Submission

to the

Productivity Commission

Review of the Radiocommunications Acts and The Role of the Australian Communications Authority

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Prepared by

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Introduction

Market Dynamics Pty Ltd thanks the Productivity Commission for the opportunity to make a submission to this important Review.

Radiocommunications is an input to nearly every aspect of the Australian economy. Sensible and efficient management of this important resource is important to a well functioning economy in the dawning information age.

Since the early 1990s, Australia has attempted to introduce a range of spectrum management reforms that have sought to better equip Australia for the challenges of convergence and the rise of the information economy.

The Productivity Commission Review of the implementation of those reforms is very welcome, because in the view of Market Dynamics the outcome of the reforms has fallen short of the vision articulated when they were proposed. Further, through the implementation of what were new ideas at the time, many new issues have emerged about the policy and legal framework. These need to be reviewed and appropriate legal responses need to be developed in order to advance the objectives of spectrum management.

This submission will focus on spectrum licensing, but for context, will make comment on some of the other more obvious issues confronting spectrum management and opened for comment in the Commission's Issues paper.

Market Dynamics has been commissioned to assist other people making submissions to this Inquiry. This submission should been seen as separate, but it will cover some issues in a way that may appear familiar.

Disclaimer

Market Dynamics acts for and advises a number of clients with an interest in the issues before the Commission.

Nothing in this submission should be taken to infer that it has the support or represents the view of any party other than Market Dynamics Pty Ltd.

About Market Dynamics Pty Ltd

Market Dynamics Pty Ltd [ACN 093 681 255] was established in 2000 as a specialist consulting firm in the fields of radiocommunications and radiofrequency spectrum management, market design and the application of price-based allocation systems.

The principal consultant for Market Dynamics is Mr Ian Hayne, former Manager of the Australian Communications Authority Spectrum Marketing Team and leader of the development effort behind the ACA's implementation of "spectrum licensing".

Mr Hayne also managed the design and implementation of the ACA's computer-based simultaneous ascending auction system. In addition to managing a number of auctions using the system, Mr Hayne has advised a number of clients participating in spectrum auctions in Australia and around the world.

With 15 years experience in the Australian communications portfolio including as a senior manager in the broadcasting policy and radiocommunications areas, Mr Hayne is particularly well placed to provide expert commentary to assist the Commission.

A comment on institutional arrangements

This submission opens by addressing some of the issues in the current institutional arrangements for spectrum management in Australia.

Market Dynamics wishes to record its concern that the terms of this Review are limited to a review of the role of the Australian Communications Authority (ACA). The ACA fits within a context of administrative arrangements that includes the Department of Communications and Information Technology (the Department), the Australian Competition and Consumer Commission (ACCC), the Australian Broadcasting Authority (ABA) and the Office of Regulation Review (ORR) [and some others[1]]. All of these bodies contribute in some way to the administration of radiocommunications in Australia, and the review will not be complete without examining the role and interaction between each of these organisations in administering the Act. These issues are also touched on under the heading **Role of the ACA** below.

Radiocommunications spectrum management is undertaken within two separate statutory authorities. This has not always been the case, nor was it the case for the regulation of telecommunications. Until 1993, the regulation of radiocommunications was undertaken within a Department of State – within what at the time was the Department Transport and Communications. Prior to

[1] In the case of spectrum auctions, the interest and involvement of the central policy agencies and their concern for the budgetary impact of auction outcomes has become a new source of administrative action and attention.

the first round of telecommunications reforms, the same was true of telecommunications. Only the broadcasting sector of the communications portfolio has a long tradition of regulation by an independent body, through the Australian Broadcasting Control Board, the Australian Broadcasting Tribunal, and in more contemporary times, by the ABA. Even so, the transfer of technical regulation and planning to the ABA from the Department is a relatively new arrangement.

It is worth noting that up until the creation of the ABA, *technical regulation* of broadcasting services was undertaken within the Department[2] – within the Broadcasting Services Division, and its predecessors. It therefore had close administrative and physical "proximity" to technical regulation of radiocommunications.

Technical regulation of the broadcasting services bands is now undertaken within the ABA, and technical regulation of the rest of the spectrum is undertaken within the ACA. The Government's technical regulatory effort for radiocommunications spectrum is effectively split between two organisations with competing (indeed conflicting) goals.

One of the observable outcomes of the creation of the expert technical regulators has been the corresponding reduction of technical expertise available to policy advisers within the Department as functions have been devolved. Prior to this devolution, communications policy advisers had ready access to competent technical advisers (engineers and technical officers) – often little further away than a walk down the corridor, or at most to another floor. That is no longer the case.

Since the creation of the external technical regulatory bodies and the transfer of nearly all of the technical functions (and thus technical expertise) to these bodies, the Department has been left with reduced access to skilled, competent and knowledgeable radiocommunications and broadcasting technical advisers. The Department has access to skilled generalists and analysts and by and large, they do a good job within those skill sets, but there are comparatively few technically skilled advisers in the field of radiocommunications[3] to provide expert advice about practical spectrum management issues.

Communications policy advisers no longer have ready access to the sort of technical understanding that is important to the development of well considered practical advice for Government.

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2 In this paper I use the short-form "Department" for convenience, but it includes the previous manifestations of Communications, Transport and Communications, Communications and the Arts, Communications Information Technology and the Arts. The common theme is that the Administrative Arrangements Order that created each of these Departments referred at the time to specific pieces of legislation falling with the constitutional communications power at s. 51(v) of the Constitution.

3 This refers to people with formal training and experience as radio engineers, and radio technical officers.

Further, since technical skills for radiocommunications management in Australia have been fragmented across two agencies, there may be some duplication of managerial effort, and for staff, a less coherent career path than if the functions were consolidated in one agency. Maintaining a critical mass of skilled engineering and technical resources is already problematic for these agencies as the growing communications industry creates demand for these skills in the larger cities and away from the Federal bureaucracy.

This submission does not propose that the Commission advocate re-centralising the functions within Departments of State – on the contrary, the creation of expert regulators with statutory objectives is a notable advance. However, Market Dynamics believes there are significant administrative advantages for the regulation of radiocommunications if the technical and engineering skill sets within the ACA and ABA are combined.

The separation of "policy" from "technical" issues appears to have resulted in some administrative duplication. There are delays in the administration of radiocommunications as recommendations from the expert technical regulator are reviewed for their policy implications within the Department before Ministerial approval is recommended. In some instances, consultative efforts are duplicated. Few would doubt the right of a Minister to seek independent advice, but the current processes lead to duplication and delays as radiocommunications issues seldom have priority over the big ticket policy issues such as the future of public ownership of Telstra. Sometimes the processes associated with administration of radiocommunications take place over many months due to these administrative delays. The review of expert advice seems to offer little additional value to the taxpayer in terms of improved outcomes. One solution to this problem that the Commission may wish to consider in its recommendations is the application of strict statutory time limits by the Minister (and by implication, the Department) for the consideration of issues put before it by the expert regulator. Alternatively, to avoid the duplication of consultative effort, perhaps the burden of consultation could be shifted away from the ACA, towards the Minister and his or her Department. After all, if the Department is going to consult affected parties anyway, why duplicate that process?

While dealing with institutional issues, it is worth commenting briefly on the composition the Australian Communications Authority. While there are enormously talented and experienced people on the Authority and people for whom Market Dynamics has the greatest of respect, the skills and backgrounds of the current appointees tends towards backgrounds in telecommunications rather than radiocommunications spectrum management. All can be proud of their achievements in telecommunications, and no criticism is implied or intended. Nevertheless, Market Dynamics believes that the composition of the Authority may benefit from including a champion for the radiofrequency spectrum management cause.

Some background on spectrum management

The goal of radiofrequency spectrum management at its *simplest* level is to facilitate communication between transmitters and receivers operating at the same time, and on the same frequency, within the technical limits of the transmitter to create radiation, a receiver to detect that radiation, and the characteristics of signal propagation loss. From there, the issues become more technical, more complicated and less certain. Essentially, spectrum management is about coordinating transmitters and receivers so that effective communication is possible and not subject to unacceptable interference.

There are also economic dimensions to spectrum management. These come from dealing with concerns about the allocation of what can be scarce resources within which technical coordination can take place, so that the utility of the resource for the community is optimised.

Notwithstanding this economic dimension, modern approaches to spectrum management should be seen in their historical context – a context dominated by an engineering and technical paradigm. We manage the spectrum the way we do to a large extent because "we've always done it that way".

The development of direct Government intervention in spectrum management can be seen initially in the context of the Great War, when spectrum management for the rudimentary radio systems of the day came under control of the Department of the Navy. In the early 1930s, radio began to proliferate as an entertainment medium. While it is not the intention of this submission to enter into an historical discourse, the unrestrained proliferation of broadcast radio, particularly in the USA (but not restricted to there), led to the need for a type of intervention that was probably the most appropriate for its day and which remains largely in place around the world – the idea of Government's authorising devices to operate, and creating an legally sanctioned offence for people operating devices without authority. The general scheme is echoed in the apparatus licensing system in Australia, with its cohorts practised in many other countries.

It is important to remember, however, that Government licensing is only one solution to the issues raised by an "open access" resource[4], and not necessarily the only one. It is largely an accident of history that we use this one today.

The current approach to spectrum management should also been seen in the context of an international central planning approach mandated by the International Telecommunication Union. The ITU's Radio Regulations provide a foundation for the practice of spectrum management around the world. These practices have also grown within an historical context.

[4] The term "open access resource" comes from the Commission's Issues Paper. The resource has many common good characteristics which if not considered properly would lead to a tragedy of the commons.

In land, which presents many similar issues to spectrum, the solutions to the open access problem come from a notion of "property rights", enforced by land title and common law. Over the last 40 years or so, emerging problems in spectrum management have led to the analogy of land being used in discussions about the future of spectrum management. The analogy is useful, but not complete, nevertheless it provides an alternative conceptual framework within which to address public policy problems associated with spectrum management and resource allocation.

The type of traditional Government licensing we have in Australia is asserted to create distortions and inefficiencies in the allocation of the spectrum resource[5]. In Australia, this was highlighted in 1990 by the Bureau of Transport and Communications Economics (BTCE) and by the House of Representatives Standing Committee on Transport Communications and Infrastructure (HoRSCOTCI). The so-called Government "micro-economic reform agenda" focused on radiocommunications for a time between 1989 and 1992. That process led to the *Radiocommunications Act 1992* and an attempt to introduce a mixed market/administrative model of spectrum management[6].

BTCE identified a body of academic literature that advocated a different management regime for spectrum – one that was believed to suffer fewer of the distortions and inefficiencies of the direct Government licensing model.

This model was predicated on land-like pseudo property rights[7].

A limited version of this was implemented in law in the "spectrum licence" concept introduced with the *Radiocommunications Act 1992*.

A central part of this submission advocates that the reforms implemented in 1992 were incomplete – they did not go far enough to advance the true benefits of a market based model that at the time was not well understood. This submission argues that the reforms started in 1992 need to be completed by:

. *adding <u>perpetual</u> spectrum property rights; and*

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5 This general theme is explored in some detail in Australia, Bureau of Transport and Communications Economics (1990), *Occasional paper 102 – Management of the Radio Frequency Spectrum – An Economics Analysis,* AGPS Canberra.

