



BRIEFING

700 MHz Auction: Combinatorial Assignment Round Options

Date:	11 March 2014	Priority:	Routine
Security Classification:	Commercial In Confidence	Tracking number:	1971 13-14

ACTION SOUGHT		
	Action sought	Deadline
Hon Amy Adams Minister for Communications and Information Technology	Agree to the recommendations in this report Forward this report to Ministers English and Joyce	26 March 2014
Hon Bill English Minister of Finance	Agree to the recommendations in this report	28 March 2014
Hon Steven Joyce Minister of Economic Development	Agree to the recommendations in this report	28 March 2014

CONTACT FOR TELEPHONE DISCUSSION (IF REQUIRED)				
Name	Position	Telephone		1st contact
Len Starling	Manager: Policy & Planning, Radio Spectrum Management	██████████	██████████	✓
██████████	Policy Advisor	██████████		

MINISTER'S OFFICE ACTIONS
Office of the Minister for CIT: forward to Ministers English and Joyce

THE FOLLOWING DEPARTMENTS/AGENCIES HAVE BEEN CONSULTED

<input type="checkbox"/> MSD	<input type="checkbox"/> NZTE	<input checked="" type="checkbox"/> Treasury	<input type="checkbox"/> COMU	<input type="checkbox"/> TEC	<input type="checkbox"/> MoE
<input type="checkbox"/> MFAT	<input type="checkbox"/> DOC	<input type="checkbox"/> MfE	<input type="checkbox"/> MoH	<input type="checkbox"/> TPK	<input type="checkbox"/> Other

9(2)(a)

Minister's Office to Complete:

Approved

Declined

Noted

Needs change

Seen

Overtaken by Events

See Minister's Notes

Withdrawn

COMMENTS

EXECUTIVE SUMMARY

The Combinatorial Assignment Round of the 700 MHz auction is scheduled to be held shortly, following a decision from the Commerce Commission on Telecom's application for clearance to acquire 2x20 MHz (four lots). In the Combinatorial Assignment Round, bidders may tender for particular placements (frequencies) within the 700 MHz band; in prior rounds they bid for generic amounts of spectrum, rather than specific frequencies. The provisional results are that 2degrees has purchased 2x10 MHz (two generic lots), Vodafone 2x15 MHz (three generic lots), and Telecom 2x20 MHz (four generic lots) subject to Commerce Commission clearance. The table below shows placement options.

This briefing assumes that the Commerce Commission will grant Telecom clearance to acquire 2x20 MHz. The Commission has recently advised us that it will extend its expected decision date to mid April. If clearance is not granted, we expect to report to you again on options as the Crown may then have a significant interest in choosing the location of the unsold spectrum block.

Table 1: Full list of placement options given the provisional allocation results

Lower MHz	703-708	708-713	713-718	718-723	723-728	728-733	733-738	738-743	743-748
Upper MHz	758-763	763-768	768-773	773-778	778-783	783-788	788-793	793-798	798-803
Option A	2x20 MHz (TC)				2x15 MHz (VF)			2x10 MHz (2D)	
Option B	2x20 MHz (TC)				2x10 MHz (2D)		2x15 MHz (VF)		
Option C	2x10 MHz (2D)		2x20 MHz (TC)				2x15 MHz (VF)		
Option D	2x15 MHz (VF)			2x20 MHz (TC)				2x10 MHz (2D)	
Option E	2x10 MHz (2D)		2x15 MHz (VF)			2x20 MHz (TC)			
Option F	2x15 MHz (VF)			2x10 MHz (2D)		2x20 MHz (TC)			

We seek a decision on whether to offer all placement options or whether to withhold some options, which is permitted under the auction rules. We recommend that options C and D (with Telecom in the middle of the band) be excluded for the following reasons:

1. This will allow the possibility of future secondary market activity, i.e. trading between 2degrees and Vodafone. Telecom is unlikely to have a productive use for more 700 MHz spectrum given that 4G-LTE

carriers use a maximum of 2x20 MHz, and is likely face difficulty with the Commerce Commission if it attempts to acquire further spectrum in the 700 MHz band.

