Australian
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Commission

Competition limits advice for 1800 MHz spectrum in regional areas

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Australian Competition and Consumer Commission

Contents

Summary

The ACCC considers that competition in the national mobile broadband services market will be promoted by the imposition of limits on the allocation of 1800 MHz regional spectrum.

We find that:

- a significant amount of competition in regional and national broadband markets is driven by non-price considerations such as network coverage and quality

- in order to provide robust networks with good geographic coverage and capacity, mobile network operators (MNOs) require access to both low and high-band spectrum in regional and metropolitan areas, and

- 1800 MHz spectrum is particularly attractive spectrum for MNOs for next generation services as it is globally harmonised – every 4G device in Australian can operate on this spectrum.

- analysis of the MNOs' spectrum holdings shows that:

    - Telstra has significant depth and breadth of spectrum holdings. We consider that it holds sufficient spectrum such that it would not be constrained in the mobile broadband market if it did not acquire 1800 MHz regional spectrum

    - Optus lacks high-band regional spectrum compared with Telstra and would be constrained in its ability to compete in regional areas if it did not obtain 1800 MHz regional spectrum, and

    - Vodafone Hutchison Australia (VHA) has significant deficiencies in both low-band regional and metropolitan spectrum and high-band regional spectrum. We consider that VHA's ability to compete in the mobile broadband market will be significantly constrained if it does not acquire spectrum.

We have assumed that 2x60 MHz will be available for reallocation by the Minister. The ACCC therefore recommends a limit be imposed such that no person or specified group of persons is allocated more than 2x25 MHz in any of the geographic areas in the 2x60 MHz available in the 1800 MHz band as a result of the allocation of spectrum licences.

In recommending these limits, we have taken into account Telstra's submission regarding the maintenance of the fixed links that it uses to backhaul fixed telecommunications services, including Universal Service Obligation services.

1 Background

1.1 Request for advice

On 17 March 2015, the ACCC received a request from the Department for Communications for advice on competition limits for the proposed auction of 1800 MHz regional spectrum in November 2015. The request asked that the ACCC's analysis include consideration of:

- the current state of competition for mobile broadband services in regional Australia
- the impact that competition limits may have on competition in downstream markets, and
- any other matters that the ACCC considers relevant.

The ACCC conducted targeted industry consultation to inform its advice by writing to select stakeholders. Submissions were received from Telstra, Optus, Vodafone Hutchison Australia (VHA), the Australasian Railways Association and Rio Tinto.

1.2 ACCC's role in spectrum

The ACCC actively promotes competitive markets and therefore seeks to ensure that markets in which radiofrequency spectrum is an input are as competitive as possible.

Radiofrequency spectrum is an essential input to the mobiles industry. Because facilities-based competition is a key characteristic of the mobiles sector, the ACCC has generally taken a lighter approach to regulation, in comparison to its approach to fixed line services, and wholesale services to be supplied by the National Broadband Network (NBN). Essentially the ACCC's direct regulatory role in the mobile industry is limited to the declaration and pricing of an essential wholesale input, the Mobile Terminating Access Service (MTAS), which covers mobile voice and SMS termination services.

The ACCC also has a role under the *Competition and Consumer Act 2010* (CCA) where there is a transfer of a spectrum asset that could have the effect of substantially lessening competition in a market. In addition, the ACCC may be asked to provide advice to the Minister as to whether competition limits should be imposed on the spectrum to be allocated by way of spectrum licences.

1.3 Rationale for auction intervention

The ACCC recognises that allowing the market to determine the use of spectrum through an auction process generally promotes allocative efficiency, that is, ensuring that the spectrum is put to its highest value use. Spectrum licences are also more likely to promote dynamic efficiency than other types of licences because licence holders may put the spectrum to a higher value use that emerges over time.

However, selling spectrum in an auction to the highest bidder can weaken competition in downstream markets by adversely affecting their efficiency. As noted by Cramton et al:

> 'This is the great deficiency of an unrestricted auction when incumbents have rents to protect. Symmetric auctions among asymmetric bidders are prone to inefficient outcomes because the interests of consumers are not directly represented in the auction.'[1]

[1] Cramton, P., A. Skryzpacz and R. Wilson (2007), 'The 700 MHz spectrum auction: an opportunity to protect competition in a consolidating industry', Submission to the United States Department of Justice, 13

The ACCC considers that auction policy should consider future competition in downstream markets because an incumbent's value may include not only use of the spectrum to enhance its network, but also the value of keeping spectrum from a competitor. At the same time, there is a trade-off regarding the benefits of high-value services that an incumbent can provide to consumers.