6 Similar reviews of telecommunications and broadcasting policy were undertaken in much the same way and in the same timeframe.

7 This submission refers to the regime as a pseudo-property rights regime because while it displays some characteristics that are drawn from the land property rights analogy, it is legally not a true property rights regime. This submission argues that the move to a more completely defined property rights regime in spectrum would be an important enhancement to the practice of spectrum management in Australia.

. *developing an improved understanding of the transition of a band from centrally planned "apparatus licensing" to "spectrum property rights"; and*

. *deploying the model more widely and strategically to deal with a wider range of communication issues.*

Objectives of the Act

In a time of rapid technological change, some of the objectives of the *Radiocommunications Act* now seem quaint and anachronistic.

Words such as *overall public benefit* mean little to those hardened by having had to navigate them. To illustrate, one view might hold that public benefit is maximised when the spectrum as a whole is used efficiently. Another might hold that *overall public benefit* is maximised by allocating spectrum on favourable terms to users regarded as socially worthwhile. There is no objectively defined *best* answer – rather there is a set of optimisations that give different weight to issues depending on the circumstances of the day, quite often with a political imperative. Unfortunately, this does little to assure stability and predictability in Government decision making that are so important to business investment decisions.

Overall public benefit is a ***subjective*** concept that has a limited place in a list of statutory ***objectives.*** Perhaps it is time for the Commission to recommend something more definitive.

Some other objectives appear inherently contradictory. For example *efficient allocation of spectrum* under the Radiocommunications Act for telecommunications has been taken to imply spectrum licensing and publicly contestable auctions, whereas the *communications policy objectives of the Commonwealth Government* can mean that broadcasting spectrum is not subject to auction and not used to its efficient optimum – rather it is planned in a way that limits the number of services that can be provided in an area, and then only a part of the planned capacity is released for use – not an "efficient" allocation scheme at all.

Provision of spectrum for public or community use sits uncomfortably with the notion that spectrum should be allocated in a way that is efficient. Favouring particular classes of user can distort the efficient allocation of the spectrum resource.

Market Dynamics believes that Australia needs a coherent and efficient approach to spectrum management based on some simple principles which could form the guiding foundations for a set of new statutory objectives:

. spectrum is a national economic resource;

- efficient allocation and management of the resource is a matter of national importance in an age of rapid technological change, convergence and a growing global information economy;

- transparency and technology and service neutrality are fundamental to efficient management and allocation, particularly as these affect business and investment decisions;

- spectrum users, for the most part, are in a better position to understand efficiency and its associated trade-offs than Government because they have better access to private information about these issues than Government[8];

- regulation of spectrum should not be unduly influenced by other elements of public policy, but rather these other elements should be expressed explicitly, openly and transparently and in a way that does not distort the underlying efficiency of spectrum management for the national good.

Spectrum Planning

Market Dynamics supports the Australia's role as an active participant in the work of the ITU, and in particular, the ITU's role in coordination of internationally required communications services such as satellite services, international aviation and maritime services and so on.

Market Dynamics also supports to some extent the role of the ITU in guiding the international allocation of some bands for purposes that allow the development of a mass-market, such as radio, television, and mobile communications. These allocations give the manufacturing sector confidence about the scale of the market for particular goods and services.

However, in an era of rapid technological change, Market Dynamics is skeptical about the ability of the central planning model, such as practised by the ITU, and through Australia's involvement in the ITU's processes, to remain relevant and up to date for some of the planning activities it undertakes. Market Dynamics believes that the central planning model practised internationally may ***intervene too deeply in the detail of spectrum use***.

The rate of technological change in some communication sectors is now so fast that there is a real danger that a band planned for one use today could be near the end of the product life-cycle for that use by the time the band is available for licensing and allocation.

[8] In the current regime, it is also true that spectrum users have incentives to misrepresent or with-hold this information about relative efficiency, compounding the spectrum management problem.

The typical consumer life-cycle of a mobile telecommunications technology provides a good example. In Australia, since the early 90s, we have had AMPS, then GSM, then in the last few years IS-95 (CDMA), and more recently the GSM enhancements like GPRS. ITU compliant 3G systems based on the US CDMA 2000 1xEV platform are today being shipped in countries like Korea and China[9]. The evolution of the GSM platform to wideband CDMA (W-CDMA), the preferred European 3G platform, is underway, albeit with huge technical hurdles to be overcome.

The ITU's radio plenary meets only every 2 years, and the preparatory lead up for developing an Australian position takes many months. In many ways, preparation for the next ITU commences on the day of completion of the last. Once the ITU has reached a position, local implementation including review and consultation over any necessary revisions to the Australian Spectrum Plan can take up to a year. If subordinate Band Plans are required to give effect to a change in spectrum use, this process of clearance and re-farming can take many years.

This is clearly not a timely or efficient way of managing spectrum in an era of rapid change. A product life-cycle can pass before the administrative process for its deployment can be completed.

Central planning can also fail badly by making planning decisions that cannot be sustained in the market. No better example of this exists than in the hype surrounding 3G mobile telecommunications in Europe. The euphoria about the prospects for 3G led Governments around the world and especially in Europe to re-farm valuable spectrum for this service, yet in Europe, the preferred and Euro-mandated technology (W-CDMA) still doesn't work and there is no credible business case yet involving high speed data that seems to justify investment. We see a procession of international carriers (including our own Telstra[10]) announcing that they have shelved plans for a 3G rollout for the time being. Whether or not a sustainable business can be made out of 3G data (its big selling point) when the dominant source of revenue form mobile telecommunications is voice traffic remains to be seen. In the meantime, European carriers carry billions of Euros in debt, CEOs of leading carriers are being forced to resign, and carriers are having their credit worthiness slashed.[11].

3G may well be recorded as one of the greatest failures of central planning in the history of western industrial economies.

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9 although pointedly ***not*** in the centrally planned ITU proposed bands for 3G recently auctioned in Australia, where equipment remains some way off being available. So much for the effectiveness of central planning!

10 See Australian Telecom, October 2001, Cover Page.

11 Market Dynamics has an extensive collection of emailed notes and press clips relating to the European 3G train wreck that can be made available to the Commission if required. Market Dynamics is indebted to JKN, "London Joe" for his coining of and making widely known the term "3G train wreck".

Government needs to recognise these failings – it is no longer enough to pretend that the existing system works and works well. Evidence to the contrary in the international 3G train wreck is there for all to see.

In Australia, we had the courage to recognise this potential problem and took the first tentative steps to solving it nearly a decade ago.

Our solution revolved around some tentative ideas on pseudo property rights implemented with "spectrum licensing", and the ability to trade those rights to provide the telecommunications industry with the flexibibility to make its own decisions about technology. We also set a goal of establishing a more rational pricing model so that pricing signals could be used to moderate demand in some parts of the spectrum and reduce the distortions in spectrum allocation. These reforms were directed at increasing the role of the private sector and spectrum users in spectrum management and decreasing the influence of central planning.

Other countries are now starting to look for similar tools.

On a recent trip to the US and UK, the author met with senior administrators in the US Federal Communications Commission (FCC) and the General Accounting Office (GAO), and the Radiocommunications Agency in the UK. All expressed interest in the ideas and concepts behind spectrum property rights because they are currently reviewing options for ***trading*** in spectrum to allow market based decisions about spectrum use and to facilitate more efficient use of spectrum. Australia is not alone in recognising the potential for problems that flow from a central planning model.

Trading implicitly depends on having something that can be traded, and property rights meet that requirement. It is worth noting here that the current spectrum licensing approach in the Australian regime places some constraints on trading which have so far limited its utility as an alternative to centralised Government spectrum planning. Spectrum property rights as an alternative to spectrum management are explored further under the next heading, **Licensing**, in response to the Commission's *question is there an alternative to licensing for allocating spectrum*?

This submission supports a continued role in the work of the ITU where Australia is highly regarded, but suggests we can do a great deal to avoid too much administration and central planning at too fine a level of detail. This submission argues that the private sector can play a much greater role in managing the spectrum allocation process, and that fully tradable perpetual spectrum property rights may play a significant role in promoting good outcomes in our own spectrum use and management.

Licensing

Australia has traditionally used licensing to authorise and manage access to radiofrequency spectrum. There are characteristics about radiofrequency spectrum that make licensing by Government a reasonable way of managing the resource for public good. The system has served us well, but is now showing its age.

The current planning and licensing regimes continue to create the distortions identified by BTCE a decade ago. The so far limited deployment of spectrum licensing has not made a fundamental difference in dealing with the concerns raised by BTCE – rather, patchy and inconsistent deployment has served to exacerbate some the problems.

Spectrum "planned" for broadcasting services continues to be used "inefficiently" – by that, Market Dynamics means the number of services licensed is below the capacity of the spectrum to support services. Even if there is a limit on the number of broadcasting *services* that should be permitted for public policy reasons, that is no reason to lay waste to large tracts of spectrum and withhold them from use for *other* purposes.

Spectrum also continues to be held in large volume by Defence agencies in Australia to maintain capabilities that might be required in the event of hostilities. Interestingly, in the USA, there is an awareness of and a likely future debate about whether or not Government agencies such as Department of Defense and the military should be granted perpetual property rights in spectrum so that they might release to the market surplus spectrum in response to market signals. That is a debate we should have here and is considered further below under **Non Commercial Use**.

Spectrum for mobile telecommunications was released progressively to the market as a matter of policy, creating artificial scarcity in the low microwave area at auction points in 1998, especially in 2000 and then in 2001. The artificial scarcity led to artificially high prices for spectrum and one could postulate that may have been a factor in the demise of the former One.Tel[12].

Some apparatus licensed bands are full to the brim and cannot sustain more licensing in, for example, the 800 MHz TLMS bands Sydney and Melbourne[13]

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12 In the initial 1998 allocation, only 2 x 45 MHz in major cities was released out of a potential 2 x 75 MHz. The remaining 2 x 30 MHz in major cities was then released in 2000 in the PCS 2000 auction to meet the demand (largely from the former One.Tel) for access. That second auction netted $1.3 billion as a reflection of that demand – a price distortion that may have had a negative effect for One.Tel in the subsequent market and is likely to be reflected badly on the balance sheet of at least one other bidder for some time to come. It should be noted here that decisions to bid these amounts in spectrum auctions were commercial decisions made by bidders – the Government cannot and should be attributed responsibility for the prices bid and paid.

13 The last two block of 5 channels in the 800 MHz TLMS band in Melbourne were allocated by public auction in 1998.

Market Dynamics believes that the steps taken to introduce a pseudo-property like right in spectrum introduced in the 1992 Act and implemented since 1996 have been ***only partially*** successful, although the licences themselves have been met with confidence by the radiocommunications industry. Licences worth more than $2.5 billion have been allocated by public auction and secondary market trading has been strong (considering the small number of licensees and licences). However, the fact that spectrum licensing has been so narrowly deployed means that the existence of spectrum licences has had little if any effect in addressing the wider distortions in spectrum management created by a history of central planning.