2. This will ensure that 2degrees is not prevented from extending its current 2G/3G roaming agreement with Vodafone to cover 4G services. Because of technical issues to do with band planning and handset compatibility, it is possible that some phones may not work across the whole band. 4G roaming partners will therefore need to be placed next to each other in the 700 MHz band. A roaming agreement would be negotiated on commercial terms.
3. This will safeguard the government's future options, should 2degrees not meet the payment terms or implementation requirements within the five-year deadline, and its spectrum returns to Crown ownership/control. The government could then consider selling some spectrum to other parties.
4. If announced before the Commerce Commission has made a decision on Telecom's clearance application, this could assist the Commission in determining the likely competitive landscape over the eighteen-year period of the 700 MHz management rights.

It is possible that competitive bidding will provide an assignment outcome that addresses these issues, without the need to limit placement options. However, it may not. The combinatorial assignment round is structured as a one-shot tender with the outcome decided by the bid combination that achieves the highest revenue to the Crown.

We have consulted with bidders about the options that should be offered. [REDACTED]

9(2)
(ba)(i)

This briefing also explains the technical issues that we think will influence the bidders' valuations of particular placement options including device availability issues, national roaming, European roaming, and potential (but unlikely) interference issues with other services that neighbour the 700 MHz band. Overall, we think that the top of the band is likely to be the least-preferred placement option. We do not have information about what amounts the bidders are likely to bid for particular placements.

Any limitation on placement options may impact on the price bidders are willing to pay (and need to pay to assure their preferred outcome) and therefore the fiscal return, but this is difficult to quantify and may be offset by the future consumer benefits arising from roaming, secondary trading, and spectrum sharing. Revenue from prior auction rounds (\$259 million) has already exceeded the amount that was forecast in budget baselines.

RECOMMENDED ACTION

The Ministry of Business, Innovation and Employment recommends that you:

- a **Discuss** the contents of this report with the Ministers of Finance and Economic Development.

Agree/disagree

- b **Agree** that placement options C and D will be excluded.

Agree/disagree

- c **Refer** this report to the Ministers of Finance and Economic Development, for their confirmation of the decisions made above.

Agree/disagree

Len Starling
Manager: Policy & Planning
Radio Spectrum Management
Ministry of Business, Innovation and Employment

Hon Minister Amy Adams
Minister for Communications and
Information Technology

..... / /

/ /

Decisions as noted above by Minister Adams confirmed by:

Hon Minister Bill English
Minister of Finance

Hon Minister Steven Joyce
Minister of Economic Development

..... / /

..... / /

Minister's feedback on quality of report:					1 Not satisfactory; 2 Fell short of expectations in some respects; 3 Met expectations; 4 Met and sometimes exceeded expectations; 5 Greatly exceeded expectations
1	2	3	4	5	

Background

1. The Ministry of Business, Innovation and Employment (MBIE) is auctioning management rights to radio spectrum in the 700 MHz band, to be used for the deployment of fourth generation long term evolution (4G-LTE) cellular broadband networks. The initial allocation rounds of the auction have been completed. In those rounds, bidders bid for generic amounts of spectrum in the 700 MHz band, i.e. not specific frequencies. The provisional results, subject to Commerce Commission clearance, are that 2degrees has purchased 2x10 MHz (two generic lots), Vodafone 2x15 MHz (three generic lots), and Telecom 2x20 MHz (four generic lots).
2. A final round, the Combinatorial Assignment Round ('CA round'), is yet to be held. In the CA round, bidders have the opportunity to each submit a single tender for particular placements (frequencies) within the 700 MHz band i.e. the bottom, middle, or top of the band. This round is a one-shot tender. The auction rules state that outcome is decided by the combination of tenders that achieves the highest revenue for the Crown.
3. Telecom's purchase of four lots is subject to Commerce Commission clearance. A decision from the Commission was expected on 14 March 2014, however the Commission has indicated it is likely to extend this to mid April. This briefing assumes that clearance is granted; if it is not, and Vodafone (the next highest bidder) does not reactivate its withdrawn clearance application, there will be an unsold spectrum block and the Crown will have a substantial interest in choosing the location of this block. In this case, we would report to you again before holding the CA round.
4. Assuming Telecom is granted clearance, possible placement options are shown in the table below.