November 2007. <http://www.cramton.umd.edu/papers2005-2009/cramton-skryzpacz-wilson-competition-in-700-mhz-auction.pdf>

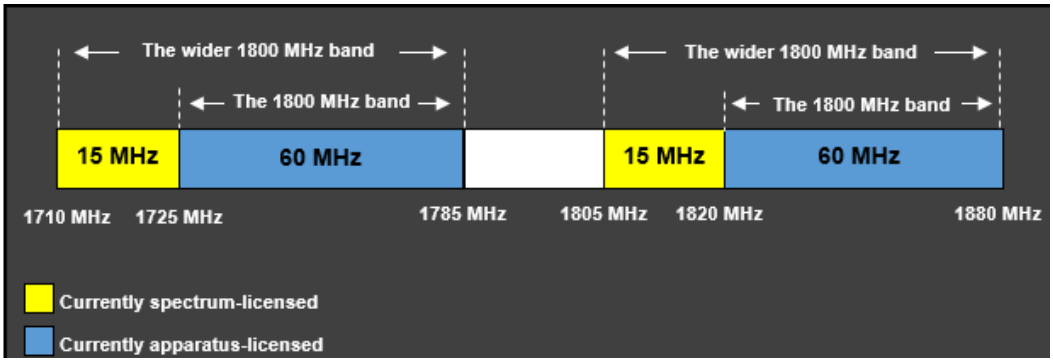
2 Identifying the relevant downstream markets

The 1800 MHz spectrum is an input into wireless telecommunications services, including mobile broadband and point-to-point fixed backhaul links. It is highly sought after for 4G[2] mobile broadband services and is regarded as the worldwide de facto 4G band. Every 4G device currently in the Australian market supports 1800 MHz.

The 1800 MHz band can also be used to deploy smart networks, automated systems for transport (safety and signalling systems) or other infrastructure uses such as autonomous mining and transport systems.

This spectrum forms part of the wider 1800 MHz band. In regional Australia, the wider 1800 MHz band is currently subject to two different licensing arrangements, as shown in Figure 2.1.

Figure 2.1 Current licensing arrangements in the regional 1800 MHz band



Source: ACMA

The ACMA advises that it likely to recommend to the Minister that 2x60 MHz spectrum be reallocated for spectrum licensing that is currently apparatus licensed. The spectrum is located in 12 regional geographic areas.[3] Telstra and other providers currently use this spectrum to provide low-capacity point to point links to backhaul fixed services. This includes servicing [c-i-c] Universal Service Obligation (USO) voice customers as well as other fixed services.

If the Minister issues reallocation instruments, these users will likely have two years (or such other period as determined by the Minister) to move these services from the band.

Telstra has indicated that it will seek to acquire spectrum licences in the auction to continue to provide these fixed links. It claims it will need to acquire up to [c-i-c] . Importantly, Telstra already has spectrum licences in the wider 1800 MHz regional band which it uses to provide 4G services. Telstra considers that the ACCC should consider two downstream markets in its assessment: the fixed regional telecommunications market and the mobile broadband services market.

2.1 Fixed regional telecommunications market

We have examined the extent to which other spectrum is substitutable for 1800 MHz spectrum in determining whether the fixed regional telecommunications market is a relevant market.

[2] Throughout this advice, we refer to 4G rather than Long Term Evolution. This is to remain consistent with how the MNOs describe their own services to consumers.

[3] Geographic areas include Hobart, Darwin and the Australian Capital Territory and exclude the major metropolitan centres.

Telstra claims that there are no effective spectrum substitutes for fixed links. It argues that low frequency bands (those below 3 GHz) are already congested by existing services in regional bands giving little opportunity to deploy additional fixed links. Higher frequency bands (those above 3 GHz) are generally unsuitable as investment in additional infrastructure would be required to act as a substitute for these bands. Telstra claims this additional investment is likely to be costly, especially in cases where it involves establishing new towers for additional radio hops or making substantial upgrades to towers.

We sought technical advice from ACMA staff. They advise that it will be a difficult, potentially expensive and time-consuming task to remove these services from the band but confirm that substitute spectrum does exist for these services.

We note that smaller fixed link incumbents, such as the Department of Defence and Air Services Australia, have requested a reallocation period of up to three years to move their links out of the band but note that they require this due to resource constraints and not the lack of access to other substitute technologies.

Further, we note that the fixed voice services being backhauled by the fixed links are provided under the USO, a technology neutral service. It is open to Telstra to seek alternative means of providing these services.

We therefore consider that substitutes exist for the fixed links and that the primary relevant market for the purposes of this advice is not the fixed regional telecommunications market.

2.2 National or regional mobile broadband markets

Mobile broadband services can only be supplied using radiofrequency spectrum.

These services can be deployed using a range of frequencies. The extent to which different frequencies are substitutes relies on a range of factors, discussed further in sections 3.4 and 4.

