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Thank you for the opportunity to respond to the consultation on Expiring Spectrum Licenses (ESL).

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Proposed Public Interest Criteria

The proposed public interest criteria are suitable for purpose, although the lack of a hierarchy, or weighting system is of slight concern, with the potential for one metric to overburden the others (eg. All of the spectrum given to a single entity would be very efficient, but not promote competition).

Geographic consideration

The geographic consideration is stated in the consideration of the public interest criteria in the body of the submission, but the 'weighting of balance' in different geographies could be more clearly stated as the ideal outcome is likely to differ between Metro, Regional and Remote Australia. Existing national spectrum licenses (SL) (and even larger regional ones to some extent) that extend from coast to coast, the level of investment by all license holders has not been equal, and in many cases has been focused to coastal areas. Even licenses that make an effort to split the 'metro' from the 'regional' areas are often mostly procured by the same entity¹; in a way that indicates that the boundaries in existing licenses do not match the 'areas of demand' that the purchasing entities foresee – as the areas of capital investment in infrastructure, and areas with sufficient competition do not align with the spectrum boundaries. For example, with one more metropolitan focused licensee; their most remote registration being only 230 km from the coast and nearest capital city with most deployments in the currently defined regional areas being close the coast. It is likely that this licence holder would not have acquired a national (or regional) licence if they had been able to obtain the coastal areas separately from the inland regional areas.

¹ Where they are allowed to do so; mostly as it removes the need to consider boundary criteria – and regional spectrum is (usually) comparatively cheap. The cost of removing the headache of working with the boundary in fairly populated 'peri-urban' areas, and the additional people in these 'fringe' areas is worth the cost of admission.

To support competition, it is worth noting that regionally focused and place-based carriers generally do not desire to compete and provide services in the greater metropolitan areas closer to the coastline. These areas usually have greater NBN serviceability, reducing the number of higher ARPU² fixed wireless customers, and have larger numbers of device density; as such these regions require a greater deal of spectrum assets to service, as they have larger number of users who expect greater capacity. These regions ergo require the additional spectrum assets held in other bands to be able to provide effective competition that a new entrant or smaller carrier would not possess.

If one of the objectives is to foster an environment in which smaller carriers can develop and compete with national ones; the licensing needs to suit smaller operators. These *start-ups* are unlikely to have the resources to be able to service and operate a network over an entire state, let alone nationally.

I ask that this geographic split be considered not as subtext of the public interest criteria, but as one of the criteria itself, to ensure that the process can cater for the public good nationwide, and not be subject to the *ambivalence* of the majority and stress that the best solution for metro (i.e. Spectrum licensing) may not be the best solution for regional (e.g. AWL³) where traditionally large amounts of spectrum have been licenced, but gone unused.

Band Specific issues

Further geography

Without reiterating the importance of geographic considerations, one issue that plagues the existing spectrum licenses, is the disparate geographic definitions for areas. In addition to these differences between bands, they can occasionally occur within a band. The historical reasoning for such splits is simple, in that the spectrum was allocated piecemeal and over time, where capital cities grew and previous 'metro' definitions were no longer suitable. These disparities have resulted in 'grey zones' around capitals where SL holders may not have been able to provide their full range of holdings, as well as making competition assessments difficult; or potentially subjectively unfair where newly offered spectrum holdings do not closely align with previously issued ones yet existing holdings contribute towards allocation limits. These different boundaries manifest themselves in complicated and different spectrum environments, where optimisations and network performance in one environment can't be matched in another. An example of this complexity present in Melbourne is given below in Figure 1 where more than 10 unique spectrum environments arise from 6 licences with different boundaries. The answer to the question of 'who has the most spectrum' could provide a different answer in each area.