Market Dynamics believes that it is now time to complete the 1992 reforms and move to a full perpetual property right in spectrum. Perpetual property rights are a justifiable and viable alternative to licensing in many bands of the spectrum. They open the way for spectrum to be traded as a way of dealing with new technologies and efficiencies, rather than having to wait for bands to be re-planned within the central planning model. They provide the certainty necessary to sustain on going capital investment in communications and provide a framework for new capital investment following trading at any point in the term of the licence. They enable surplus spectrum to be released back to the market in response to market incentives, and with the owner taking the benefit of the transaction. The centrally planned model, by contrast, has little response to recovering surplus spectrum because it seldom has information about what is surplus and users have no incentives to make that information available. Perpetual rights can make spectrum management much more responsive to the growing pressures of a growing information and communication economy.

Market Dynamics acknowledges, however, that private property rights are not a universal panacea and would be inappropriate for managing some bands. So, Market Dynamics supports the continuation of a licensing regime based on devices in parallel with a property rights regime. This is analogous to the concepts of “Crown land” and “private land”. In short, this submission advocates a continuation of the mixed market/administrative approach to spectrum management, but with an important change in bias: rather than apparatus licensing being regarded as the default condition and spectrum licensing the exception to be justified through extensive consultation, Market Dynamics would like to see a reversal (or at the very least a re-balancing) so that spectrum licensing and private property rights are regarded as the default condition and apparatus licensing is justified on a case by case basis. Market Dynamics would like to see a much more strategic vision of spectrum property rights that avoids the distortions in price we have seen created through restricted allocation of spectrum in the market.

The further deployment of a private property rights regime for radiofrequency spectrum allows scope for a ***contestable spectrum management*** regime, where other bodies than the ACA authorise people to use spectrum under

their own approach to device coordination. This already happens to a limited degree, but it could have much more widespread application as a tool of spectrum management.

Perpetual rights would be a significant change from the fixed term non-renewable right currently "enjoyed" by spectrum licensees. The issue of the term of a spectrum licence or property right is considered further under **Tenure**.

Licence Types

Central to any state managed licensing regime is the idea that one is not permitted to operate a device and create radiofrequency radiation without a licence. All licensing regimes create some sort of offence that allows the state to sanction people who do not submit to the licensing regime. Without this authority, the licensing regime would soon be a farce[14]. Fishing without a licence, driving a car without a licence, selling tobacco without a licence, selling alcohol without a licence – they all have one thing in common – legal sanctions! So too in radiocommunications – to operate a device without a licence is to entertain the prospect of prosecution.

In Australia, we have three licence types for radiocommunications[15]:

. apparatus licensing which focuses on the Government authorising devices;

. class licensing; and

. spectrum licensing.

From a theoretical perspective, all of the spectrum can be considered to start within a "parent" [or "root"] spectrum licence that is held by the Government. This derives from the constitutional provision for the Federal Government to makes laws with respect to postal, telegraphic, telephonic, and other like services[16]. There is general acceptance of the principle that the Commonwealth is the root legal authority over spectrum in Australia. The Government has "root" management of the entire spectrum over all of Australia.

Within that "root" licence, the Government (through the ACA) plans and coordinates radio devices within an ordered hierarchy of planning instruments

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14 It could already be argued that low compliance rates in some bands already render the licensing regime ineffectual. Class licensing is an obvious response to this and has been applied to CB radio and some other bands for a number of years as a way of dealing with widespread non-compliance with an individual non-assigned licence type.

15 Note however, that there is also an "exempt" class that relates to Australian Defence Force and National Security issues.

16 *Commonwealth of Australia Constitution Act,* s. 51(v)

to minimise interference. This is ***apparatus licensing*** as we currently understand it and it provides for centrally planned coordination of devices within a homogenous radio environment constrained by the hierarchy of the Australian Spectrum Plan, subordinate Band Plans, and ultimately by the many planning instruments and instructions such as RALIs[17].

Class licensing in many ways is like a public park or common. The ACA creates out of its "root" licence bands that are to be class licensed, and it creates a set of standard conditions that allow anyone to operate devices within the "park" provided that they comply with the rules posted at the metaphorical entrance to it. Users would normally only be sanctioned for breaking the posted rules of the park.

The concept of ***spectrum licensing*** as embodied in the law today takes defined bands over defined geographic areas out of the "root" licence and creates a form of right to plan and deploy devices within that licence, subject to the devices not interfering with other devices outside the boundaries. Within the licence, the licensee has substantial freedom. There is normally no band plan constraint, no technical standards enforcing one technology or another, no other technical constraint other than the boundary conditions[18].

There is substantial latitude for spectrum licensees to choose their own type of communications system without the limitations of the spectrum plan, band plans and RALIs. Even so, the right as currently defined still requires that application of "good engineering practice" when planning devices within a spectrum licences and it requires that all devices be registered with the regulator, and certified that they will not cause unacceptable interference. Spectrum licensing does little to alter the basic requirement that all new ***radio devices*** be coordinated with radio devices that are already in place[19]. While spectrum licensing creates some new freedoms for the licensees, there remain substantial obligations. Market Dynamics believes that many of the constraints on spectrum licensees could be substantially simplified, but detailed technical discussion about how this might be accomplished is outside the scope of this submission.

After a number of years, spectrum licensing in Australia appears not to have been actively embraced by the administration of radiocommunications with the

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17 Radiocommunications Assignment and Licensing Instructions. These are the administrative practices that the ACA follows and that it expects external parties to follow in all frequency assignment for apparatus licensing.

18 It is important not to understate the complexity of these boundary conditions. The ACA uses a sophisticated procedure and complex nominal path loss algorithms to give effect to these boundary conditions.

19 This "first-in-time" rule is fairly fundamental to the current scheme because in the event that interference is caused by the addition of a new device to the radio environment, normal practice would have it that the last device in is the cause of the interference, and the operator of that device has some responsibility for rectification to restore the utility of others previously enjoyed.

fervor that BTCE might have expected[20]. Spectrum licensing remains the exception, to be carefully justified to Government[21], rather than a default condition with which everyone is comfortable. There are some reasons for that cautious deployment, including some difficult issues within the regime as it has been implemented in law. This submission, however, advocates that it is in our national interest for spectrum property rights to be regarded increasingly as the "default" condition, for spectrum licensing to be overhauled, and for continued centrally planned apparatus licensing to increasingly become the exception that needs to be justified on public policy grounds.

Despite the advantages of spectrum licensing, the joy that licensees have for it, and the fact that its has brought more than $2.5 billion to the Australian Federal Budget, the ACA (and other agencies, for the ACA does not act alone) deploys spectrum licensing sparingly. Compared with the auction record of the US FCC over the same period of time, the Government has released only a fraction of the number of bands to the market. That is not a true comparison, for the regulatory regimes are different and the US does not have a property rights model or the issues of transition, but the rate of progress is a viable comparison. The Commission needs to consider why our processes are so much slower than the US and why it takes so long to get a band into market. Market Dynamics has some observations on this issue under **Role of the ACA** that relate in part to the administrative burden on the ACA placed on it by the legislation.[22]

The ACA's web site shows a limited *forward* outlook for spectrum licence auction based allocations in its recently released rolling forward program of

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20 The Act provided for spectrum licensing in 1992, but the effect of the provisions commenced in mid 1993 with the creation of the former Spectrum Management Agency. The first spectrum licence auction was conducted in 1996 (500 MHz bands) and the next did not take place until 1998 (the first "PCS spectrum auction"). A full list of bands that have been allocated by the ACA can be found on the ACA web site, but briefly, it contains 500 MHz, 800 MHz, 1.8 GHz [in two major releases in 1998 and 2000], 2.1 GHz in 2001, 2.3 GHz in 1999 [MDS bands by conversion] 3.4 GHz, 28/31 GHz and 26 GHz.

21 The process of introducing spectrum licensing is administratively cumbersome and typically protracted. There are a number of statutory reference points for public consultation and approval by the Minister. Anything that involves reference to the Minister will take time, for the submission to the Minister from the ACA would normally be referred to the Department for policy advice before being resubmitted by the Department that the Minister either accept the ACA's recommendation or otherwise. Typical delays in spectrum licensing implementation related to the approval processes are typically at least 3 to 6 months. There are questions here for the Commission over whether this administrative review adds value for the taxpayer, especially noting that the technical skills to evaluate the expert advice from the regulatory authority are not as strong within the Department as they once were, due largely to the devolution of functions and skill sets to independent statutory authorities.

22 Comparisons with other administrations are notoriously difficult. In the US, the FCC is under Congressional budgetary pressure to achieve an aggressive spectrum auction program. Until the Australian 3G spectrum auction, budget concerns featured to only a limited degree in Australian planning for spectrum auctions.

spectrum auctions[23]. In 1995, the former Spectrum Management Agency published a booklet that discussed how it proposed to implement spectrum licensing[24]. The booklet listed a very large number of bands that were potential candidates for spectrum licensing below 3100 MHz, indeed, it went through all the bands in the Australian Spectrum Plan in this range and considered each against 6 potential exclusions for spectrum licensing. Even after this process, a large number of bands remained listed. The progress against this outlook has been limited, and the planned forward deployment against this outlook is equally limited.

In summary, Market Dynamics sees a continued place for three distinct types of licence in the regulatory scheme, all within the "root" licence that derives from the Constitutional authority of the Commonwealth over all of the radiofrequency spectrum. This covers the entire spectrum, over all of Australia:

. authorisation to operate devices approved within a hierarchy of planning devices and instruments – this involves a centrally planned and constrained device authorisation (apparatus licences) that needs to have some sort of tenure limitation and renewal process because in a centrally planned model, there needs to be some way of getting current users out, and new users in, in a planned and systematic way;

. divisions of the "root" licence to create public parks for low power uncoordinated devices where there is no great public policy requirement to intervene – a little like "national parks"; and

. a revamped and improved private perpetual property right in spectrum that is carved off from the "root" licence and where the ACA relinquishes its planning responsibilities and confers these by property right to an another party. These rights may be the conferred on organisations in the private sector, but equally, Market Dynamics believes that public sector agencies will obtain significant benefits from holding private property rights and from being sensitive to market signals about the worth of those rights, and potentially to be able to relinquish some of those rights to the market on commercial terms.

Market Dynamics suggests that this form of private property right may need to be employed more often and in a much wider set of circumstances than at present because of:

. rapid technological change and the likely difficulty of central planning to keep up; and

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23 The rolling forward program can be found at http://auction.aca.gov.au/Future/future_plans.htm

24 Australia, Spectrum Management Agency (1995), *Implementing Spectrum Licensing*, AGPS, Canberra.

. the increasing risk that central planning will deliver outcomes that cannot be economically sustained.

There is also some pressure on the regulator in its traditional planning and licensing roles:

. budgetary pressure on the regulator (indeed all Commonwealth bodies) to reduce resources;

. loss of skilled staff, and the fact that there is an age-related "bubble" in the profile of the ACA's technical resources;

. potential difficulty in attracting new skills because of the wage disparity between the Government and private sector in the radio engineering field[25].

The ACA needs a relief valve from these pressures – devolution of spectrum management to the private sector and other agencies through private property rights in spectrum is a way of providing such relief.

Standard Setting

Standards are an integral part of the central planning model of spectrum management. Standards provide for homogeneity of performance of radiocommunications devices, so that they may be coordinated easily within the homogenous radio environment created by the hierarchy of spectrum plans, band plans and administrative instruments.