In terms of the geographic market, the 1800 MHz spectrum to be allocated is located in 12 regional geographic areas serving approximately 5.7 million people. The Australian Capital Territory, Hobart and Darwin are included in these areas.

However, the ACCC has traditionally considered mobile broadband services in a national market and submissions from mobile operators support us continuing to do so. Telstra considers that the state of competition in the mobile broadband market should only be considered on a national basis as it is not aware of any variation in pricing between regional and metropolitan areas that would point to the existence of regional markets. Optus agrees that mobile services should be considered in a national market context but notes that both the level of and potential for competition is not equal in all areas. VHA also supports a national market, arguing that if an MNO is capacity constrained by lack of spectrum in some geographic areas, its ability to compete nationally is reduced and there is less competitive pressure in the entire market.

While spectrum allocations for regional 1800 MHz spectrum may have a greater impact on competition in regional mobile markets, they also have the potential to affect competition for mobile services more generally. This is because having reliable 4G services in regional areas can affect a service provider's ability to compete for subscribers in metropolitan areas who wish to access 4G services in regional Australia. Therefore, it is important for competition in mobile markets more generally that all operators have the opportunity to provide 4G services in regional areas.

For this reason, the ACCC considers that the primary relevant market for the purposes of determining whether competition limits should be imposed in the 1800 MHz spectrum auction is the national market for mobile broadband.

3 Analysis of the relevant markets

3.1 Market structure

Telstra, Optus and VHA are infrastructure-based providers of mobile broadband services that can be described as national mobile network operators (MNOs). Telstra and Optus are horizontally integrated carriers with large fixed-line operations, whereas VHA is currently a mobile-only operator. In Australia, MNOs hold approximately 90 per cent of the mobiles market.

TPG purchased 2.6 MHz spectrum in the recent digital dividend auction but has not made any announcement about its use. We consider there is little prospect of entry by an MNO of the scale and scope necessary to constrain existing MNOs.

Mobile Virtual Network Operators (MVNOs) purchase and resell services from the MNOs. An MVNO is different from a reseller in that in addition to buying wholesale network capacity from an MNO it also provides a technical support layer that gives it more control over the services it provides to customers. MVNOs and resellers typically target low-income groups, or young people and other niche consumers. The MVNO market is fluid with frequent entry and exit.

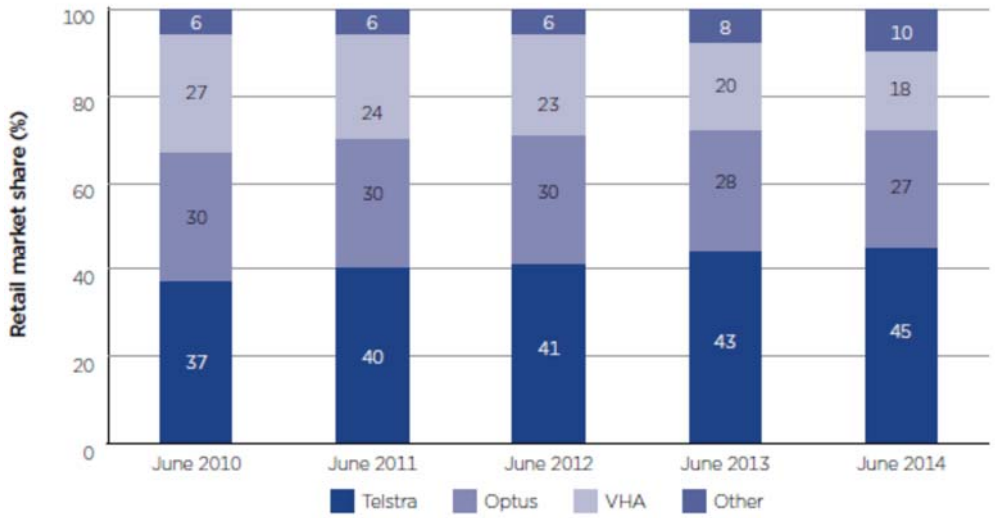
The MVNOs' share of the retail mobiles market increased from 6 per cent in 2012 to 10 per cent in 2014.[4] There are currently approximately 50 MVNOs operating in Australia.

Non-integrated fixed operators such as TPG and iiNet operate within the MVNO market to enable them to bundle their fixed and mobile services. This reflects the bundling strategy that increasingly pervades the telecommunications and content sectors. This horizontal expansion is likely to continue as service providers vie to offer the full range of fixed and mobile solutions to their customers as a 'one stop shop.'

3.2 Market shares

As noted above, the MNOs account for 90 per cent of the mobiles market in Australia.

