

Digital Dividend

Opportunities for New Zealand

Ministry of Economic Development
August 2011

ISBN: 978-0-478-38210-5

Table of Contents

1.	Introduction	3
1.1	What is the Digital Dividend?	3
1.2	What are the Opportunities from the Digital Dividend?	3
1.3	What is Happening Internationally?	3
1.4	Allocation of the 700 MHz Band in New Zealand	4
1.5	Related Issues	4
1.5.1	WAI 2224: Māori Claim to the Radio Spectrum	5
1.5.2	Arrangements for Users of Radio Microphones	5
2.	Consultation Process and Timeframe	6
2.1	Purpose	6
2.2	Making a Submission	6
2.3	Cross-submissions	6
2.4	Publication and Public Release of Submissions	6
3.	The Digital Dividend in New Zealand	8
3.1	Best Use	8
3.2	Technology Choices for New Zealand	8
3.2.1	Long Term Evolution	9
3.2.2	WiMAX	9
3.3.3	Proposal	9
4.	Band Plans – Development and Implementation	10
4.1	Band Plan Options – Major Markets	10
4.1.1	Europe	10
4.1.2	The United States of America	10
4.1.3	Asia-Pacific Telecommunity (APT)	11
4.1.4	Timelines	11
4.2	Standards Development for APT Band Plan	12
4.2.1	Current Developments	12
4.2.2	Process	12
4.3	Preferred Band Plan for New Zealand	12
5.	APT Band Plan – Implementation in New Zealand	13
5.1	Relationship to Mobile Broadband Technologies	13
5.2	Division into Blocks for Allocation	13
5.3	Paired Allocations	13
5.4	Allocation of the Guard Bands	14
6.	Allocation Considerations	15
6.1	Current Allocation Policies	15
6.2	Relationship to the Radiocommunications Act	15
6.3	Existing Cellular Spectrum Holdings	15
6.4	Potential Reservation for Public Safety	16
7.	Competition Considerations	18
7.1	Relationship of the Radiocommunications Act to the Commerce Act	18
7.2	Competition in the Mobile Market	18
7.4	Spectrum Acquisition Limits	20
7.4.1	Caps Applied in the Digital Dividend Internationally	21
7.4.2	Cap Options for 700 MHz in New Zealand	21
7.4.3	Proposal	22
7.5	Implementation Requirements	23
7.5.1	International Developments	24
7.5.2	Implementation Requirements in New Zealand	24
8.	Allocation Methodology	25
8.1	Auction Design	25

8.1.1	Simultaneous Ascending Auction	25
8.1.2	Combinatorial Clock Auction	26
8.1.3	Industry Experience.....	26
8.2	Proposal	26
9.	Summary of Proposals	28
10.	Summary of Questions.....	29

1. Introduction

1.1 What is the Digital Dividend?

The 'digital dividend' refers to the part of the radiofrequency spectrum that is able to be freed up following the switch from analogue to digital television. The switchover is taking place across the world. Various countries have either already completed, or are mid-way through, the move to digital TV. The freed-up spectrum is then able to be allocated to new uses. Different regions around the world are releasing slightly different spectrum bands.

Analogue television in New Zealand is currently broadcast in the VHF and UHF frequency bands. The UHF TV band spans 502-806 MHz. Cabinet agreed in 2009 that the frequency band 510-694 MHz would be allocated to digital TV, and the remaining 694-806 MHz (the '700 MHz band', which is New Zealand's digital dividend spectrum) would be allocated to new services following the switchover to digital television (DSO).

In September 2010, Cabinet agreed that DSO would be completed by November 2013, following a four-step process beginning in September 2012. The switchover process is being run by the Ministry for Culture and Heritage, through the Going Digital Office.¹

1.2 What are the Opportunities from the Digital Dividend?

The allocation of the digital dividend provides opportunities to improve the provision, quality and use of wireless broadband within New Zealand. It will allow New Zealand to remain a 'fast follower' of international developments and technological advances.

It provides an opportunity to further encourage competition in the mobile market, encouraging further innovation and efficiency gains to create benefits for end-users – in terms of better services, and lower prices.

It provides an opportunity to support the implementation of the Government's Rural Broadband Initiative (RBI), encouraging the provision of rural mobile broadband services offering speeds and data capacity over and above those already contracted.

Some objectives that might be considered for allocation of the 700 MHz band are:

- An economically and technically efficient allocation of the 700 MHz band that promotes competitive outcomes in the market for mobile broadband services.
- Realising the productivity benefits offered by new technologies, including through:
 - Rapid deployment of next generation services to consumers.
 - Wide coverage of next generation services.

1.3 What is Happening Internationally?

The switchover to digital television is taking place around the world. Various administrations are encouraging, requiring, and helping transition viewers and broadcasters to digital television, recognising the dual benefits of digital television and the ability to free up a slice of spectrum, the digital dividend, to allocate to new uses.

¹ Details of this process can be found at <http://www.rsm.govt.nz/cms/policy-and-planning/projects/digital-dividend-planning-for-digital-television-and-new-uses> or <http://www.goingdigital.co.nz>.

Of those countries which have completed, or are in the process of, their transition to digital television, the vast majority have identified mobile broadband services as the preferred use of the digital dividend radio spectrum. Given the focus on mobile broadband, many countries are choosing to allocate the digital dividend in tandem with spectrum in the 2.5/2.6 GHz band, also designated for mobile use.

Some key international developments concerning digital dividend spectrum are:

- The United States held an auction in 2007, which resulted in two national mobile network operators acquiring spectrum, along with many regional operators.
- Germany and Sweden held auctions in June 2010 and February 2011 respectively. In both countries, three mobile network providers won 2x10 MHz each.
- France and the United Kingdom are planning to hold auctions to allocate both the digital dividend and 2.6 GHz bands later in 2011.
- Australia expects to hold an auction in 2012 to allocate the digital dividend and 2.6 GHz bands.
- India has begun considering the use of the 700 MHz band for new 4G wireless broadband uses, and is expected to release a consultation document in August.

1.4 Allocation of the 700 MHz Band in New Zealand

Once the switchover is complete and the 700 MHz spectrum has been cleared, it needs to be allocated to new users for new uses. This is the focus of this document.

First, the band will need to be technically divided (a 'band plan') into spectrum blocks that can be allocated. The design of this technical subdivision relies on identifying the preferred use of the spectrum by industry, and the most beneficial use of the spectrum to New Zealand.

In New Zealand, as we are largely a technology taker, the 'best use' is influenced by international developments, to allow alignment with major markets, ensuring availability of equipment.

Once a band plan has been decided upon, Government needs to determine the allocation methodology. This may include:

- The number and size of spectrum blocks to be allocated.
- The method of allocation (for example, by auction or another method).
- Any rules or conditions that may be placed on the spectrum blocks, including:
 - Competition safeguards, such as acquisition limits or implementation requirements.
 - Any potential reservations of spectrum to meet government objectives.

Finally, Government will need to decide upon the timing of any allocation process. While the spectrum will not become available for use until late 2013, there is benefit in an early allocation process to facilitate business planning and investment by any party that successfully acquires spectrum.

1.5 Related Issues

There are two issues connected to the 700 MHz band that must also be resolved, but are not the subject of this consultation paper.