Australia is a net importer of communications technology. In many bands of spectrum, communications technology is brought into Australia as a function of it being manufactured in large quantities to satisfy bigger markets than ours.

To provide homogeneity, we allocate specific bands to these equipment types (or "services") and we use the standards as a shorthand way of ensuring compliance with a simplified planning and licensing regime that eases the complexity of radio coordination.

Standards, apparatus licensing, band plans and administrative instruments are all elements of the central planning strategy, and they can and do provide for an environment where the potential for unacceptable interference is manageable.

The trade-off for certainty is that standards take time to implement – they require administrative coordination, meetings, proposals and ultimately a vote

[25] Market Dynamics is aware of recent situations in Australia where radio planning skills have been brought into Australia from overseas because of a shortage of these skills in the Australian market.

within industry. So, the development of standards can take time and this investment of time and effort by large numbers of people is hard to write off. Standards, once made, therefore tend to have ***longevity***. And so, longevity becomes a brake on innovation. People become unwilling to depart from the standard because of the time invested in making it. This can be particularly disadvantageous in a time of rapid technological change.

Many standards for equipment performance and description such as exist in some parts of the communications industry have little place within the spectrum rights regime. Spectrum licensing needs few standards because it anticipates that users will make their own trade-off between the quality and finesse of their equipment and the amount of spectrum it consumes[26].

There are issues in standard setting that are important, even to spectrum licensing, and need to be considered well. These are in the areas of health and safety and the way that equipment is safe to operate and use, in exposure to radiation, and in the potential for electromagnetic interference and incompatibility.

Market Dynamics supports the continued application of standards for health and safety and to minimise the harmful effects of electromagnetic interference and incompatibility.

Market Dynamics supports the operation of a standards regime as an integral part of a centrally planned and controlled apparatus licensing regime that will continue to be appropriate in many bands of the spectrum.

Market Dynamics does not support the widespread application of formal standards (or codes of practice) for spectrum licensees who should be free to make their own trade-offs about system operation and performance and spectrum consumption within the rights they buy. In most cases, Market Dynamics anticipates that spectrum licensees will adopt equipment sourced internationally that already complies with standards developed for other markets.

[26] There is a general theory at work here that equipment that that creates "cleaner" emissions and consumes less spectrum comes at the cost of the additional high performance filtering necessary to give it this performance edge. Cheap nasty equipment can be quite inefficient in the way it uses spectrum. Broadcasting receivers are perhaps a good example of this, where the tradeoff is cheaper, and less efficient receivers (to keep the cost to consumers low) combined with inefficient spectrum use (which regrettably is not recognised economically).

Charging for spectrum Use

Class licensing

Access to spectrum under a class licence is free – there is no revenue for Government. The Commission asks if the absence of fees affects how much spectrum is allocated for class licensing.

The ACA, like all Commonwealth agencies, is sensitive to budgetary issues and like most bureaucracies tends to devote administrative effort to monitoring outcomes against budget projections. It would be naïve to think that the ACA would offer up a potential revenue stream without specific Government approval to do so within the budget context, unless that revenue stream is below budget threshold, and performance against budget is solid.

There are also costs in class licensing. Maintaining any sort of public space comes at a cost, and that cost is mostly worth the benefits to the community of the class licences, just as public open spaces in cities have benefits. Moreover, in some bands the cost of class licensing is significantly less than enforcing compliance costs in applying a licensing regime.

The cost of maintaining these public parks is an overhead cost on the national administration of spectrum, and so is met by the spectrum maintenance charge levied on the other types of licence – all spectrum users ultimately pay the cost of the providing these public parks.

Market Dynamics supports these continued arrangements, but notes its expectation that budget constraints and revenue objectives of the Government more generally will always feature in any decision to forego revenue through the creation of public parks in spectrum to support low power non-assigned licence types.

Apparatus Licensing

The Government applies a tax on spectrum use through apparatus licence fees for resource rental. Apparatus licensees also pay the direct administrative costs of licence application and renewal. All licensees (spectrum and apparatus) also make a contribution to the overhead costs of national spectrum administration through a spectrum maintenance component and its spectrum licence equivalent.

The spectrum access tax component of apparatus licence fees can be seen as a tax on use of a public resource.

For a time, Australia proudly led the world in the deployment of sophisticated resource based pricing for spectrum. In many ways, we still do, however, the existing approaches are showing signs of age.

For example, Market Dynamics believes that the Government may be significantly ***under-recovering*** the value of spectrum under apparatus licensees in ***some bands*** of the spectrum. Market Dynamics believes there is evidence that pricing applied through the apparatus licence fee schedule is ***inconsistent*** and sets prices that are ***below contemporary market values*** for spectrum as set through a series of spectrum auctions since 1996.

Market Dynamics believes that through the improved application of new technology and by revamping business systems, there is substantial scope to improve spectrum management pricing efficiency.

The ACA updates the apparatus licence fee schedule periodically to reflect updated revenue expectations from Government. However, since the current formula based approach was developed, there has not been a substantial re-balancing of the licence fee schedule to take account of spectrum values obtained since 1998 *except* for re-balancing the 900 MHz GSM band, where licence fees went up by 150 per cent[27]. Further, the methodology of the fees and tables has remained constant while new technologies and new techniques have developed that could provide opportunities for substantial improvement.

Market Dynamics proposes an alternative view of licence fee setting for the Commission's consideration and uses an example from the 3.4 GHz bands auctioned in 2000 as evidence to highlight the difficulties with the current approach.

The auction of the 3.4 GHz band raised a little over $110 million for 15 year fixed term licences. This band not unique – similar sorts of issues are raised for a number of bands in the spectrum that have been auctioned.

Market Dynamics has a geographic model of spectrum values attained in this auction. It is possible with only a little work to develop a similar model for ***any*** other spectrum band that has been auctioned, and indeed, to build new models for other bands based on some basic assumptions about the value of an act of communication to a licensee[28].

Within the Market Dynamics model, it is possible to take a radiocommunications device and model the spectrum that the device consumes[29]. From that model, it is possible to place a value on the spectrum space consumed.

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27 This was done in the context of the 2001/02 Federal Budget. Rumour has it that the announcement was met with "cold fury" by the three affected carriers, Telstra, Vodafone and Optus.

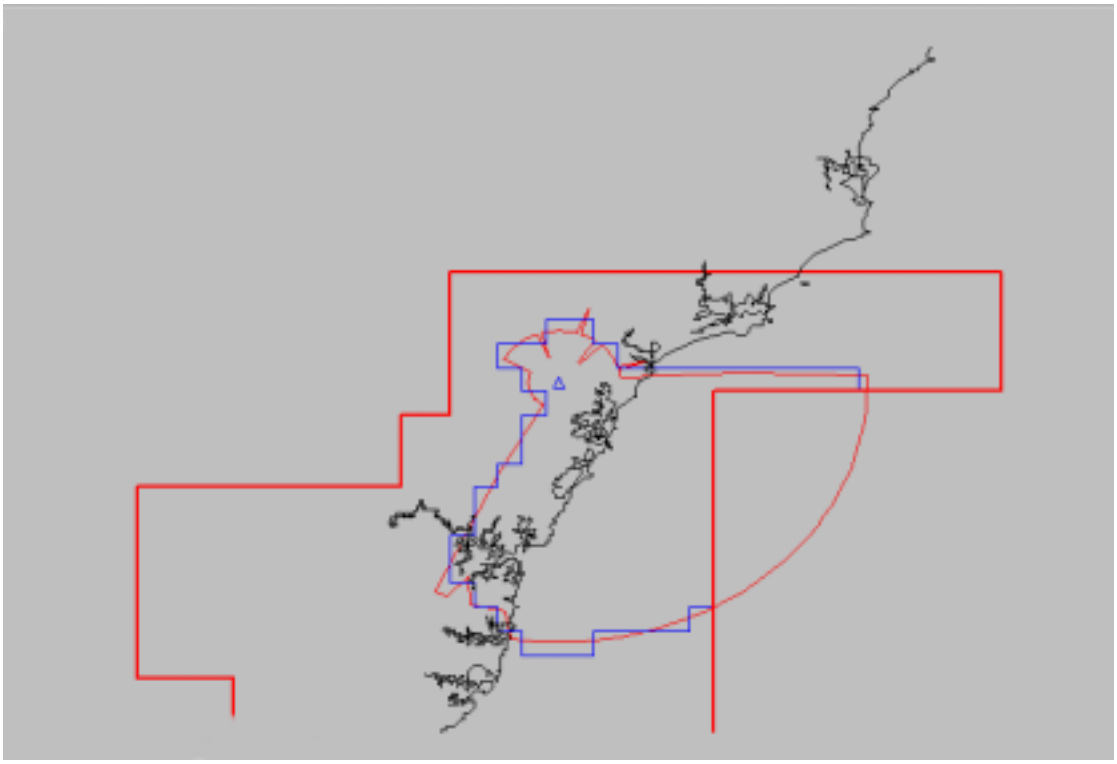
28 The model itself is confidential and proprietary to Market Dynamics, but was demonstrated to Commissioners Roberston and Byron and staff of the Commission in October 2000.

29 This is a "spectrum denial" model that looks at the cost of spectrum denied to another potential user and so should not be confused with a coverage planning model. The model uses an improved version of the ACA's device boundary modeling algorithms published in the s.145 Determination for the 3.4 GHz bands. It has as inputs, the characteristics of the device

The following Graphic 1 is a map of modeling done by Market Dynamics for a device that is currently operating in the 3.4 GHz bands. The device is located at Mt Heaton to the West of Newcastle and uses a 120° sectored antenna with an azimuth of 145°.

The first issue with the current licence fee approach is that it defines three levels of density[30], and applies differential fees based on the relative density. This transmitter is sited in the "medium" density area defined by the licence fee schedule[31]. As can be seen from Graphic 1, the bulk of the radiation from this device is actually directed by a high gain directional antenna down the NSW Central Coast and into the northern beaches area of Sydney – the "high density" area in the parlance of the licence fee schedule. So, for apparatus licence fee purposes, while the device is located in the medium density area and therefore attracts a lower fee, the radiation that the device emits consumes spectrum into a high density and hence high value area.

Graphic 1
Modeling of Spectrum Space for a Device on Mt Heaton



(power, site, antenna gain, sectorisation and azimuth) the ACA's digital elevation model, and a path loss model published by the ACA in its s.145 Determination of unacceptable interference. The model provides as an output a calculation of the spectrum space consumed by a device with the characteristics entered, and a value for that space on a per MHz basis.

30 High, Medium and Low – see the Apparatus Licence Fee Schedule.

31 Maps of these areas are contained in the ACA's Apparatus Licence Fee Schedule.

The spectrum space modeled for this device (the blue line) can be valued using Market Dynamics' geographic model[32]. The value of the spectrum consumed by this device has been calculated by Market Dynamics using its model at about $73,000 for just over 1.8 MHz over a fixed 15 year term[33]. Even on the most conservative assumption of linear depreciation and no accounting for the cost of money, this reduces to $4,865 per annum for this device. Market Dynamics invites the Commission to seek an accurate apparatus licence fee quotation for this device based on the last licence renewal[34], and we believe it is well below the value calculated here.