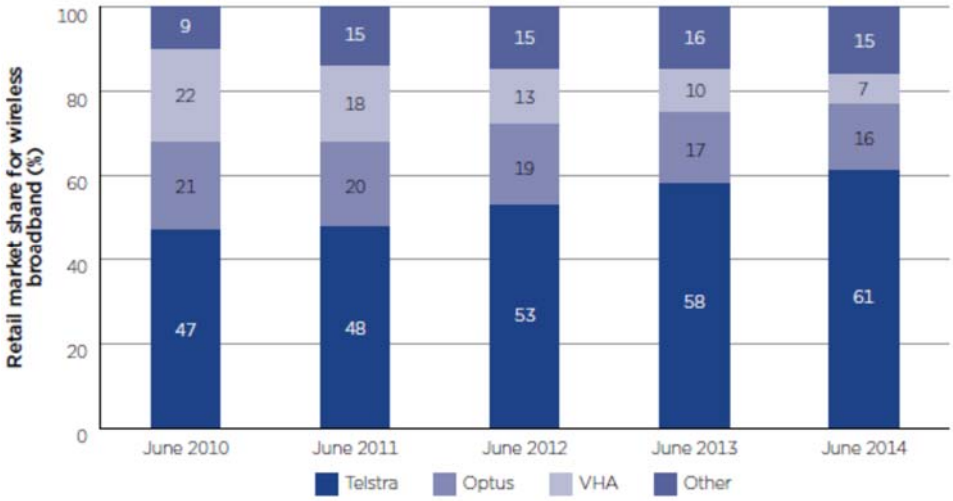
Figure 3.1 Retail national market share for mobile handset services



Source: ACCC

[4] ACCC, Telecommunications competitive safeguards report 2013-14, March 2015, p. 30.

Figure 3.2 Retail national market share for wireless broadband services



Source: ACCC

The ACCC does not collect information disaggregating market shares in regional and metropolitan areas.

Optus advises that it undertook market research conducted by Roy Morgan to assess its market share in the 12 auction areas. Its research indicates that in the auction areas:

- [c-i-c][5]

An important driver of Telstra's dominance in regional markets is likely to be historical – for many years Telstra has had broader network coverage and is also more dominant in fixed services in regional areas. However, Telstra has invested significantly in mobiles in regional areas increasing its 4G coverage. This is discussed further below.

In terms of metropolitan markets, market share appears much more even:

- [c-i-c][6]

These estimates by Optus appear consistent with those from other MNOs. The distinction between regional and metropolitan market shares indicates that where network coverage and quality are more even, MNOs are more competitive.

In terms of the wholesale market, Optus is the main provider of wholesale services to MVNOs. Telstra estimates that of total wholesale mobiles services in operation (noting that this includes 2G, 3G and 4G services):

- [c-i-c][7]

Telstra does not wholesale its 4G services but has announced that it will do so from June 2016.

[5] Optus, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, April 2015, p. 18-19.
[6] Optus, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, 2015, p. 18-19.
[7] Telstra, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, April 2015, p. 13.

3.3 Price and non-price rivalry

Price competition in the mobiles market is consistent with the concentrated market structure. That is, price competition for basic access and including voice calls and texts, appears subdued but remains hard to gauge with mobile plans offering many inclusions and subsidies. Significant price reductions or value offers from one MNO generally result in immediate price reductions from another. For example, at the iPhone 6 launch, Optus offered $450 worth of incentives to switch to it on a 24-month contract. This offer was matched by Telstra two days later.[8]

However, Telstra prices at a significant premium to other competitors on mobile broadband data. Optus estimates that Telstra charges [c-i-c] more for data.[9] Strong performance on the basis of network quality and coverage has allowed Telstra to price its services as a 'premium' product.

With improvements in its network performance, VHA has been able to increase its prices and now price at a level much closer to the other MNOs.

MNOs differentiate themselves in the market by offering improvements in network coverage, capacity and quality. They can offer additional content deals such as access to services like Stan and Spotify. Network quality alone can be an important point of difference. The launch of the NextG network in 2006 provided Telstra with a first-mover advantage by emphasising network quality, high capacity and extensive population coverage. This was a strategic capital expenditure decision that has effectively meant it has had a dominant position in the mobiles market ever since.

In terms of network coverage, as at June 2014, MNOs reported that:

- Telstra's 4G network covered 87 per cent of the population, up from 66 per cent from the previous year
- Optus expanded its 4G metro population coverage to 78 per cent (on-street) and 58 per cent (in-building), with 1,980 sites upgraded to 4G, and
- VHA's 3G network reached 96 per cent of the Australian population. VHA has continued to invest in its network, accelerating its 4G network rollout, adding more than 100 new 4G sites per month on average.[10]

Network coverage in regional and remote areas continues to be raised by consumers as a key issue. The 2011-12 Regional Telecommunications Review identified a lack of adequate mobile voice and broadband coverage as a major concern for regional communities. It found that the cost of deploying mobile base stations in rural and remote areas remains a significant barrier to increasing the mobile coverage footprint.