² ARPU – Average Revenue Per User

³ Area Wide Licensing

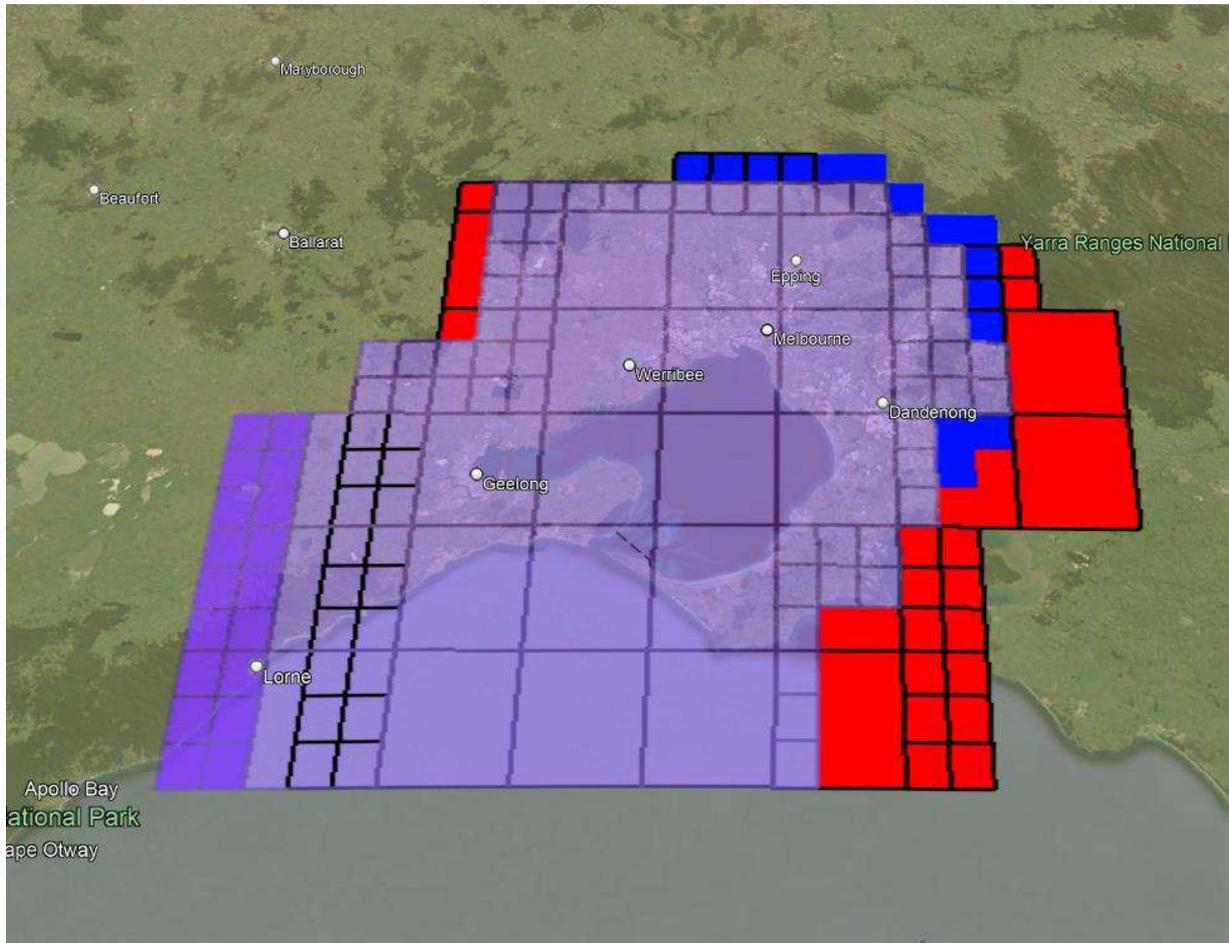


Figure 1 - Different spectrum environments that occur due to mismatched geographic boundaries of Melbourne. Licences shown here represent 1800 MHz (Red), 2100 MHz (Also red), two 2300 MHz (Blue, purple) and two 3.4 GHz licences (White, Yellow). Many more licences are actually present but not shown for simplicity.

The ESL provides an opportunity for the ACMA to align the boundaries, and remove the issue of the mismatched geographic boundaries; and have already adopted a working separation of 'Major population area' and 'regional' as evidenced in the 850/900 MHz geographic boundaries (Figure 2). Using this definition would align upcoming licences with the recently sold 850/900 MHz licence, and set

the basis for standardisation of spectrum licences.