Market Dynamics has completed modeling on nearly 30 other devices in this same spectrum and all show a ***significant*** under-recovery by the apparatus licence fee formula of the value of the spectrum consumed compared based on contemporary spectrum valuations. This device on Mt Heaton is a typical, not exceptional, example.

This spectrum at 3.4 GHz is being deployed by the licensee for a wireless local loop (WLL) (also described as a fixed wireless access [FWA]) business). There are many bands that are capable of supporting a WLL business. The equipment chosen by one 3.4 GHz licensee is capable of operating in a wide range of spectrum from around 1.7 GHz to 4 GHz.

Market Dynamics believes that the prices paid per MHz at the 3.4 GHz spectrum are indicative of the minimum value of *all of the other bands where WLL* is possible.

Similar issues could be raised in relation to the spectrum between 1.7 and 2.4 GHz, most of which has been spectrum licensed and auctioned and for which values can be calculated. The prices established in these bands provide a clue as to the value of a wider range of spectrum assets with broadly similar propagation characteristics.

Market Dynamics asks that the Commission consider making recommendations to the Government for a ***strategic*** re-balancing of its apparatus licence fee taxes to correct the under-recovery of the value of some parts of the spectrum in its current approach.

Market Dynamics believes that there is substantial scope to develop new and much more sophisticated geographic modeling tools that lever off existing technologies already available within the ACA and which could improve the ability to capture the value of spectrum consumed by apparatus licence users.

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32 Subject, of course, to some assumptions about the distribution of value. Market Dynamics uses a widely accepted concept of MHz/pops, originally developed in the US for FCC spectrum auctions. It provides a useful proxy for communications value when one considers that a lot of radiocommunications involves people (pops).

33 The Tx uses 3 channels each of .3072 MHz bandwidth, and the Bx uses a further and corresponding 3 channels of the same characteristics, giving a total occupied bandwidth for the Tx/Bx combination of 1.843 MHz.

34 The licence number for this device is 1207928.

Market Dynamics believes that the current limited number of geographic areas for licence fee "demand" modeling, while simple for readers of a licence fee schedule, could be replaced by more sophisticated techniques supported by high level information technology[35].

There may be arguments that the licence fee formula so implemented would not be transparent and accessible, but Market Dynamics believes that it would be a feasible to create an interactive web site to give licence fee calculations to anyone interested[36].

Market Dynamics believes that it is time to move away from device related licence fees and consider the value of spectrum that devices use.

Spectrum Licensing

The Act requires spectrum licences to be allocated using a price-based system. The Act provides guidance about the methods to be used and includes:

. auctions;

. tenders; or

. predetermined or negotiated price.

There are theoretical reasons why one-shot sealed bid tenders are not suitable for allocating spectrum licences and the ACA's experience with predetermined or negotiated price mechanisms is problematic. If the price that is "predetermined or negotiated" is below the market price (whatever that may be), then the Government is missing out on potential revenue. On the other hand, if the price is greater than the "market price" (again, whatever that may be), there is an argument the excess over and above "market price" is taxation, and Constitutionally, taxation requires tax legislation.

The question quickly becomes "what is the market price", and in the absence of a standing open market mechanism, the ACA creates a market context for each release of spectrum licences by running ***auctions***.

Market Dynamics supports the use of auctions as a way of allocating scarce resources, but believes that private perpetual property rights in spectrum open the possibility of additional and far more sophisticated market mechanisms such as trading exchanges.

35 Market Dynamics spectrum valuation tool users nearly 22,000 discrete values.

36 The modeling tool demonstrated by Market Dynamics to the Commissioners would be able to be adopted to a web-based system.

Of the alternatives to auction, most have been openly discredited on efficiency or equity grounds. For example, other styles of allocation system include:

. first-come-first-served administrative allocation that confers windfall gains on early claimants;

. comparative merit based selection by independent "Tribunal", an approach abandoned for good reason in Australia for broadcasting nearly a decade ago;

. the "lotteries" and ballots that allowed speculators to create massive windfall gains in the USA;

. and allocation systems that reward officials and politicians for allocating "favours" to friends and those who can sustain what Australians call "bribes" - in Australia, we find those sorts of approaches counter to our cultural norms.

Market Dynamics believes there is another alternative that is not directly envisaged in the legislation, but is not precluded by it. That is the concept of an open ***trading exchange***. When combined with perpetual rights in spectrum, a trading exchange would provide an alternative to auctions as a means of primary allocation of private property rights, and would allow other government users, and the ACA as a spectrum "owner" to release spectrum to the market in an ordered way. This issue is discussed further under **Trading**.

In regard to auctions, there are attributes of spectrum licensing that require fairly sophisticated auction design considerations. In order to facilitate regionally based business, the ACA has tended towards creating regional market areas. To accommodate the possibility that some bidders might require complementary sets of these areas and assemble larger aggregations up to the size of national licences, the ACA has tended naturally towards adopting ***multi-object auction*** designs to facilitate both regional and national outcomes equally[37].

Further, since spectrum licensing strives towards technology neutrality, there is an objective of allowing bidders to aggregate spectrum by bandwidth up to their requirements. Again, this tends to warrant multi-object designs and building-block components.

So, in spectrum licensing, design goals include multi-object allocation systems that can solve allocation problems involving complementary and substitutable lots in three-dimensional space.[38]

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[37] This is an important theoretical issue, for the SMR auction used by the ACA suffers from a well documented "exposure problem" that makes national aggregations problematic in some situations.

[38] For a more considered discussion of the issues of market design and allocation system design, see Hayne, Ian (1997) *Spectrum Property Rights and Practical Auction Design: the Australian*

In 1995, the ACA's predecessor sought and selected the most sophisticated tool of its time that had been deployed. The former Spectrum Management Agency designed and built its own auction system following the format of what is today referred to as a simultaneous multiple round (SMR) auction[39]. This type of auction was first deployed by the US FCC in 1994 and has been used successfully since then to allocate many tens of billions of dollars worth of spectrum in the US, and more than $2.5 Billion in spectrum here.

The first Australian spectrum auction using the technique was completed in 1996 and the technique has been used repeatedly in a series of auctions, most recently for the 2.1 GHz band where spectrum for "3G" mobile telecommunications spectrum was allocated.

The ACA also uses English open oral outcry auctions for non-complementary allocations.

The ACA has had mixed success with its spectrum auction program. Some auctions have exceeded expectations, others have barely limped to an acceptable revenue outcome, with lots passed in[40]. The Australian 3G auction grossed a little over $1 billion with a number of lots passed in, well short of the much written about $2.6 billion "budget expectation", and well short of the previous "PCS 2000" mobile phone auction at $1.3 billion[41].

These outcomes highlight the volatility in the market for spectrum. Volatility in turn is influenced by the changing fortunes of the international telecommunications investment climate, but also dynamics in the relative scarcity of spectrum as new bands are considered for new and innovative services.

Auctions require product to be auctioned, and the ACA "creates" product from its stock of spectrum (from the "root" licence, if one accepts the concept described above) and releases it to the market against what it perceives to be "demand". An accidental consequence of this is that the release of small amounts of spectrum creates artificial scarcity and demand, so inflating prices along the way[42]. At the same time, though, it is not really feasible for the ACA

Experience, in Industry Commission (ed.) 1997 *Industry Economics Conference*, Conference Proceedings, 10-11 July, AGPS, Canberra.

39 This form of auction is also sometimes referred to as a "Milgrom FCC" auction after one of the major contributors to the design, Professor Paul Milgrom of Stanford University. Milgom and fellow Stanford Professor Robert Wilson proposed a set of activity rules that are fundamental to the design.

40 Lots were passed in the 1.8 GHz "PCS" auction, the 3.4 GHz auction, the 26 GHz auction and the 2.1 GHz auction.

41 This low revenue outcome may turn out to be a blessing for Australia, for 3G is a very uncertain space at the moment.

42 It could not be argued successfully that this is a deliberate strategy by the ACA, rather it is an outcome of the non-strategic approach to spectrum licensing where spectrum licensing must be public-policy justified as an exception. There are also constraints about what can be

to release all the spectrum it ever intends to release at the one time – there would be no market and spectrum for everyone in spades!

Trading exchanges present a potential solution to this issue. A trading exchange would involve another allocation mechanism that is market based, but is not strictly an auction, tender or predetermined or negotiated price as defined in the Act, although it would involve very sophisticated auction-like technologies for solving multi-object three-dimensional two-sided allocation problems.

Auction Design

The ACA has just two tools available for auctioning spectrum licences:

. English open oral outcry auctions; and

. simultaneous ascending multiple round (SMR) auctions.

The first is not appropriate to multi-object allocation, and in the view of Market Dynamics, the second has passed its use-by date and it's outcomes are considered sub-optimal compared with newer and better designs in terms of revenue outcome, allocative efficiency, and time to completion.

While at the time, the SMR auction design was the best tool available, the data from a number of auctions in Australia shows evidence of the sort of sub-optimal allocation that might be predicted by theory, evidence of a failure of the process to completely solve an efficient allocation.[43] This evidence is consistent with theoretical predictions of an exposure problem, that has been backed by empirical analysis of the design in the laboratory.

Further, in advising clients participating in spectrum auctions, Market Dynamics has seen first hand from a bidder perspective the risks of not being able to achieve objectives, but having to lay out at risk significant sums of money. ***SMR auctions are known and understood by bidders to present very dangerous and risky business***. The design is complex, and it requires significant understanding to bid well. In auctions that Market Dynamics has witnessed, many bidders have been ill-prepared, ill-advised, and have shown signs that they have not understood the process. In the United States, bidders in SMR auctions routinely spend hundreds of thousand of dollars to get the best academic advice, yet in Australia, bids have been run from hastily converted conference rooms, with temporarily acquired computer equipment with bids being planned and coordinated by people with little understanding of the game being played. To think that these people have been playing with

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justifiably released that come from the ACA taking into account statutory public consultation process.

[43] Market Dynamics has a number of sophisticated tools for analysing SMR auctions and is able to assist the Commission in interpreting the data, all of which is public and available from the ACA web site.

hundreds of millions of dollars of shareholders' funds, and quite often wasting tens of those millions in the process along the way is a sobering thought, but that is the reality of the SMR experience, and there is evidence of that within the results of some Australian auctions.

If bidders are ill prepared for the complexity of an SMR auction, then the credibility of the overall auction program may depend in future on coming up with a better and simpler way ***for bidders to participate***.

The limitations of SMR auctions and their propensity for suffering from an exposure problem are well known and documented in the literature. When combined with ill-informed bidders, it presents a recipe for inefficient allocations and for people to bid far more than they need.

Unfortunately, this has not been helped by market design issues. For example, the 2001 3G spectrum auction at 2.1 GHz implemented a market design that created an incentive for people to bid inefficiently. In this auction, there is evidence that at least two bidders paid substantially more than they needed for equivalent spectrum in other parts of the band. Their decision to bid in this way was likely to have been a function of this market design[44].

Even before the first SMR auction was conducted in 1994, some theorists were proposing alternative designs and expressing caution about SMR[45]. There are a number of competing approaches in multi-object auction design. The designs now showing most promise for solving complex three dimensional allocations such as required for spectrum property rights have the feature of offering a single bid for a defined package, rather than individual bids on the items comprising a package, as SMR auctions do. These form a class of auction called "combinatorial auctions".