However, in 2014, the Telecommunications Industry Ombudsman received approximately 55 per cent fewer complaints about mobile network coverage compared to the previous year.[11] This fall coincides with significant investment in mobile phone infrastructure and the migration of many customers to 4G networks.

VHA lost significant numbers of customers following its network issues in 2010. This occurred over a period of time as customers exited post-paid contracts with VHA's market share of 27 per cent in June 2010 dropping to 18 per cent by June 2014 (refer figure 3.1). These network

[8] Commonwealth Bank Global Markets Research, Mobile competition update, April 2015, p. 3.
[9] Optus, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, 2015, p. 19.
[10] ACCC, *Telecommunications Competitive Safeguards Report 2013-14*, March 2015, p.29.
[11] ACCC, *Telecommunications Competitive Safeguards Report 2013-14*, March 2015, p. 34.

issues were primarily related to VHA's attempts to consolidate networks. VHA reports that it has stemmed the loss of customers by focusing on building a robust 3G network.

Network coverage, capacity and quality is affected by inputs such as:

- base stations
- backhaul and transmission, and
- radiofrequency spectrum.

The ACCC recently found that Telstra continues to increase its market share while VHA continues to lose subscribers. We noted that this is most likely reflects consumer demand for data services, a consumer perception that Telstra has a superior mobile network, and Telstra capitalising on having the most progressed 4G network.[12]

3.4 Key determinants of network quality and coverage

The importance of network quality and coverage to competition in the Australian market is clear from the above analysis.

Essential input segments to mobile network have varying characteristics. Network equipment has numerous competitive suppliers and tends to experience price deflation. Backhaul is likely to be contested in built-up areas but have monopoly characteristics in regional and remote areas. Spectrum is a scarce and highly contested resource which acts as the key barrier to entry for an infrastructure-based entrant.

Spectrum is by no means the main determinant of the quality of mobile networks. Well-located spectrum is important to user experience and can significantly reduce network costs. However, other crucial factors in a good mobile network include the number and location of base stations, network architecture, the quality of hardware and software and backhaul capacity.

Operators face a choice between increasing network capacity by building more infrastructure or obtaining more spectrum. Operators that have adequate spectrum holdings are more able to substitute spectrum for base stations, which is generally more cost effective and efficient.

3.4.1 Base stations

Base station equipment is integral to operation of a mobile network and global equipment suppliers such as Ericsson and Huawei dominate the supply of these products to the MNOs. In Australia, MNOs have access to thousands of base station sites such as towers and buildings and are often located with each other. Third party providers such as Crown Castle and Broadcast Australia lease site space to the MNOs to facilitate the deployment of radio equipment and controllers. Crown Castle, for example, owns approximately 1,850 sites across Australia.[13]

Telstra has a significant number of towers in regional Australia. Optus estimates that in the auction areas, Telstra has [c-i-c][14]

The spectrum band used to supply services also has a significant impact on the number of towers needed to serve an area because of different frequencies propagation characteristics. At low frequencies, fewer towers are needed because radio waves carry further. Higher

[12] ACCC, *Telecommunications Competitive Safeguards Report 2013-14*, March 2015, p. 30.

[13] Crown Castle, Submission to the Department of Communications' Regional Coverage Programme, February 2014, p. 2.

[14] Optus, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, April 2015, p. 13.

frequencies need more towers. Optus estimates that 1800 MHz cell site can cover three times as much area as a 2600 MHz cell site. In simple terms, this means that because Optus only holds high band 2600 MHz spectrum currently in the auction areas, it theoretically may require three times as many towers as Telstra requires with its current 1800 MHz holdings to cover the same area.

3.4.2 Backhaul / Transmission

Backhaul is likely to be the most significant constraint to smaller incumbent MNOs competing in regional areas.

The backhaul network links base stations to an MNO's core network. Access to sufficient backhaul is becoming increasingly important for MNOs as consumer demand for mobile data grows exponentially. Traditional (and inexpensive) microwave backhaul in mobile networks is unable to cope with the current rate of data consumption and MNOs are continuously upgrading data links to optical fibre in order to meet growing demand.

