



Preparing for 5G in New Zealand:

Discussion Document

**Two Degrees Mobile Limited
Submission to the Ministry of
Business, Innovation &
Employment, Radio Spectrum
Policy & Planning**

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1 Executive Summary

Government 5G spectrum allocations are critical to the future structure of the New Zealand mobile, fixed wireless and Internet of Things (IoT) markets, as well as other emerging markets.

Successive governments have worked hard to enable wireless infrastructure competition. As a result, and without taxpayer funding, 2degrees has made a long-term investment in New Zealand. Launching in 2009, 2degrees has successively deployed 2G, 3G and 4G networks. 2degrees can now reach c. 98%% population coverage via its own network and more than 92% LTE coverage.

New Zealand mobile consumers have reaped huge, well-recognised benefits. A high-cost duopoly has been broken and New Zealanders now have access to three world-class wireless networks, with prices that are 47% and 27% below the OECD average for each of low and serious mobile users respectively, as reported by the latest Commerce Commission monitoring report (December 2017). By comparison, prices are just 5% below the OECD average for fibre broadband.

2degrees is completing its national rollout, expanding its business, IoT and wholesale presence, and looking to invest in 5G. As it does so, the company is concerned that government spectrum decisions could undo hard-fought for gains and undermine future competition in contestable wireless markets.

MBIE has been gamed in the past by promises of increased competition. It is critical the next government 5G spectrum allocation decisions:

- **Ensure ongoing three player national competition.** The Minister and MBIE need to ensure 5G allocation decisions do not allow further increases in spectrum disparity between the national wireless operators. Vodafone and Spark already hold 70% of the IMT spectrum allocated to private rights holders versus 2degrees' 18%¹. This means that government must ensure 2degrees, the late entrant that does not have a 'war-chest' to purchase spectrum, acquires at least the same amount of 5G spectrum as its national operator competitors, so it can maintain and build on the competition it has brought to the wireless market.

2degrees has stimulated the significant improvement in New Zealand's mobile market, but widening the spectrum imbalance between the late entrant and incumbent operators will constrain current mobile competition and future growth areas such as IoT, 5G fixed wireless and new areas that are yet to develop.

With its national-scale challenger mobile network, 2degrees is uniquely able to constrain the incumbent providers, building on its 4G network and continuing to innovate. Yet as a company still reinvesting heavily in its growth, 2degrees is not in a position to win a bidding war for spectrum.

In the hype surrounding 5G networks, a number of operators have promised improved consumer outcomes if they receive spectrum. MBIE would be wise to avoid outcomes that reward speculators, allocate a scarce resource to those that cannot achieve meaningful scale or allow spectrum to monopoly players with public financing that are seeking to enter competitive markets.

- **Do not undermine future competition in contestable markets.** Monopoly fixed line operators received public financing to create open-access networks that addressed a problem in the broadband market. While the UFB enabled investment in fibre that was otherwise unlikely to occur, planning for 5G network deployment is already being

¹ This excludes 3.5GHz, mmWave holdings and non-IMT spectrum, which have also been acquired.

developed by several privately-funded operators. This market-driven investment will be complemented by the broadening of wholesale markets and future markets such as IoT and connected vehicles.²

We must avoid a return to the 'Old Telecom' and ensure Chorus is focused on addressing issues with its fibre network, rather than using fixed revenues to distort other markets.³ The Minister's spectrum decisions cannot be taken in isolation of other changes she is progressing in the Communications portfolio, in particular the Telecommunications (New Regulatory Framework) Amendment Bill.⁴

- **Seek to provide wireless operators with as wide a band as possible**, to facilitate all three national operators getting an efficient allocation of 5G spectrum (80-100MHz each of 3.5GHz spectrum) and an optimal outcome for New Zealand. This will enable them to build on their existing national LTE networks and continue to provide world-class service.⁵

2degrees agrees there is enough spectrum for three national mobile networks, but this depends on decisions the government makes regarding the allocation. For optimal use and benefits for New Zealand, each of the three operators requires 80-100MHz of 3.5GHz spectrum – wider than the proposed 280MHz band (not allowing for guard bands or other uses)⁶. Currently, the band is used sporadically (in three urban locations) and is underutilised. MBIE should widen the band to include 3.7GHz to 3.8 GHz frequencies, consistent with developments overseas and spectrum efficiency objectives. We appreciate there are current incumbents in these bands (as there are for 3.5GHz), and support options to transition these, including increased regional sharing (consistent with MBIE proposals for other users), consolidation of regional licences and in some cases, potential compensation from 5G allocation proceeds.

- **Consider efficient solutions to regional player needs.** 2degrees recognises the important role regional players have in providing services, particularly to New Zealand's more remote communities. However, continuing to allocate 5G spectrum for non-5G use has costs for consumers. While regional players require continued access to spectrum, for the benefit of New Zealand Inc, the government should consider ways it can minimise these costs and maximise benefits for *all* of New Zealand, rather than extend underutilisation of spectrum. A solution can be found that substantially improves on the current situation and provides for more efficient use of 5G spectrum *and* spectrum access for regional communities. We support a combination of:
 - Serious consideration of the 3.7 to 3.8 GHz band (including sharing with current very sporadic geographic and timing use);
 - Consideration of the first channel in 3.403-3.410GHz and more use of the 2.6GHz TDD band;

² [

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³ There are considerable issues with the fixed fibre network, including fibre speeds, terms and installation.

⁴ This includes consideration of Line-of-business restrictions and non-discrimination requirements of the Telecommunications Act, which were agreed at the time regional fibre monopolies were created, and must remain in place to prevent Chorus leveraging its market power in both existing and future markets, and the proposed 'regulatory holiday' on fixed backhaul services that are a key input for fixed wireless and mobile services. We consider Chorus will play an important role in 5G, but this is at Layer 2 or below, and not providing end-to-end services. This does not prevent discussions with Chorus on infrastructure sharing or services at Layer 2 or below.

⁵ We note if there was a fourth national entrant this would reduce efficiency, e.g. this could imply only 60MHz bands for each operator. In addition, that operator would not be building on a 4G national network.

⁶ If there were to be more than three national bidders this would result in suboptimal amounts of spectrum.

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- Consolidating the Crown Management rights in the 3.5GHz band into the lower part of the band and allocating licences to regional users;
- Providing shared access to regional providers of national spectrum resource where this is not being used to deliver 5G services by the mobile operators and incumbent satellite operators in the 3.7-3.8GHz band.

There could be potential compensation to regional providers related to transitional costs.

Importantly, we do not support a set aside of “open access” spectrum for Chorus in regional areas. This would be an inefficient use of spectrum and would undermine rural broadband investment and government investments aimed at reducing the digital divide. It is important government considers:

- It is already investing in rural wireless open access infrastructure in the form of the RCG rollout;
- 2degrees, Vodafone and Spark are complementing this with their own significant investments in this wireless infrastructure and will rely on retailing in these areas to cover costs (there is still retail-level competition);
- This infrastructure already has upgrade paths to 5G;
- The economics are already challenging in these areas;
- Facilitating a duplicate open access wireless network in regional areas, and without the expertise of the three largest wireless operators, will be inefficient and a poor use of government funding.

It will also make it more challenging for both parties to justify rural business cases (given lower economies of scale).

- **Don't look to extract maximum value for spectrum.** As this government has acknowledged, spectrum should not be treated as a revenue stream. Higher spectrum costs equate to less funding for network rollout, higher cost inputs for wireless services provision, and ultimately, higher consumer pricing. The economic benefits of better telecommunications infrastructure should be expected to far outweigh the income earned from a spectrum allocation. High spectrum prices also favour larger players, as demonstrated in the 700MHz auction. While Spark and Vodafone have rolled out newer technologies first, 2degrees has led the service and product innovation over those technologies that has truly benefited customers and driven Spark and Vodafone to offer similar products.⁷ 2degrees encourages MBIE and the government to keep this in mind when setting the reserve price and payment terms for this spectrum. 2degrees support payments over time.
- **Spectrum allocation should be timely, not premature.** 2degrees supports prioritisation of the 3.5GHz band, including up to 3.8GHz. It is clear this is the key global band for 5G initially and will be critical for operators to commence 5G deployments. We then support prioritization of the 26GHz band, but not allocation pre-ITU standardisation. We also support MBIE's assessment that allocation of 1400MHz and 600MHz are not high priority: New Zealand has a history of allocating spectrum too early, which has resulted in underutilisation of spectrum, limiting of spectrum and the rewarding of speculators.⁸ New Zealand depends on larger market adoption by countries using the same band plans, who

⁷ For example, 2degrees introduced unlimited calling, the prepay combo, Carryover Data, Share Data, Aussie Call & Text, significantly higher data plans and an 'unlimited data' plan, Data Clock, as well as WiFi calling on your mobile (NZ and overseas).