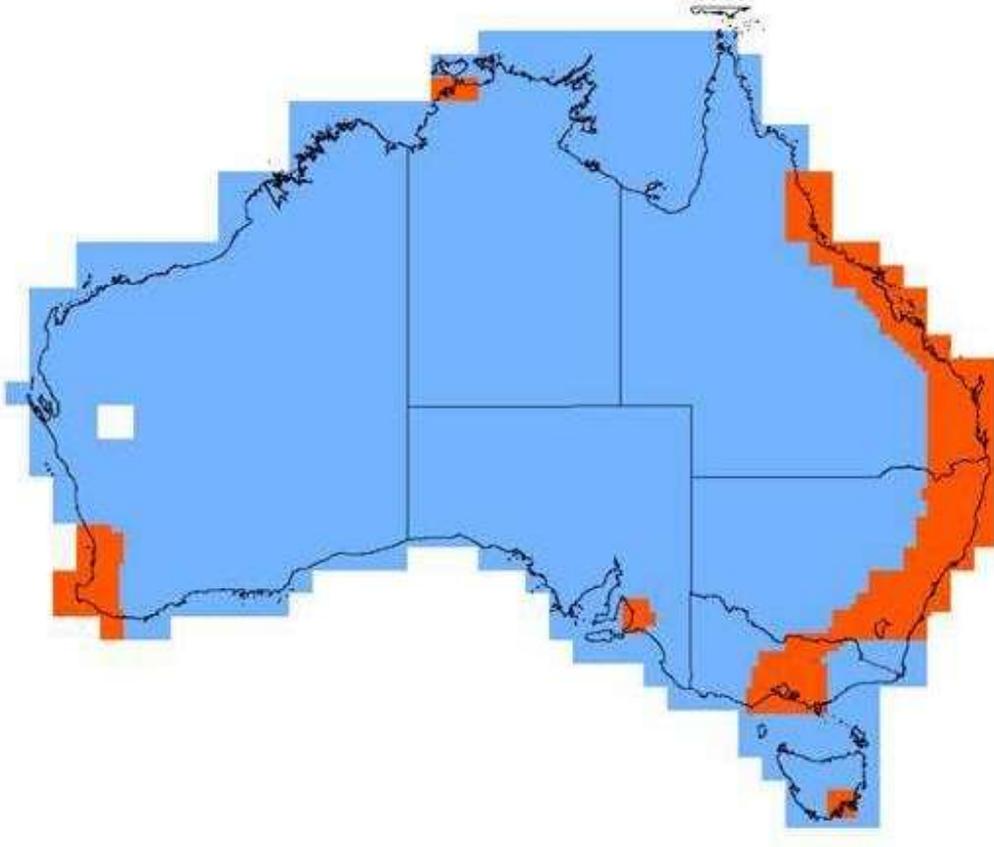


Figure 2 - Major population area (Orange) vs regional (Blue); from Radiocommunications Spectrum Marketing Plan (850/900 MHz Band) 2021

The downsides of having multiple licenses adopt the same definition has the risk of creating what might be considered a 'dead zone' where due to license conditions, an operator without co-channel holdings on the other side of the boundary is unable to provide any services due to the boundary conditions, across multiple bands. Possible solutions to this problem involve apparatus or AWL licensing (instead of spectrum licensing) outside of the 'major population areas' to effectively extend the licence boundary, use of third party authorisations, or spectrum licence trading, if there is spectrum licensing – as in more regional areas, the other side of the boundary is less likely to contain another population centre (as opposed to existing metro boundaries, where both sides are usually heavily suburban), and this area may be unsuitable to the other party.

Spectrum products should enable a service

With modern 4G and 5G networks, utilising a single band alone in 4G and 5G mobile networks is suboptimal. These technologies are designed to operate on multiple frequency bands to achieve optimal performance. Different frequency bands offer different coverage due to the propagation characteristics, both in terms of distance from a serving site, and in terms of penetration into a building. By utilising multiple bands, 4G and 5G networks can leverage the strengths of each band to provide a seamless and robust user experience across various environments, including urban, suburban, and rural areas.

A network using a single frequency band would limit the compatibility and coexistence of 4G and 5G networks. These technologies are designed to work together, allowing smooth transition and handover between them. By deploying multiple frequency bands, mobile operators can allocate specific bands for 4G and 5G, ensuring backward compatibility for older devices while enabling the deployment of advanced 5G services and technologies. Switching bands allows mobile networks to dynamically adapt to varying conditions and user demands, enabling seamless connectivity, improved coverage, and capacity management for enhanced user experiences.