In 2012, Telstra was estimated to have over 90 per cent of its backhaul as fibre, Optus had around 60 per cent fibre and VHA had 25 per cent in 2012.[15]

[c-i-c]

The cost of backhaul is directly related to the capacity required and the distance of the backhaul link. For mobile services in regional areas this is particularly prominent. Backhaul links from base stations in regional areas to an MNO's nearest point of presence are likely to be relatively long distances. In addition, increasingly higher capacities are also required to meet current data requirements. While backhaul transmission is likely to be regulated in regional and remote areas, regulated prices reflect the higher cost to carry data over long distances. These costs are relatively higher for those MNOs that do not own their own backhaul infrastructure. The ACCC is currently conducting an inquiry into the prices for the regulated transmission service, the Domestic Transmission Capacity Service. It is expected that this will place downward pressure on transmission prices, particularly in regional areas.

We understand that NBN is trialling a Cell Site Access Product providing backhaul to mobile towers. In February 2014, the ACCC made a public submission to the Department of Communications expressing the view that using NBN infrastructure to improve mobile services in regional areas has the potential to deliver significant long term benefits to consumers and businesses.[16]

3.4.3 Spectrum

Spectrum is a critical input into mobile wireless services as it affects the ability of providers to expand capacity or deploy new networks. New entrants need access to a mix of high and low band spectrum to compete with incumbents.

The propagation characteristics of different spectrum bands is important. Low bands below 1 GHz (1,000 MHz) can be used both over long distances and in densely-built areas to penetrate buildings. High-band spectrum (above 1 GHz) is able to allow for the transmission of large amounts of data. For this reason, low-band spectrum is generally thought of as "coverage" spectrum while high-band spectrum is thought of as "capacity". Mobile networks in Australia need access to both to compete and access to both regional and metropolitan spectrum.

Different bands of spectrum have been used for different generations of mobile technologies. This can be for technical or market reasons. Spectrum bands are harmonised within

[15] Goldman Sachs Research, CME Investment Strategy Update Themes from Reporting Season: Key CME buy and sell ideas, March 2012, p. 38.

[16] ACCC, Submission to the Department of Communications' Mobile Coverage Programme discussion paper, February 2015.

international regions but if other mobile operators within the region are not using the same bands, devices and network equipment may not be developed. For example, the 900 MHz band was trialled for 4G services by Telstra but has been found as not suitable.

It is unlikely that large amounts of spectrum attractive to MNOs will become available in the short to medium term. However, spectrum shortages overseas and the intensely dynamic nature of technical advances mean that it is likely that new spectrum bands will be found suitable for mobile communications in the future.

One way in which Australia's radiocommunications legislative regime sought to encourage allocative and dynamic efficiency of spectrum holdings is through spectrum licensing.

When it was introduced, the *Radiocommunications Act 1992* provided that spectrum licences, which have tenure of 15 years, have a presumption of reallocation on expiry. In theory, this would effectively add a regular supply of high-value spectrum to the market enabling new entrants to acquire and incumbents to release, adjust or add to their holdings.

In 2012, the then Minister for Broadband, Communications and the Digital Economy made a wide-ranging determination, which provided that it would be in the public interest to re-issue spectrum licences to incumbent licensees providing mobile and wireless services in the 800 MHz, 1800 MHz, 2 GHz, 2.3 GHz and 3.4 GHz band.[17] This covers most spectrum bands used to provide mobile services and a significant number of 15-year licences have now been re-issued after confidential price negotiations with the Government rather than being offered back to the market. Additionally, the re-issue of a licence under these conditions is not considered an acquisition for the purposes of s50 of the CCA.

We consider that this makes the case for competition limits more persuasive as spectrum licences can potentially be held by licensees for a significant period of time.

There have been several important trades on the secondary market in Australia. The most significant recent trades are Optus's acquisition of Unwired and its metropolitan 2.3 GHz spectrum in 2011 and NBN Co in the same year acquiring Austar's regional 2.3 GHz and 3.4 GHz spectrum for its fixed wireless network.

3.5 Conclusion

Network quality and coverage are strong drivers of competition in the Australian market. Given Telstra's market dominance in regional areas, we consider that there is significant scope to improve mobile broadband competition in regional areas and the broader national market. Consumers in regional areas seek good coverage and network quality and this relies significantly on spectrum. If competitors obtain sufficient spectrum to cost-effectively increase network coverage and capacity further into regional Australia, then it is likely that more price competition will emerge in the national market.

The next section will examine what outcomes in the auction may raise concerns about MNOs future ability to compete.

[17] Radiocommunications (Class of Services) Determination 2012.

4 Spectrum holdings analysis

In order to be a credible national competitor, we consider that an MNO has to some degree match Telstra's current spectrum holdings. Telstra holds a significant portfolio of low band spectrum for coverage in both regional and metropolitan areas, and high band spectrum for capacity, again in regional and metropolitan areas.

Technological advancements such as carrier aggregation, which enables MNOs to aggregate different spectrum bands to increase bandwidth, has meant that we have focused less on the quantum of spectrum that MNOs hold and more on the breadth of their holdings. We have assessed the likely outcomes against MNOs' holdings of low and high band, regional and metropolitan holdings, as we consider that this forms a more robust analysis that is less likely to be superseded by technological developments.