⁸ Examples include the MDS band in 2.3GHz in 1990, the LMDS band in 26GHz in 1998, the LMDS band at 24GHz in 2002, the 3.5GHz band in 2002, the 2.3GHz band in 2007 and the 2.6GHz band in 2007.

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enable mass-market devices and equipment. We do not support allocation while the global equipment and device ecosystem is still under development.

In sum, it would be a poor outcome for New Zealand if government 5G spectrum decisions mean:

- Fixed fibre monopolies such as Chorus are allowed to leverage their market power into 5G contestable wireless, IoT and mobile 5G markets;
- 2degrees, the third national mobile entrant that has brought major benefits to New Zealand consumers, is not able to acquire any or enough national 5G spectrum to continue to provide competition benefits;
- Spectrum prices are high, ultimately increasing consumer prices, reducing competition, investment and innovation and slowing network investment.

A summary of our responses to specific questions is provided in the table below.

Section 2 sets out our response to MBIE’s specific questions.

Summary table

Issue	Response
Industry Structure	<ul style="list-style-type: none"> • Infrastructure competition best serves New Zealanders and should be maintained
5G priority spectrum	<ul style="list-style-type: none"> • The 3.5GHz band should be given the highest priority. • Consistent with international developments in Europe and the Asia-Pacific, MBIE should include as much as possible of the 3.7 to 3.8 GHz band. • 26GHz should be allocated with priority, but not before ITU-standardisation is complete. • We agree allocation of other bands (including 600MHz, 1400MHz, and other mmWave spectrum) should wait for international determinations (relevant to the NZ band plan).
Allocation Methodology	<ul style="list-style-type: none"> • Support an auction with appropriate competition checks such as spectrum caps and enforceable implementation obligations.
Implementation Requirements	<ul style="list-style-type: none"> • Must be imposed to prevent spectrum hoarding and speculation, and support efficient use of 5G spectrum. • Should be 3GPP defined 5G technologies (potential exemptions for regional players). • Limitations on on-selling for profit. • Site-based rather than population-based where possible (national networks).
Block sizes	<ul style="list-style-type: none"> • Will be impacted by competition limits and bandwidth. • For optimal use national operators require contiguous lots of 80-100GHz of 3.5GHz spectrum, and 800-1GHz of mmWave spectrum. This supports larger blocks as smaller lot sizes when allocating large band sizes are unnecessarily complex and inefficient. • At least 20MHz for 3.5GHz, a mix of larger blocks and 20MHz blocks could be appropriate (size determined by bandwidth available). • At least 100MHz for mmWave spectrum (200MHz may be preferable).

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Issue	Response
Acquisition limits	<ul style="list-style-type: none"> • Depends on band width available. • Must not permit increased spectrum disparity between three national operators. • Do not support caps based on 5G maximum carrier width requirements if only 280MHz of spectrum is available for national operators. This necessarily implies at least one operator could have very substantially below the 100MHz 5G maximum carrier width requirement and would harm competition. • Caps should ensure all existing national players get adequate spectrum (for example a minimum of 80MHz or 100MHz depending on the bandwidth available). • Over time, 2degrees support an overall cap of 35% being applied to total (not band-specific) spectrum holdings (including each of sub 6GHz and mmWave spectrum). Unlike previous spectrum caps that have applied, this cap would apply for an extended term. This reflects that over time we do not consider any particular operator should hold more than 35% of the IMT spectrum and is consistent with international developments. A total spectrum cap also encourages operators to identify and keep the best value spectrum for them.
Duration	<ul style="list-style-type: none"> • 20 years, to allow for reasonable implementation obligation timeframes, investment certainty and return on investment.
Timing of 3.5GHz	<ul style="list-style-type: none"> • We do not support Government interventions that reward speculation and favour incumbents, for example by compensating players for giving up underutilised 3.5GHz spectrum early. • We support no intervention (but commercial arrangements are possible) or consideration of a new option: a condition of making a successful bid on 3.5GHz spectrum is that any remaining management right, if any, is forfeited. Given existing Vodafone and Spark holdings, we consider this would free up much spectrum, but not reward speculators or non-users of that spectrum.
Regional providers	<ul style="list-style-type: none"> • Regional providers should be accommodated in spectrum allocations more efficiently. • MBIE should consider a combination of using alternative bands (including 3.7 to 3.8GHz, 3.403 to 3.410GHz, the 2.6GHz TDD band, and consolidation of licences within the lower 3.5GHz band as a first preference). • Any regional sharing should not disadvantage certain operators and should be able to be combined with full national (unshared) management rights. • Of those options identified by MBIE, we would support a combination of MBIE's Option 1 and Option 2, or Option 2, where particular lots in the band share spectrum in certain regional areas and there is a lower reserve price. However, we do not support limiting a national operator to only the top 10 main centres. If pursuing a sharing option MBIE should work with industry to determine an appropriate threshold and measure.
Other regulatory issues	<ul style="list-style-type: none"> • Line of Business Restrictions, regulatory oversight of fibre backhaul inputs, need for a Government representative on Radiation Standards, Resource Management and planning requirements to support lower cost and timely deployment of 5G infrastructure

2 Response to specific MBIE Questions

2.1 What is 5G?

Q1 What are the likely uses for 5G⁹ in New Zealand initially and in the longer term?

“5G” is the next wireless evolution that will be critical to support delivery and developments of traditional ‘mobile’ voice, text, data and machine-to-machine services, fixed wireless broadband services and the Internet of Things. It will provide for much higher speeds, increased reliability and lower latency (as shifting from 2G to 3G to 4G did in the past), as well as the ability to connect large numbers of devices enabling much greater development of massive machine-to-machine/internet of things applications).

It is the next technology upgrade, but importantly it will not be the last. As with previous generations we expect economic and social benefits throughout the different sectors of the economy - health, education, transport and agriculture to name but a few. Two 5G use cases that are commonly talked about are IoT and connected vehicles, but as MBIE has identified, not all future uses are known - and that is not what is important.

The key is that, building on existing services, 5G will support ongoing advances and innovations of both residential and business services – including industrial and agricultural applications - using substantially increased bandwidth and devices, whatever those developments and innovations are. These will be rural and urban applications, residential, business and industrial. As not all use cases are known, MBIE should not make allocation decisions based on hypothetical use cases.

2degrees must provide 5G both to retain and to increase competition in these markets, including by continuing to support evolving new applications and ‘seamless’ connectivity across and between these services. The widely recognised benefits 2degrees has brought to the various mobile markets would be undone if it cannot remain competitive in the 5G world.

2degrees, which is now nearing completion of its national rollout, are expecting to work with not only traditional residential and more recently business consumers (that will be attracted to enhanced mobile broadband services offered by 5G), but with industry. Industrial applications will be a key driver of New Zealand Inc economic benefits. This includes working with businesses on specific local network and automation requirements, and deployments of IoT applications. [

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In terms of rollout, 5G will operate in parallel and build on existing networks (including 4G, 4.5G and 4.9G networks). Over time it will require investment in network equipment, base stations, and fibre backhaul, as well as spectrum.¹⁰ While 5G is to some extent the current “hype” word, in reality consumers still demand LTE technology services and will do for some time to come. In fact, LTE advanced services will deliver many of the developments promised by 5G in the near term. Further, it takes time for device penetration to get to a level where the new technology is able to deliver large scale benefits. 2degrees notes that it is planning for further LTE/LTE-A Pro rollouts as well as 5G rollouts to meet consumer demand. [

⁹ We note this refers to 5G standards developed by 3GPP – this has been abbreviated to 5G in the MBIE Discussion Paper. This will be the most common 5G technology to be deployed around the world. 5G standards developed by other standards bodies are not included in this abbreviation.

¹⁰ Fixed fibre monopolies (Chorus and the LFCs) will have a significant role in providing inputs.

]. Greater densification will be required with 5G as traffic (capacity demand) increases, as well as because of higher frequency spectrum, making relative spectrum holdings between national mobile providers important – including addressing 2degrees’ relative spectrum disparity and ensuring 5G allocations do not increase this.

2.2 Regulatory considerations for 5G in New Zealand

Q2. Do you consider competition should be encouraged at the infrastructure level or purely at the retail level for 5G? Why?