1.5.1 WAI 2224: Māori Claim to the Radio Spectrum

The radio spectrum, its use by Māori, and its management by the Crown, are currently the subject of a Treaty of Waitangi claim (WAI 2224). The claim, lodged in December 2009, concerned the Crown's decisions at that time to designate spectrum for digital television (including what spectrum would be available for Māori broadcasting), and to free up the 700 MHz band (among others) for new uses.

The claim seeks findings that the Crown's policies are inconsistent with the principles of the Treaty of Waitangi on the basis that the electromagnetic spectrum is a taonga, which the Treaty partners are required to establish a long-term plan to manage, and to facilitate Māori participation in the telecommunications industry.

To date, the Crown has not accepted that spectrum is a taonga or that Treaty principles give Māori particular rights in relation to spectrum. However, it undertook to review issues relating to the Māori interest in spectrum allocation and management, and to also consider this as it developed plans for allocation of the 700 MHz band.

The Government is considering its approach to these issues in parallel with the consultation process set out in this paper.

1.5.2 Arrangements for Users of Radio Microphones

In the 2009 'Digital Futures' consultation process, which prepared for the switchover to digital television and the subsequent release of the digital dividend spectrum, it was recognised that radio microphones currently make extensive use of the spectrum in the 700 MHz band.

Cabinet agreed in 2009 that radio microphones will continue to be authorised in the new digital TV band, in areas where spectrum is unused for television services, and in unused parts of the 700 MHz band. These may include, for example, guard bands and inter-band gaps, which are not used for TV or mobile services in order to manage the risk of interference between different services. Identification of these frequencies, and how they may be used by radio microphones, will depend on the outcomes of the technical planning work and finalisation of the 700 MHz band plan.

2. Consultation Process and Timeframe

2.1 Purpose

This discussion document outlines the issues relating to allocation of the digital dividend spectrum resulting from the upcoming Digital Switchover (DSO) process.

The document seeks the opinions of interested parties on the analysis and options presented. This will be followed by a period of 'cross-submission' where parties who provided a submission will be invited to respond to any other submission.

Workshop

This discussion document will be supplemented by a workshop to be held on Thursday, 8 September 2011. The workshop will provide an opportunity for interested parties to clarify the proposals or assumptions within this document.

Please note that attendance at the workshop will not replace a written submission, and only written submissions will be taken into account in the final analysis.

To confirm your attendance at the workshop, please email radiospectrum@med.govt.nz (Subject line: "Digital Dividend Workshop") no later than Friday, 2 September 2011.

2.2 Making a Submission

Comments should be submitted in writing, no later than 7 October 2011, as follows:

Email (preferred)

radiospectrum@med.govt.nz (Subject line: "Digital Dividend Submission")

Post

Digital Dividend Submission
Radio Spectrum Policy and Planning
Ministry of Economic Development
PO Box 1473
WELLINGTON

2.3 Cross-submissions

Parties who have provided submissions within the initial consultation period will be invited to provide cross-submissions, responding to the submissions of other parties.

All cross-submissions should clearly identify to which original submission it responds, and which point(s) within that submission it wishes to address.

A period of four weeks will be provided for cross-submissions. These should be provided in writing, as above, no later than 9 November 2011.

2.4 Publication and Public Release of Submissions

Our intention is to publish all submissions on the Ministry website www.rsm.govt.nz. Submitters will be considered to have consented to publication unless clearly specified otherwise in the submission. We expect to publish all initial submissions by 12 October 2011, and all cross-submissions by 11 November 2011.

If parties wish to make points which are commercially sensitive, these should be submitted as a suitably labelled appendix. This will assist us to easily strip out such material and enable us to upload the submissions more rapidly.

Submitters should also be aware that the content of submissions provided may become subject to public release under the Official Information Act 1982. Please advise if you have any objection to the release of any information contained in a submission, and in particular, which part(s) you consider should be withheld, together with the reason(s) for withholding the information. Confidential information should be clearly marked. The Ministry will take into account all such objections when responding to requests for information on submissions to this document under the Official Information Act 1982.

The Privacy Act 1993 establishes certain principles with respect to the collection, use, and disclosure of information about individuals by various agencies including the Ministry. It also governs access by individuals to information about themselves held by agencies. Any personal information you supply to the Ministry in the course of making a submission will be used by the Ministry only in conjunction with consideration of matters covered by this document. Please clearly indicate in your submission if you do not wish your name to be included in any summary of submissions that the Ministry may publish.

3. The Digital Dividend in New Zealand

Given the international developments, and the decisions already made regarding the switchover to digital television and the allocation of the 700 MHz band to new uses, it is important to consider how best this spectrum should be allocated. This consideration will inform the selection of the most appropriate band plan, and help the Ministry plan for both the most economically and the most technically efficient allocation of the band.

3.1 Best Use

New Zealand is largely a technology taker. Therefore, the 'best use' will be heavily influenced by international developments, to allow alignment with major markets, ensuring availability of equipment.

Economic studies internationally suggest the highest economic benefit in using digital dividend spectrum will come from allocating it in a form suited for mobile broadband. Other countries are generally following this course. Expected allocation of digital dividend spectrum to mobile broadband use has underpinned the development of most band plans internationally.

Analysis by Venture Consulting² has suggested that allocating the 700 MHz band to mobile broadband would also provide the highest economic benefit to New Zealand, in the range of \$1.1 to \$2.4 billion over twenty years, largely from the reduced costs of deploying mobile broadband networks in this band compared to deployment in higher frequency bands. The Ministry has not identified alternative uses which would offer comparable economic benefits.

3.2 Technology Choices for New Zealand

The Ministry aims to allocate spectrum in a technology-neutral manner. Spectrum management rights do not typically come with conditions specifying the technology that may be used. This recognises that technologies used to deploy wireless services are changing rapidly, and can be expected to change again during the life of the right. Technology neutrality encourages innovation by service providers, allowing them the flexibility to deploy the most efficient technology choice, and upgrade to new technologies as they become available.

There is, to some extent, a natural tension between this aim and the process of selecting a band plan. The selection of a band plan suited to the technology most likely to be implemented is essential to support a technically efficient allocation of the spectrum. There are currently two main mobile broadband technologies likely to be implemented in New Zealand – Long Term Evolution (LTE) and WiMAX. Both technologies are available in frequency-divided (FDD) or time-divided (TDD) modes.³

² <http://www.rsm.govt.nz/cms/pdf-library/policy-and-planning/digital-futures-planning-for-digital-tv-and-new-uses/Review%20of%20Applicability%20of%20Overseas%20Studies%20on%20Costs%20and%20Benefits%20of%20Digital%20Dividend.pdf>

³ FDD: separate frequency allocations are provided for the uplink and downlink communications. TDD: the same spectrum is used for both uplink and downlink, with the network alternating between uplink and downlink on a time basis.

3.2.1 Long Term Evolution

The most favoured mobile broadband technology internationally for the digital dividend spectrum appears to be FDD-LTE technology.

LTE offers operators and end users high data throughput and low latency. Peak speeds utilising multiple antennas (MIMO) in optimal conditions are in excess of 300 Mbps. While actual speeds experienced by users will be dependent on equipment and the number of users connected to any cell, it is clear that LTE offers speeds which could result in a step-change in mobile broadband connectivity.

