal with a fixed term	25%	25%	25%	25%	50%	50%
	Partial auction	25%	50%	25%	50%	50%	50%
Auction-based re-assignment	Full auction	100%	25%	100%	25%	50%	100%
	Full auction with licence harmonisation	100%	25%	100%	50%	50%	25%
	Full auction with first right of purchase	25%	50%	25%	50%	50%	25%
Administrative reassignment	Assignment with full regulatory discretion	50%	25%	50%	50%	50%	0%

Licence renewal regimes provide a relatively high degree of certainty to operators and therefore promote investment. They are supported by Australia’s existing legal framework and may eventuate in rolling or fixed-term licences at renewal. NRAs, such as Ofcom in the UK, have opted for a transition to rolling contracts after the initial licence term to permit greater regulatory discretion to alter spectrum assignments, though retaining a five-year notice period for any revocation.¹⁴ However, since the promotion of investment and innovation is an explicit public interest criterium for the ACMA, and the

¹⁴ The main reason that this approach has been followed in the UK is that licences are perpetual, but with an initial fixed term relating only to the licence fee (i.e. a kind of pre-payment of the first twenty years of licence fees on a perpetual licence). This approach is highly unusual internationally, and means that Ofcom cannot grant a new fixed-term licence, since a perpetual licence is already technically in place.

payback period on network investments is often greater than even five years, a fixed-term licence renewal is likely to be the more suitable approach in Australia.

Re-auctioning spectrum can be an effective relicensing approach because auctions tend to promote high levels of competition and are usually transparent and fair. Re-auctioning may be appropriate in some instances, for example where minimal changes to spectrum value are expected in the long-term. Auctions may also be an appropriate option where promoting investment incentives might be a (relatively) less important objective for the NRA, although this does not appear to be the case in Australia.

Spectrum auctioning could also present a risk to service continuity, and in addition, may result in reduced incentives for operators to invest given the lower certainty relative to other approaches. As an alternative, hybrid auction-based approaches with more nuanced features (first right of refusal to incumbents, incorporating only part of the spectrum etc.) may to some extent avoid the risks associated with poorer service continuity and investment incentives while continuing to promote competition. Although, in our view, in the Australian context, licence renewal with a fixed term contract results in fewer trade-offs between the ACMA's policy objectives compared to any re-auctioning options.

Finally, administrative reassignment can be effective in certain specific circumstances, as it provides the regulator with considerable control and can be pro-competitive if executed correctly. However, this approach tends to carry a higher risk of regulatory failure and may come at the cost of decreased investment incentives and reduced transparency. In our view, administrative reassignment is unlikely to be warranted in the Australian context due to the current level of market maturity.

The Radiocommunications Act provides a means to renew licences, and, in the case of renewal refusal, to administratively reassign spectrum or follow an auction-based approach.

As discussed in Section 2.1, the revised Radiocommunications Act provides the ACMA with three options for expiring licences: renewal, renewal with changed core conditions, and refusal (following which the ACMA has discretion to administratively reassign spectrum or to follow an auction-based approach).

It should firstly be noted that perpetual licences do not appear to be supported in the Australian legal framework. Under the Radiocommunications Act, existing licence holders are responsible for applying to the ACMA to have their licences renewed, with licence terms limited to a maximum of twenty years. The ACMA is not permitted to renew a licence in the absence of a valid application, and accordingly, a pure perpetual licensing approach does not appear to be a legal relicensing option. As such, we will predominately focus our discussions on licence renewals in the remainder of this report.

The consultation published by the ACMA also makes little reference to the re-auctioning of spectrum or administrative reassignment, although these are acknowledged to be viable options should renewal be refused. As such, exploring licence renewal should be a central focus for the ACMA, with bands either renewed with the same spectrum access conditions, or with different conditions.

The ACMA’s proposed approach to gather preliminary views across all expiring bands simultaneously indicates an intention to make decisions that consider the holistic spectrum environment. This approach should allow the ACMA to achieve public benefit (in line with its public interest criteria) while retaining a moderate degree of control over the upcoming spectrum assignment in case of changes in policy priorities ahead of the renewal of specific bands.

Details listed in the proposed four-stage ESL process within the ACMA consultation document provide indications of the types of analysis that could be undertaken to inform renewal decisions. The ACMA appears keen on assessing whether existing use cases and users of the spectrum will continue to facilitate public interest, whether any existing band-specific issues (e.g. fragmentation within bands or lack of regional connectivity) need to be addressed, and whether any market or competition issues could arise (by considering both broader market issues and matters specific to each licence and licensee).

The ACMA intends to review any changes to policy closer to the expiry of licences within each band, further demonstrating that licence conditions may be subject to change at renewal. The multi-stage process also provides opportunities for industry players to provide feedback, and the ACMA intends to “consult on options if any substantive change is contemplated”, suggesting an openness to substantive changes if deemed necessary based on its assessment.

3.3 The ACMA has proposed a generally sound process, but should be clear about licence length and payment structure

The considerable number of spectrum licences due to expire between 2028 and 2032 are expected to be in high demand from the MNOs. The licences cover a range of frequencies from the 700MHz band to 3.4GHz band (as shown previously in Figure 2.1). Most of these bands have been purposed for mainstream mobile broadband use, and in many cases the spectrum assignment is national in scope. Given the ACMA’s promotion of investment and innovation, we consider the renewal of these licences on a long-term basis to be a favourable approach, so long as licence conditions are met.

Somewhat separately from the method of assignment, annual licence fees are likely to be the optimal payment mechanism, rather than upfront payment for a long-term licence. This subsection explores these topics (licence extensions and annual licence fees) in more detail through the lens of global case studies of how different NRAs have approached licence expiry and the different features of the post-expiry licensing approaches they have adopted. The analysis informs the discussion of key topics in Section 4, such as effective spectrum pricing and the estimation of market value.

The ACMA’s approach to forming preliminary views on its relicensing approach (Stage 3 in the December 2023 finalised framework) across all ESL bands at the same time would allow the ACMA to concurrently evaluate the substitutable or complementary nature of different spectrum bands, allowing it to more holistically understand the potential impact and utility of options for the various spectrum bands. This approach could also help to lessen the extent of pricing anomalies moving forward (such as between spectrum bands) which is elaborated upon in Section 4.3.

Similarly, licence holders need to assess the potential impact of the ESL bands holistically in order to appreciate the likely impact on their networks and customers. It is important to note licence holders may not be able to finance lump-sum payments given the large number of ESL bands under consideration. Licence holders should be given as much notice as possible on price and payment structure so they are able to prepare their finances in anticipation of financing any ESLs.

Long-term licence extensions can provide an opportunity to promote the ACMA's public interest criteria whilst avoiding complexities associated with other relicensing approaches

The inclusion of extension clauses within a licence's initial terms may enhance the attractiveness of the proposition for potential spectrum licence holders by providing greater certainty of (long-term) tenure. Extensions are typically subject to the fulfilment of set criteria and involve consultations with other stakeholders prior to their issuance. Licence extensions are likely to be considered by NRAs where analysis suggests the existing spectrum distribution should be maintained, whether this be due to limited competitor demand for the spectrum or to maintain an assignment that already effectively supports the public interest.