4.1 Telstra

Figure 4.1 Telstra's spectrum designations

Spectrum MHz			Metro	Regional
LOW	700	3.1km	4G	4G
	850	2.8km	3G	3G
	900	2.6km	3G & 2G	3G & 2G
HIGH	1800	1.4km	4G	4G
	2100	1.1km	3G	3G
	2600	0.8km	4G	4G

Telstra recently made a $1.3 billion new investment in digital dividend spectrum. It has more regional than metropolitan spectrum, spread across a number of bands. It purchased twice as much digital dividend spectrum as Optus.

Telstra has invested heavily in spectrum and holds significant assets across low and high bands and regional and metropolitan areas.

Telstra has nationwide spectrum licences in the 1800 MHz band. It used this spectrum to launch its first 4G network in September 2011 having previously used it for capacity on its 2G network.

It operates its 3G 'NextG' network on its 850 MHz holdings with extra capacity provided by its 2100 MHz spectrum and claims it reaches 99 per cent of the population. Telstra has announced that it is shutting down its 2G 900 MHz network in 2016. It has not announced any plans for its 900 MHz spectrum, which it found unsuitable for its newest 4G network.

Telstra uses its digital dividend 700 MHz spectrum to provide its newest LTE network, '4GX', along with higher band spectrum including 1800 MHz. This network was launched on 1 January 2015 when the digital dividend spectrum became available. The low band 700 MHz spectrum provides efficient, widespread geographic and in-building coverage, while the high bands (1800 MHz and digital dividend 2.6 GHz) provide data capacity.

This network uses new 'carrier aggregation' technology which aggregates channels from different spectrum bands to double or even triple bandwidth. This is a significant development as any spectrum suitable for wireless services can be used, meaning that different high bands are potentially economic substitutes.

If Telstra did not acquire additional regional 1800 MHz spectrum in the auction, it is unlikely that its ability to compete in the relevant mobile broadband markets would be constrained.

- Telstra has significant assets in regional Australia comprising of backhaul infrastructure and tower and base station facilities. This would enable to it increase the capacity of its existing 1800 MHz holdings at a lower cost than other MNOs

- Telstra has significant 2.6 GHz holdings that would further enable it to roll-out this spectrum where additional capacity was needed in regional centres at much lower cost than other MNOs, and

- Telstra has a significant advantage in that its existing regional market share is estimated to be around [c-i-c].[18]

4.2 Optus

Figure 4.1 Optus's spectrum designations

Spectrum MHz			Metro	Regional
LOW	700	3.1km	4G	4G
	900	2.6km	3G & 2G	3G & 2G
HIGH	1800	1.4km	4G	
	2100	1.1km	3G	3G
	2300	0.9km	4G	
	2600	0.8km	4G	4G
	3500	0.3km	Mobile backhaul	

Optus has had an aggressive spectrum acquisition strategy since 2011 when it purchased Unwired and its spectrum assets. Optus has successfully integrated this large holding into its 4G network. Upon the merger of Vodafone and Hutchison, Optus had the least spectrum holdings of the MNOs, which it has now addressed. Optus made a strategic but rational investment in digital dividend spectrum, paying $600 million for half the amount of Telstra's holdings. Optus now owns the largest share of metropolitan spectrum and has significant regional holdings.

Optus has significant metropolitan holdings in both low and high bands but is not as strong as Telstra in regional areas in high band spectrum.

[18] Optus, Confidential submission to the ACCC on the proposed spectrum reallocation for 1800 MHz in regional Australia, April 2015, p. 18-19.

Optus operates its 3G network on 900 MHz and 2100 MHz and its 2G network on 900 MHz and 1800 MHz. This network reaches 98.5 per cent of the population.

Optus was the first MNO to use carrier aggregation technology to deliver its 4G network over its 700 MHz, 900 MHz, 1800 MHz, 2100 MHz and 2300 MHz. Optus acquired the 2300 MHz spectrum on the secondary market through its purchase of Unwired.

Nevertheless, if Optus did not acquire regional 1800 MHz spectrum in the allocation, it is likely to be constrained in its ability to compete with Telstra in the relevant mobile broadband markets.

- Optus does not the extensive infrastructure assets in regional Australia that Telstra does. We understand that [c-i-c] but it still faces a significant hurdle in matching Telstra's 4G footprint with its existing high-band spectrum holdings.

- Acquiring 1800 MHz regional spectrum would enable Optus to roll-out an efficient 4G network in these areas. While Optus has 2.6 GHz holdings, it would require significant capital investment to acquire approximately three times the towers needed to match Telstra's 1800 MHz primary capacity footprint.