The move to LTE is seen as the key next step for mobile network operators (MNOs) aiming to respond to the increasing demand for mobile data access. LTE offers greater spectral efficiency, allowing the provision of higher data speeds and greater data allowance, at lower cost. This will be particularly important for MNOs as average revenue per user from voice and text services falls.

FDD-LTE offers a natural upgrade path from GSM and W-CDMA technologies which are already widely implemented in New Zealand. It will be able to provide both mobile and fixed-wireless broadband services.

There is also growing interest from some manufacturers in using TDD-LTE in the 700 MHz band. This move is led mainly by equipment manufacturers and mobile network operators in China. At this time, however, the technology is largely untested.

3.2.2 WiMAX

WiMAX is a wireless broadband technology that evolved from the fixed-wireless and wireless LAN service, as opposed to the cellular origins of LTE. WiMAX originated as a 'last-mile' broadband service for remote areas that did not have access to fixed broadband.

As with LTE, WiMAX supports MIMO and the use of different channel bandwidths. Given the same channel bandwidth and number of antennas, LTE and WiMAX should be able to achieve similar transmission speeds.

WiMAX is typically deployed in TDD mode. FDD versions have also been recently developed. Most international deployments of WiMAX have been in the 2.3, 2.5 and 3.5 GHz bands. WiMAX has also been adapted for use in the 700 MHz band; however, there does not appear to be extensive demand to deploy the technology at this frequency.

3.3.3 Proposal

The Ministry understands from initial discussions with interested parties that FDD-LTE is the preferred technology at this time. This is consistent with international developments, where digital dividend spectrum has typically been allocated in a mode suitable for FDD technologies.

The Ministry proposes that an FDD band plan be implemented in New Zealand, but on a technology-neutral basis. This will allow operators to deploy the FDD technology they believe most suited to their needs.

Q1. What is the best use of the 700 MHz band in New Zealand? Do you agree that it should be allocated in a mode suited to FDD technologies?

Q2. Could or should both FDD and TDD modes be accommodated?

4. Band Plans – Development and Implementation

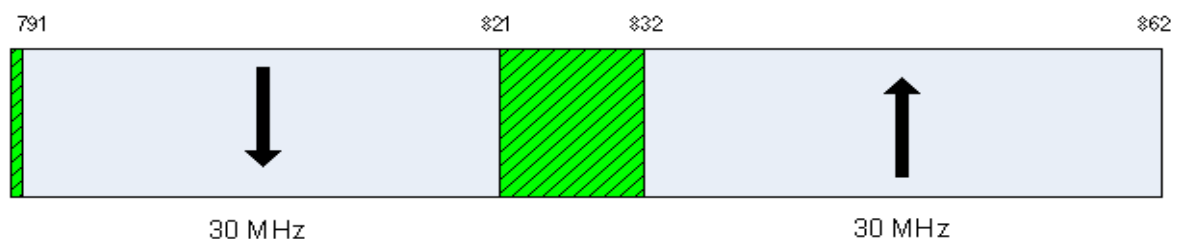
New Zealand is a small market and, as such, needs to align with a major market to ensure broad availability of equipment (such as consumer handsets) at low prices.

Band plans are typically set at regional/global level, and are defined by the International Telecommunication Union (ITU) through a Recommendation. Inclusion of a band plan in an ITU Recommendation is necessary for standards and equipment development to occur. Standards groups such as 3GPP determine the operating parameters of both the mobile devices and base station equipment that will utilise the band plans. Without these standards, manufacturers are unlikely to produce the necessary equipment.

4.1 Band Plan Options – Major Markets

4.1.1 Europe

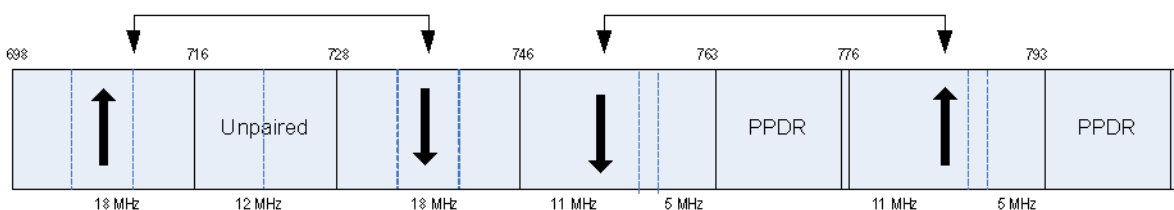
The European Union has recommended a band plan that consists of 30 MHz paired with an 11 MHz centre gap, spanning 790-862 MHz.



This is not compatible with New Zealand’s digital dividend (694-806 MHz). Some countries in Africa are expected to use the European band plan. A number of countries are also interested in a band plan that has been developed by the Asia-Pacific Telecommunity, as it aligns better with their potential digital dividend.

4.1.2 The United States of America

The United States has implemented a band plan for 698-806 MHz and has begun deploying services.



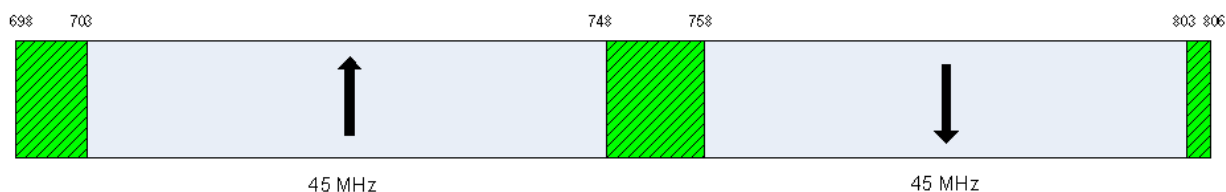
While it aligns with New Zealand’s digital dividend, we consider the United States’ band plan inefficient for use in New Zealand. It provides two nationwide paired spectrum holdings totalling 2x29 MHz, with many fragmented regional allocations, and unpaired allotments. The nationwide uplink and downlink spectrum blocks have been designed in a manner which only allows for two nationwide mobile network operators, and prevents handsets from being able to operate in both nationwide networks.

The plan is also designed around 6 MHz blocks of spectrum originally used for broadcasting. These do not align particularly well with the expected carrier sizes for LTE.

Canada, Mexico, and many South American countries have yet to determine a band plan. It is likely that Canada and Mexico will implement the US band plan due to their proximity to the USA. Several countries in South America, however, have indicated an interest in implementing an alternative plan, such as the plan developed by the APT.

4.1.3 Asia-Pacific Telecommunity (APT)

The APT has recommended to the ITU a band plan that consists of 45 MHz paired, with a 10 MHz centre gap. New Zealand has been involved in the development of this band plan.



Of the three options, this band plan offers the largest amount of useable spectrum. Due to the potential for large-scale regional or world-wide adoption, it is hoped that this plan will help drive significant economic growth in the region.

However, despite strong technical support for the plan internationally, few countries have formally confirmed their support for the band plan at this stage.

There is also some initial work underway to develop an APT 'TDD' band plan; however, the detailed engineering work for this plan is not yet particularly advanced. It is likely to span 100 MHz from 703-803 MHz, with no centre gap. Interference between TDD operators would need to be managed, either through coordination between operators on uplink and downlink operation, or the imposition of individual guard bands between operators.

