Managing spectrum in the 400 MHz band

Response to submissions

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# Background

Historically, there has been strong demand for 400 MHz spectrum in the high-density areas of Sydney/Wollongong, Melbourne/Geelong and Brisbane/Gold Coast. Recognising this, the ACMA has been implementing opportunity cost (OC) principles by progressively increasing apparatus licence tax rates towards an OC-based price estimate to complement other reforms designed to address congestion and enable more efficient use of this spectrum. The staged introduction of OC-based licence tax rates (potentially five increases, each of 15 per cent) is designed to ensure that increases do not unduly disrupt licensees’ business plans or cause an unexpected contraction in demand for the spectrum.

Two such increases have been implemented, in August 2012 and in April 2016. In August 2012, the ACMA highlighted that each subsequent increase would only be made after monitoring the impact on the demand for spectrum and licensees, and consulting with relevant stakeholders.

The ACMA has been considering the need for a third increase. The decision whether to implement the third increase depends on whether growth in demand results in a material risk that congestion is likely to re-emerge in the near future.

The monitoring analysis undertaken by the ACMA in this context has two major aspects. The ACMA is concerned that any increase in licence tax rates (already implemented and projected) does not lead to:

* an absolute reduction in demand for spectrum; or

reduced growth in spectrum demand that prevents, or substantially delays, efficient use of the additional capacity resulting from the 400 MHz band re-channelisation and the consolidation of government services in the Harmonised Government Spectrum (HGS) band.

Such outcomes may indicate that the combination of increases already implemented and the signalled intention for further increases towards OC would result in licence tax rates that were too high and unnecessarily curtailed demand.

The ACMA released a consultation paper in November 2016. Having regard to its monitoring framework, the ACMA found a strong increase in measured demand (based on the increase in licences issued) and formed an initial view that there was a continuing risk of congestion re-emerging in the 400 MHz band. As a result, the ACMA proposed implementing the third increase in licence tax rates. The ACMA sought feedback from interested stakeholders. Submissions were received from two stakeholders[[1]](#footnote-2):

* the Australian Radiocommunications Industry Association (ARCIA), the peak national industry body representing the two-way and associated wireless radiocommunications industry in Australia. ARCIA represents the interests of a wide range of users of spectrum in the 400 MHz band

Telstra, a major user of 400 MHz spectrum in the high-density areas.

ARCIA and Telstra both raised concerns about the use of the monitoring framework and the conclusions drawn from it to implement the third increase in licence tax rates. Telstra also queried whether the ACMA had considered whether the risks of negative consequences for efficiency associated with increasing licence tax rates were asymmetric; that is, they would be more pronounced if licence tax rates were too high than too low. These issues are discussed below.

# Monitoring framework

ARCIA’s main contention was that the monitoring framework did not recognise differential denial characteristics of high-power devices (licensed on a local basis) and low-power devices (licensed on a sub-local basis).[[2]](#footnote-3) Telstra also made a similar point.[[3]](#footnote-4)

Low-power services interfere with the operation of other services over a significantly smaller geographic area than high-power services. This implies that the spectrum band ‘used’ by low-power services can be re-used by other services across the high-density area significantly more often than for high-power services. In effect, there could be many low-power devices deployed in the geographic area occupied by a single high-power service.

The ACMA considered this view and, following further examination of additional information provided by ARCIA on relative denial of services operating at different powers, the monitoring framework was modified to more accurately capture variable re-use distances[[4]](#footnote-5) (and hence denial areas) across both relevant service types. As a result, differential geographic denial is now reflected in the monitoring framework and demand is more accurately measured.

Under this modified monitoring approach, the bandwidth used under each licence is weighted by an averaged indicator of how much of the high-density area is ‘used’, that is, denied to other users.[[5]](#footnote-6) Reflecting the larger denial area of high-power services, their denial weight is significantly higher than for low-power services.