The benefits of such a design are obvious. Bidders can nominate a package of bids that are all contingent on one another, at a single price. They can, if the wish, present single items bids, but if they require a contingent package, then a single package bid offers a low risk bidding method. In this way they can avoid the risk that they may win some components and not others. In addition to contingent bids, it is possible in some designs for bidders to develop "OR" bids – mutually exclusive alternative packages[46].

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44 This market design should not be attributed solely to the "expert regulator", as the ACA was given a specific Government Direction about the market design to implement, and this is understood by Market Dynamics to have been developed with the involvement of the central agencies including the Federal Treasury and the Department of Finance and the Department of Communications, Information technology and the Arts. Was this a horse designed by committee - a camel by another name? Market Dynamics discloses here that it acted for a bidder in this auction – a successfully winning bidder.

45 Bykowsky, M, Cull, R J, and Ledyard J O, *Mutually Destructive Bidding: The FCC Auction Design Problem*, *Journal of Regulatory Economics*, May 2000

46 For example "I bid for A and B and C at x dollars or I bid for C and D and E for y dollars".

Work in the field of experimental economics at the California Institute of Technology and other places suggests that new designs such as RAD[47] can offer significant improvements in efficiency, reduce bidder losses and improve the time taken to close compared with the SMR design.

Long argued as being too computationally complex for all but a handful of items, these "combinatorial" designs rely on advances in computing and programming for their success and are now feasible on modest and affordable computing platforms.

While travelling in the US and UK during September, Market Dynamics was heartened to see strong interest in moving ***away*** from SMR designs. The FCC has been struggling with combinatorial designs and package bidding augmented SMR auctions for some years, and has a goal of running combinatorial auctions as soon as practicable[48]. The UK Radiocommunications Agency is also clearly interested in deploying combinatorial designs in association with some form of three-dimensional property right.

The Government has only limited developmental capability for spectrum auctions and for exploring new designs available to it. Most of the developmental capability resides outside of Government (indeed, most of the developmental capability in the field is located outside of Australia). The design and conduct of advanced multiple object auction designs is a sophisticated business requiring access to specialised intellectual property, and it is clearly an area ripe for outsourcing.

Nothing in the Act requires the ACA to run these auctions[49].

Licence Tenure and Band Clearance

Market Dynamics supports calls for more flexibility in setting licence terms for apparatus licences, but notes that this is an area of administrative discretion that could easily be abused. Earlier in this paper, it was noted that some sort of licence renewal is a valuable thing in a centrally planned model of apparatus licences for it provides a mechanism where licences may be discontinued to allow band re-planning. That is a function inherent to a centrally planned model of spectrum management. The problem for Government if it sets long terms for apparatus licences is that its ability to re-

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47 Ledyard, J.O, DeMartini, C, Kwasnica, A and Porter, D, *A New and Improved Design For Multi-Object Iterative Auctions*,. Social Science Working Paper No. 1054, November 1998, revised March 1999.

48 Advice from Market Dynamics' partners in the US indicates that the FCC is expected to attempt a stripped down version of RAD early next year. By "stripped down", the pricing rules are expected to be based on a relatively simple deficit pricing approach, with the FCC apparently willing to accept the inefficiency that this brings.

49 The New Zealand Government recently commissioned an international process seeking expressions of interest from firms interested in taking over the New Zealand Government's spectrum auction business on an outsourced basis.

plan a band becomes constrained to the point of being unable to adapt to new circumstances. In an era of rapid technological change, one must question the value of that approach.

Apparatus licences, as a centrally ***planned*** way of authorising access, and need to have mechanisms in place that allow central ***re-planning***. Relatively short terms (up to 5 years) and a general presumption of renewal provide for this, subject to statutory review and consultation processes. Market Dynamics does not support the idea of longer terms for apparatus licences because it adds a further constraint on the ability of the Government to re-farm a band for a new and alternative use under the central planning model. If spectrum, users want longevity, Market Dynamics would propose they consider the benefits of a perpetual property right, or to lease spectrum under contract from spectrum licensees, where all sorts of terms and conditions can be negotiated and contractually established through commercial negotiation.

Spectrum licences, on the other hand, lose nearly all of their utility under the current fixed term/no renewal model. Trading becomes less likely as the licence moves through its life cycle, because the new owner will find it increasingly difficult to make a return on its investment the further into the licence term it makes its acquisition.

Further, capital expenditure for infrastructure on an existing spectrum licence is likely to decline in the sunset years of the term as the licensee prepares for the risk that it might not win a new licence after its existing licence expires.

Only with *perpetual* property rights can these two issues be overcome. Only then can the benefits of a tradable spectrum property right facilitate licensees responding in the market to changes in technology

The case for a fixed term right was made by the BTCE[50] in 1990 and it is interesting to review that case now with the experience so far in spectrum licensing. The argument for a fixed term is looking shallow and unsustainable.

BTCE made a case that fixed non-renewable terms have advantages and could be added to the design for spectrum access rights to achieve increased *flexibility*.

BTCE highlighted that historically the Department had relied on user cooperation or legal enforcement to re-plan spectrum to introduce new technologies, new services and for relocating users. BTCE noted that users viewed their access under the traditional form of licensing as ownership in perpetuity and planned their operations on this basis.

> *For example, they may plan their investment over long periods using long term borrowings and it becomes financially unattractive for them to*

[50] Australia, Bureau of Transport and Communications Economics, *op. cit*., Appendix 3

change their spectrum access equipment or arrangements to accommodate new uses or new users.

BTCE suggested that the major advantage of ***fixed terms*** on SARs would be that they would ***increase the flexibility*** in the planning process, allowing re-planning of the spectrum in an environment where change was accepted and planned for by users.

Essentially, fixed terms allow for SARs to be reclaimed without undue legal process, after which the regulatory agency has the opportunities to:

- *introduce new uses on the basis of redefined SARs;*
- *introduce new conditions on the basis of redefined SARs;*
- *allow for new technologies on the basis of redefined SARs;*
- *change the process for issuing SARs (for example, auctioning);*
- *commence a new fixed term (with the same period of time, or shorter or longer); or*
- *relocate users from one part of the spectrum to another .*

The sorts of issues outlined here derive obviously from a *central planning model* – they envision little role for users adapting to new uses, little role in users selecting and implementing new technologies, little opportunity from market-lead trading and re-assignment. Rather, this model sees a long term continuing role for centrally planned spectrum allocation by the regulatory agency. As noted previously, Market Dynamics is skeptical about the capacity of the international and national spectrum planning processes to work with sufficient speed and clarity of focus to respond to rapidly changing and evolving technology.

BTCE went on to propose that a second major advantage of fixed terms would be that they can be used to "correct" unintended outcomes of a market-based system for spectrum access.

They can:

ensure that social users (providing public and merit goods) are able to gain access; and
overcome undesirable market outcomes, such as market dominance by large users.

BTCE was at the time recommending a purely market-based spectrum access rights regime. The Government ultimately enacted a ***mixed*** administrative/market regime that included apparatus licensing and a process of converting apparatus licensed bands to spectrum licensing. So far, the application of spectrum licensing has been to high value commercially

attractive bands where the values achieved have been out of reach of most "social" users. "Social" users have continued to be able to access spectrum through the traditional centrally planned apparatus licence based system. It is therefore questionable as to whether the administration of spectrum property rights needs to be corrupted to take account of what seems to be a non-issue.

In the event that private spectrum property rights become ubiquitous (and this submission does not argue that they should), then the issue is a different one. In that case, when "social users" need access to valuable spectrum, they should in the opinion of Market Dynamics be required to obtain access on the same terms as other spectrum users. To not have them do so provides false signals about the relative value of the spectrum resource they consume and they will have few incentives to not waste it. Waste, inefficiency and price distortions that do occur must ultimately by shouldered by the whole of the remainder of the radiocommunications using community. Since radiocommunications is intertwined with virtually all aspects of the economy, it is the Australian people who inevitably will pay for the inefficiency through higher charges for services.

Market dominance as raised by BTCE is already a matter on which there is a substantial body of legislation and case law in the trade practices domain. This submission sees little public benefit in using radiocommunications law, intended for the technical regulation of radiocommunications and administered by technical regulators, being used to advance competition policy objectives which are better suited to administration by skilled competition policy regulators under competition policy and law.

BTCE went on to note that fixed terms may also assist overcome some other difficulties associated with converting spectrum to new uses which yield greater economic benefits or promote public interest goals. For example, BTCE cited an example of an assignment for a land mobile radio service allows for a 25 kHz bandwidth and a coverage area of approximately 200 square kilometres. The only other uses that could be placed on this assignment at present would be a smaller bandwidth land mobile radio or fixed service.

> *To accommodate spectrum uses requiring larger bandwidths and larger coverage areas, it would be necessary to combine SARs. For example, it would require over 20 contiguous SARs of land mobile radio size for an FM radio service or over 1000 (with spacing) for a pay television service. Amalgamation of this number of SARs could be difficult to achieve through a market system, as the SARs would need to be contiguous both in frequency and geographical dimensions (that is, side-by-side) and would need to be purchased from existing holders, some of whom may be unwilling to sell or only to sell at exorbitant prices (particularly those who are aware that they hold the last remaining frequencies required to make the new use viable }.*

Market Dynamics is not persuaded by this argument. The implementation of spectrum licensing within the law and within the ACA's administrative

practices already provides for a framework of trading in multi-dimensional licences. There is already active trading of spectrum licences and at least one spectrum licensee ***has participated in spectrum licence acquisitions that provide the very type of bandwidth aggregation that BTCE felt improbable***.

BTCE proposed that an alternative solution would be compulsory acquisition with compensation. BTCE was dismissive:

> *However, as with land which has been re-zoned for a new use, there are difficulties in deriving a suitable level of compensation.*

BTCE made no comment as to what these difficulties might be, or how they were solved in the market for land.

Market Dynamics notes that the legislation as passed by the Parliament ***does*** include provisions for resumption with compensation, and the Parliament appeared to feel sufficiently strongly about the prospect that it included in the legislation a schedule devoted to resolving the compensation issue! It has not so far been used.

Market Dynamics also notes that for compensation to be just and fair, there needs to be some rational basis for determining contemporary values of spectrum. As such, there are a number of enhancements to the trading regime that could be contemplated to provide that sort of contemporary information which could be used to support valuations for compulsory acquisition, much as there is ongoing contemporary revaluation of land in the market. One of these mechanisms is a trading exchange.

BTCE suggested that a major difficulty with fixed terms relates to setting the length of the fixed term.

> *The period should be related to changes in demand and developments in technology, but should be of sufficient duration to allow users to cover their costs within the period. Therefore, the fixed period would be different for each type of use and would vary between regions. For example, in areas of low demand, the period could be of the order of fifteen to twenty years. In areas of high demand, where technology is being developed rapidly, the fixed period might be less, say five to ten years.*

The issues of concern here are so subtle that it is an open question as to whether a regulatory body would have the skills and aptitude for getting the choices right. The difficulty simply raises risk that bad or inappropriate regulatory choices will be made on the basis of less than complete understanding of largely private information.

For example, BTCE suggests that the fixed terms could vary, depending on a number of factors, such as:

. life cycle of equipment;

. spectrum use;

. pace of technological innovation;

. taxation write-off period;

. demand for access;

. geographical area of use; and

. spectrum location.