New Zealand has seen substantial benefits from mobile infrastructure competition in 2G, 3G and 4G technologies, with the entry of 2degrees. Preventing continued wireless infrastructure competition, encouraged by successive government policies, for 5G is in our view very short term thinking and would undermine all these benefits for consumers, and result in significant investor uncertainty in the New Zealand regulatory system.

The New Zealand wireless market is not the same as the fixed market, where government intervened following a lack of willingness to invest. In wireless, all three national wireless operators are seeking to invest in 5G, without government funding. Due to this investment and competition to date, New Zealand performs well by international standards. This is evidenced by both benchmarking of price and network performance measures such as downlink throughput. For example, the latest Commerce Commission benchmarking report found that New Zealand’s mobile pricing was 47% and 27% below the OECD average for low and high users respectively. This compares to only 5% below the OECD average for the entry-level speed (100/20Mbps) fibre product (unlimited with standard phone line) based on UFB provider products.¹¹ 4G services are already over 92.5% population coverage on all three networks, and 4G network speeds are ranked amongst the top in the world.¹²

Further, 2degrees is now at the stage of completing its national rollout – now with c.98% population coverage on its own network [

]. It would not make sense for the government or consumers, if government prevented this.

While 5G will require densification over time, we note that:

- Densification is needed to deliver the faster speeds in higher frequency bands: it will be required regardless of the number of networks;
- A single network is not likely to significantly reduce the site build cost as there are likely to be little savings in radio requirement needed to support bandwidths used by all three operators. Further, a single network will be a new build as opposed to an incremental build for existing operators, leading to higher establishment costs.
- A single shared network is not without complexities. Network sharing places significant commercial complexities and restrictions on operators and, as we have seen in Europe and Australia, did not deliver the benefits originally envisaged.

¹¹ Commerce Commission, Annual Telecommunications Monitoring Report, 20 December 2017.

¹² International benchmarking provided by our vendor places New Zealand in the top 10 for 4G speeds (global ranking of download throughputs). OpenSignal’s report (February 2018) ranks New Zealand 4G speeds as 8th out of 88 countries, and well ahead of countries such as the UK.

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- Operators are able to share infrastructure where that makes sense (and for example are doing so with the Rural Connectivity Group initiative), which due to competition at a retail level and national pricing enables rural customers to continue to benefit from infrastructure competition.
- Various forms of infrastructure sharing are possible and the regulatory framework should allow operators to explore the most appropriate areas/forms of infrastructure sharing as 5G develops, not force particular forms of sharing (which are likely to be inefficient).

Government should concentrate on ensuring that where fibre monopolies have been established, and including receiving taxpayer funding (and associated benefits in financial position), that access to the fibre products are on competitive terms. For example:

- UFB products are not improving at the same pace as wireless products, which are benefiting from infrastructure competition. Lack of innovation in UFB has made fixed wireless access product offerings more attractive to consumers than they would otherwise be. For example, Chorus demonstrated the new GPON technology in October 2015. However, it has no plans to roll out this technology as there are no commercial or regulatory pressures to do so. Contrast this with the mobile industry where operators are continually improving the network and the products and services due to competition between the three national operators.
- While in mobile continual competition means innovation and better and faster products are being provided at the same price, changes in UFB products have been limited.¹³ Chorus and LFCs should concentrate on improving the UFB (including speeds, product terms and the installation process) and providing quality open access fibre input services to other operators to ensure New Zealand truly benefits from the fibre network, rather than enter contestable markets. Improved fibre services will be a requirement to 5G roll out and Chorus and LFCs could hold back 5G services if they continue their current rate of innovation.
- The key fixed fibre products that input to mobile and wireless services, must be subject to relevant regulatory oversight, including:
 - Non-discrimination: for all markets (existing and future) Chorus should not be able to favour itself in providing fibre products;
 - Fibre backhaul inputs: These must be subject to regulatory oversight and not subject to a very high price cap and exemptions from Schedule 3 and the Commerce Act (less regulatory oversight than competitive mobile operators).

In addition, fixed monopolies that have received taxpayer funding (and will be subject to a revenue cap) should not also be supplying wireless services that use their regulated asset as an input. This undermines the UFB initiative and allows them to leverage their market power into contestable markets (whether or not they are open access), and will constrain or prevent multiple operators, that are investing and innovating in those markets. This includes Internet of Things applications, mobile and fixed wireless access services above Layer 2, all of which multiple operators are investing in.

Allowing a subsidised monopoly to control and constrain the fixed and mobile markets will only undermine the hard-fought gains made over the years. The current line-of-business

¹³ It is notable that Chorus has upgraded its VDSL services to compete with LFC fibre and in return LFCs have dropped the price of GB fibre to compete with the VDSL service in their areas. However, the Chorus GB service is priced higher as it does not have the same competitive pressure in areas it has fibre. Further the Chorus GB fibre is significantly more expensive than LFC fibre. This is the type of behavior one could expect once Chorus is able use its monopoly advantage in currently competitive markets.

restrictions of the Telecommunications Act, which prohibit Chorus from offering above Layer 2 services, end-to-end services and retail services appropriately recognise this and it is critical these are not removed.¹⁴

2degrees is strongly opposed to Chorus (and other LFCs set up with the Crown) leveraging their tax payer funded/subsidised fibre network and related financing position to the detriment of existing operators who have had to privately fund the roll out of cellular networks. If government allowed this, this would likely to take New Zealand back to pre-local loop unbundling days, where investment was limited, service quality lagged other OECD countries, innovation was limited and prices were high. It would mean:

- Substantial and ongoing regulation would be required relating to additional services and investment in those services;
- Significant complication of the current process for implementing the new Telecommunications (New Regulatory Framework) Bill, and likely delays (this includes impacting the pricing of fibre services to other players also using the fibre network).

Rather than trying to get Government to allow them to leverage their subsidised fibre to constrain competition from mobile operators, we consider they should innovate in the fixed markets they were established to deliver to. Current competition from mobile is the only market lever that will force the fixed monopolies to innovate. If this lever is taken away, then both fixed and mobile markets will lose the hard-fought gains of the last decade.

Q3. What regulatory issues need to be considered from a 5G perspective in New Zealand?

To support 5G deployment in the interests of New Zealanders, in addition to spectrum-related decisions (including competition related checks that ensure the third mobile entrant is not squeezed out of the future markets), the Government and regulators need to:

- Ensure the Government's decisions on the **Telecommunications (New Regulatory Framework) Amendment Bill** support efficient 5G deployment (including Chorus and LFCs offer competitive-equivalent fixed backhaul inputs for 5G wireless networks (and quality UFB products). Dark fibre is critical to connecting base stations and we are likely to see a significant increase with 5G roll out. An increase in dark fibre use will need to be factored into calculating future dark fibre wholesale prices.
- Ensure any future Government initiatives take into account significant investment demands on operators at a time of considerable regulatory, commercial and technology uncertainty. We note multiple Government and regulatory reviews and initiatives are currently underway increasing regulatory uncertainty at a time 2degrees is looking to invest. This includes a significantly delayed decision on 1800/2100 MHz renewals, a Mobile Market Review and a new Digital Economy and Inclusion Advisory Group (with no representation from key telecommunications operators in New Zealand).
- **Radiation Standards:** Provide a Government representative to address public concerns that arise regarding the radiation standards set by Government. New Zealand standards are consistent with international standards, which we consider is appropriate, and to which New Zealand operators comply, however we note there is clearly some public concern and lack of education over this issue. The network builders are not viewed as an

¹⁴ This is our strong recommendation regarding the Telecommunications (New Regulatory Framework) Amendment Bill and is a widely supported position.

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independent source to explain the standards we comply with and we consider the Government has a role in explaining the standards it sets.

- Continue to work with industry to address **cybersecurity and privacy risks** in 5G's new types of network deployments and systems.
- Ensure resource management and planning requirements support low cost and timely deployment of infrastructure:
 - Although released recently, the National Environmental Standard for Telecommunications Facilities (NESTF) was subject to a three to four year process to develop. As a result, it is already out of date and is unlikely to cover a number of the deployment scenarios that will be required as a result of 5G. The NESTF is also not a comprehensive rule-set for telecommunications operators, with a complex interface remaining with local and regional plans. The status of National Standards for Infrastructure is also currently unknown. As a result, deployment is likely to be hindered by costly resource consenting issues, including unnecessary costs due to marginal non-compliances.
 - We consider the following aspects will require regulatory assistance to ensure 5G is effectively delivered:
 - Access to third party (including local Government) assets. This is currently reliant on ad hoc processes and a 'first come first served' approach. We believe the current processes can be made more efficient with a better outcome for the environment;
 - Requirements for New Developments (for example provision for in-building coverage solutions);
 - Radiofrequency Compliance in NESTF; and
 - Support for larger antenna sizes to deliver higher order MIMO.