The amount of spectrum (bandwidth) used by each licensee is then multiplied by a factor representing the geographic area over which spectrum is denied[[6]](#footnote-7), to provide an indicative estimate of how much spectrum is geographically denied by each licence. Aggregating across all relevant licensees effectively creates a measure of demand adjusted to allow for differential geo-spatial denial.

The approach is not a precise measure of actual denial based on actual base station/transmitter locations within the high-density area, but an averaged approach sufficiently differentiated (in terms of treatment of high- and low-power devices) to facilitate identification of broad trends in demand across time.

The ACMA has also implemented other improvements to the revised monitoring framework, notably:

* including the effect of denying spectrum from services into immediate adjacent channels
* the inclusion of denial by licences with base stations located in the 100-kilometre zone immediately surrounding the relevant high-density area.[[7]](#footnote-8)

These improvements effectively capture other ‘uses’ of spectrum in the high-density area, and therefore can contribute to spectrum congestion in the high-density area.

Analysis applying the revised monitoring framework indicates that there is a more gradual rebound in demand than identified in earlier analysis. That is, while there has been an increase in demand for spectrum, the increase is not occurring at a rate that would suggest that congestion within the band would re-emerge in the immediate future. The evolution of demand over the last few years resulting from the previous (orange bars) and revised (light blue bars) monitoring frameworks are contrasted in Figure 1 below.

1. Denial adjusted adjacent and co-channel demand (denial from within high-density areas only, aggregate for three high-density areas)

Denial adjusted adjacent and co-channel demand (aggregate for three HDAs, denial from within HDA only)

Source: ACMA analysis

The growth in unadjusted licence numbers (used previously as the demand measure for monitoring) was predominantly for low-power devices (with small re-use distances and denial circles). Because low-power devices were treated equivalently with high-power services (with large re-use distances and denial circles), the aggregate amount of available spectrum used by licensees was effectively overstated. The new monitoring framework recognises different denial characteristics and measures demand to reflect this.

Adjusting demand along these lines (reflecting the lower denial weight now attached to low-power services) indicates that aggregate demand is not growing as strongly as previously thought. With a lower likely future demand trajectory, congestion appears unlikely to re-emerge over the near future.

On this basis, the rationale for further increases in relevant licence tax rates is now less apparent. For this reason, the ACMA is not intending to implement the third increase in licence tax rates at this time.

The ACMA will continue to monitor denial-weighted demand on a semi-regular basis. In the future, should the monitoring framework indicate that there is a material increase in demand, then additional technical studies—together with additional consultation with affected parties—can be undertaken to identify whether there is a material risk of congestion re-emerging.

The further analysis could also focus on particular sub-bands (for example, the 450–470 MHz sub-band) as well as examining demand in each high-density area separately (for example, demand is relatively higher in the Sydney high-density area than the Brisbane high-density area). If there is a risk of congestion re-emerging, then the ACMA can again consider increasing licence tax rates, or increasing licence tax rates in some areas or in some sub-bands.

The ACMA understands that parties may be interested in providing further feedback on the current monitoring framework. Interested stakeholders are invited to contact the ACMA should they wish to discuss these or related issues further. These discussions can also include how frequently the ACMA should monitor demand within the band.

# Asymmetric consequences

In its submission, Telstra argued that the ACMA needs to consider whether the consequences of any regulatory error in setting the licence tax rate for high-density areas in the 400 MHz band is asymmetric.[[8]](#footnote-9) Telstra noted that if the licence tax rate is set above ‘true’ opportunity cost, then there is an efficiency loss associated with foregone use and that this is likely to be greater than the efficiency loss associated with licence tax rates that are set below ‘true’ OC (which causes some viable use to be displaced by lower value uses).

The ACMA generally recognises this potential risk when setting licence tax rates. Given considerable uncertainties around accurately estimating OC, the ACMA is typically conservative (that is, it errs on the low-side) when setting licence tax rates for spectrum because of a concern that the negative consequences of mis-estimating licence tax rates may be asymmetric.