Case study: the EU and Spain

While 15-year and 20-year licence durations are relatively common, some jurisdictions have embedded extension clauses. For example, under Article 49 of the European Commission's recent Electronic Communications Code (ECC), the EU requires EU Member States to issue mobile licences with a minimum duration of 15 years and provisions for a 5-year extension if certain criteria are met (as means to facilitate 5G deployment).¹⁵ Notably, Spain¹⁶ decided to increase the maximum licence duration to 40 years as of April 2021,¹⁷ resulting in new licences (such as for the 700MHz auction in July 2021) that have a 20-year initial term and potential renewal of an additional 20 years. Renewal will depend on whether licence conditions have been met, and as such, the renewal is essentially a licence extension.

Short extensions, such as the 5-year extension in the EU, are unlikely to be as relevant in the Australian context since the outcome may be perceived as relatively inconsequential by market participants and would result in lingering uncertainty that reduces investment incentives until a future where a longer-term renewal might take place. A greater burden would also be placed on the ACMA to carry out another similar process relatively soon afterwards. Conversely, a 20-year extension as has become the practice in Spain would provide significant certainty to the market and would likely be a more favourable approach in the Australian context.

Long-term licence extensions would provide licensees with a reliable long-term view of their spectrum holdings and therefore be likely to stimulate investment in line with the ACMA's public interest criteria

¹⁵ <https://www.europarl.europa.eu/legislative-train/carriage/jd-electronic-communications-code/report?sid=6001>

¹⁶ https://portal.mineco.gob.es/es-es/comunicacion/Paginas/210721_np_-subasta_.aspx,
<https://boe.es/boe/dias/2021/05/31/pdfs/BOE-A-2021-9060.pdf>

¹⁷ https://portal.mineco.gob.es/es-es/comunicacion/Paginas/210427_np_frecuencias.aspx

(as discussed in Section 3.1).¹⁸ This may be especially true if the extension includes additional investment commitments (potentially among other conditions), which is an approach that is discussed further in Section 4.2. Furthermore, market participants would be able to avoid the challenges and costs associated with other relicensing approaches, such as auctions, in the long-term. Accordingly, long-term licence extension is a highly suitable approach in Australia, so long as extension conditions are met.

Structuring payments for spectrum in the form of annual instalments can provide market participants with greater flexibility

When renewing (or initially issuing) spectrum licences, annual licence fees are an alternative to upfront payments. Depending on the fee-setting process, the NRA might also benefit from the ability to review fees periodically to reflect changes in the market value of the spectrum (as is the case in the UK).¹⁹

Case study: the UK and Canada

Ofcom, the UK NRA, has used an annual licence fee approach when issuing national licences. Annual licence fees for certain spectrum bands come into effect indefinitely after an initial paid term of 20 years has passed following the original assignment (usually by auction). In effect, the approach consists of perpetual licences with annual licence fees commencing after an initial paid term. The licences are irrevocable during the initial 20-year paid term, but then become revocable for spectrum management reasons, with a five-year notice period, thereafter.

A similar approach is used in Canada, where consultations are held two years before licence expiry to inform new licence conditions including annual fees that “*reflect some measure of market value*”, adjusted for the consumer price index (CPI).²⁰ Notably, total or partial transfers of licences are permitted and a licence may not be renewed if the conditions are breached or spectrum is to be allocated to a new service.²¹

Ultimately, the examples above demonstrate that the implementation of a renewal approach that includes annual licence fees can be effective since it affords the regulator greater flexibility regarding long-term spectrum pricing (relative to an auction or a purely upfront renewal fee), in a way that should help to maximise efficiency. It also offers greater flexibility to the licensee to relinquish the spectrum at any point, rather than be committed to usage and fees in the long-term.

It should be considered, however, that the prospect of changes to annual licence fees (for example, as a result of periodic reviews) effectively reduces operator certainty and could therefore suppress investment. Accordingly, in the Australian context, a set annual licence fee (that merely distributes

¹⁸ Long-term certainty can significantly increase investor confidence, resulting in investment into new technologies, quality-of-service improvement and network expansion.

¹⁹ The benefits of this approach, along with potential drawbacks, are discussed in Section 4.1

²⁰ https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/h_sf01713.html

²¹ See sections 3.5 to 3.7, <https://www.ic.gc.ca/eic/site/smt-gst.nsf/eng/sf01626.html#section35>

operators' otherwise upfront spectrum costs over time) is more likely to align with the ACMA's public interest criteria. The magnitude of the annual licence fee should also be considered in relation to other conditions imposed on spectrum holders.

Perpetual licences (without annual licence fees) might provide operators with even greater certainty, such as in the USA.²² In such cases, more stringent service requirements and other licence conditions/criteria may be applied and the spectrum allocation would need to be rigorously scrutinised to ensure that market efficiency is not compromised (e.g. limiting new entrants), since the regulator might have less opportunities to adjust spectrum pricing without the existence of annual licence fees. However, we do not believe a perpetual licence approach to be compatible with the legal framework for managing spectrum in Australia.

²² The USA adopts indefinite duration licences without annual licence fees in its 2017 standardised renewal framework. Whilst licensees must apply for renewal, no competing renewal applications are permitted. To be granted a licence renewal, the licensee must demonstrate continued provision of the required level of service, as well as comply with any other licence-specific conditions. The Federal Communications Commission's (FCC's) stated motivations were to promote efficient use of spectrum and to afford licence holders more certainty with regard to licence duration and renewal requirements]

4 Optimal relicensing outcomes should result in fair and consistent pricing, which is not excessive, and enhanced investment to benefit consumers

This section examines the properties of good spectrum assignment outcomes, specifically with regard to setting spectrum prices and enhancing investment or consumer experience.

- Section 4.1 explains how the pricing of spectrum can impact economic efficiency of assignment and competition, and discusses difficulties associated with attempting to price spectrum at market value. It also explores the link between spectrum pricing and both network investment incentives and retail prices.
- Section 4.2 considers the advantages, disadvantages, and core considerations that the ACMA should be mindful of when deciding whether to impose investment commitments, with reference to global case studies.
- Section 4.3 takes a more practical view on effective spectrum pricing frameworks, considering the limitations of certain pricing approaches and outlining what we consider to be important features of effective frameworks.

We acknowledge the complexities associated with accurately estimating the true market value of spectrum (and the drawbacks of certain approaches that attempt to do so). Nonetheless, we believe that a good overall approach to setting fees for renewing ESLs would avoid setting the fees at excessive levels, would consider whether fees might be reduced to help achieve other public interest criteria (e.g. through imposing coverage or investment commitments) and would ensure that fees are set in a consistent manner across the different spectrum bands, reflecting the underlying technical characteristics of the bands.

4.1 Prices for licence extensions should not be excessive: high fees are not necessary to promote efficiency or competition, and could harm the market

The ACMA recognises the importance of determining appropriate spectrum access charges, and the presence of a spectrum trading framework in Australia helps to facilitate efficiency of assignment

In its May 2023 consultation paper, the ACMA outlined its intention to develop valuations for licences for ESL bands to determine appropriate spectrum access charges, considering domestic and international evidence. The ACMA has expressed an awareness of (indicating an intention to take into account) the following considerations:

1. **Auction avoidance pricing:** factoring in the value to the licensee of renewing spectrum licences and avoiding the uncertainty/costs of going to auction

2. **Public interest pricing:** factoring in public interest considerations rather than simply the economic value (such as for rail safety)
3. **Licence conditions:** considering specific conditions for individual licences rather than the spectrum band in its entirety (e.g. for allocations with specific requirements, such as additional spectrum to provide guard bands between services or users)

The impact of any usage restrictions, which may be introduced in the public interest as per point two above, can reduce options for spectrum licensees and thus should lower the value of the spectrum. Similarly, consideration of licence specific conditions, depending on their nature, is likely to reduce the value of spectrum and should be reflected in more favourable licence terms. The impacts of the above considerations on the perceived spectrum value by market participants should therefore be carefully assessed when setting prices.