Table 1: Full list of placement options given the provisional allocation results

Lower MHz	703-708	708-713	713-718	718-723	723-728	728-733	733-738	738-743	743-748
Upper MHz	758-763	763-768	768-773	773-778	778-783	783-788	788-793	793-798	798-803
Option A	2x20 MHz (TC)				2x15 MHz (VF)			2x10 MHz (2D)	
Option B	2x20 MHz (TC)				2x10 MHz (2D)		2x15 MHz (VF)		
Option C	2x10 MHz (2D)		2x20 MHz (TC)				2x15 MHz (VF)		
Option D	2x15 MHz (VF)			2x20 MHz (TC)				2x10 MHz (2D)	
Option E	2x10 MHz (2D)		2x15 MHz (VF)			2x20 MHz (TC)			
Option F	2x15 MHz (VF)			2x10 MHz (2D)		2x20 MHz (TC)			

5. The auction rules allow us to exclude one or more options. This rule could now be used to facilitate pro-competitive policy outcomes. We seek a decision from you as to whether to rule out one or more placement options. We recommend that options C and D, which place Telecom in the middle of the band, are ruled out for the following reasons (explained further in the paragraphs below):
 - To allow future secondary market trading between 2degrees and Vodafone, the only parties that could increase their holdings and remain within the current acquisition limit. This could include spectrum sharing.
 - To ensure that the current 2degrees/Vodafone 2G/3G roaming agreement can be extended to cover 4G services.

- To protect the Crown’s options in case 2degrees does not meet the five-year payment terms or implementation requirement deadline and its spectrum returns to Crown ownership/control.
- To assist the Commerce Commission in determining the likely competitive landscape over the eighteen-year period of the management rights, and narrow the range of options and variables it must consider in assessing Telecom’s clearance application.

Technical issues potentially affecting preferred placements

6. MBIE does not have a firm view on exactly which position(s) within the band are likely to be most sought-after; however, the lowest demand is likely to be for the very top of the band, for reasons outlined below. Bidders will have done their own commercial and technical analyses, importing detailed information from their preferred handset and network technology manufacturers.

Consumer device availability and national roaming

7. For technical reasons relating to limitations in cellular componentry it is possible that some 700 MHz 4G cellphones will not operate across all of the New Zealand 700 MHz band. In particular, the first 700 MHz phones that come to market may operate in only two thirds of the band (either the top-and-middle or the bottom-and-middle), as this will be easier to manufacture from both a technology perspective and in terms of fitting the necessary components into the physical size/design of the device. Holding the middle of the 700 MHz band would allow a network operator to guarantee that all 700 MHz phones would work on its network.

8. Australia and New Zealand will be among the first countries to deploy 700 MHz networks. Telstra Australia has recently announced that it will start selling 700 MHz devices in May 2014. These devices will only need to work in the bottom-middle of the band because the unsold 700 MHz spectrum in Australia is at the top of the band. However, given that the APT band plan for 700 MHz has been adopted by markets exceeding 2.6 billion people internationally, over time sufficient market demand is likely to develop for more sophisticated handsets that cover the entire band.

9. [REDACTED]

9(2)(ba)(i)

10. A 4G roaming agreement would only be possible if phones of the host network (e.g. Vodafone) and access seeker (e.g. 2degrees) can operate in the same part of the band or if all the access seeker’s customers have the more sophisticated phones, which is unlikely in the short term. [REDACTED]

9(2)(ba)(i)

[REDACTED] Excluding placement options C and D will ensure that the current 2degrees/Vodafone roaming agreement can be extended to cover 4G services, assuming the parties can negotiate a satisfactory agreement on normal commercial terms.

¹ Dongle: a plug-in device providing a cellular broadband connection for a laptop.

International roaming

11. Europe is in the process of switching to digital television broadcasting and freeing up the 800 MHz band for 4G, rather than the 700 MHz band as in the Asia-Pacific region. It is possible that in years to come Europe will create a “second digital dividend” by clearing the lower portion only of the 700 MHz band and allocating it for cellular use (the upper portion has other uses in Europe). If this occurs (there is no guarantee that it will), a New Zealand network operator may have an advantage in holding the lower end of the 700 MHz band as this could allow easier roaming for incoming European consumers.
12. On the other hand, 1800 MHz is steadily becoming the accepted standardised band for 4G international roaming (except for in North America), and is already being used for 4G in Europe, the Middle East, and the Asia-Pacific region including New Zealand.