Market Dynamics believes that most of these factors are matters best understood with private information held mostly by the licensees and seldom disclosed. For the regulator to make good decisions on the basis of these inputs it would need extraordinary access to the business thinking of licensees *and other potential spectrum users*. One wonders about the regulatory cost and benefit of having to maintain an administration large enough to collate, analyse and apply this information. In any event, Market Dynamics doubts whether an appropriate skill set exists within the ACA as a technical regulator to undertake this role.

BTCE noted that a major argument ***against*** fixed terms is that there could be costs associated with the disruption caused at the end of the term - such as a loss in business during a changeover or additional costs associated with the changeover - which might outweigh any benefits of fixed terms.

Market Dynamics agrees. The potential requirement to shut down a telecommunications network worth a billion dollars or more at the end of an arbitrary licence term does nothing for the long term interests of end users or investors. The loss of quality in the network over the last few years as the owner reduces capital investment to factor the risk of losing its licence is not in the long term interest of end users either.

Indeed, the decay in quality of a telecommunications network as capital maintenance dries up suggests that the last 5 or so years of a spectrum licence can be expected to become self-fulfilling prophecy of business decline.

The lack of a full 15 year term following any secondary market trading implies that licensees buying spectrum in the market will have reduced payback periods for their investments. As the payback period shortens the further into a term the trade is made, the prospect of trades that might improve the overall efficiency of spectrum use declines. Such a fixed term, then, can be seen as a brake on innovation, a brake on trading, and a brake on improving the efficiency of spectrum use. ***In short, a fixed term is brake on all of the***

positive things that the literature on spectrum property rights proposes are good and necessary.

Market Dynamics believes that it is time to let the market properly do what the central planning model is likely to be less capable of doing in the future and that is to allow spectrum users to make informed economic choices within the certainty of a perpetual property right.

Transition from Government Held Management Rights to Private Management Rights

The legislation provides two mechanisms for transition from apparatus licensing to spectrum licensing:

. conversion; and

. spectrum reallocation.

Both approaches present substantial administrative, technical and economic difficulties.

Conversion

Conversion was the process originally included in the legislation when it was passed in 1992. It envisaged the creation of spectrum licences in a band that is already licensed to apparatus licensees. It has its roots the BTCE's spectrum access rights concept.

The objective of conversion is to offer an apparatus licensee a spectrum licence that substantially replaces the utility it enjoys with its apparatus licence.

To do this, a common interference model must be established so that the geographic area covered by the emissions of the apparatus licensed device can be modeled.

Then, each device must be considered using the model to establish a geographical outer boundary of coverage. That area in turn needs to be converted to some sort of common reference (and the ACA has developed the Spectrum Map Grid as a common geographical referential system).

Areas that overlap need to be considered, for a spectrum licence is an exclusive right. The boundary between overlapping licences needs to be drawn in some way that is acceptable to potentially multiple parties.

The same process must be undertaken to model the spectrum bandwidth occupancy of the device and again, this must be negotiated for mutual

exclusivity against a common referential system (in this case, “standard trading units” in the frequency dimension).

Since the process is an administrative action, each modeled “draft” licence needs to be offered to the licensee for comment and licensees must have a reasonable opportunity to comment and have their comments considered by the decision maker.

Assuming that all the licences get to this point, the ACA would then make an offer of the licence at a price that reflects market value. That creates its own problems, for the Act envisages that unencumbered spectrum will be offered to the market. There needs to be price consistency between what are very similar spectrum licences that might have been arrived at by different routes. Valuations for similar licences should be similar, whether obtained at auction, or obtained through a conversion. So, the ACA’s practice the only time that this version of the process was attempted[51], was to define the unencumbered space as the inverse of the encumbered space, auction it to determine a value, and then shadow price that value to the converting apparatus licensees.

All in all, this was a complex detailed administrative process that required a substantial time to complete (longer, in fact than the corresponding auction of unencumbered space).

Another conversion process was undertaken in the MDS bands in February 2000. The original MDS apparatus licences were auctioned on an area basis, and so defining the geographic areas for conversion was much simpler. The apparatus licences already had a basis in an exclusive area-based allocation. There was no “unencumbered” spectrum in this band to be separately auctioned, so no means for shadow pricing. As the conversion process was envisaged, this MDS conversion was comparatively simple, but valuation was problematic. The outcome of this process was sub-optimal, because the value of the licences estimated in the conversion process turned out to be substantially below the inferred “market” value. The price for one set of licences at conversion was $26 million[52] and this set was traded in the secondary market for $140 million[53] only 8 months later[54].

Problems with the conversion process were well recognised by the Government after the 500 MHz band experience and in the context of the

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51 The 1996 conversion of 5 apparatus licences including 8 spectrum access in the 500 MHz bands.

52 Licences issued to Television and Radio Broadcasting Services Australia Pty Ltd in accordance with the *Radiocommunications Spectrum Conversion Plan (2302-2400 MHz Band) 2000* signed 3 February 2000.

53 *Austar to acquire TARBS spectrum,* Austar United Communications Press release of 23 Oct 2000 available from http://www.austarunited.com.au/press.asp?action=showarch&record=7&year=00

54 Market Dynamics suggests this is further evidence to support the assertion of systematic under recovery of spectrum values made in this submission.

1997 telecommunications reform package amendments to the Radiocommunications Act were introduced to provide for spectrum reallocation.

Spectrum Reallocation

The spectrum reallocation process introduced in 1997 avoided entirely the technical complexity of conversion – it simply said to incumbents "you're gone".

And so a new set of problems was created and those problems resonate around the industry today and manifest themselves in calls for longer licence tenure and for compensation on relocation. Rather than treat these symptoms by responding to these noisy calls[55], we should try and treat the underlying disease.

Evicting a whole band of apparatus licensees presents its own problems. Before doing it, we must be convinced that the overall economic cost will be outweighed by the benefits of moving to spectrum licensing. So far that has not been a difficult case to mount. High value mobile telecommunications spectrum has been the target of most of the spectrum reallocations so far, and more than $2 billion in proceeds seems on the face of it to justify the cost of clearing the mobile bands of existing fixed links.

But what will happen when it becomes a more marginal issue – when the cost of dislocation may outweigh the proceeds of sale and the benefits of the change?

The process of spectrum reallocation has been deeply divisive within the radiocommunications user community. There have been impassioned pleas for compensation (some of them disingenuously for old, outdated and completely depreciated equipment, but that is the nature of the debate) and strident calls for changes to the tenure arrangements for apparatus licensees to provide some protection and certainty against this process[56].

Under spectrum reallocation, large numbers of apparatus licences have been cancelled before their time. There has been difficulty in relocating some users from some bands because of constrained and overcrowded spectrum in alternative bands. Millions of dollars worth of equipment has been written off.

This is not a happy or enjoyable process for anyone involved, including the regulator.

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55 as the recently published Departmental "Radiocommunications Review" advocates…

56 even though the legislative provisions cancel the apparatus licences after a period of time no matter how long they have left to run.

Market Dynamics believes that it may be possible to develop a new and alternative framework that does not suffer from the failings of either conversion or spectrum reallocation processes.

Before considering that, Market Dynamics believes that there may be a set of circumstances where conversion may be a useful methodology[57] and that there may be a continued application for the spectrum reallocation process. Both mechanisms should be retained and any new methodology should be seen as augmenting these processes. The selection of the approach to be taken in particular cases should be a matter of good administrative judgement.

In developing a new approach, this submission reflects on the concept that all of the spectrum is effectively a "root" spectrum licence "owned" by the Government. From that root licence, some spectrum has been devolved to public parks, some to the ABA for broadcasting, other parts to Defence and the military for defence and national security, and some other spectrum has been allocated as spectrum licences. Of the remainder, the ACA is effectively the manager of the spectrum within this "root" licence and it administers the spectrum by authorising others to operate devices. The act of creating a spectrum property right is really an act of devolving spectrum management responsibility over a band to some other party.

In this model, we can conceive of spectrum licences as more of a management right (or indeed a set of management responsibilities) that can be allocated to another party.

So, in the event of the ACA dividing part of its root licence and devolving management responsibility (in a spectrum property rights model), we can set some criteria about the features that a new transition process ought to have:

. firstly, the spectrum property or management right would come with existing devices and users in place;

. the spectrum licensee (property right holder) should not be able to arbitrarily force those devices to leave;

. similarly, though, by having to endure them, the spectrum licensee should be entitled to all of revenue from the incumbent device operators that it now has management responsibility over, rather than those operators paying licence fees to the ACA;

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57 While this submission will remain silent on most matters affecting broadcasting, one option that exists is for the technical regulation of radiocommunications to be consolidated in one agency. If this was to occur as the Commission recommended in its Broadcasting Inquiry, then all apparatus licences to operate broadcasting transmitters would default to the ACA. Converting these area-based licences to spectrum licences would create many issues, especially in relation to valuation, but technically, because the licences are already area based, their conversion would be of the same level administrative complexity as the MDS conversion.

. that revenue, however, should be a reflection of the market price paid for the right - the spectrum licensee should not have to internally subsidise the management responsibilities it inherits;

. this submission has previously noted how the Apparatus Licence Fee Schedule under-recovers spectrum values in some parts of the spectrum, and so an incumbent apparatus licensee may, in current circumstances, face some economic "shock" in having to increase its payments to a level that provides a fair return to the new spectrum licensee. In these circumstances, it seems reasonable to stage the ramp-up in price over a period of time to enable the incumbent to make an market-influenced decision about whether to remain or to leave[58]; and finally

. any decision by the new licensee to evict an incumbent might need to be done on purely commercial terms. This addresses the compensation issue in a way that has some commercial relevance.

This model is far from complete, and there will be many criticisms of different aspects of it, but nevertheless it is offered as the beginning of a potential solution to the myriad problems raised by conversion and spectrum reallocation processes.

Trading and the Market for Spectrum

The Act is quite open to the possibility of trading licences. Both apparatus licences and spectrum licences may be traded[59].

The absence of prescriptive regulatory provisions is a good thing. There is a provision for the ACA to make rules regarding trading of spectrum licences, and those that have been applied so far are relatively simple, straightforward and necessary. The rules regarding trading spectrum licences have put in place some of the basic mechanisms needed to provide a stable trading framework. Foremost among these is the concept of a standard trading unit, without which, the ability to establish an open trading market would be especially problematic.

Despite the regulatory facilitation, there are some constraints on trading in the market place.

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58 Note here that if the Government undertakes the licence fee re-balancing that has been advocated in this submission, the likelihood of old apparatus licence fees being out of step with new spectrum rental charges that reflect the value of the spectrum asset is reduced.

59 However, apparatus licences in many bands are available over the counter, opening questions about the utility of trading apparatus licences for the most part. Nevertheless, there are some bands where the capacity of an area to support additional apparatus licences has been passed, and so trading does have a role here when the ACA is not issuing more licences. In these situations, the case made for the Government re-balancing its apparatus licence fee schedule gains more support. When a band is saturated in this way, one way to moderate demand would be through some form of price signaling, by increasing licence fees.