A key consideration when setting spectrum fees should be the promotion of efficiency (technical and economic, as well as spectrum utilisation). Technical efficiency refers to spectral efficiency (i.e. bit/s/Hz)²³, whereas economic efficiency is maximised when spectrum is allocated to users that generate the greatest economic value from it. In mainstream mobile bands such as the ESL bands, it is highly unlikely that there is a higher value (more economically efficient) user than an MNO. Spectrum utilisation refers to how widely used (in a geographic and/or temporal sense) the spectrum is.

There may remain differences in how efficiently different MNOs could make use of spectrum within the ESL bands. The value that each MNO places on spectrum is likely to depend upon market shares, network congestion levels and other spectrum holdings, among other factors. However, markets with spectrum trading frameworks in place, such as Australia, enable MNOs to efficiently trade their spectrum licences. Therefore, it is reasonable to presume that a spectrum licensee is efficiently utilising its spectrum holdings as it is otherwise foregoing the opportunity of selling its spectrum licence to another party.

We note that, in practice, some MNOs may be more responsive to a direct cost (e.g. a spectrum fee) than an opportunity cost (i.e. foregone revenue) in light of budgetary constraints. And we note that the ACMA seeks to balance public benefits, which are likely to include revenue raised from spectrum licence fees, against impacts as part of its public interest criteria. Therefore, whilst we do not suggest that no fees are charged to MNOs for use of licensed mobile spectrum, it is our view that there is no compelling efficiency-based reason to set these fees at a high level.

Accurately estimating the market value (auction avoidance price) of spectrum can be difficult

Accurately estimating the market value of spectrum can be difficult given nuanced considerations (such as the particular set of market conditions at the time) and a need to factor in the expected market evolution. Auction and licence conditions will also have a bearing on the prices that have been paid in

²³ Technological convergence to what is effectively a common mobile standard (within 3GPP) means that there are fewer differences between MNOs in terms of how efficiently they use their spectrum (from a technical perspective)

the past (for example, more stringent conditions may have resulted in lower prices), which are likely to form a key input to estimating prices based on forward-looking spectrum value.

There is also an asymmetric risk of setting prices too high as opposed to too low since the former could choke off efficient demand (resulting in unassigned or under-utilised spectrum). Given the complexity and risks, the ACMA should avoid setting excessive prices. The method of setting prices also has the potential to inhibit trading (discussed below).

- **Price-setting based on auctions:** The level at which the ACMA sets spectrum prices may be guided by the results of prior auctions. While reliance on historical benchmarks (either domestic or international) may help to ground market value estimates to some extent, every auction is different, and hence auction price benchmarks should not be interpreted as accurate indicators of market value in a different context. Another drawback of referencing prior auctions to set prices is that there is a credible risk of bidders acting strategically in auctions if they know or expect that auction prices will affect their own, or a competitor's, spectrum prices in future for another frequency band. A key consideration is that this 'circularity risk' argument also applies to trades if the NRA intends to use trade prices as a reference point to guide future pricing. Accordingly, the setting of prices might also actively inhibit/distort trading (in a similar way to distorting auction prices) and thus act as a barrier to economically efficient outcomes.
- **Fee-setting that includes periodic review:** A system whereby there is only an upfront price paid by MNOs for spectrum access can eliminate any reflection of changes in spectrum value in price over time. Although this provides MNOs with greater certainty, it can result in sub-optimal spectrum allocations as market conditions evolve. To combat this, some NRAs (such as Ofcom in the UK) have implemented annual licence fees which are periodically reviewed as a means to assist in reducing emerging discrepancies with market value (as mentioned in Section 3.3). This may be a sound approach in some cases, however, there is a risk that periodic reviews may lag behind market requirements and introduce administrative inefficiencies. A lack of certainty as to what the evolving liability associated with any particular mobile spectrum licence will be in future years can also be counterproductive for MNOs and can potentially deter investment and inhibit trade. It should be noted that although Australia has a relatively small annual spectrum licence tax used to cover the cost of spectrum management, this is not comparable to the use of annual licence fees in the UK, which are set at Ofcom's estimation of the full market value of the spectrum.

High spectrum prices have the potential to negatively impact network investment and retail prices

Criteria 2 of the ACMA's public interest criteria, "promotes investment and innovation", demonstrates the importance that it places on improving service availability, quality and coverage. Given the ACMA's focus on investment, it is important to consider the argument that setting high prices for spectrum could potentially reduce free cashflow and thereby decrease an MNO's funds available for investment.

A number of 'real-world' arguments have been made to suggest there may be a link between spectrum pricing and investment levels, for example:

- MNOs must operate within set capex budgets and meet annual free cashflow targets, even if satisfying these restrictions may not be ‘text-book optimal’.
- Capital markets may be more pessimistic than an MNO with respect to expected return, compromising an investment that would otherwise be undertaken by the MNO.²⁴
- In reality, no enterprise has infinite borrowing capacity, regardless of the viability of the business case.
- Information asymmetry may exist between MNOs and lenders (such as in relation to perceived cost certainty), and therefore capital markets might price in additional compensation for this risk.
- Financing investment through additional debt funding might lower an MNO’s credit rating and therefore increase its weighted average cost of capital (WACC); enterprises are also typically subject to debt covenants, which if breached could result in significant penalties (financial or otherwise).

However, it should be understood that standard economic theory considers that funding an investment should be possible so long as the expected return exceeds the cost of capital (the MNO’s cashflow position is inconsequential). By this argument, high spectrum pricing should not deter efficient investment. A similar argument could be made concerning the link between spectrum pricing and retail prices. As spectrum prices might be considered as sunk costs, according to standard economic theory, these higher costs might not be expected to be passed on to consumers in the form of higher retail prices (in a competitive market).

Diverse conclusions have been drawn from a large amount of empirical research into cashflow and investment, as well as spectrum costs and retail pricing, and, as such, the exact nature of the relationships between these variables is inconclusive.²⁵ The ACMA should consider the broad range of arguments (both empirical and theoretical) and assess which of them are most applicable in the Australian context.

Regardless of which arguments are preferred, it is important to be mindful of consistency with other arguments. For example, it would be inconsistent to adopt an economic theory argument that high

²⁴ It can also be argued that high spectrum prices can impair investment, to the extent that investors perceive that the pricing has an impact on the MNO’s ability to generate a stable return – that is, the price of the spectrum may increase the MNO’s WACC. However, we consider this effect to be marginal.