4.1.4 Timelines

ITU-R Recommendation M.1036 sets out recommended band plans for the IMT and IMT-Advanced mobile technologies in different frequency bands.⁴ The current draft of this Recommendation now includes the APT band plan.

Finalisation of other parts of the Recommendation is expected to occur at the ITU-R Working Party 5D meeting to be held in October 2011. The Recommendation will then be submitted to ITU-R Study Group 5 for consideration at its meeting in November 2011. At this meeting, a decision will be taken on whether to circulate the Recommendation to ITU Member States for approval.

⁴ IMT (International Mobile Telecommunications) and IMT-Advanced are terms used to describe the capabilities of different generations of cellular mobile technologies.

4.2 Standards Development for APT Band Plan

4.2.1 Current Developments

Technical developments to date suggest that a dual duplexer will be required in handsets to cover the whole APT band, i.e. a single duplexer may not be able to cover the whole 45 MHz. It is unclear at this point what form the duplexers may take in the standards. If two duplexers are required to cover the entire 45 MHz band, these may be developed as two separate standards, or they may be one standard.

As a consequence of this standards development process, handset manufacturers may have the option of including just one of the duplexers in a handset, or they may be required to include both. This may restrict interoperability throughout the whole band, depending on handset design, although future duplexer designs may alter, or remove, these presently envisaged restrictions.

The final outcome of the standards development may have a bearing on the commercial value of different frequencies within the band plan.

4.2.2 Process

Before equipment can be designed that would operate in the APT band, standards and technical specifications need to be developed by the standards body 3GPP.

The standards development work has already commenced. 3GPP is expected to confirm the frequency standards for the APT 700 MHz band by March 2012. The subsequent availability of cost-effective handsets manufactured in scale will be dependent on adoption of the APT band plan by major markets.

4.3 Preferred Band Plan for New Zealand

Of the two band plans able to be implemented in New Zealand, the Ministry considers that the preferred band plan is the APT band plan. This plan offers significant benefits as it efficiently subdivides the spectrum band and duplex direction, offers the largest amount of spectrum to allocate to new uses, and has the potential for large scale international adoption, driving economies of scale in the development of equipment and handsets.

Adoption of the APT band plan is not yet widespread. It is likely that Australia will implement this band plan; however, to see the most benefits from economies of scale in equipment manufacturing, other large economies in the region will also need to adopt the plan. At present, it is unclear whether they will do so.

The Ministry proposes that New Zealand announce its intention to adopt the APT band plan, to be implemented from December 2013. The Ministry also proposes taking an active role in the promotion of this band plan to other Asia-Pacific countries. The Government would reserve the right to reconsider this position in mid-2012, should no large-scale adoption of the plan emerge.

Q3. Do you agree that New Zealand should adopt the APT band plan?

Q4. What alternative options should government consider if international support for the APT band plan does not emerge?

5. APT Band Plan – Implementation in New Zealand

To consider the development of related allocation policies, it is helpful to reference a band plan. While the decision on the most appropriate band plan will be made through this consultation process, for the remainder of the document we will assume the implementation of the APT band plan as the most likely outcome.

5.1 Relationship to Mobile Broadband Technologies

The three different band plans available have all been developed primarily with FDD-LTE technology in mind. This is particularly true for the APT band plan, which offers spectrum easily divisible into blocks suited to LTE carrier sizes.

At its current revision, the LTE standard allows carriers of the following sizes: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, and 20 MHz.

5.2 Division into Blocks for Allocation

A key consideration in the allocation of the digital dividend will be the subdivision of the band plan into blocks for allocation.

While several options exist, the Ministry considers that the most appropriate starting point would be to divide the spectrum into 5 MHz blocks. This is consistent with outcomes in European allocations of the digital dividend. It is our view that a 5 MHz carrier size is the minimum required to see the true benefits of LTE technology. 5 MHz blocks also provide an efficient, scalable allocation should the recipient of spectrum wish to deploy LTE.

5.3 Paired Allocations

Typically, New Zealand does not set specific technology or mode requirements in spectrum allocation, preferring to allow spectrum operators to acquire spectrum as they deem best for their business and deployment plans. Operators wishing to deploy FDD technologies in the past have ensured that they won both pairs of the required spectrum at auction.

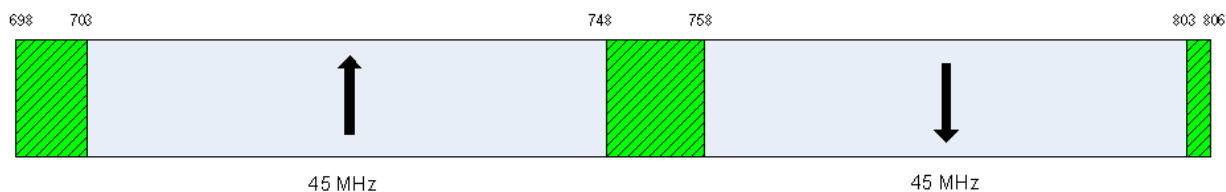
This is naturally in tension with the selection of a band plan, reflecting the Ministry's expected highest use of the spectrum – however this selection is essential to ensure maximum economic benefits to New Zealand.

However, there may be a case for the Government to select a preferred mode of technology – that is, FDD vs. TDD, to minimise interference between the two modes. As the expected preferred technology is FDD-LTE, the digital dividend spectrum could be allocated in paired blocks. This has been a common approach in international allocations.

The Ministry proposes allocating 700 MHz Rights in pairs of 2x5 MHz blocks.

Q5. Should the 700 MHz band be allocated in 5 MHz blocks together with natural pairs, i.e. 2x5 MHz?

5.4 Allocation of the Guard Bands



The implementation of the APT band plan will result in two 45 MHz spectrum blocks to be allocated for uplink and downlink communications, separated by a 10 MHz centre gap. There are also guard bands at both the low and high end of the band.

As discussed earlier in section 1.5.2, radio microphones will be authorised in unused parts of the 700 MHz band, for example, spectrum not able to be used for technical reasons to manage the risk of interference between different services, such as guard bands and inter-band gaps.

The Ministry also seeks views on whether the guard bands and centre gap identified as being required in the APT band plan (shown as hatched in the above diagram) may also be valuable for the provision of alternative, non-interfering and technically compatible services, and whether they should be offered for allocation.

Q6. Is there an alternative use for the guard bands and centre gap that should be considered?

6. Allocation Considerations

6.1 Current Allocation Policies

Current policies for the allocation of spectrum that is suitable for commercial use recognise that investment certainty is best achieved by allocating exclusive long-term rights. The Radiocommunications Act allows for allocation of spectrum rights for periods of up to 20 years.

In addition, acquisition and/or use of the relevant spectrum may be accompanied by competition safeguards, which operate in parallel with competition law ensuring that there is competition in the market.

In some cases spectrum in high demand is also required to meet public policy objectives that will not be delivered through normal commercial incentives. In these cases, it may be appropriate to reserve from the market allocation some spectrum for that purpose, or to place additional requirements on the use of the spectrum.