Q4. What aspects of these regulatory issues are most significant for 5G?

In addition to ensuring competition checks are in place that do not place the third entrant a disadvantage, we consider that ensuring 'competitive' dark fibre backhaul inputs and a resource management process/rules that support 5G deployment are critical to the success of 5G.

2.3 Possible frequency bands for 5G

Q5. Do you agree that the 3.5 GHz band is the top priority for allocation for 5G?

2degrees supports the allocation of the full 3.4 to 3.8 GHz "3.5GHz band" for 5G, not just the 3.4 to 3.7 GHz proposed. This 3.5GHz band will be the first priority band internationally. Not only equipment support, but adequate device support for this band is expected by late 2019 for 2020 deployments. We therefore support the MBIE re-planning this band for 5G and TDD (per our response to Q26).

MBIE is not currently considering the 3.7 to 3.8 GHz band, likely to be allocated in Europe and in the Asia-Pacific for 5G. This limits New Zealand's options in terms of band lots, number of efficient 5G operators that can be supported (for example 280MHz cannot support three national 100MHz providers) and regional allocations. Over time it is likely to be considered inefficient use by New Zealand of a key IMT 5G band.

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While we understand there are some users on this band (as there are on the rest of the 3.5GHz band) to support both increased efficiency of spectrum, consistent with Government objectives, and continued access to spectrum by those operators, we support MBIE considering whether:

- These can be more efficiently consolidated to free up some of the band for allocation to 5G use;
- Whether these can be more efficiently consolidated to free up some of the band for allocation to regional operators (consistent with MBIE's regional sharing option);
- Alternative spectrum allocations for (some) licences, for example there are potential alternatives available for licences held by TVNZ and Vodafone;
- We note that, as shown in the MBIE RSM SMART database, there are currently only 8 licences in the 3.7-3.8GHz band in only 3 locations¹⁵. Given that the satellite licences are in urban areas, this provides MBIE with an opportunity for parts of this band to have regional sharing, consistent with its thinking on other sections of the band. It is very inefficient to reserve such a large bandwidth in 5G spectrum for such limited use, and this would remove impediments to national operators offering more 5G services in regional areas over time. Not using the band 3.7 to 3.8GHz band outside areas where the current licences are will deny significant economic benefits to New Zealand.
- 2degrees actually considers there are better alternatives for TVNZ and Vodafone instead of using satellite connections and would support these licences being moved as an alternative to regional sharing. However, to do this, we would support the cost being borne from the allocation proceeds and not the incumbent rights holders.

We further address spectrum access for regional operators in our response to Q32 to Q34.

Timing

Regarding timing of the availability of the 3.5GHz band, we understand current right holders of 3.5GHz have prevented reallocation prior to October 2022 to date, despite MBIE's efforts. 2degrees are not a current holder of 3.5GHz and (as set out in our response to Q36 and Q37) we are strongly against the Crown compensating speculators for giving up unused/under-utilised spectrum early. We are also against providing compensation to such operators, which is effectively money that can be used to bid against non-incumbents such as 2degrees.

To address this, we propose what we consider a fairer option to provide earlier access and not favour existing rights holders in our response to Q35. Any successful bidder in the future allocation would forfeit their existing management rights. We note that given incumbent rights holders that wish to deploy 5G on this spectrum need it to be re-planned for TDD, this could assist those incumbent holders receiving re-configured spectrum early.

Q6. Do you have any comments on reallocating 3587 to 3690 MHz for 5G?

2degrees supports the allocation of 3587-3690MHz for 5G use. We consider interim measures can be applied to ensure access excluding the immediate areas beside the satellite gateway earth station in North Auckland.

¹⁵ The two TVNZ licences are practically in the same location.

Q7. Do you agree that the 26 GHz band is a high priority for allocation to 5G in New Zealand?

2degrees support the allocation of the 26GHz band (24.25 to 27.5 GHz) for 5G and therefore support non-renewal of remaining rights in this band, which would underutilise a key future 5G band.

However, consistent with previous MBIE policy and with MBIE's current proposal, we do not support allocation prior to the identification and finalisation of ITU standards. We support further work being undertaken on the band once decisions at WRC-19 are known. The 3.5GHz band remains the priority band being allocated worldwide.

2degrees understands that the third generation partnership project (3GPP) has already started work on the bands 24.25-27.5 (n258) and 27.5-29.5GHz (n257) but this work is yet to be completed, and the WRC-19 identification and band plan developments yet to be finalised.

Given the importance of the 26GHz band for providing future high gigabit connections, we consider that the negatives from premature allocation are likely to outweigh any benefits from early allocation.

We note while the US is likely to allocate parts of the 26GHz band, New Zealand spectrum allocation is generally aligned to Europe and now to Asia-Pacific, not the US. Unlike the US, New Zealand does not have the scale to influence device availability. The WRC-19 identification is aimed at identifying a larger bandwidth compared to the current US plans.

We understand some parties may push for early allocation of parts of this band. We note if MBIE does allocate any of this spectrum early e.g. 28GHz, it must be considered subject to a wider spectrum cap applying to mmWave bands, to ensure MBIE is not allowing certain operators to acquire a disproportionate amount of spectrum in what will be a key 5G band, giving them a significant advantage in future.

2degrees would like to remind MBIE that the long-term cost of any distortion from premature allocation is expected to significantly outweigh any benefits from early allocation. Any benefits from early allocation will be incremental to those delivered by 3.5GHz and will be more limited than for 3.5GHz, given device support for mmWave bands will not be as widespread as the 3.5GHz band.

Q8. Would this band be of interest to your organization for trials for 5G services in New Zealand?

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Q9. Do you agree that the 31.8 to 33.4 GHz, 40.5 to 42.5 GHz and 42.5 to 43.5 GHz bands are a low priority for allocation to 5G in New Zealand?

2degrees supports MBIE's assessment that these are lower priority bands for New Zealand allocation and that these should be further considered following WRC-19 decisions.

Q10. When do you think equipment is likely to become available in the bands identified in Q9?

It is important to clarify between availability of network equipment versus availability of user devices or handsets, and importantly mass-market availability allowing benefiting from economies of scale.

Getting network equipment support is relatively easy. Vendors are able to produce radio units for the required bands. However, getting handset and other device support is dependent on a large operator or operators rolling out before scale economies are achieved. 2degrees believes that key issues for the uptake of services is the availability of suitable mass market devices. New Zealand benefits from mass market equipment and devices to provide affordable services to consumers.

Given the bands identified in Q9 are not priority bands for most countries, it is unclear when there will be mass market devices available for this band. With international focus on 3.5GHz initially and 26GHz, this is better considered following those allocation decisions.

Q11. Do you have any comment on the possible allocation of 27.5 to 29.5 GHz to IMT?

2degrees considers the value of allocating the 27.5 to 29.5 GHz band is linked to international developments and the availability of device support for this band. While we are aware of developments in the US, Japan and South Korea regarding (at least some of) this band, this represents only a handful of countries, and countries that New Zealand spectrum allocations are not aligned too, which could limit device support.

As set out in our response to Q7, our view is that any spectrum acquired in this band must be subject to a wider spectrum cap for mmWave bands to ensure MBIE is not facilitating substantial advantage in key future 5G spectrum bands.

Q12. Is there demand for alternative uses other than IMT of the 1400 MHz band? If so, what uses?

2degrees consider that MBIE should allocate the 1400 MHz band to IMT use, consistent with the WRC-15 decision. Given this international decision, over time this is likely to be its highest value use.

Given the current uncertainty surrounding the proposals for this band and the lack of ITU standardization to date, 2degrees supports MBIE continuing to follow this at the ITU before starting the re-planning process, and we support MBIE's assessment that this is a low to medium priority band for reallocation.

We do, however, support MBIE considering how best to shift existing users out of the band in light of future IMT deployment - and providing certainty to users regarding future use and expectations.

Q13. When is the demand likely to require consideration of reallocation of the 1400 MHz band for IMT, if at all?

Demand for this band is related to device availability, not simply capacity demand. As per our response to Q12, it is not clear when the technical work for this band is likely to be completed, but this does not appear to be a high priority band internationally.

Q14. Is there a need for more sub-1GHz spectrum for IMT/5G?