²⁵ A sample of relevant literature on the subject includes: Janssen, M. and Reynolds, P. (2018), *Is pricing spectrum at market value good for consumers?*, CEG Global, https://www.ceg-global.com/uploads/PDFs/White%20Papers/DPTelecoms_SpectrumMarket.pdf; Williamson, B. (2018), *Keeping an eye on the prize – investment in mobile networks to deliver coverage, capacity & the 5G strategy: A reappraisal of recurring spectrum fees* (paper for EE), Communications Chambers, <http://www.commcham.com/pubs/2018/5/3/recurring-spectrum-fees.html>; Lewellen, J. and Lewellen, K. (2016), *Investment and cash flow: new evidence*, *Journal of Financial and Quantitative Analysis*, Vol. 51, No. 4 August 2016, pp. 1135–1164; Chen, H. and Chen, S. (2012), ‘Investment-Cash Flow Sensitivity Cannot Be a Good Measure of Financial Constraints: Evidence from the Time Series’, *Journal of Financial Economics*, 103, <https://www.sciencedirect.com/science/article/abs/pii/S0304405X11001929>; Kaplan, S. and Zingales, L. (1997), ‘Do Investment-Cash Flow Sensitivities Provide Useful Measures of Financing Constraints?’, *Quarterly Journal of Economics*, 112, <https://academic.oup.com/qje/article-abstract/112/1/169/1870889?redirectedFrom=fulltext>

spectrum prices have no impact on investment incentives while also arguing a ‘real-world’ view that MNOs may respond to direct costs differently to opportunity costs (as discussed in Section 4.1). In other words, it would appear inconsistent to argue that high spectrum prices are needed to promote efficiency (if that is indeed the ACMA’s current thinking) but that these same high prices would then not be detrimental to investment. NRAs around the world have adopted different approaches to manage some of these trade-offs, as discussed below in Section 4.2.

4.2 Approaches that enhance investment or consumer experience can potentially be desirable from a public interest perspective, as long as competition is not distorted

Some NRAs have attached investment obligations to spectrum licences to promote the public interest

To promote the public interest, investment obligations can be introduced into licence conditions as a means to encourage greater and more targeted operator investment than would otherwise occur. Such obligations should be heavily informed by the local context, such as the status of existing infrastructure and the competitive environment. A common example of investment obligations is the extension of population and landmass coverage to promote network roll-out in less commercially attractive areas (to increase digital inclusion). The benefits could include improvements to digital infrastructure (contributing to economic growth) and enhanced network quality. Relicensing approaches including investment commitments have been effectively implemented in many markets, as discussed in the following case studies.

Case study: Portugal and France (licence renewal), Germany (licence extension), and Denmark (auction)

Licence renewal - In 2021, the Portuguese NRA, Anacom, agreed to renew MEO and Vodafone’s 900MHz and 1800MHz licences with additional population coverage and speed obligations (which fell outside the scope of the existing 5G obligations). This demonstrates how minimum network quality and population coverage requirements can be effectively introduced into licence terms, and is especially relevant to Australia given the focus on new technology deployment and coverage of areas with low population density. A similar approach was also used in France in 2018. Instead of a re-auctioning 900MHz, 1800MHz and 2100MHz spectrum, French licences were renewed with additional coverage and quality obligations, while keeping annual licence fees flat at historical levels. Although Australia does not currently impose annual fees on spectrum holders (aside from relatively low spectrum management taxes), a decision to use this renewal approach for bands with investment obligations may be an interesting trade-off to consider, should the ACMA seek to introduce annual fees for other bands.

Licence extension - NRAs have frequently included investment commitments within licence extension conditions, which has proven to be a viable middle-ground (relative to an absolute renewal). The German NRA, BnetzA, is currently finalising a proposal to provide a 5- (or even 8-) year extension to expiring 800MHz, 1800MHz and 2.6GHz licences in return for moderate additional network coverage obligations. Extensions with attached investment obligations in return for favourable licence terms may

be a suitable option in the Australian context, depending on the ACMA's final position on licence extensions more broadly.

Auction - In Denmark's most recent (combinatorial) spectrum auction in 2021, obligations were attached to the 3.4–3.8GHz licences to achieve 60% population coverage by the end of 2023, and 75% by the end of 2025. The 2100MHz licences also incorporated coverage requirements for poorly covered areas, and a separate second auction stage was included in which MNOs could place an additional bid to specify one of three coverage zones (of similar size, each containing 40/41 target areas). The key feature of the Danish approach on 2100MHz (and similarly in previous auctions for other bands, including 1800MHz) was that initial licence prices for the spectrum were set in the first stage of the auction and the second stage then determined an explicit discount to be applied to this agreed pricing to reflect an additional coverage commitment.²⁶

Price reductions may be introduced together with investment obligations to encourage investment

Spectrum prices that would otherwise be set at or below market-value (e.g. based on auction avoidance pricing) could instead be levied (in part) in the form of MNO coverage or investment commitments in return for additional price concessions (as an incentive). For example, applying this approach to expiring spectrum licences up for renewal would result in a reduced price being offered in exchange for obligations to invest in network infrastructure. Diverting revenue from spectrum prices into investment commitments of this nature can offer a number of advantages, including the ability to execute modular improvement programmes over time (i.e. not disrupting the entire network at once), and greater control and/or supervision of projects by the NRA to ensure resources are allocated optimally (e.g. ensuring value for money and that resources flow efficiently to the most appropriate players). Some jurisdictions have offered some form of rebate to operators for extended coverage obligations or the achievement of their coverage targets, which may be an effective approach.

Case study: Austria and the Czech Republic

The 2020 combinatorial spectrum auction in Austria consisted of four stages. The first two stages took the form of a simultaneous multiple round ascending auction to assign lots first in the 700MHz and 2100MHz bands, and then in the 1400MHz band. Each 700MHz lot included a minimum coverage obligation. In the third stage, MNOs submitted sealed bids to secure specific frequencies within the three bands. In the fourth and final stage, MNOs submitted sealed bids to accept extended coverage obligations in exchange for a price reduction. This price reduction was subtracted from the auction price settled in the first stage, essentially functioning as a rebate to funds that had already been committed, in a similar manner to the Danish example described above. Notably, the extended coverage obligations assigned in stage four were not bound to any specific frequencies.²⁷

²⁶ https://ens.dk/sites/ens.dk/files/Tele/information_memorandum_1.pdf

²⁷ https://www.rtr.at/TKP/was_wir_tun/telekommunikation/spectrum/TenderDocument-700_1500_2100_MHz-F_1_16_EN-non-binding-trans.pdf

Similarly, in the Czech Republic, as a means to ensure 2G network continuity, CTU (the NRA) decided to extend the 2100MHz licences with a discount that accounted for the cost of maintaining the network until 2028.

Based on these examples, additional investment commitments paired with reduced spectrum pricing (e.g. in the form of discounts/rebates) can be an effective method to incentivise operator investment and should be considered by the ACMA, with appropriate consideration of the applicability to the Australian context.

The ACMA should adopt a prudent approach when considering investment commitments to suitably account for the Australian context and avoid undesirable outcomes, such as distortions to competition

Given the ACMA's objectives, it is likely to prefer assigning spectrum to operators that are willing and able to invest in network expansion and new services and technologies. However, Australia's vast geography means that large swathes of the country are commercially unviable for MNOs to deploy their networks to. Accordingly, the ACMA may determine that some form of ongoing investment obligation attached to spectrum licences may be desirable, in order to incentivise MNOs to address persisting population coverage gaps (that is, where mobile networks are deemed more suitable than satellite connectivity), thereby increasing spectrum utilisation. Given the considerable upfront investment and ongoing operational costs associated with certain deployments (such as 5G massive multiple-input and multiple-output (mMIMO) technology), investment commitments are likely to be particularly beneficial if the ACMA aims to drive greater coverage of more advanced services in low population density areas.