In determining market allocations and reserved allocations for a given band of spectrum, commercial and public interests need to be balanced in order to maximise the benefit that spectrum use provides to New Zealand.

6.2 Relationship to the Radiocommunications Act

The allocation of radio spectrum is governed by the Radiocommunications Act 1989. The Act sets out two different allocation regimes:

- **Radio Licences**
Radio licences are issued for a specific service at a set frequency, and are provided on an administrative 'first-come, first-served' basis. Radio licences are not tradable and have limited security of tenure. They are typically not suited to cellular mobile services.
- **Management Rights**
A spectrum management right ('right') is a tradable private property right to manage and use a defined band of the radio spectrum over the whole of New Zealand. With such rights comes considerable technical flexibility. Rights are 'usage rights' much more than anything else, reflecting a right to enjoy freedom from interference, more than simply a right to issue licences. Most managers deploy their own equipment in their rights, reflecting that the aim of spectrum management is to protect receivers from harmful interference, rather than to create rights to transmit.

6.3 Existing Cellular Spectrum Holdings

Cellular spectrum is typically allocated under the management rights regime, for terms of twenty years.

Currently, several bands are available to provide mobile cellular services in New Zealand, including the 850/900 MHz, and 1.8 GHz, 2.1 GHz, 2.3 GHz, and 2.6 GHz bands.

Rights in the 850 and 900 MHz bands were originally allocated in 1990 but variously commenced in 1991 and 1992. The renewal policy for these rights was confirmed in 2007, and

included aligning expiry of all cellular rights in the band to a common date, being 28 November 2031.

The Ministry proposes allocating the 700 MHz band as management rights for a term of slightly less than 20 years, to align with the expiry of the 850/900 MHz rights. This will allow renewal policies for all mobile cellular spectrum holdings below 1 GHz to be developed at the same time.

The Ministry therefore proposes allocating rights in the 700 MHz band for the period 1 December 2013 – 28 November 2031, subject to conditions discussed later in this document.

6.4 Potential Reservation for Public Safety

Government has an interest in ensuring adequate resources are available for public safety communications operated by agencies such as the Police, and Fire and Ambulance services (known generically as Public Protection and Disaster Relief (PPDR) services). The PPDR services currently have some spectrum reserved for their exclusive use for narrowband radio services. This provides for voice services and low data rate applications.

Emergency services agencies in New Zealand and abroad are interested in provisioning for the future use of broadband and wideband communications applications, such as remote access to databases and live video streaming. A reservation of some 700 MHz spectrum would be one mechanism to allow for this.

Internationally, a number of bands have been identified as suitable for PPDR use. In the Asia Pacific region the following bands have been harmonised for PPDR services: 406.1-430 MHz; 440-470 MHz; 806-824/851-869 MHz; 4940-4990 MHz; and 5850-5925 MHz. Some individual countries in the Asia Pacific have also identified the bands 380-400 MHz and 746-806 MHz for PPDR applications.

In the United States, a specific block of spectrum was reserved in the 700 MHz band for a public-private partnership to develop a PPDR mobile broadband network. However, this block did not sell at auction in 2008 and its future use is uncertain. Some PPDR-specific broadband equipment is however emerging for use in the US.

In Europe, discussions relating to wideband and broadband PPDR applications have centred on the use of bands in the 400 MHz range, although discussions are at a very early stage and decisions have not yet been taken.

More recently, Australia considered the reservation of spectrum for a broadband PPDR network and determined not to set aside any of the 700 MHz band for this purpose. It is instead considering options for PPDR access to spectrum in the 800 MHz band, building on work currently underway in the 3GPP to develop standards for broadband use in that frequency range. It has been proposed that the APT consider developing harmonised plans in this band to enable use of broadband technologies.

The Ministry sees two key arguments supporting a reservation of spectrum in the 700 MHz band for PPDR broadband use:

- The 700 MHz band will be cleared in the near future and is able to be allocated to new uses. Providing for PPDR broadband in alternative bands may require costly spectrum replanning and transitioning of existing users.
- PPDR broadband equipment is already emerging for use in the 700 MHz band, based on developments in the United States. There does not appear to be any other PPDR broadband equipment being developed for alternative frequencies at this time.

There are a number of arguments against New Zealand reserving spectrum in the 700 MHz band for PPDR use, however:

- PPDR broadband equipment designed to operate in the 700 MHz band is based on the United States band plan, which is incompatible with the APT band plan. Such equipment would not be able to be used in New Zealand at 700 MHz under the APT band plan. Additional development and customisation would be required, or the implementation of the US plan (foregoing the efficiency and economic benefits expected from adopting the APT band plan).
- Beyond developments in the United States, there is little evidence of emerging international harmonisation for PPDR use in the 700 MHz band. Most countries, including Australia, are looking elsewhere for spectrum suitable for broadband PPDR use. Use of the 700 MHz band in New Zealand for broadband PPDR would remove opportunities for international interoperability.
- It is not clear to what extent mobile broadband PPDR applications are 'mission critical' and could not be provided on a commercial network. The timing and utility of these applications remains uncertain at this point. There would be a significant economic cost in reserving spectrum that will not be used in the short- to medium-term and might not be used for the life of the management right.
- New Zealand has opportunities for broadband PPDR use in other parts of the spectrum, should the need be established. It would be preferable to harmonise PPDR broadband spectrum with that of Australia and other major markets.
- There are ways to provide PPDR services other than through a new reservation of spectrum. For example:
 - Broadband network capacity could be purchased from commercial service providers.
 - Permanent and 'hotspot' PPDR networks could be deployed using satellite-based technology.

Q7. Should a reservation for PPDR broadband use be made in the 700 MHz band? Why? Why not?

7. Competition Considerations

7.1 Relationship of the Radiocommunications Act to the Commerce Act

The Radiocommunications Act is silent on competition policy, with the exception of section 138 which specifically deems management rights, and spectrum licences granted within management rights, to be assets of a business for the purposes of the Commerce Act.

The Commerce Act prohibits the purchase of business shares or assets if that purchase leads to a substantial lessening of competition in the relevant market (section 47). Section 66 of the Act allows firms to make clearance applications to the Commerce Commission for an acquisition of business assets or shares. The Commission, in granting the clearance, must be satisfied that the acquisition would not have the likely effect of substantially lessening competition in the market.

Sole reliance on the Commerce Act for competition promotion can be problematic where, as may be the case for fourth generation data, services are not clearly defined or are non-existent, because the Commerce Commission guidelines rely on well-defined markets and market shares, and are difficult to apply where the future market is unknown.

If a spectrum acquisition proceeds but subsequently has the effect of maintaining or enhancing the market power of the right-holder, then the restrictive trade practices prohibition in Part 2 of the Act is not well suited to enabling access to the spectrum by existing or potential competitors. This is because the Commerce Act provisions constitute a largely principles-based approach and serve to restrict or punish anti-competitive behaviour after or as it is happening (ex post), whereas measures that actively promote competition (such as a spectrum cap) tend to be rules-based and prescriptive (ex ante, or forward-looking).

It can therefore be useful to apply ex ante policies on the acquisition of spectrum to support a competitive allocation. For instance, in 2001, the Government determined that the Commerce Act provisions may not be sufficient to promote competition in the 3G cellular market because the market was still emerging and the acquisition of spectrum was fundamental to how competition would develop.