Modern mobile networks, including 4G and 5G, rely on multiple 3GPP bands to ensure effective and efficient operation. For instance, 4G and 5G networks commonly utilise bands (and their 5G equivalents) such as 700 MHz (Band 28), 1800 MHz (Band 3), 2100 MHz (Band 1), and 2600 MHz (Band 7) for different purposes. The 700 MHz band provides excellent coverage over long distances and better penetration through obstacles, making it suitable for wide-area coverage. The 1800 MHz band offers a balance between coverage and capacity, making it ideal for urban areas. The 2100 MHz band provides higher capacity and faster data speeds, while the 2600 MHz band enables increased data throughput for high-demand areas. By leveraging multiple 3GPP bands, modern mobile networks can meet the diverse needs of users and ensure optimal performance in different environments and use cases.

Relying on a single frequency band would restrict the capacity and data throughput of 4G and 5G networks. With the exponential growth of data consumption and emerging technologies, such as augmented reality and Internet of Things (IoT) devices, mobile networks need to support high data speeds and low latency. By utilising multiple bands, operators can allocate different frequencies for data traffic, allowing for efficient load balancing, congestion management, and enhanced network performance. The total equipment cost to enable such capabilities may be outside the reach of the average consumer, but is mild business expense for even a medium sized organisation.

For instance, the infrastructure cost to enable digital agriculture with an LTE based solution would be in the order of magnitude of less than \$100,000; with a spectrum cost of possibly as low as \$42 per annum, with additional coverage potentially added for as low as \$20,000 per base station – this begs the question of where the many private LTE networks supporting the digital agricultural economy are.

Low band (<1 GHz) spectrum is critical for a competitive mobile network as it provides superior coverage compared to higher frequency bands. They have better signal propagation characteristics, allowing them to penetrate obstacles and cover larger geographic areas, including rural and indoor environments. This

wider coverage footprint gives mobile operators a competitive advantage by reaching more customers and providing connectivity in underserved or remote areas. Without access to low band, competition from smaller players is untenable, particularly in offering private or 'place based' networks to communities that would be willing to provide funding to improve their coverage issues – but is currently held solely by larger operators who are unwilling to entertain third party authorisations, or even allow for private groups to provide infrastructure to extend the operators network for the benefit of both.

Given the importance of having low band, and of having multiple layers in the form of different bands in modern mobile networks – thought should be given to offering spectrum products that are a 'bundle' of bands. An auction product that provided *an amount* of low band, mid-band and high-band spectrum as a SL could provide for a 'base layer' that a modern mobile network could design and deploy a network around. For example, an auction product that provided 10 MHz of 700 MHz, 10 MHz of 1800 MHz, and 20 MHz of 3 GHz could allow a network to appropriate direct users as capacity and coverage needs allow. These allocations could be 'topped up' either through AWL in areas with forecast, expected or experienced capacity – or purchased as additional lots during the initial auction.

This has the added benefit of coupling the highly valuable (for reasons just mentioned) low band spectrum with generally cheaper and less valuable mid band spectrum.

Aligned Spectrum Licence Expiry dates

With so many spectrum licences expiring in close proximity, the above suggestion of packaging bands together into bundles is only achievable if the expiry dates are aligned. Even without following this suggestion of bundling, the benefits of aligning the expiry dates can be provided for below.

Synchronising the expiry dates of expiring licenses across different bands has several advantages. It simplifies the administrative and regulatory processes for both mobile network operators and regulatory authorities, both the ACMA and the ACCC. When licenses across different bands have aligned expiry dates, the licensing renewal and management procedures can be streamlined, reducing administrative burdens and ensuring smoother operations.

Synchronised expiry dates facilitate efficient spectrum planning and utilisation as it allows for assessment of the overall spectrum availability and make informed decisions regarding spectrum allocation and assignment as each band has been 'in play' for an equal amount of time. By aligning expiry dates, the ACMA can analyse and plan for the future use of spectrum resources more effectively, considering the evolving technology landscape and market demands.