Investment commitments should be designed to result in greater social benefit than otherwise achievable, aligning with the ACMA's public interest criteria (especially Criteria 2) and reflecting the Minister's request to consider the use of roll-out obligations for coverage purposes and 'use-it-or-lose-it/share-it' spectrum licence conditions (as discussed in Section 3.1). However, the ACMA should not be overly ambitious in setting investment obligations (as this may hamper efficiency) and needs to consider such an approach in the unique Australian geographical context, as well as the Australian market context. In a geographical sense, Canada is perhaps a somewhat relevant example, although there are of course stark differences between Australia and Canada.

Case study: Canada

Given the country's vast landmass, Canada has decided to assign varied coverage obligations across different licence areas. This has enabled the jurisdiction to tailor commercial incentives in a way that encourages greater coverage expansion in rural areas. For example, for spectrum assigned in the 2021 3450–3650MHz auction, operators are required to meet certain coverage obligations (with varied population coverage thresholds and achievement timelines) depending on whether the licence area is classed as containing a large population centre or not. The varied implementation of coverage obligations by licence area (based on geography) is likely to be a suitable approach in the Australian context given similarities with Canada with respect to a large national land mass with relatively concentrated population centres. Furthermore, in such a landscape, a regional licencing model can provide smaller regional operators with better opportunities to acquire spectrum.

While the Canadian coverage obligations are relatively stringent, the ACMA needs to be mindful of setting overly restrictive requirements as they might deter operator buy-in and result in inefficient outcomes and under-utilised or unassigned spectrum.

It should be noted that there are likely to be some significant challenges associated with any such inclusion of investment commitments as part of the relicensing approach, which would need to be carefully explored in collaboration with industry before implementation.

Coverage commitments, for example, could result in distortions to competition, depending on existing coverage levels, as costs to achieve the coverage targets may vary by MNO. Notably, Telstra (which used to be government owned) has a considerably higher market share and land coverage area than Optus and TPG, and is generally granted the majority of public funding in regional / rural blackspot funding programmes. Accordingly, the ACMA would need to rigorously assess operators' current positions to determine the most fair and equitable coverage or investment commitments and avoid market distortion.

It may also be difficult for the ACMA to gauge the extent to which investment might have occurred commercially, and therefore accurately estimate the impact of the coverage commitment above each MNO's 'business as usual'. The four-step process proposed by the ACMA for the ESL process provides opportunities for industry participants to provide input, which might help to mitigate these risks and to ensure smoother implementation.

4.3 A consistent framework for determining band prices is necessary to ensure that relative pricing between different bands reflects forward-looking value

Past auction prices in Australia may reflect market conditions (including overall spectrum scarcity) at different points in time, so these alone are not likely to form good indicators of the forward-looking value of spectrum in each band

As the market values of different spectrum bands evolve, discrepancies between prices paid in past auctions and forward-looking market value may emerge. In accordance with its public interest criteria, the ACMA should take account of the substitutability of spectrum bands into its spectrum pricing to promote efficiency.

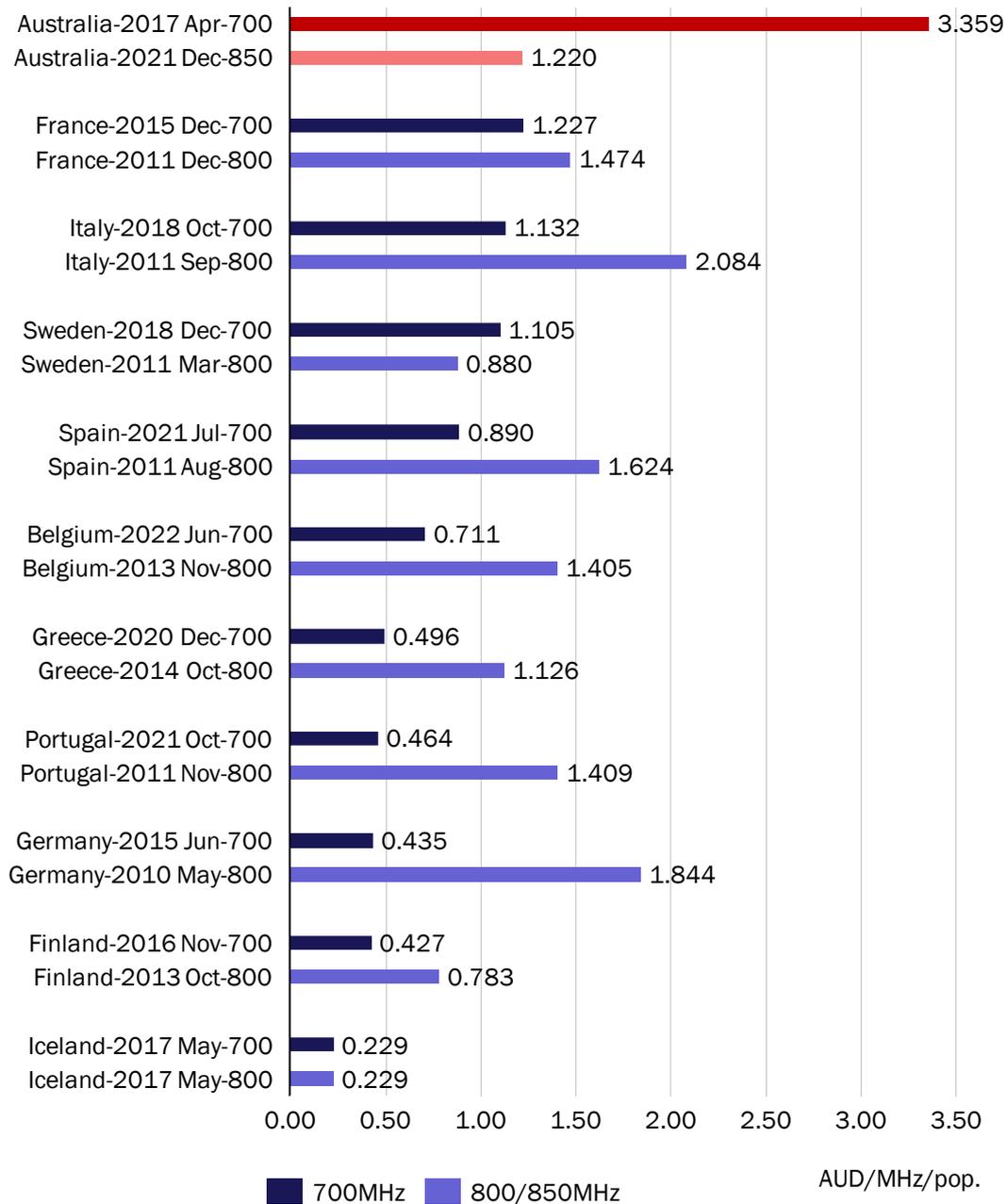
Sub-1GHz spectrum bands are broadly technically equivalent and currently all have extensive device and equipment ecosystems. In Australia, past auction results show a significant pricing discrepancy between the 700MHz (band 28) and 850MHz (band 26) bands, despite their similar technical properties.