Two key forms of competition control are set out in this section: spectrum acquisition limits, and implementation requirements. While options are proposed, these may need to be amended following the consultation process dependant on the final amount of spectrum available for allocation.

7.2 Competition in the Mobile Market

Since the previous major allocations of spectrum particularly suited for cellular mobile services or broadband wireless access in 2001 and 2007, the mobile market has developed substantially. Key to this has been the deployment of a third mobile network by market entrant Two Degrees Mobile (2degrees).

Mobile network concentration remains high, however, with the market share of the three operators, by number of subscribers, standing at Vodafone (51.5%), Telecom (39%) and 2degrees (9.5%).

Spectrum in the frequency range below 1 GHz is seen as particularly valuable to cellular operators as it allows a more cost-effective network implementation than in higher bands, and may enable an effective overlay of existing infrastructure, further lowering implementation costs.

Existing bands below 1 GHz suited to cellular operation are the 850 MHz and 900 MHz bands. These bands are being renewed for a 20-year period ending in November 2031. We have proposed assigning spectrum rights in the 700 MHz band to expire at the same time.

Over the 18-year period of the rights, it can be expected that the structure and composition of the mobile market will alter, although the nature and timing of changes cannot be accurately predicted. Therefore, consideration may need to be given to options allowing new entry into the market at some point over the term of the rights. Provision for another mobile operator in the future could be made in several ways. For example:

- **Set-aside**
A certain amount of spectrum could be set aside for allocation solely to a new entrant. If allocation is not successful in the initial process, this spectrum may be reserved for reallocation to a new entrant at a later date. This approach has costs as, if a new entrant does not emerge prior to commencement of the rights, valuable spectrum would lie fallow until a new entrant is ready to enter the market.
- **Spectrum caps**
Spectrum acquisition caps may be tailored to ensure a minimum number of parties acquire spectrum in the allocation process. This would work in a similar way to a set-aside, and prevents the efficient and full use of the available spectrum if a new entrant is not ready to enter the market. Possible acquisition caps are described in more detail below.
- **Sell-down requirement**
Spectrum could be allocated with a provision on one right requiring the operator to sell part of its spectrum holdings to a new entrant, should one wish to enter the market during the life of the right. Conditions on the right could require a minimum quantity of spectrum to be on-sold at cost-price, updated for inflation. The on-sold spectrum could be required to be in the 700 MHz band, or could on agreement be in the 850/900 MHz bands. While enabling new entry, this approach would lower the value of the spectrum to incumbent managers, and may create uncertainty around the value of further investment.
- **Roaming requirement at 700 MHz**
Spectrum in the 700 MHz band could be made available for nationwide roaming to new entrants in defined conditions. Under this approach, new entrants could deploy network equipment for services in urban areas using spectrum at higher frequencies, and roam on other networks where it is not economical to build an additional network.
- **A combination of a sell-down requirement and roaming requirement**
It has been argued in the past that it is not viable to build a new network without spectrum below 1 GHz. If this is the case, the two options could be combined; where an incumbent is required to sell down at least 5 MHz of spectrum to a newcomer in either the 850/900 MHz bands or the 700 MHz band. Once the newcomer has built a defined number of sites using the spectrum, roaming requirements would be applied.

While an increased number of operators may be beneficial for competition, each operator would be required to invest in network expansion and improvement, while having access to a reduced share of total market revenue (although total market revenue may grow). The limited population and market size in New Zealand, coupled with difficult terrain for radio propagation, may cause issues with minimum efficient scale for new entrants in the mobile broadband market. It is not clear to the Ministry to what extent other operators could be supported.

Furthermore, it is not clear whether providing for a new entrant in the mobile market would improve competitive outcomes in the market as a whole, or whether competition would be mainly between relative newcomer 2degrees and the new entrant, potentially undermining wider competition with the larger mobile companies.

At present, the Ministry is unaware of a potential fourth mobile network operator.

Q8. Should provision be made for a new entrant at some point in the future? If yes, how should this be done? If no, why not?

7.4 Spectrum Acquisition Limits

Acquisition limits (commonly known as ‘caps’) set a maximum amount of spectrum that any operator can hold or have an interest in.

While the prime objective of acquisition caps is to minimise risks to competition by a dominant firm acquiring a significant portion of spectrum, they may also be used to determine the minimum number of operators desired in the market, and to ensure an equitable allocation between operators.

These competition-focused objectives need to be balanced, however, with the objective of maximising the value of spectrum to society, and promoting other government objectives – such as improving the quality of broadband available in rural areas.

Setting the acquisition limit too low will limit the data speeds and network capacity that operators are able to offer, thereby reducing the potential quality of service and productivity improvements that could be seen from such a service.

The Ministry has applied spectrum acquisition limits several times in the past, in an effort to ensure a competitive allocation of spectrum. They have typically been applied to a specific band at the time of allocation. For example, in the 2.1 GHz auction, a cap of 2x15 MHz, recently relaxed to 2x25 MHz, was applied for a total band of 2x60 MHz, while in the 2.3/2.5 GHz auction, operators could not hold more than 40 MHz unpaired.

Specific competition safeguards for the 2.1 GHz spectrum, in the form of ownership caps, were created due to a perceived lack of certainty about the applicability of the Commerce Act mechanisms. This ensured a minimum of four initial participants in the 3G cellular market (at a time when there were no 3G services planned for deployment). While four operators acquired 2.1 GHz spectrum, only three have deployed services. The cap was relaxed in 2009 to 2x25 MHz to enable the unused block to be sold on the secondary market, should it be desired by the market participants.

Assessing optimal market shares for the 700 MHz spectrum is difficult when the future market and final band plan and spectrum availability are unknown.

7.4.1 Caps Applied in the Digital Dividend Internationally

Acquisition limits have been applied, or are likely to be applied, in digital dividend allocations in other countries. (Note that for allocations in Europe, the digital dividend only allows for 2x30 MHz total, compared to the 2x45 MHz available in the APT Band Plan.)

Germany

Germany set an acquisition limit of 2x10 MHz. Three of the four mobile network operators each acquired the maximum amount possible (2x10 MHz). One operator did not acquire any digital dividend spectrum.

Sweden

Sweden set an acquisition limit of 2x10 MHz. Three operators each acquired 2x10 MHz.

France

France is considering an acquisition limit of 2x15 MHz. This represents half of the available spectrum. Of the four MNOs, it is then possible that only two will acquire digital dividend spectrum.

France has also divided its digital dividend spectrum into four paired blocks for allocation – two 2x10 MHz blocks and two 2x5 MHz blocks.

It is therefore possible that the allocation process will result in MNOs holding differing quantities of spectrum (e.g., one holding of 2x15 MHz, one of 2x10 MHz, and one of 2x5 MHz).

United Kingdom

The United Kingdom is planning to set both acquisition limits and acquisition floors. The spectrum limits are not specific to the digital dividend spectrum, but rather span all sub-1-GHz spectrum, while the proposed floors set out options for combinations of sub-1-GHz spectrum with holdings at 1.8 GHz and 2.6 GHz.