Consistent with our response to Q13, we support MBIE's assessment that until more countries have deployed IMT in the 600MHz band and equipment/device availability improves, it is premature to allocate this band. However, 2degrees encourages MBIE to take steps to migrate the management right used by Maori TV to other part of the broadcast band so a wider 600MHz band is available in future.

We note allocation of the 600MHz band in future will provide an opportunity for Government to rebalance the current imbalance in sub-1GHz spectrum holding among the national wireless operators.

Q15. If so, how should we deal with radio microphones in the 600 MHz band?

2degrees considers that part of the proceeds from any future 600MHz allocation could be used for relocating the radio microphones. 2degrees understand that radio microphone users were moved to the current band after the digital dividend and it could be considered unfair to expect them to have to pay for a second move in such a short time period.

Q16. When is the demand likely to require reallocation of the 600 MHz band to IMT, if at all?

2degrees is of the view that demand will arrive when mass market equipment is available. As MBIE noted, the 600MHz band has not been allocated outside the US. The European Digital Dividend 2 is not aligned to the 600MHz band (610-698MHz), therefore, New Zealand will rely on Asia Pacific countries for mass market devices. It is not clear when Asia Pacific countries are likely to allocate this band. 2degrees, therefore, supports MBIE's position to keep a watching brief on international developments in this band.

2.4 Spectrum Allocation

Q17. Which allocation methodology should be used for allocating spectrum bands identified for use with 5G? Why?

2degrees could support an auction for the allocation of 5G spectrum, if there were appropriate competition checks such as spectrum caps and enforceable implementation obligations to prevent market power and speculative bidding in place.

In particular, 2degrees does not consider New Zealanders would benefit from further increases in spectrum disparity between 2degrees and the other national wireless operators, Vodafone and Spark, and competition checks should prevent this.

Allocation methodologies other than auction (with appropriate competition checks) are likely to result in inefficient outcomes, including as identified by MBIE in its discussion paper.

First come first served, lottery and administrative allocation are all likely to encourage speculators and could result in under-utilisation, as has occurred in the past.

International experience shows that a clock or ascending bid auction produce similar results. 2degrees considers that a clock auction, consistent with what MBIE used in 2013, could be

most appropriate. However, clearly the auction methodology chosen necessarily depends on other Government decisions regarding allocations, including, whether the Government plans to auction one band or multiple bands, the timing of spectrum availability and bidder criteria. For example, while a clock auction may be more appropriate if a single band is being auctioned, if multiple bands are auctioned, then an ascending bid auction should be considered, because in a clock auction it is not possible to mix and match if one band of spectrum becomes more expensive relative to the other.

Under all auctions the setting of an appropriate reserve price is also critical: as demonstrated by the 700MHz auction, this can have a lasting impact on industry structure.

In addition, MBIE should include limitations on on-selling of spectrum to mitigate against speculative behaviour. There are too many examples of speculative bidding for spectrum and eventual concentrating among a few holders and/or limited roll out of services. The 2.6GHz, 3.5GHz, 24GHz and 28GHz bands are all examples where a number of parties bought the spectrum in the original auction, however many of them on-sold the spectrum at a significant profit without rolling out service and the spectrum ended up distributed between a small number of parties. Given there are enough examples that the New Zealand competition laws do not effectively limit such spectrum concentration it is incumbent on MBIE not to place conditions that encourage such speculative behaviour.

Q18. Should different allocation mechanisms be used for rights for regional providers and national providers? Why?

The allocation mechanism for regional players will depend on other important allocation decisions regarding regional players, including factors such as whether regional players are sharing spectrum within national management rights or with satellite providers, and whether there are multiple regional operators that want access to spectrum in a particular region.

The allocation mechanism for regional providers should:

- Ensure timely roll out of service to regional consumers;
- Discourage speculative acquisition;
- Not unnecessarily prevent national providers use of the spectrum to deliver services to regional consumers.

In general, and especially if there are multiple regional players, 2degrees support the use of the same allocation methodology for national and regional players. Other allocation mechanisms encourage spectrum hoarding and underutilisation of spectrum. However, we note:

- The criteria for being able to make a regional bid may be different;
- Regional operators will of course continue to be able to commercially negotiate with national management rights holders regarding access to particular spectrum in areas where they do not operate (for example areas outside the RCG footprint). This could involve discussions surrounding interference concerns and timeframes (and should not be assumed to involve a direct price).
- 2degrees support alternative solutions that provide regional operators with spectrum for their purpose and more efficiently allocate scarce 5G spectrum as part of national 5G management rights. As set out in our response to Q32, this includes exploring availability of other bands including the 3.7 to 3.8 GHz band (currently underutilised) and the 2.6GHz TDD band (already used by regional operators but not utilised at a level similar to cellular operators). We also support certain forms of regional sharing, but not options

which could lock in a long-term disadvantage to 2degrees, as the late entrant, versus larger national operators.

We note:

- The Government used an auction mechanism to allocate both the national and regional management rights in the 3.5GHz band in 2002 and 2006; and
- As for national operator allocations, it is also important that the reserve price, spectrum caps and implementation obligations are set to ensure that spectrum allocated to regional players deliver the Government policy outcome for consumers. If regional consumers are not provided services as a result of allocations to regional operators designed to do this, then this would be a policy failure and could be considered a 'waste' of spectrum if other operators could have used it.

Q19. Should deployment of 5G technology be specified for some or all bands? If not, why not?

The spectrum bands being considered for allocation are the key international bands where 3GPP defined 5G ("5G"¹⁶) technology is likely to be deployed first. We consider allocating this spectrum to 5G is its highest economic use, consistent with the key objective of spectrum regulation outlined by MBIE.

This would support 5G deployment obligations in all bands. As for other spectrum bands this implementation requirement is *not instantaneous* and would be expected to be within the first period of the management right and would not prevent other more advanced technologies being deployed in the band at a later date (for example 6G technologies).

This is also likely to be most consistent with the Government's digital divide objectives – providing for 5G in both urban and regional areas over time.

We would be concerned that:

- If 5G technologies are not specified, this will create technical compatibility issues and associated spectrum wastage (for example to allow necessary separation to avoid interference between national management rights holders). The width of the 3.5GHz band is already challenged and this would be an inefficient outcome for New Zealand. Notably, the clock synchronisation option (which would reduce required guard bands) cannot be used if mixing 5G and non-5G rights. We note that these issues are being discussed in the separate 3.5GHz technical workshops currently being hosted by the MBIE RSM team.
- Over time, New Zealanders cannot receive 5G services, or particular 5G services, because non-5G services are rolled out on 5G bands in a given area.

We understand some existing regional users do not use LTE technologies at present and are not planning to provide 5G services to their consumers. As a second-best option, we consider at the very least all non-5G rights should be limited to regional rights and grouped together to reduce guard band spectrum wastage. We comment further on provision for regional use in our response to Q32.

¹⁶ As noted previously, there are a wide range of "5G" definitions, however this MBIE consultation is focussed on 3GPP defined 5G technology.

Q20. What implementation requirements should be specified and how should these be expressed? (time, extent, etc)

As set out above, we consider the implementation requirements in key 5G spectrum bands should require that spectrum is put to use for 5G 3GPP by an Implementation Date.

2degrees proposes that implementation obligations should be easily measurable and can be independently verified without the need for expensive tools. We would support site-count, rather than population-based, roll out obligations, where possible, for example [30%]¹⁷ of total sites.

We agree that 3.5GHz rollout is likely to be in more urban areas initially given population density and band physical propagation characteristics, which are quite different from those of the 700MHz band. We would not support implementation obligations on 3.5GHz spectrum that require operators to roll out inefficiently and favour larger operators with more resources. Notably, mobile operators are already heavily investing, in addition to government, in addressing regional digital divide issues under the RCG initiative. This provides for an upgrade path to 5G using shared infrastructure and is an open access infrastructure agreed with government. We would be concerned if government undermined this significant private and government investment by creating a separate open access infrastructure, as some parties (with a clear self-interest) have proposed. This would make marginal rural broadband business cases even more marginal for both the RCG and any new providers using a separate open access platform.