Conversely, in Europe, the 800MHz band (band 20) was auctioned across the continent a decade ago and the prices paid for this are much higher (on average) than the technically equivalent 700MHz band (band 28), which was auctioned more recently, as shown in Figure 4.1 (noting there may be some exceptions, such as auction prices in Sweden).

Accordingly, it is not the case that the 700MHz band should intrinsically have greater value than the 850MHz in Australia, just because previous assignments (which took place at different stages of market development) resulted in pricing discrepancies. Rather, discrepancies in pricing across substitutable bands appears to be the result of relative spectrum scarcity, amongst other factors, at the time of auction.

In setting prices for renewal of ESLs, the ACMA should therefore consider the 700MHz and 850MHz band to be technically equivalent and set the same prices for these two bands.

Figure 4.1: Normalised²⁸ spectrum pricing benchmarks (Western Europe) from 700MHz and 800/850MHz auctions [Source: Analysys Mason's Spectrum Auction Tracker, 2024]



There are similar discrepancies between past auction prices and the forward-looking market value of spectrum in some of the mid-bands in Australia.

²⁸ Normalising to a licence duration of 20 years, assuming a 6% WACC and adjusting to 2023 real terms. Annual licence fees are included where applicable.

Noting the recent completion of 3.4GHz and 3.7GHz spectrum auctions in Q4 2023, the ACMA is still in the process of assigning additional spectrum at the higher end of the 3.4-4.0GHz range.²⁹ Despite lower prices for spectrum in this range in the recent auction than for the 2017 and 2018 auctions, the average prices across these bands remain high by international standards and high relative to other mid-band spectrum in Australia.

In our view, the pricing of spectrum in this band should be aligned much more closely with spectrum in the 2300MHz and potentially the 2500MHz bands than past auction prices in Australia would suggest (see Figure 4.2). In particular, these bands are to a large extent technically substitutable for 5G use cases. For example, in the Middle East, 2300MHz and 2500MHz spectrum have been used by operators for 5G services in a very similar manner to 3.4GHz and 3.7GHz spectrum. We note in this context that in the Middle East the 2500MHz band is used in a time division duplex (TDD) configuration like the 2300MHz and 3.4-4.0GHz bands, whereas in Australia (and Europe) the 2500MHz is primarily a frequency division duplex (FDD) band. This may limit the usefulness of the above comparison as pertains to 2500MHz, although we note that globally its value is often not that different, regardless of the band plan configuration (FDD or TDD).

The 2300MHz and 2500MHz bands should also have somewhat better propagation characteristics (given that they are significantly lower frequency than 3.4-4.0GHz spectrum bands), partially mitigating any differences in the maximum carrier size available in each band (which might imply favourability of the 3.4GHz and 3.7GHz bands in some circumstances).

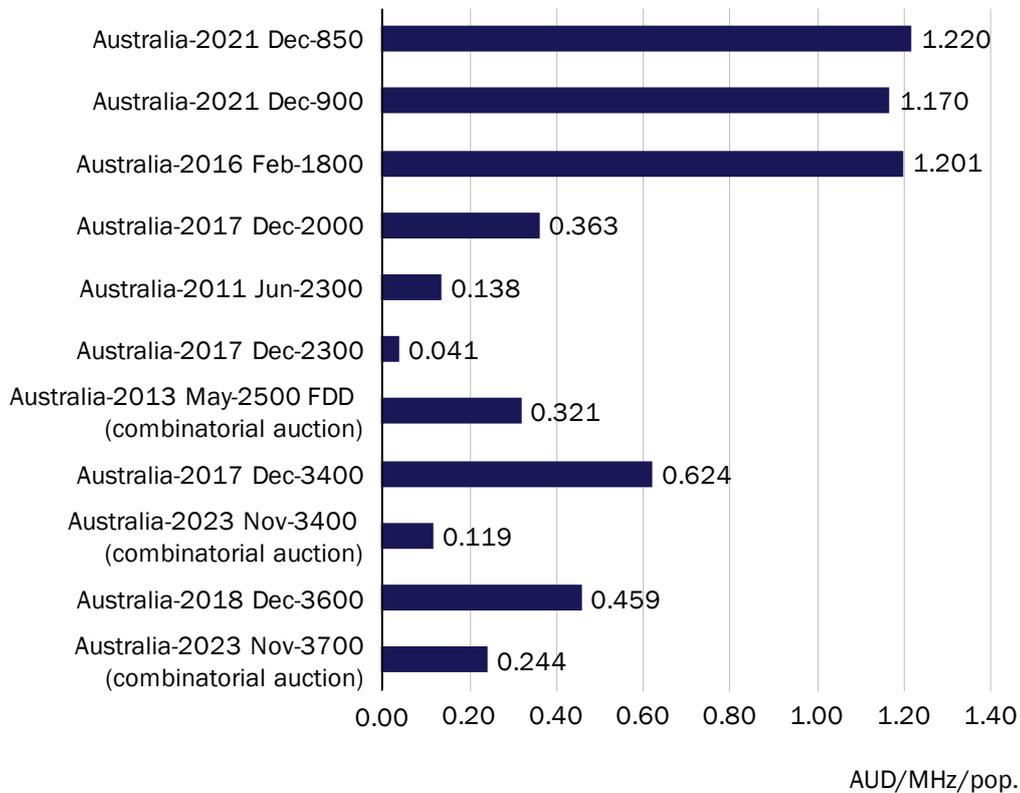
There is unlikely to be a justification for pricing 3.4/3.7GHz spectrum above 2300MHz spectrum³⁰ since the advantageous technical characteristics of the latter (such as a wider coverage area) are unlikely to be outweighed by other advantages associated with the 3.4/3.7GHz band, such as the potential availability of larger contiguous blocks of spectrum.³¹ Accordingly, in light of varied technical (and other) considerations, relative pricing between spectrum bands should be carefully considered by the ACMA and not simply be based on past auction prices.

²⁹ See <https://www.acma.gov.au/allocating-34-40-ghz-band>

³⁰ Similar arguments may apply in relation to the 2500MHz, although, as noted, the comparison between an FDD and a TDD band is not as direct.

³¹ Beamforming (focusing a wireless signal towards a specific receiver) could be used to extend the coverage in both bands, and so the superior propagation of the 2300MHz band would remain.

Figure 4.2: Normalised³² spectrum pricing for Australian spectrum bands [Source: Analysys Mason's Spectrum Auction Tracker, 2024]



In principle, spectrum pricing should evolve to reflect the changing market value of the spectrum. Accordingly, when a regulator has an opportunity to revise pricing (such as the ACMA for licences expiring between 2028 and 2032), it should strive to determine the spectrum's forward-looking market value at that point in time, and avoid distortionary pricing decisions. The UK's periodic review mechanism³³ is a prime example of this.

Case study: the UK

In 2019, annual licence fees for a UK operator's 3.4GHz and 3.6GHz spectrum licences were set based on the results of a prior (2018) 3.4GHz auction. However, in a more recent (2021) 3.6GHz auction, spectrum sold at a lower price per MHz, indicating that fees might initially have been set at a level that was too high. Under its periodic review process, Ofcom recently made a decision to ameliorate the discrepancy, altering the fee structure and changing the revocation period and fee payment start date.