The design of the auction and the caps/floors is intended to ensure a minimum of four MNOs holding spectrum packages deemed by Ofcom, the UK regulator, as sufficient to provide an effective and competitive mobile service.

Australia

We understand that Australia is considering options, but has not yet made any decisions regarding the application of acquisition limits.

7.4.2 Cap Options for 700 MHz in New Zealand

The cap options below, and associated analysis, are for a band plan offering 2x45 MHz of spectrum. The peak speeds assume LTE implemented with 4x4 MIMO. Peak rates represent the top speed achieved in optimal radio conditions and with only one user attached to the cell.

Cap	Indicative Peak Speeds	Potential No. of Operators	Comment
2x5 MHz	75 Mbps	9	Do not see true benefits of 4G technology. No demand for this number of operators.
2x10 MHz	150 Mbps	4.5	Minimum to see real benefits of 4G technology. Unaware of presence of fourth or fifth operators, so may not provide an optimal allocation.
2x15 MHz	225 Mbps	3	All existing mobile operators will be able to access spectrum, and provide strong services.
2x20 MHz	300 Mbps	2.25	Offers greatest technological benefits. May result in a non-competitive outcome.

The Ministry's objective is to identify the optimal level of the cap, which promotes ongoing competition in the mobile market, while realising the potential productivity benefits that larger spectrum holdings offer.

Therefore, while setting a cap limit at 2x10 MHz may encourage greater market participation, there is a significant reduction in potential service levels able to be offered. It is not clear to what extent the benefits from increased competition will outweigh the cost of reduced potential services.

Conversely, setting a cap at 2x20 MHz may result in a less than optimal competitive allocation, although could offer the greatest technological efficiency for spectrum utilisation.

Applying Caps beyond 700 MHz

There may be scope for caps to be applied more generally to all spectrum held in the sub-1-GHz band, similar to the approach taken in the United Kingdom. This approach would differ from previously applied policies; however, such an approach could allow flexibility in the 700 MHz allocation while continuing to ensure a competitive allocation of spectrum rights between operators.

Rights over a total of 2x15 MHz in the 850 MHz band and 2x25 MHz in the 900 MHz band are currently held by the MNOs and used to provide services. An example of a sub-1-GHz cap would be to apply a 2x30 MHz total cap on holdings below 1 GHz, should an MNO seek to acquire 2x20 MHz of spectrum in the 700 MHz band. This would limit the MNO's holdings in the 850/900 MHz bands to 2x10 MHz.

Enabling a party to acquire 2x20 MHz could be particularly beneficial in the provision of next generation mobile broadband services in rural areas, where it would typically not be economical to deploy 2x20 MHz carriers at higher frequencies.

7.4.3 Proposal

The Ministry considers that a compromise approach may be appropriate, in which the cap is set at 2x15 MHz, with provision, however, for one party to be able to exceed the cap to acquire a 2x20 MHz block. The 2x20 MHz block would be subject to additional conditions, likely to be either of the following:

- A 2x30 MHz sub-1-GHz spectrum cap. This would prevent one party from holding dominant amounts of spectrum in both the 850/900 MHz bands and the 700 MHz band. If an operator sought to purchase a 2x20 MHz block in the 700 MHz band, they would need to reduce any holdings in the 850/900 MHz bands to no more than 2x10 MHz.
- A requirement to sell down a specified minimum quantity of spectrum holdings to a new entrant, should one present itself over the life of the management right. The minimum required would be 2x5 MHz below 1 GHz, and 2x10 MHz above 1 GHz (if the new entrant does not already hold spectrum). The exact quantities would be clearly defined prior to the allocation process.

It is worth noting that acquisitions, regardless of any cap, will be subject to the Commerce Act (particularly sections 47 and 66) – with parties invited to seek clearance from the Commerce Commission prior to acquiring spectrum.

Q9. Should spectrum acquisition caps be applied in the 700 MHz allocation process?

Q10. If yes, what level of cap should be applied? Should caps be specific to 700 MHz or wider?

Q11. Should the Ministry endeavour to ensure that at least one party can access 2x20 MHz in the 700 MHz band? What impact would this have on competition?

7.5 Implementation Requirements

Implementation requirements specify that the spectrum must be used to provide a defined service within a set period of time. They are designed to help Government achieve its goals of technical efficiency in spectrum allocation, to spur investment at an early date, and to avoid spectrum being unused for lengthy periods (denying other parties from the opportunity to implement services). Failure to fulfil implementation requirements usually results in penalties, such as additional charges for use of the spectrum or forfeiture of the spectrum, to ensure compliance.

A practical timeframe for implementation of a service would need to recognise that equipment availability, network planning, and site and consent acquisition need to occur to achieve practical use.

Implementation requirements distort investment, as they may force a spectrum holder to invest before it is necessarily economic to do so. However, in the case of the 700 MHz band, the Ministry considers that they are justified. There is sufficient demand from consumers for additional mobile services and from operators for access to the spectrum, that the risk of distortion is outweighed by the need to ensure that spectrum is not held for the purpose of restricting access to others who may seek to deploy competitive services.

7.5.1 International Developments

France is considering including implementation requirements in its upcoming allocation process that will require operators to gradually improve total coverage provided (using any spectrum bands at their disposal). The exact targets are operator-specific.

The United Kingdom has proposed coverage requirements on one licence in the digital dividend band to deploy a network with a sustained downlink speed of not less than 2 Mbps with 90 percent probability of indoor reception covering least 95 percent of the UK population.

Sweden included coverage requirements in one digital dividend licence. The winner, Net4Mobility, will be required to provide coverage to all permanent homes and fixed business places that do not have data services with a bitrate of 1 Mbps by the end of 2013. The rollout cost is estimated at SEK300m (NZ\$52m) by the regulator. This licence sold for significantly less than other unencumbered licences.

7.5.2 Implementation Requirements in New Zealand

In New Zealand, implementation requirements have previously been deployed in the 850/900 MHz cellular renewals. The implementation requirement was that the spectrum be used to provide services to at least 65 percent of the population within five years. A 'buy-out' option was also provided, which allows spectrum holders to pay an additional 15 percent of the original purchase price to gain an additional two years to meet the implementation requirement. If the implementation requirement is not met within that time, the spectrum rights revert to the Crown.

The Ministry considers that including implementation requirements in the allocation of the 700 MHz band will help spur investment in the band and prevent spectrum hoarding. It proposes a similar approach to that taken in the 850/900 MHz bands, but that this should be balanced to allow a roll-out which is economic for operators.

While 65 percent population coverage was deemed appropriate for the provision of standard voice cellular services, this may not be an appropriate coverage requirement for mobile broadband services.

To minimise the risk of distorting market investment, but to balance this with ensuring that spectrum is effectively utilised, the Ministry proposes that an implementation requirement of providing fourth generation mobile broadband services with at least 50 percent population coverage within five years (i.e. by the end of 2018) may be more appropriate.

Q12. Should implementation requirements be placed on digital dividend spectrum? Why / why not?

Q13. What form should any implementation requirements take?

8. Allocation Methodology

Spectrum may be allocated in a variety of ways, including through:

- 'First-come, first-served'
- 'Beauty contests' (direct allocations)
- Contestable allocation such as auctions.