Coexistence with digital television below 700 MHz

13. We have previously briefed you (and the Minister of Broadcasting) on the concerns that television broadcasters have expressed around possible interference between 4G-LTE in the 700 MHz band and digital television below 700 MHz (see Annex Two to the briefing titled ‘700 MHz Auction: Auction Format’, dated 16 August 2013). At that time, we explained why we think their concerns are unfounded² and in the unlikely event that interference does occur, there are technical solutions available. If the cellular network operators share the broadcasters’ concerns, then they may prefer not to be at the bottom of the 700 MHz band as this borders the digital television spectrum and therefore has the most potential for interference.
14. [REDACTED] considers that the possibility of interference with digital television is greatest if Telecom’s 2x20 MHz block is assigned to the bottom of the band (its emissions may be greater than those of a smaller block). We agree that this is theoretically accurate, but we stand by our assertion that interference is extremely unlikely anyway.

9(2)(ba)(i)

Coexistence with fixed links above 800 MHz

15. Fixed radio links use the frequencies directly above the 700 MHz band.³ MBIE released a coexistence study in 2013 that found substantial coexistence issues were unlikely. Of a total of approximately 3200 existing 850/900 MHz cellular base stations (cell towers) nationwide just 35 may require technical solutions, such as additional filtering to avoid interference with fixed links, if they are upgraded to 700 MHz.⁴ The cost of these technical solutions will be minor and will be borne by mobile network operators rather than incumbent users. This may make the top part of the 700 MHz less attractive for mobile network operators.
16. [REDACTED] agrees that any interference issues that arise at the top of the 700 MHz band will be easily addressed through the installation of filters ‘at minimal cost relative to the cost of the spectrum.’ Vodafone has suggested this cost will be [C-i-C] in the very low millions.
17. The middle position has the lowest risk of interference with neighbouring non-cellular services above and below the 700 MHz band, and therefore the lowest associated out-of-band interference mitigation costs.

9(2)(ba)(i)

² In short, New Zealand has a much larger guard band (buffer) between 4G cellular and digital television services. Additionally, while some countries such as the UK have cellular base stations at the bottom of the band New Zealand has them at the top, which further reduces the likelihood of interference between 4G networks and digital television.

³ These provide low speed data transmissions to utilities companies, KiwiRail, and emergency services organisations, for example: between electricity networks’ substations.

⁴ 850/900 MHz is the near-nationwide “base layer” lower frequency spectrum used for 2G and 3G, and is therefore most comparable to 700 MHz. We used 850/900 MHz base stations to calculate the 700 MHz rural upgrade requirement applied to successful bidders. Higher frequencies such as 1800 MHz (2G/4G) and 2100 MHz (3G) are generally used in cities for added capacity.

Secondary trading and spectrum sharing

18. As a general radio spectrum management objective, MBIE is supportive of secondary market spectrum transactions as they help to ensure that spectrum is allocated to its highest-value use (or user), which may change over time. With the current acquisition limit in place for at least another three years, Telecom is unable to acquire any more spectrum in the 700 MHz band, and may face considerable difficulty getting Commerce Commission clearance to do so anyway. Telecom is unlikely to have a productive use for more 700 MHz spectrum given that 4G-LTE carriers use a maximum of 2x20 MHz (as standardised by the international cellular standards organisation 3GPP). Telecom is very unlikely to want to divest any 700 MHz spectrum either, for commercial reasons. Any secondary market activity is therefore likely to involve 2degrees and Vodafone, and would be very unlikely if they were not assigned neighbouring placements (i.e. options C and D would need to be ruled out).
19. 2degrees (2x10 MHz) and Vodafone (2x15 MHz) may wish to institute a spectrum sharing arrangement whereby they agree to share their spectrum in order to implement a 20 MHz carrier. This would enable them together to claim network data speeds and capacity equal to Telecom; consumer benefits may result from the provision of more than one network with the ability for the same very high data speeds. It is likely that this would only be technically possible if 2degrees' and Vodafone's spectrum blocks are neighbouring.
20. The auction's non-association rules and the acquisition limit present challenges to spectrum sharing. [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
21. [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
22. In conclusion, 4G roaming seems more likely and feasible than spectrum sharing but we do not wish to prevent spectrum sharing in the future if clear consumer benefits would result. Both would require the parties involved to be neighbouring and to reach a satisfactory commercial agreement.