³² Normalising to a licence duration of 20 years, assuming a 6% WACC and adjusting to 2023 real terms. Annual licence fees are included where applicable.

³³ Although periodic reviews are not suitable in the Australian context (due to the potential for diminished operator certainty/investment), the use of this approach in the UK demonstrates the value of updating spectrum prices to account for changes in the value of spectrum for market participants, which is something that the ACMA can aim to do in its upcoming licence renewal process, albeit using a different mechanism to the one used in the UK (periodic reviews are discussed further in Section 4.1).

In this way, Ofcom attempted to more accurately reflect underlying differences in spectrum value through reestablishing the pricing differences between these bands. However, a periodic review is associated with licence renewal on a rolling basis, rather than with a fixed licence term, and hence would not be compatible with our recommended approach in the Australian context. Nonetheless, undertaking a more ad-hoc pricing review if there is strong evidence to suggest that spectrum prices have become materially misaligned to forward-looking market value (or whichever other basis on which they may have initially been set) may be worthwhile for the ACMA to provision for.

Spectrum pricing decisions should be transparent and fair to interested parties

As referenced as additional objectives in Section 3.1, the licensing approach should allow for a transparent, inclusive and neutral procedure of assigning spectrum among competing stakeholders. This policy objective also applies to the setting of spectrum prices. It is our view that all licensees and potential licensees should be treated in an equal manner and benefit from transparent and fair spectrum pricing. In the Australian context, this means that transparent treatment should apply to all users and potential users of spectrum, including the Tier 1 MNOs and entities such as NBN Co, which is 100% state owned.

In markets with diverse sets of participants, there may be cases where special treatment of certain operators could be deemed necessary by NRAs, to promote outcomes aligned with the public interest. For example, there may be players aside from MNOs that might have a valid use for the spectrum and should be provided with an opportunity to participate, which could be facilitated through equitable pricing decisions. To achieve fair outcomes in such instances, high transparency of the spectrum allocation process (including pricing) as well as extensive consultation with relevant stakeholders are likely to be essential. Where there is discrimination (whether positive or negative), the basis of such discrimination must be rooted in strong public policy justifications beyond the business-as-usual approach; a higher evidentiary hurdle should be applied.

Any form of treatment that could be perceived by market participants as being potentially unfair should be communicated to the public in a transparent manner, as this would enable all market participants to understand the rationale behind all decisions related to spectrum assignment.

5 Summary of recommendations

The ACMA's approach to expiring spectrum licences between 2028 and 2032 should account for the most suitable approach to relicensing and pricing, as well as being reflective of the unique characteristics of the Australian market and the ACMA's stated public interest criteria.

- The approach proposed in the ACMA's consultation document includes a strong focus on public interest criteria, which reflect relevant policy objectives
 - in addition to the five stated criteria, we believe transparency and fairness could also be key dimensions
 - we acknowledge that although these are not explicitly mentioned in the ACMA's proposed approach, they do appear to be accounted for in other material that the ACMA has published.
- Licence renewal appears to be the most suitable approach to ESLs in the Australian context, given the market's maturity and existing regulatory frameworks
 - the Radiocommunications Act provides a means to renew licences with changed core conditions if deemed necessary
 - pursuing a licence renewal approach will provide investment incentives and promote service continuity, which are key priorities for the ACMA
 - it would be beneficial for this renewal to incorporate a long-licence term and for the ACMA to charge spectrum fees on an annual basis to provide both certainty for MNOs and flexibility to help maximise efficiency.
- The ACMA should avoid setting excessively high spectrum prices as they could distort the market and prevent spectrum from being used optimally
 - high spectrum prices are not required to promote efficiency since the existence of spectrum trading means that MNOs already face the opportunity cost of their spectrum
 - moreover, high spectrum pricing carries a risk of decreasing investment incentives, putting upward pressure on retail prices or otherwise harming the market (e.g. creating barriers to trading)
 - the ACMA should be mindful that pricing based on historical data might not reflect forward-looking market value and consider methods to ameliorate this (i.e. through extensive consultations).
- In line with its public interest criteria, if the ACMA considers attaching coverage or investment commitments to licences, then this should be reflected in lower spectrum pricing

- this approach could be beneficial as long as there is extensive stakeholder consultation and competition is not distorted (for example, coverage commitments might place different burdens on each MNO depending on its current network footprint)
 - furthermore, careful attention would need to be paid to the suitability of any such licence conditions in the Australian context, particularly in relation to Australia’s extremely large landmass, highly concentrated population and unique geography
 - this approach could also complement the ACMA’s licence renewal option, while reducing the need to introduce commitments through spectrum re-auctioning.
- Related to our wider concern about the use of past auction prices to infer forward-looking spectrum value, historical auction pricing by band appears in some cases to not accurately reflect the relative value of different bands; the ACMA should account for how spectrum value has evolved to avoid distortions
 - fixing spectrum prices (over time) can distort the market as spectrum availability and use cases evolve, so the ACMA could consider introducing reasonable methods to ameliorate this (such as pricing reviews if there is strong evidence to suggest that spectrum prices have become materially misaligned to forward-looking market value)
 - the ACMA’s approach to setting prices for numerous bands concurrently should help to account for spectrum substitutability.
 - We recommend that the ACMA maintains a high degree of transparency and fairness when setting spectrum prices given the major impact it can have on market participants

Annex A Analysys Mason team member profiles

This report was authored by a team from Analysys Mason, consisting of Mark Colville, Shahan Osman, and Sabre Konidaris. Profiles for all members of the team are included on the following pages.

CURRICULUM VITAE



MARK COLVILLE

Principal



Mark is part of the Regulation practice at Analysys Mason's Cambridge office. He joined Analysys Mason in 2003 and has led a wide range of projects dealing mostly with regulatory issues (across telecoms and media) and service pricing.

He is an expert in spectrum management, spectrum valuation and auctions and also has expertise in media regulation, with a focus on competition issues in pay-TV markets, content rights issues and TV advertising.

Contact him at mark.colville@analysismason.com

Expertise

Mark has extensive experience in spectrum policy and in particular mobile spectrum valuation and auction theory. He has led a number of projects for mobile network operators (MNOs) and for regulators to value spectrum for different purposes. His major area of expertise is in regulation more generally; he has assisted many regulators to develop policy and on a range of issues, and operators in their responses to regulatory consultation documents.

Mark is also experienced in media sector issues. He led a significant, wide-ranging project for a major Western European regulator looking at the pay-TV market, which involved analysing the main market players and detailed impact modelling of various potential regulatory remedies.

Mark has contributed to a wide variety of other projects across the telecoms and media sectors, often involving detailed modelling. These include projects on service pricing, core and access network cost modelling, business planning and due diligence.