In bands that are highly valued and where demand exceeds supply, non-contestable allocations risk inefficient outcome. First-come, first-served allocation offers no assurance regarding the value of the use of the spectrum, and beauty contests assume that the Government is able to better determine the best use and who is best placed to provide that service than the market.

In such bands, the process for allocating long-term rights should determine the users who value the spectrum the most, to ensure the most economically efficient allocation. Auctions are typically used in New Zealand for market-based allocation, as the party who values the spectrum the most can be expected to be willing to pay the highest price.

Auctions also have the benefit of ensuring transparency in the allocation process. Auction rules are able to be designed to give effect to any desired Government policy outcomes (for example, including acquisition limits or implementation requirements). As these rules are published in advance of the auction, all players have full information for determining the spectrum's value.

In allocating spectrum by auction, there is some financial return to the Crown. The primary goal of the auction, however, is not to raise revenue, but rather to determine the party who values the spectrum the most.

8.1 Auction Design

Many forms of auction have been used for spectrum allocation, in New Zealand and internationally. There are two main options which the Ministry considers may be appropriate for allocating the 700 MHz band – the Simultaneous Ascending Auction (SAA), and the Combinatorial Clock Auction (CCA).

8.1.1 Simultaneous Ascending Auction

An SAA is essentially several traditional 'outcry' auctions held at the same time – bidding is held over multiple rounds where all lots are auctioned at the same time. This form of auction is particularly suited to the allocation of spectrum for cellular mobile purposes, as it allows operators to bid on multiple lots at once, enabling them to create paired spectrum holdings necessary to provide services. Bidding on lots is simultaneously closed when no new valid bids are received on any lot.

By auctioning the lots at the same time over multiple rounds, additional information is provided to participants in the form of other bidders' valuations. This form of price discovery also limits the 'winner's curse' as the highest bids are announced at the end of each round.

The mechanics of the SAA, coupled with an auction rule allowing the withdrawal of bids, enable bidders who see the licences as substitutable to move from lot to lot (or between groups of lots), based on their relative price. Similarly, as bidders are able to assess their ability to obtain a group of lots they see as complementary, they can modify their bidding strategy or withdraw from the auction as the situation dictates.

New Zealand adopted SAA in 1996 and has used this system for the majority of spectrum auctions since then.

8.1.2 Combinatorial Clock Auction

The United Kingdom is looking to allocate its digital dividend via CCA. Under this method, the price of spectrum blocks rises automatically (that is, price rises are controlled by the auctioneer, and not by the bidders) and incrementally in response to excess demand, via a 'clock' mechanism.

At each price level, bidders indicate the combinations of blocks they wish to purchase. If there is greater demand than supply, then the overall price increases by an increment. This continues until the price results in a level of demand which meets supply.

A key benefit of this approach is that bidders can place 'all or nothing' bids, avoiding exposure issues for bidders due to not being able to back out of failed aggregations of spectrum blocks. This also helps Government avoid inefficient allocations.

There are also downsides to the CCA auction, including the risk of reduced transparency for bidders, and the possibility of free-riding by some bidders.

8.1.3 Industry Experience

The Ministry considers that both auction methodologies would effectively allocate the digital dividend. However, when selecting an auction methodology, consideration should be given to industry and government experience of the auction process. The Ministry has a slight preference for the SAA methodology as it delivers the desired outcomes, and industry is sufficiently experienced in its operation. However, we are open to considering an alternative auction methodology, and plan to do so in more detail if the Government confirms that it will hold an auction for spectrum rights in the 700 MHz band.

8.2 Proposal

The Ministry proposes that the digital dividend spectrum be allocated via auction, once the outstanding international and domestic issues have been addressed.

The detailed selection of auction type and design of the auction rules would be developed following the outcomes of this consultation, and will be released for comment in mid-2012.

Ideally, the digital dividend would be allocated sufficiently in advance of DSO to allow winning parties enough time to plan their network investment.

However, there are a number of issues that need to be resolved prior to any allocation process occurring, including the development of relevant standards at 3GPP, the uptake of the APT band plan by a sufficient number of countries to ensure economies of scale in equipment and handset production, and the finalisation of the Crown's approach to addressing Māori interests in the radio spectrum.

Nevertheless, the Ministry considers that the outlook for uptake of the APT band plan and finalisation of standards development is positive. We therefore deem it appropriate to plan ahead based on these assumptions.

We propose to report back to Government with final recommendations on the timing and allocation methodology of the 700 MHz band in April 2012, once international developments are clearer.

This will be followed by a technical, targeted consultation on potential auction design and rules in June 2012, to allow an auction to be held in November 2012.

Q14. How should the 700 MHz band be allocated? Why?

Q15. Do you agree with the Ministry's proposed timeframe? Why? Why not?

9. Summary of Proposals

The Ministry proposes, therefore:

- Adopting the Asia Pacific Telecommunity (APT) 700 MHz FDD band plan, comprised of 45 MHz paired separated by the 10 MHz centre gap.
- Allocating the band in 2x5 MHz blocks (i.e. in pairs).
- Allocating the band as management rights, for the period 1 December 2013 – 28 November 2031 (to align with expiry of the existing 850/900 MHz cellular mobile management rights).
- Applying an acquisition limit of 2x15 MHz.
- Allowing for one party to exceed the acquisition limit, to achieve a 2x20 MHz block, and that this block be subject to additional competition controls, being either:
 - Imposition of a 2x30 MHz cap on all holdings below 1 GHz.
 - Imposition of a 'sell-down' requirement where the operator will be required to onsell at least 2x5 MHz below 1 GHz, and perhaps an additional 2x10 MHz above 1 GHz, to a new entrant, should one present itself during the term of the Management Right.
- Imposing an implementation requirement on the rights that they be used to provide fourth generation mobile broadband services to at least 50 percent of the population within five years.
- Allocating the rights using an auction.
- Releasing auction design, rules and timing for consultation in mid-2012.

10. Summary of Questions

- Q1. What is the best use of the 700 MHz band in New Zealand? Do you agree that it should be allocated in a mode suited to FDD technologies?
- Q2. Could or should both FDD and TDD modes be accommodated?
- Q3. Do you agree that New Zealand should adopt the APT band plan?
- Q4. What alternative options should government consider if international support for the APT band plan does not emerge?
- Q5. Should the 700 MHz band be allocated in 5 MHz blocks together with natural pairs, i.e. 2x5 MHz?
- Q6. Is there an alternative use for the guard bands that should be considered?
- Q7. Should a reservation for PPDR broadband use be made in the 700 MHz band? Why? Why not?
- Q8. Should provision be made for a new entrant at some point in the future? If yes, how should this be done? If no, why not?
- Q9. Should spectrum acquisition caps be applied in the 700 MHz allocation process?
- Q10. If yes, what level of cap should be applied? Should caps be specific to 700 MHz or wider?
- Q11. Should the Ministry endeavour to ensure that at least one party can access 2x20 MHz in the 700 MHz band? What impact would this have on competition?
- Q12. Should implementation requirements be placed on digital dividend spectrum? Why / why not?
- Q13. What form should any implementation requirements take?
- Q14. How should the 700 MHz band be allocated? Why?
- Q15. Do you agree with the Ministry's proposed timeframe? Why? Why not?