In the context of the introduction of OC principles in the high-density areas of the 400 MHz band, two factors reduce the likelihood of licence tax rates becoming too high and causing the larger downside associated with unutilised spectrum.

Firstly, the indicative OC target towards which the licence tax rates have been progressively moving was based on an independent estimate of the likely optimised deprival value (ODV) of the relevant spectrum (reflecting the cost to a licensee if deprived of spectrum). ODV is widely regarded as a lower bound estimate of OC as it only captures network and/or operational cost impacts associated with deprival of, or access to, incremental spectrum. This simplifying assumption (that only network and/or operational costs are impacted by spectrum deprival) facilitates estimates of OC, but does not recognise other components of the overall value to licensees. For example, ODV estimates do not recognise either the potential increase in revenue or the embedded real options—both of which can be substantial contributors to spectrum value and part of the OC of spectrum denial.

Secondly, the practice of moving tax rates progressively towards the estimated OC also mitigates elements of these asymmetric consequences. The rationale for monitoring demand is to ensure that licence tax rates are not increased by too much, given considerable uncertainty around ‘true’ opportunity cost. If licence tax rates were progressed above ‘true’ opportunity cost, it is likely that demand would decline materially. The updated monitoring analysis suggests that a material decline in demand has not emerged. In summary, the monitoring framework and the recommended pause in increasing licence tax rates mitigate the potential for asymmetric risks around the licence tax rate approaching and exceeding an uncertain ‘true’ OC level.

# Spectrum Pricing Review

On 2 February 2018, the Australian Government announced the outcome of the [Spectrum Pricing Review](https://www.communications.gov.au/documents/spectrum-pricing-review) (the pricing review). The pricing review includes recommendations 7 and 8 that require the ACMA to review the apparatus licence tax formula and apply OC pricing to a greater number of spectrum bands.[[9]](#footnote-10)

While the 400 MHz monitoring framework was developed largely to monitor indicative trends in demand, rather than to estimate actual demand as an input to setting prices, the ACMA expects to consider the utility of something similar or analogous to the monitoring framework as part of its consideration of how to support the new pricing arrangements. There will be future opportunities for stakeholders to contribute to the development of the new pricing arrangements, including the application of OC pricing principles to a wider range of spectrum bands.

1. More detail about the monitoring framework is presented in the consultation paper and the submissions can be accessed at <https://www.acma.gov.au/theACMA/managing-spectrum-in-the-400-mhz-band-further-steps>. [↑](#footnote-ref-2)
2. See pages 2 and 5 of the ARCIA submission. [↑](#footnote-ref-3)
3. See page 2 of the Telstra submission. [↑](#footnote-ref-4)
4. Re-use distances define the minimum distance between transmitters using the same radio frequency to cause minimal interference with each other. [↑](#footnote-ref-5)
5. The averaged denial indicator depends on the re-use distances for the relevant service type; the size of the relevant high-density area; and modelled representative base station locations. [↑](#footnote-ref-6)
6. Relative to the size of each high-density area. [↑](#footnote-ref-7)
7. Given the re-use distances for some services are up to 120 kilometres, a number of services located in the 100-kilometre zone will cause denial into the relevant high-density area. The 100-kilometre zone is defined as the area extending 100 kilometres out from the high-density area boundary. [↑](#footnote-ref-8)
8. See pages 1 and 2 of the Telstra submission. [↑](#footnote-ref-9)
9. Recommendation 7: the ACMA should undertake a detailed review of the administrative pricing formula’s parameters, including density areas, the number of pricing bands, and the number of power categories and implement regular updates to the location and band weightings to reflect changes in density, demography and demand.

   Recommendation 8: the ACMA should apply opportunity cost pricing to a greater number of spectrum bands, especially where it is impractical to competitively allocate spectrum. This work should be identified in the ACMA’s annual work program. The ACMA should consider more time effective approaches to implement these, and review fees as market conditions change over time. [↑](#footnote-ref-10)