- If Optus also used 1800 MHz spectrum in regional areas, it would have access to all the existing handsets currently used by Telstra's customer base. There are currently few handsets compatible with Optus' existing high-band regional spectrum holdings.

- Telstra has announced that it is going to wholesale its 4G service in June 2016. This is likely to significantly affect Optus' share of the wholesale mobile markets unless it is able to redress perceptions regarding its inferior network coverage and capacity.

4.3 VHA

Figure 4.1 VHA's spectrum designations

Spectrum MHz			Metro	Regional
LOW	850	2.8km	3G & 4G	3G & 4G
	900	2.6km	3G	3G
HIGH	1800	1.4km	3G & 4G	
	2100	1.1km	3G	3G

VHA has not made new investments in spectrum for a number of years. VHA's spectrum portfolio is weak in regional areas.

VHA has significant 1800 MHz holdings in major metropolitan areas with small holdings in Hobart, Darwin and Canberra. Until recently, it used this to add capacity to its 3G network but has recently shifted some of this spectrum across to its new 4G network, which is also based on 5 MHz of its 850 MHz band spectrum. Its 4G network is only available in selected areas of Sydney, Perth, Melbourne, Adelaide, Brisbane, the Gold Coast, Canberra, Hobart, Newcastle and Wollongong.

The company has spent significant amounts since 2011 essentially rebuilding its 3G network and adding 4G capacity after its network issues of 2010. VHA claimed in August 2013 that it is currently investing $1 billion a year in its mobile network.[19] It is likely however that at least some of this figure is being invested in commercial strategy.[20]

VHA's 3G network is based on 850 MHz, 900 MHz and 2100 MHz holdings and it has additional capacity, which it calls 3G plus, provided by 1800 MHz.

VHA's decision not to participate in the digital dividend auction was considered by analysts at the time to be a risky strategy. Consequently, VHA now suffers from both low and high band spectrum constraints. While its 850 and 900 MHz holdings looked suitable for LTE three years ago, it now seems unlikely that LTE will be rolled out in the near-term on 900 MHz (noting that Telstra found it unsuitable), which has forced VHA to re-farm 5 MHz of its 850 MHz spectrum to its 4G network. This means that VHA will need alternative low-band capacity for its 4G network and we expect that it would seek access to the 700 MHz holdings left over from the digital dividend if this was made available.

If VHA does not obtain 1800 MHz spectrum, then we consider that its ability to compete in the mobile broadband market will be severely constrained:

- VHA has very few infrastructure assets in regional Australia and does not have the scale and scope of Optus to negotiate attractive backhaul agreements.

- If VHA had access to 1800 MHz spectrum in regional areas, it would have access to all the existing handsets currently used by Telstra's customer base.

[19] David Ramli, 'Vodafone bets on billion-dollar boost to network' (*Sydney Morning Herald*, 4 August 2014).

[20] Mitchell Bingemann, 'Vodafone in $1 billion market share push' (*The Australian*, 2 June 2014) <http://www.businessspectator.com.au/news/2014/6/2/technology/vodafone-1bn-market-share-push>

5 Competition limits

Given the above analysis, the ACCC strongly recommends the setting of competition limits in the allocation of 1800MHz spectrum in order to promote competition in regional areas and at the national level.

Having determined this need, the ACCC has considered the issue of appropriate limits. Recommending in-band competition limits to prevent monopolisation and promote competition has been the favoured approach in the past. This approach recognises that Telstra is relatively unconstrained in its ability to acquire spectrum and may, acting rationally, seek to tie up spectrum to prevent other incumbents or new entrants from acquiring it to compete in downstream markets.

This approach is complicated by Telstra's argument that it requires spectrum for its existing fixed links. Spectrum licences are liberal and enable licensees to provide whatever services they consider to be of value within the technical parameters of the licence.

The wider 1800 MHz band is 2x75 MHz with 2x15 MHz already held by Telstra and a further likely 2x60 MHz to be allocated. An approach to prevent monopolisation by Telstra would prevent it from holding more than half of the band, that is, 2x40 MHz. If Telstra were to obtain an additional 2x25 MHz at auction we consider it would be able to make decisions on what use it wishes to use the spectrum for, that is, whether its highest value use is fixed services backhaul or mobile.

We consider that, assuming Telstra acquires up to the limit of 2x25 MHz in the auction, that the remaining 2x35 MHz will provide enough competitive tension in the auction so that another MNO can potentially acquire up to the limit of 2x25 MHz.

We therefore recommend that a limit be imposed that no person or specified group of persons be allocated more than 2x25 MHz in any of the geographic areas in the 2x60 MHz available in the 1800 MHz regional band.

In making this recommendation, we have considered other relevant matters as requested.