Other than for the 700MHz band, MBIE has used population-based implementation requirements, without sufficient defining on how this was measured. This has resulted in MBIE signing off 'token' meeting of implementation requirements, with no or little consumer benefits and in some cases consumer harm. For example:

- The limited number of licences in the 2300MHz band. After nearly 10 years there are 87 licences in this band;
- The limited number of licences in the 2600MHz band. After nearly 10 years there are only 205 licences in the 2600 MHz band;
- In one case, MBIE signed off implementation of a commercial service in 2600MHz when licences were only registered the last day possible and without testing whether a commercial service was actually available as required.¹⁸

2degrees support operators being given [5]¹⁹ years to meet the obligation from the day the spectrum becomes available and having the option to extend this period by a maximum of two years by paying an additional fee (as for the 2300MHz and 2600MHz spectrum bands). Any new operators should have the same obligation as the smallest existing operator. If a population measure is deemed necessary, for example where there is no current coverage, a service level requirement could improve the consumer outcome over existing population measures – however, this is still subjective and prone to manipulation.

If any changes to implementation obligations were considered necessary, these should be publicly consulted on to both test the validity of reasons for extension and ensure this is in the public interest (including considering alternative users of the spectrum). This should be completed before the due date(s) for implementation.

¹⁷ This percentage figure will depend on a number of decision factors and should be determined as part of a future allocation consultation specifically on the 3.5GHz.

¹⁸ As set out in Q21, it is clear this spectrum has remained underutilised.

¹⁹ As for the site count percentage figures, this implementation timeframe will depend on a number of decision factors and should be determined as part of a future allocation consultation specifically on the 3.5GHz.

We note it is likely to be less relevant to have rural population coverage obligations related to 3.5GHz, rather than sub-1GHz spectrum. This is a reflection of population density and physical propagation characteristics, which mean alternative spectrum bands are more appropriate to address digital divide issues in the short to medium term. Use of 3.5GHz will relate to specific customer and capacity requirements and complement other spectrum bands, including in regional areas. Economic capacity demand for wide use of the 3.5GHz band in regional areas could be after the initial implementation obligation period, given likely demand and alternatives to 3.5GHz available.

Q21. What should be the consequence of non-implementation?

Failure of MBIE or the Crown to enforce implementation obligations results in wasted spectrum, rewards spectrum speculation and penalises other parties that value that spectrum.

As set out in our response to Q20, operators should have the option to pay additional monies to extend the period for meeting the roll out obligations, as pre-agreed at the time of auction. Such an option gives the opportunity for those who are serious about imminent roll out of service but for financial reasons have not done so within the more limited timeframe.

However, if a spectrum holder is not able to meet the implementation obligations, even after the extension, there should be no further extension and the management right should expire automatically. A management right holder that has not deployed on spectrum it has held for, for example, 7 years should not be able to benefit from holding that spectrum and preventing utilisation of that spectrum by others.

Any change to this – for extenuating circumstances - should require public consultation. For example, this could relate to developments in technology for the band. It should not be possible, as occurred with the 2600MHz process, for information to be presented by particular parties, without the scrutiny of other parties well placed to test the validity of that information. In the case of the 2600MHz, this resulted in spectrum remaining heavily underutilised nearly a decade after the spectrum was released. [

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Q22. Should the implementation requirements be different for regional and national providers? What should these be and why?

Again, MBIE's decision is impacted by wider decisions on allocation of spectrum to regional operators, including what spectrum is allocated and whether any sharing is taking place.

It is possible to have different implementation obligations. However, it is important that the same principles should be applied for both national and regional operators. Regional players getting a valuable national resource, and using it sporadically, does not best serve *all* New Zealanders. Therefore, it is especially important to ensure regional operators use the spectrum in their allocated areas to deliver suitable services to regional New Zealanders.

PUBLIC VERSION

As for national operators, we also support limitations on on-selling that discourage speculators. For example, if implementation obligations on spectrum cannot be met for extenuating circumstances then the spectrum reverts to the Crown for reallocation and is not sold for profit.

Q23. Should acquisition limits be imposed on 5G bands? If so, what should these be and why?

2degrees support acquisition limits on 5G bands. The challenge for MBIE is to ensure all existing national operators each get enough spectrum to maintain current hard-fought gains and levels of competition, which are bringing clear benefits to New Zealand consumers (For example the Commission has reported that mobile pricing for low and serious users is 47% and 27% below the OECD average respectively).

MBIE needs to be mindful of noise and “hype” versus those that have invested privately and continued to deliver benefits to New Zealand.

MBIE and the Government also need to ensure their 5G allocation decisions do not allow further increases in spectrum disparity between the national wireless operators. Spectrum advantage translates to a lower cost structure, due to the high cost of building sites and associated resource management and planning costs, and service differentiation. Already the two largest national operators hold 70% of the spectrum. 2degrees has 18.5%. This means that 2degrees should acquire at least parity with the other national operators. Under this scenario, it would still have substantially less spectrum.

MBIE decisions will impact future competition in mobile, the Internet of Things and fixed wireless markets and any new markets where 5G will be used to deliver services.

MBIE has proposed caps based on 5G maximum carrier width requirements. 2degrees does not support such an approach, with only 280MHz of spectrum available (not including necessary guard bands and any allocation to regional operators). This implies at least one operator could have substantially below the 5G maximum carrier width requirement. This would limit its ability to effectively compete.

We consider:

- Caps should ensure all existing national players get adequate spectrum (for example a minimum of 80MHz or 100MHz depending on the bandwidth available);
- The challenger national mobile operator should not be squeezed out by a fixed monopoly with deeper pockets, and the existing spectrum disparity between the three national wireless operators must not be extended (for example by Spark or Vodafone continuing to acquire more spectrum than 2degrees);
- As set out in our response to Q27, block sizes should also be used to ensure existing national players get adequate spectrum;
- MBIE should allow for a wider bandwidth, if it values optimal allocations. For example, extending the band to 3.8GHz would support optimal allocations for all three national operators, but not provide any national operator with a long-term spectrum advantage over others (which the current proposal would do);
- Over time, 2degrees support an overall cap of 35% being applied to *total (not band-specific)* spectrum holdings (including each of sub 6GHz and mmWave spectrum). Unlike previous spectrum caps that have applied, this cap would apply for an extended term. This reflects that over time we do not consider any particular operator should hold more than 35% of the IMT spectrum.

PUBLIC VERSION

Up to now MBIE has imposed temporary individual band caps, however, operators have been able to acquire significant amounts of spectrum after the expiry band of those caps. Combined with a Commerce Act that has not served New Zealand well regarding spectrum acquisitions, these rules have allowed an operator like Spark to acquire 40% of the allocated cellular spectrum, including 44% of the 700MHz band directly from the Crown [

] and 74% of the 2300MHz band.

Regulators internationally are now considering overall spectrum caps, for example in the UK when Orange merged with T-Mobile, the merged company EE had to divest 2x15MHz of 1800MHz spectrum to ensure it did not have significant spectrum advantage. Ofcom also imposed a maximum cap of 37% prior to its auction of 2300MHz and 3400MHz spectrum, which it had identified as key to 5G. This prevented BT/EE, which held 42% of the spectrum, from acquiring 2300MHz spectrum and extending their spectrum advantage at the expense of O2 and 3.

In its briefing to the House of Commons, Ofcom states²⁰Error! Bookmark not defined.:

Ofcom considers that asymmetry in the amount of spectrum held by mobile network operators poses a risk to competition because providers with more spectrum are better placed to respond to increased consumer demand for mobile data than others.

We note a total spectrum cap also encourages operators to identify and keep the best value spectrum for them.

Importantly, the significant improvement in New Zealand mobile market performance was due to 2degrees. The Reserve Bank has even referred to the '2degrees effect'. A government 5G spectrum allocation that results in 2degrees not getting enough spectrum relative to other national operators will effectively undermine competition in the current mobile market as well as future growth areas such as IoT, 5G fixed wireless and new areas that are yet to develop.

Alternative competition checks

We note in terms of alternative competition checks that may be put forward, 2degrees does not support set-asides of spectrum for "open access". [

] As multiple parties have pointed out in relation to the Telecommunications (New Regulatory Framework) Amendment Bill, it would also be entirely inappropriate, and defeat the purpose of separation, for a fixed monopoly provider to be enabled to enter contestable fixed and wireless markets. In particular, given Chorus' market power, this would cause long term damage to wholesale fixed and multiple national wireless markets, including mobile, fixed wireless and IoT markets. It is important government and officials recognise the important role of the line-of-business restrictions of the Act in supporting ongoing innovation and competition in markets that are contestable.

²⁰ Briefing Paper Number CBP 8270, 22 March 2018.

Q24. Should acquisition limits be imposed for regional providers? If so, what should these be and why?

Acquisition limits for regional providers depend on other allocation decisions regarding regional providers. However, 2degrees support acquisition limits on regional players, including regional acquisition limits where there are multiple parties wanting access to spectrum in a region. The same framework should be applied to all parties. Acquisition limits can also mitigate against speculative acquisitions with the intention of on-selling.