9(2)(h) &
9(2)(f)(iv)
& 9(2)(g)(i)

9(2)(h) &
9(2)(f)(iv)
& 9(2)(g)(i)

Possible future market developments

23. 2degrees is the weakest market player. [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
24. [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
- [REDACTED]
25. If 2degrees was unable to make payments on the spectrum (assuming it takes up the five-year payment plan) or meet the implementation requirements within the five-year deadline, its management rights would return to Crown control/ownership. The Crown may therefore now wish to consider its future option value including selling 2x5 MHz to Vodafone, which Vodafone could use to upgrade its services. This would require placing 2degrees and Vodafone next to each other (i.e. ruling out options C and D).
26. Placing 2degrees between Telecom and Vodafone would provide 2degrees with more options for roaming,

9(2)(f)(iv)
& 9(2)(g)(i)

9(2)(f)(iv)
& 9(2)(g)(i)
& 9(2)(b)(ii)
& 9(2)(ba)(i)

and may appear to provide more options for future spectrum transfers and therefore increase the Crown's option value. However, because the maximum carrier size for 4G-LTE is 20 MHz and Telecom already has 2x20 MHz, Telecom would not be able to easily expand its network capacity if it had access to an additional 2x5 MHz, in the same way that Vodafone could easily expand its carriers from the current 15 MHz to 20 MHz.

Consultation outcomes

27. MBIE has consulted the three bidders on whether any placement options should be ruled out. Their responses are summarised below.

9(2)(ba)(i)

[Redacted]

28.

[Redacted]

9(2)(ba)(i)

[Redacted]

29.

[Redacted]

9(2)(ba)(i)

[Redacted]

30.

[Redacted]

9(2)(f)(iv) & 9(2)(g)(i)

[Redacted]

31.

[Redacted]

9(2)(ba)(i)

[Redacted]

32.

[Redacted]

9(2)(ba)(i)

[Redacted]

33.

[Redacted]

9(2)(ba)(i)

[Redacted]

34.

[Redacted]

9(2)(f)(iv) & 9(2)(g)(i) & 9(2)(ba)(i)

[Redacted]

35.

[Redacted]

9(2)(f)(iv) & 9(2)(g)(i) & 9(2)(ba)(i)

[Redacted]

[Redacted]

[REDACTED]

9(2)(ba)(i)

[REDACTED]

36.

[REDACTED]

37.

9(2)(ba)(i)

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

[REDACTED]

38.

[REDACTED]

[REDACTED]

Fiscal issues

39. Auction revenues to date have surpassed budget baseline forecasts. Limiting the placement options offered to bidders will have an impact on the amount they need to bid to obtain their preferred placement. Any loss in potential revenue due to limiting the placement options is difficult to quantify, as we do not know the value that bidders place on particular assignment options. For example, Telecom may have an interest in preventing 2degrees and Vodafone from arranging roaming or spectrum sharing, and may therefore be prepared to bid higher for the middle placement. However, under this situation the consumer benefits arising from market competition (through roaming or spectrum sharing) may outweigh any direct loss of revenue to the government.

40. Fierce competition between Telecom and Vodafone during the supplementary allocation rounds suggests that both are prepared to bid aggressively for their preferred outcome. On the other hand, Telecom may have now exhausted much of its “war chest”.

41. The Treasury has seen a draft of this report.

Risks

42. If options C and D are allowed and the bidding results in one of these options being the outcome, the current 2degrees/Vodafone 2G/3G roaming agreement could not be extended to cover 4G services. Future opportunities for secondary market trading would also be limited, as would the Crown’s options in the event that 2degrees is unable to complete the payment terms or implementation requirements.