Specialist skills

- Spectrum valuation
- Auction design and strategy
- Regulatory policy
- Retail and wholesale pricing
- Fixed and mobile networks
- Economic cost modelling

Career	• 2003 to present: Analysys Mason
Education	<ul style="list-style-type: none"> • BA (Hons) in Mathematics (Churchill College, University of Cambridge, UK) • Diploma in Computer Science (University of Cambridge, UK)
Office	Cambridge, UK
Languages	English (mother tongue), French (basic), German (basic), Flemish (basic)

Notable projects

- Directed a series of projects to support two UK MNOs in responding to Ofcom's consultations on the annual licence fees to be set for 1800MHz, 900MHz and 2.1GHz spectrum in the UK
- Conducted a study reviewing the market mechanisms as applied to licensed mobile spectrum bands in the UK, namely: auctions, pricing and trading
- Directed projects for a Western European mobile operator to provide spectrum valuation for auctions of firstly 700MHz, 1400MHz and 2.1GHz, and subsequently of 3.5GHz spectrum
- Directed a project for the Danish regulator to value spectrum, assess coverage obligation options and design an award process for spectrum to be auctioned across the 1400MHz, 2.1GHz, 2.3GHz, 3.5GHz and 26GHz bands
- Directed a project to support a South African mobile operator over an 18-month period encompassing spectrum strategy, consultation response, spectrum valuation, bid strategy and live auction support for the auction of 700MHz, 800MHz, 2.6GHz and 3.5GHz spectrum
- Provided regulatory assistance to a mobile operator in a major Western European market as part of a merger clearance process
- Managed a project to assist Ofcom with cost-benefit analysis of potential release of the 700MHz band for mobile broadband.
- Assisted CITC in planning and developing a roadmap and strategy for the implementation of 5G and the Internet of Things (IoT) in the Kingdom of Saudi Arabia in order to achieve the Kingdom's "Vision 2030"
- For the regulator in a major Asia-Pacific country, managed an impact assessment of a proposed regulatory remedy in the pay-TV market.

CURRICULUM VITAE



SHAHAN OSMAN

Manager



Shahan joined Analysys Mason in 2017, and is based in our London office. He graduated from the National University of Singapore with dual undergraduate degrees in Economics and Business Administration, and subsequently completed a postgraduate degree in Managerial Economics and Strategy at the London School of Economics and Political Science.

Contact him at shahan.osman@analysismason.com

Expertise

At Analysys Mason, Shahan has managed regulation and policy assignments for operators, regulators, industry associations, and internet companies. He has also managed several transaction support and strategy development projects, largely focused on digital infrastructure assets and telecommunications services.

Specialist skills

- Scenario-based analysis and modelling
- Public policy and economic analysis
- Investment appraisal
- Business case and strategy development

Career	<ul style="list-style-type: none"> • 2017 to present: Analysys Mason (now Manager) • 2016: Institute of Systems Science, National University of Singapore (Adjunct Consultant in the Digital Innovation and Design team) • 2015 to 2016: IQVIA – then IMS Health (Strategy Consulting Intern) • 2015: Innovation Group, DBS Bank (Management Intern)
Education	<ul style="list-style-type: none"> • Master's Degree in Managerial Economics and Strategy (London School of Economics and Political Science, UK) • Double Bachelor's Degrees in Economics and Business Administration (National University of Singapore, Singapore)
Office	London, UK
Languages	English (native), Mandarin (basic)

Notable projects

Shahan has worked on a range of projects, including:

- Managed a project regarding long-term European regulatory strategy for a converged operator
- Led modelling to assess spectrum and operating licence value for a mobile operator in African countries
- For a regulator in a developed market, built models to assess viability of 5G deployment scenarios, developed evaluation criteria for assigning 5G licences via beauty contest, and assessed operator proposals accordingly
- Built models for a regulator to investigate viability of a new mobile entrant and likely impact on competition
- Authored a public report for a trade association that represents internet companies as well as broadband providers, on the impact of network investment by technology firms on the economics of broadband ISPs
- Authored a report for an association, that advocates across the automotive and telecoms sectors, on the cost of deploying different road-side unit technologies
- Authored a public report sponsored by Google on investments and innovations by internet companies in hosting, transport, and delivery infrastructure
- Authored a public report sponsored by Meta on fibre deployment and technological evolution in Europe
- Authored three public reports for the Telecom Infra Project on the economic impact of Open RAN and other disaggregated network technologies
- Authored a technical report on behalf of a streaming provider to support litigation regarding a tax dispute
- Authored a briefing document on the network usage fee debate for a global media conglomerate
- Managed projects supporting transactions of fixed and mobile infrastructure across Europe, Africa, and Latin America, including projects in support of IPO processes
- Managed several strategy and business planning projects, including for private equity firms, for digital real estate companies, as well as for a mobile operator present in multiple developing countries

CURRICULUM VITAE



SABRE KONIDARIS

Consultant



Sabre joined Analysys Mason in September 2020. He graduated from the University of Melbourne (Australia) with a BComm degree in Economics and Finance and from London Business School with a MSc in Management.

Contact him at sabre.konidaris@analysismason.com

Expertise

Since joining Analysys Mason, Sabre has contributed primarily to transaction support and commercial strategy assignments, with an emphasis on business planning and providing strategic advice to operators, investors and other industry players. He also has a keen interest in topics related to environmental, social and governance (ESG).

Specialist skills

- Business plan review
- Modelling (MS Excel)
- Geographical (Alteryx) and database analysis
- Market and competitor analysis
- Spectrum valuation

Career	<ul style="list-style-type: none"> • September 2020 to present: Analysys Mason (now Consultant) • January 2019 to August 2019: Strategic Project Partners (Strategy Consultant) • June 2018 to August 2018: Nous Group (Intern Consultant) • January 2018 to February 2018: Strategic Project Partners (Intern Consultant)
Education	<ul style="list-style-type: none"> • MSc in Management (London Business School, United Kingdom) • BComm in Economics and Finance (University of Melbourne, Australia) • Exchange/study abroad programmes at University College London, UK (Economics) and Tokyo University of Foreign Studies (Japanese)
Office	London, UK
Languages	English (native), Japanese (intermediate), Greek (intermediate)

Notable projects

- Advised two of Australia's mobile network operators on their network infrastructure-sharing strategy, which involved the development of a site-by-site model to assess alternative network-sharing scenarios with respect to coverage implications and cost savings
- Advised an American information technology company on the e-commerce regulatory landscape (mandatory and voluntary regulation) across five jurisdictions, leading reviews of the EU and Australian markets; undertook extensive research in adjacent sectors, such as advertising, competition and consumer protection, and trade and tax registration, as well as international e-commerce guidelines and initiatives (e.g. UN model laws)
- Supported Vodafone to sell its stake in Vantage Towers across nine European markets, with a focus on driving the business plan review (towers) for UK and Germany
- Supported the initial public offering (IPO) of Africa's largest independent tower company by undertaking a rigorous assessment of eight markets spanning Africa, the Middle East and Latin America
- Took part in a tower due diligence related to the Czech market, and forecasted future co-location potential
- Conducted detailed business plan reviews of fibre-to-the-premises (FTTP) and fixed-wireless access (FWA) alternative network operators (altnets) in the UK, including Airband, Brsk, FullFibre and Truespeed, etc.
- Undertook strategy development for a Greek long-haul backbone operator, with a focus on understanding and evaluating new markets for expansion, advising on the product offering and partnership opportunities, and producing a thorough competitor assessment
- Analysed demand and supply trends in the German data-centre market and assessed target's positioning as part of a commercial due diligence
- Assessed the size of the global network performance monitoring market for a network performance analytics provider based in Canada