Q25. What term should be used for management rights suitable for 5G? Why?

2degrees support the maximum term of 20 years for management rights, which is consistent with New Zealand's approach to spectrum allocation terms in the past. This allows time to have an implementation obligation period and a further period to deliver service and recover economic value from the spectrum - necessary for substantial investments in New Zealand's infrastructure.

Notably, at a time when margins are being squeezed and growth opportunities are being captured by OTT players and the like, it is especially important that network operators investing in New Zealand infrastructure are given adequate opportunity to get a fair return on their spectrum and network investments.

2.5 Management rights for 5G

Q26. Should the 5G bands be replanned as TDD bands or some bands or parts of bands be retained as FDD? Why?

The technical standards for the 3.5GHz band are defined as TDD. We support MBIE re-planning this spectrum as a TDD band consistent with the approach being taken internationally.

Q27. What bandwidth should be used as the basis for allocation? Why?

Competition limits should impact the appropriate block sizes. 2degrees is comfortable with MBIE's proposal of 20MHz blocks for the 3.5GHz band and 100MHz blocks for the 26GHz band. However, it is important that block sizes and competition limits result in *all* three national operators getting adequate 5G spectrum.

For optimal use national operators require contiguous lots of 80-100MHz of 3.5GHz spectrum, and 800-1GHz of mmWave spectrum. This supports larger blocks as smaller lot sizes when allocating large band sizes are unnecessarily complex and inefficient.

We note for 3.5GHz a mix of larger blocks and 20MHz blocks could be appropriate. The size of the larger blocks would necessarily be dictated by the size of spectrum available for allocation (for example, availability of the 3.7 to 3.8GHz band, which would allow for national operators to receive optimal 100MHz sized blocks).

Given the large bandwidth required in mmWave spectrum, it may be appropriate to increase mmWave block sizes to 200MHz.

Q28. What out of band emission limits should apply to management rights when first created for allocation? Why?

2degrees does not support AFEL being used as an interference management tool and considers that the Radiocommunications Act (the Act) should be relied upon for addressing interference.

Despite the number of submissions on the Radiocommunications Act review outlining that complying with emission limits does not guarantee that there will be no interference, MBIE appears to be continuing with the AFEL approach. Our view is that hard emission limits result in wastage of spectrum and do not guarantee interference protection.

It is also important that MBIE:

- Include clauses so that one operator does not claim first-in-time advantage over the others, which could restrict and delay rollout by the affected parties. This is critical to operators like 2degrees who already have a significant spectrum disadvantage compared to its larger competitors.
- Tightens the licensing process before the management rights for these bands come into existence. The certification process and engineer's responsibilities for considering all harmful interference should be clearly articulated and independent of the responsibilities of the Registrar in the Act. This will provide much greater clarity to responsibilities under the Act and result in a more consistent approach to assessments under the Act. Notably, the current drafting of the Act does not place any direct obligation on the certifying engineer and the permissive language of section 25(5) and the IRR does not make it mandatory for the engineer to comply with these requirements.²¹

Given that the above changes are not likely to be implemented in the Act before the 5G bands are auctioned, the above conditions should be incorporated in the management rights.

Q29. Should out of band emission limits be different if the band is technology neutral? If so, what out of band emission limits should be applied?

Technology neutrality can deliver benefits in two forms:

- Allow right holders to roll out newer technologies; and
- Allow right holders to choose the most appropriate technology.

2degrees strongly supports the technology neutral management rights approach the New Zealand Government has taken since the introduction of the Radiocommunications Act in 1989. 2degrees supports the ability to move to newer technologies as they become available. It is important that MBIE does not mix these two benefits.

As set out in our response to Q31, 2degrees supports 3GPP defined 5G implementation obligations applying to such 5G bands. However, if MBIE allows non-3GPP defined technologies to be used in these bands this will result in inefficient outcomes in the form of guard band requirements.

We do not support different management right limits or requirements for different parties/management rights. We consider that this will lead to future issues among operators which MBIE would have inadvertently created.

²¹ These recommendations are in line with 2degrees' submission on the Radiocommunications Act Review.

Q30. How should interference between adjacent frequency 5G TDD networks be managed? Should this be the same for all frequency bands?

These issues are currently under discussion in relation to the 3.5GHz technical workshops MBIE is hosting.

As a starting principle MBIE should adopt solutions that will lead to efficient use of this valuable spectrum.

2degrees notes that synchronisation of adjacent TDD networks reduces spectrum wastage as a result of guard bands required between management rights. With a limited 280MHz bandwidth available, this could be the most efficient solution. However, synchronisation is only possible if relevant operators are all operating 5G systems (for example, this wouldn't work with regional operators using non-5G technologies) and it will require cooperation and limit operator use of the band.

If MBIE is able to expand the band beyond 280MHz (into the 3.7-3.8GHz band), then it gives more options to implement guard bands between technologies. Extending the top end to 3.8GHz allows MBIE to take full advantage of the whole spectrum while catering for existing users.

Any guard band for non-5G technologies²² should come from those who are not using 5G technologies. MBIE should use this as an incentive to encourage operators to move to 5G technologies as early as possible.

In addition, if band planning is based on TDD synchronisation and a party opted not to synchronise, the guard band (both in frequency and in geography) they required should come from the spectrum allocated to that party. This recognises the trade-off between the amount of spectrum available versus the cons of synchronisation for that party and incentivises that party to make the most efficient choice.

2degrees do not support power restrictions at the edges of each band. This will only result in further wastage of spectrum.

Q31. How should interference between different technologies within the same band be managed, if bands are technology neutral?

The purpose of technology neutrality is to provide the flexibility to change technologies as technologies evolve - in IMT bands, as IMT technologies evolve. This has allowed efficient refarming of 2G to 3G to 4G spectrum to date.

New spectrum bands are allocated to encourage the roll out of newer technologies. This delivers the best outcome for New Zealand from the roll out of new technologies.

As set out in our response to Q19, 2degrees supports 5G 3GPP implementation obligations applying to 5G IMT bands. We expect IMT technologies to be compatible with each other, therefore we do not expect any significant interference issues arising from evolving the newer IMT technologies.

If the government does allow non-5G/3GPP technologies to coexist side by side with 5G technologies in the key 5G bands, then this would lead to inefficient outcomes. We consider

²² This refers to non-3GPP specified 5G technologies.

this would require guard band protections. If any party wants to deploy non-5G technologies then any guard band must come from the non-5G technology side of the spectrum.

2.6 Access to spectrum for regional providers

Q32. Should regional uses be provided for in the 3.5 GHz band plan? Why?

2degrees recognises the value of regional wireless players and that in many cases they are well-placed to deliver wireless services to remote users. While 2degrees' own network covers c.98% of places Kiwis live and work, and this is increasing, including with the RCG rollout, existing and future mobile networks will not provide 100% geographic coverage.

2degrees do not consider either Option 1 (renewing the existing Crown Management rights in the 3.5GHz band and allocation licenses to regional users (status quo)) or Option 4 (Requiring regional providers to relocate to the vacant portion of the 600MHz band, the unallocated portion of the 2.3GHz band or the 2100MHz expansion band) are efficient solutions.

2degrees would support:

- Consideration of the 3.7 to 3.8 GHz band (including sharing with current very sporadic geographic and timing use); and/or
- Making use of the first channel in the 3.403-3.410GHz when moving the current users. 2degrees notes that currently there are no licences in the band 3.3 to 3.4GHz band and any further guard and should be allowed below 3400MHz; and/or
- Consideration of the 2.6GHz TDD band, which is currently used by regional players but has significant opportunities to use in many areas; and/or
- Consolidating the Crown Management rights in the 3.5GHz band into the lower part of the band and allocating licences to regional users (Option 2); and/or
- Providing shared access to regional providers of national spectrum resource where this is not being used to deliver 5G services by the mobile operators (Option 3).

However, any regional sharing arrangements should not disadvantage certain national operators:

- Any required guard band to address non-5G use must come from that 'shared' spectrum to so not disadvantage operator(s) sharing spectrum;
- We do not support options that provide further advantages to first-in-time rollouts. This includes later rollouts having to pay compensation to regional providers using the national management right they purchased.

2degrees is committed to providing national services to both urban and rural consumers. We have made a very substantial investment in a national network, and in 2018 we have now reached c.98% population coverage, nearing a completion of our national coverage programme. In 2017 2degrees committed to the RCG RBI2 rural rollout, showing our commitment to rural coverage and New Zealand. It is important that government does not impose additional disadvantages on 2degrees, by virtue of having less money in 2018/2019.