Moreover, synchronised expiry dates promote spectrum harmonisation and interoperability. When licenses in different bands expire simultaneously, it provides an opportunity to reevaluate the spectrum allocations and potentially reallocate frequencies to optimise spectrum usage and foster harmonisation. Harmonized spectrum management encourages compatibility, reduces interference, and facilitates the deployment of advanced technologies and services across multiple bands.

Furthermore, synchronised expiry dates enable fair competition and a level playing field among mobile network operators. When licenses in various bands expire concurrently, it ensures that all operators have an equal opportunity to renew or acquire licenses, preventing any unfair advantage for specific operators. This fosters healthy competition, encourages innovation, and helps maintain a competitive market landscape.

Overall, synchronising the expiry dates of licenses across different bands simplifies administrative processes, enhances spectrum planning, promotes harmonization, facilitates fair competition, and contributes to efficient spectrum utilization. It streamlines operations for both operators and regulatory authorities while ensuring optimal use of spectrum resources and promoting a conducive environment for innovation and growth in the mobile communications industry.

This can be achieved by either extending the current licences to align the dates, or by having mismatched terms on upcoming licences to have the new licences end at the same time. To avoid the risk of artificially increasing value of specific bands as they are sold, the former method is recommended.

Creating further competition

Due to the aforementioned issues of national and ‘regional’ licences, when infrastructure is concentrated in coastal areas – there may be a case to be made for spectrum licences to come with a commitment for the licence holder to construct or provide a certain level of coverage and capacity, making sure that the allocation of the licence *is* in the public good, rather than *hopefully* provides for the public and prevents other entities on the basis of ‘we might use it later’. This tactic has been used in international regulatory environments to compel mobile operators to provide services not just to the high value customers in dense metropolitan areas, but to less populous regional, suburban and peri-urban areas. Such a licence condition would mandate the enhancement of competition, and investment and innovation; and if it is achieved via methods such as site sharing, neutral host or the enabling of domestic roaming; can easily facilitate increases in efficiency.

Further competition could be potentially created by adoption of ‘Use it or Lose it’ conditions, with existing licences already having such conditions⁴ to avoid the problem of ‘spectrum squatting’. With a licensing framework that allows for designer licences (eg. AWL), creating a licence that meets the business needs can be done on demand; rather than trying to meet future prospects that might arise – or simply to stop competitive growth.

Examining Use

In addition to the proposed methods of examining use, two suggestions are provided.

⁴ <https://www.legislation.gov.au/Details/F2006B00135>

Standardised modelling

It would be inappropriate for spectrum users to provide their own coverage maps, as different groups use different Key Performance Indicators, geodata⁵, metrics and capacity goals – along with different propagation models with different assumptions around radio characteristics in various environments; without first agreeing on parameters to be used such that the comparisons can be ‘apples to apples’. For example, an entity that used low resolution terrain data could predict much greater coverage provided from the same radio source compared to an entity using high resolution data. If this approach is taken, a Technical Liaison Group (TLG) to agree on *standardised* modelling for the purpose of comparative coverage maps is suggested.

Use of Monitoring

As the regulator, the ACMA has the capability to determine spectrum usage from its monitoring stations and mobile monitoring equipment. It is suggested that the ACMA perform sampling to validate any conclusions drawn from desktop analysis. It is suggested that this should be considered as a regular survey to inform usage of the scarce resource that is the radio-spectrum over time, and determine how policy decisions are impacting usage.

Summary and closing

In closing, the recommendations from this submission are as follows.

- Adopt geographic consideration of solutions as they stand for the public good of the people in the region impacted; not simply the greatest number of people – (and that this may result in solutions that differ).
- Consider the opportunity to standardise the group of spectrum licences as a whole in terms of their geographic boundaries and expiry dates.
- Consider the idea of ‘bundling’ bands to enable the desired outcome in efficient ways.
- Recognising that competition is likely to grow from small starts, and that allocations that require national presence aren’t going to support this goal
 - This can be somewhat mitigated by site build, or coverage requirements can facilitate further investment in areas currently lacking competition.
- Standardisation of coverage and validation of examined usage by measurement.
- Use-it-or-Lose-it conditions to promote usage of the licences – as unused spectrum is the most inefficient usage of spectrum.

Kind regards,

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⁵ The ‘base data’ that represents the terrain, clutter, structures and etc for modelling