Of the regional sharing options presented in section 6, 2degrees could support:

- A combination of Option 1 and Option 2, or Option 2, where particular lots in the band share spectrum in certain regional areas and there is a lower reserve price. Access to this regional sharing band could be combined with national (unshared) spectrum rights.

- However, we do not consider limiting a national operator to only the top 10 main urban centres is the appropriate balance if that operator does not also have other national 3.5GHz rights. This would severely limit its ability to compete in national markets and restrict competition in regional areas outside the top 10 centres. If pursuing this option, we consider MBIE should work with industry to determine a more appropriate threshold, which could - for example - be a greater number of towns, or population-based.

2degrees do not support Option 3. This is likely to impose additional costs and disadvantage on later entrants – paying compensation to players for loss of spectrum they had paid for.

In addition, 2degrees notes it supports the ability of national rights holders to work with regional operators towards mutually beneficial commercial arrangements regarding spectrum it is allocated, recognising that over time 2degrees wishes to deliver nationwide 5G retail and wholesale mobile services.²³

Q33. If allowed in the 3.5 GHz band, how could this be managed or facilitated?

2degrees encourages MBIE to re-plan the 3.5GHz regional licences so that these licences occupy the minimum amount of bandwidth. As we noted in Q32, MBIE should make use of all the spectrum available in the 3.4-3.8 GHz band.

Further planning needs to be done to ensure that the FDD licences are kept away from the TDD part of the 3.5 GHz band. The output of the technical workshop will inform the guard band requirements between TDD and FDD and non-5G users.

2degrees encourages MBIE to be bold when clearing out the 3.5GHz band. Encouraging low efficiency use is not in the interests of New Zealanders.

Q34. Which alternative bands may be suitable for regional allocation? Why?

2degrees does not support the three bands proposed by MBIE for regional allocation. This would not be an efficient use of the IMT spectrum bands. However, as set out previously, we would support consideration of:

- The 3.7-3.8 GHz band (including sharing with current very sporadic geographic and timing use); and/or
- The 2.6GHz TDD band.

The 3.7-3.8 band is highly underutilised at present. As we noted earlier there are 8 licences in the band 3.7-3.8GHz in essentially 3 locations. 2degrees encourages MBIE to clear all or some of the users out of this band to provide for more efficient use.

The 2.6GHz TDD band is already allocated for regional uses. However, 2degrees is of the view that the use of this band is limited by first in time users. For example, a licence in Sky Tower in Auckland could rule out use of this band in large parts of Auckland. Further, a large number of the licences are for 40MHz - effectively ruling out other parties from using this

²³ [

spectrum in that particular location. MBIE should take steps to ensure that this spectrum is used efficiently.

2.7 Timing

Q35. Is early access to the 3.5 GHz band required for roll out of 5G networks prior to the expiry of existing rights in 2022? If so, why?

While we recognize the desire to allocate this spectrum earlier than October 2022, we understand current right holders of 3.5GHz have prevented reallocation of 3.5GHz prior to this date.

Whichever approach the Government adopts, it is critical that Government does not favour current rights holders and reward speculation on that spectrum. This should be discouraged, not rewarded.

For this reason, we are strongly against MBIE's Option 3 (Government purchasing remaining rights in the band from incumbents) and Option 4 (Incumbents receiving a portion of the final allocation price).

More critical than the concerns MBIE identifies regarding price for these options, these:

- Reward speculation, including paying owners for bands they are not using;
- In some cases will pay money to operators that will bid against non-incumbents for future lots (in effect giving them an advantage in the future allocation).

Option 2 (allocating access to the upper 3.5GHz band two years earlier than the lower bands) provides the successful bidder with a significant market advantage and we therefore do not support this.

Of the Options provided, we support Option 1 (no government intervention and commencement of all rights aligned in time, access seekers can reach commercial agreements with current rights holders).

However, we also note it would be much easier for certain operators with existing 3.5GHz rights to commercially negotiate early access under both Options 1 and Options 2 than for other operators.

2degrees suggest a further option for consideration:

Option 5: A condition of making a successful bid on 3.5GHz spectrum is that any remaining management right on 3.5GHz spectrum, if any, is forfeited. This could then be made available by MBIE for early reallocation.

This would:

- Not reward speculators or non-users of that spectrum;
- Not require MBIE to set a price;
- Not require Connect A or Kordia to give up their management rights *involuntarily*;
- Enable early allocation of most of the band (given Spark and Vodafone hold a significant portion of this bandwidth);
- Not allow any successful 'upper band' winner to hold up early access to other portions of their band by virtue of existing spectrum holdings; and

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- Allow all three national operators an option to have access to some 3.5GHz spectrum early. There would be an advantage to the 'upper band' position, in that this is totally free earlier, but the other operators would not have no 3.5GHz spectrum for those two years.

MBIE could determine the price of early access terms, if relevant, as part of the allocation rules. As an example, this could be determined on a pro-rata per MHz/pop basis based on allocation prices.

Q36. How could early access to the 3.5 GHz band be achieved?

Please see our response to Q35.

Q37. Should the government be involved in early access arrangements for the 3.5 GHz band?

Please see our response to Q35. 2degrees does not support Government further engaging in facilitating early access.

Q38. Is early access to the 26 GHz band required for roll out of 5G networks prior to the expiry of existing rights in 2022? If so, why?

As set out our response to Q7, while 2degrees will require 26GHz spectrum, it does not support allocating the band 24.25-27.5GHz before identification and technical standards are completed. New Zealand has a history of allocating spectrum too early, which has resulted in under-utilisation of spectrum, spectrum concentration, limiting of competition as well as rewarding of speculators. For example:

- The MDS 2.3GHz band in July 1990: There were 203 licenses issued in 12 management rights nearly over a 20 year period. These were temporary licenses which were issued for short periods and no national service was rolled out. The band remained idle for most part of its term. Most of the spectrum was owned by one player (Telecom, who held eight out of the twelve blocks) and no long-term service was rolled out.
- The LMDS 26GHz band in Jan/Feb 1998: There were 36 licenses including 6 satellite licenses issued over a 20-year period. For most of the term all the spectrum was owned by one party who did not roll out any substantial service.
- The LMDS 24GHz band in July/August 2002: There are 343 current licenses. It appears that these bands are not used to deliver large scale service. 80% of this band is owned by one party.
- The 3.5GHz band in July/August 2002: There are 2026 licenses in the 3.5GHz band, with the majority of the licences being rolled out by regional players. The largest management rights holder Vodafone has only 35 licences.
- The 2.3GHz band in December 2007: This is one of the prime TDDs band used for cellular services worldwide. MBIE rushed through the allocation of both 2.3GHz and 2.6GHz bands on the promise of wireless broadband roll out by new players. Ten years later the spectrum is concentrated among three players and original buyers made windfall gains along the way. MBIE not enforcing the allocation rules resulted in rewarding speculative behavior: when Craig Wireless bought Woosh, the new entity exceeded the 40MHz spectrum cap, which was not enforced. Kordia and Woosh/Craig Wireless on-sold the

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2.3GHz spectrum making significant profits in the process. There are 84 current licences and this band was hardly used until Spark's recent purchase. Even after this purchase there, there is only limited use.

- The 2.6GHz band in December 2007: This is a prize LTE FDD band where LTE was first launched and operators around the world have been rolling out LTE services in this band. There are 205 current licences. The band is owned by three parties and half of the spectrum is not used to provide consumer services – representing a failure of the policy objective of delivering fast broadband to New Zealand.

2degrees understand some parties may push for early allocation of parts of this band. We note if MBIE does allocate any of this spectrum early, it must be considered subject to a wider spectrum cap applying to mmWave bands, to ensure MBIE is not allowing certain operators to acquire a disproportionate amount of spectrum in what will be a key 5G band, giving them a significant advantage in future, and/or forcing other operators to participate in an early allocation process to mitigate against such an outcome.

Q39. How could early access to the 26 GHz band be achieved?

Please see our response to Q38.

Q40. When is demand for the bands above 30 GHz likely to eventuate?

We agree with MBIE's position that bands above 30GHz are not likely to be required for 2020 5G deployment. We support consideration of this spectrum band following allocation of the 3.5GHz and 26GHz rights.

Q41. When is demand for the 600 and 1400 MHz band likely to eventuate, if at all?

Please refer answers to Q12-Q16 regarding 600 MHz and 1400 MHz allocations.