Foremost among these constraints is the fixed term nature of spectrum licences. The licences are for a fixed term, and if traded mid-term, the new owner has only the remainder of the original term in which to plan, deploy and make a return on its asset. Once can see that the closer to the end of the term the licence is traded, the less likely it will be that he new owner will make a return. In an open market, this suggests quite strongly that towards the end of the term of a fixed term licence, there will be decreasing probability of a trade taking place, ***with consequences for the efficiency of spectrum use***.

This submission advocates that the solution to that problem is perpetual private property rights over spectrum.

The second constraint on trading, is the propensity of some State Governments to want to levy stamp duty and related state taxes and charges on the transfer of spectrum licences. In 2000, Market Dynamics was approached by one spectrum licensee acting on the behalf of others to attempt to navigate a rationalisation of spectrum licences in the 1.8 GHz bands[60]. It transpired that some licensees had been advised by their own lawyers that trading to resolve the inefficiency would be subject to stamp duty, and Market Dynamics was asked to look at creative ways of rationalising access outside of pure trading mechanisms and exposure to these taxes.

Market Dynamics asks that the Commission recommend to the Federal Government that it clarify the issue of state government taxation of transactions in spectrum licences as a matter of some priority, for it is a real impediment to sensible rationalisation of spectrum holdings, for wider trading in spectrum licences, and is therefore a brake on all of the efficiencies for spectrum management that would flow.

The third constraint on trading is the absence of useable market information about spectrum licence holdings. The ACA's register of spectrum licences is inadequate for providing market advice about where licences are and what they cover. Spectrum licences exist in a three-dimensional space. Graphical tools are fundamental to people conceptualising them. The ACA needs to make available as soon as possible a GIS based searchable register of spectrum licences that can be interrogated spatially. The current RDBMS based register is incapable of performing the required functions – it is simply the wrong technology for the problem.

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[60] In the context of auctions, it is worth noting that the rationalisation was necessary because of an inefficient solution to the 1.8 GHz auction allocation that came from the exposure problem inherent in the ACA's SMR system. Indeed, it was while Market Dynamics Managing Director Ian Hayne led the Spectrum Marketing Team at the ACA that he observed this inefficiency and began thinking about alternative designs such as combinatorial auctions.

Notwithstanding these limitations, there has been remarkably strong trading of spectrum licences, given the limited number of licences in the market[61]. All of the trades so far have been for whole licences – there has been no subdivision and while there is scope for aggregation of licences out of some of the trades that have taken place, aggregation has not been initiated with the ACA.

A small number of private auctions for spectrum licences have been conducted, but most trading has been done by bilateral negotiation, or by brokerage[62].

Market Dynamics believes that when there is widespread acceptance for a greater role for private spectrum management and private property rights in spectrum, then more sophisticated approaches to trading than private auctions and bilateral negotiations will be required.

Market Dynamics and its partners in the US would be happy to provide a confidential briefing on some of these issues, and on our work on trading markets for the Commission.

We see a market exchange where all spectrum users can garner information about contemporary spectrum values and where anyone holding a perpetual right (including Defence and any other Government agency) could release surplus spectrum into the market, or acquire additional spectrum management rights. We believe that a continuous market will moderate price distortions and fluctuations over time, and provide information to the ACA about better pricing for its apparatus licences.

Such a market would provide an alternative to auctions as a way of releasing spectrum for private property rights by the ACA.

The features that such a market have must emulate many of the ***multi-object*** design characteristics in three dimensional space that are so important to primary allocations of spectrum licences by the ACA. This is ***no trivial matter***, but it is one where Market Dynamics' s partners have uniquely applicable patented intellectual property. We would be happy to provide a confidential briefing and demonstration of some of the technologies that have been developed for similar multi-dimensional markets for the Commission if this would assist the Commission's inquiry.

In addition to the outright sale of licences, their subdivision and amalgamation, there is another aspect to trading and the market that needs to be considered:

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61 There have been trades at 500 MHz, 800 MHz, 2.3 GHz and 3.4 GHz as well as some "technical" trades within linked corporate structures at 1.8 GHz.

62 Market Dynamics has been involved in the documentation audit for the first private spectrum auction in Australia, in brokering a small number of licences to the market, and undertaking buyer due diligence in support of bilateral negotiations for a trade.

that of leasing so that a private spectrum manager can operate in the same way as the ACA in administering a "licensing" regime.

Already, this submission has indicated that spectrum licensees can increase the efficiency of their spectrum holdings by releasing surplus capacity in the market place. It is possible to sub-let surplus capacity that might exist for a short or long period of time. However, the potential for efficiency disappears when the prices that need to be charged to provide a viable alternative to Government issued apparatus licences are far below what would provide a reasonable return to investors. So, again, this submission calls for a comprehensive re-balancing of apparatus licence fees to reflect contemporary market values. If surplus spectrum in the holdings of existing spectrum licensees could be offered to the secondary market on a leasing basis at reasonable returns, then it follows the utilisation and efficiency within those spectrum licences might increase[63].

Non-commercial use of spectrum

Elsewhere in this submission, Market Dynamics has argued for consistency and transparency in spectrum access pricing so that all users get rational pricing signals about the value of the resource they consume, and so can compare that with the cost of alternative communications systems.

Market Dynamics extends this basic principle to non-commercial users.

Non-commercial user as a term extends broadly. It includes all Government users, police, safety of life, fire, and volunteer organisations across the whole of the Australian community.

For Government users, Market Dynamics notes that these are, for the most part, budget funded. Those operating as Government Corporations do so on a commercial footing. It always exists within the capacity of Governments to appropriate funding to these bodies to meet their communication costs. Radiofrequency spectrum is a resource like other resources that are consumed: fuel, telecommunications, electricity. Governments pay for these resources like others – at best, they qualify for bulk purchase discounts. ***Spectrum should be treated no differently and all non-commercial users should pay for spectrum in the same way as commercial users, as they do for any other resource they consume.***

63 Market Dynamics recognises that there are competition issues in this. However, we believe that nothing would restrain a spectrum licensee from placing some restrictions on use of its spectrum rights by other through the execution of contracts. These might be in the form of "no compete" clauses". If there are competition issues that emerge, then the ACCC has the power to intervene. At the moment, it would be difficult for the ACCC to justify enforcing access against spectrum licensees, given that the licensees acquired their access in a public auction.

Defence

The Commission raises a number of specific issues about Defence use of spectrum. The specific opportunity costs of use of spectrum by Defence are well hidden from public gaze, perhaps justifiably so. However, Defence as an organisation has no consideration of the opportunity costs to the wider community of its spectrum holdings, nor has it any interest in or motivation for finding out what these might be. There are no incentives on Defence and similar bodies to make efficient use of spectrum, and no specific sanctions by the community of these bodies when they don't.

It is worthwhile using what little information is available to make some broad generalisations about what some Defence bands are worth. The bands from 3.1 to 3.6 GHz, for example, are all nominated in the Australian Spectrum Plan with footnotes denoting that:

> *Assignments to users other than the Department of Defence or the Australian Defence Force will not normally be authorised for this Service.*

The 3.5 GHz component of the bands was recently valued in an open public auction at more than $100 million per 100 MHz, so the band is worth theoretically as much as $500 million dollars on a simple linear extrapolation for a 15 year fixed term licence. That would buy a lot of jet fuel for our F/A-18 aircraft!

It is a matter of record that Defence did not give this spectrum up for commercial auction quietly. Perhaps if Defence had been paying market value for this spectrum, it might have been an easier decision.

Earlier in this submission, Market Dynamics argued that the Government should undertake a comprehensive re-balancing of apparatus licence fees to reflect contemporary market values. In this context, perhaps re-balancing of the fees charged to Defence for the 3.1 GHz to 3.6 GHz and other broadly comparable bands is in order.

The Commission opens the question on whether Defence holdings should be subject to review and challenge by other users. Market Dynamics does ***not*** believe that this would be either useful or helpful. Defence should not have to "lift its skirts" exposing sensitive operational capabilities simply because someone wants to challenge it. How easy would it be for foreign intelligence operations to undertake repeated challenges across the Defence bands in order to gain information? And how easy would it be for Defence to say no more than "national security, sorry"?

This is clearly not the way ahead.

Market Dynamics believes that the way to obtain efficiencies in Defence spectrum holdings is to provide incentives for Defence (and all Government users) to value their spectrum, and to release what ***they*** regard as surplus to the market in structured and ordered way, either through outright sale, or by lease with call-back options. Market Dynamics believes that there are some prerequisites for this to be effective and they include:

. Defence to be able to retain the proceeds of sale/lease with that quarantined from budget review;

. Defence to have a property right over spectrum so that it can release the spectrum to third parties on terms that meet Defence operational requirements;

. Defence to be able to set the terms and conditions of its release of spectrum to the market, including any terms that allow it to "call back" spectrum in time of operational engagement.

. Defence to be charged for its spectrum openly and transparently on the same terms as others; and

. there to be a viable trading market for spectrum in continuous operation and capable of yielding market information to inform Defence and other Government decision makers about the opportunity costs of their spectrum holdings on both a sale and lease basis.

Market Dynamics believes that the blocks of spectrum currently allocated to Defence in the Australian spectrum plan should be allocated to Defence as private perpetual property rights (an excerpt from the "root" licence described earlier) – this would be an administrative convenience that simply confirms current practice, but it opens a new way of thinking about Defence related spectrum, and new incentives for Defence to manage its spectrum better. Indeed, private property rights combined with a market structure for trading private property rights (see **Trading**) would provide an environment where Defence as a spectrum user could be sensitive to the comparison of the value of the operational capabilities its supports with the contemporary value of like spectrum reported by the market. The same is true of other Government users of spectrum. The theoretical rationale for trading private property rights in Government spectrum in the US is discussed in a paper by Dr Mark Bykowsky[64] provided privately to the Commission.

There are issues about how Defence would pay for these property rights (an up front payment would have profound distortionary effects), but these can be overcome, perhaps with some Government "time payment" plan.

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[64] Bykowsky, Dr M (2001) *Reforming Federal Spectrum Management through Spectrum Trading*, unpublished paper provided to the Productivity Commission.

Fee Exemptions

The Commission opens discussion regarding fee exemptions and invites comments about what sort of groups should be extended fee exemptions. Market Dynamics does not believe that there should be ***any*** fee exemptions or rebates in the licence fee schedule – indeed, Market Dynamics reiterates that for a properly functioning spectrum market and contestable spectrum management regime to be effective, the Government must charge for spectrum in a way that reflects contemporary market-derived spectrum values ***across the board***. If all exemptions and fee rebates are removed, then the cost burden should be eased on all spectrum users as the hills and troughs in spectrum values are equalised.

Volunteer and community organisations operate on a different basis to Government and obtain funding from a wide variety of sources including grants, commercial sponsorship and community fundraising. Nevertheless, while many of these organisations struggle for funding, and spectrum access costs are an expenditure item, the case for extending exemptions and rebates so that these users have "special" and privileged provision of spectrum raises some difficulties. As noted already in this submission, the market distortions so created are passed to the wider radiocommunications using community and ultimately to the Australian public. As such, these distortions amount to a hidden subsidy, and the have the added negative effect that they do not provide useful price signals about the value of the resource being consumed, leading to inefficient and sometimes inappropriate use. Market Dynamics believes that to the extent that the people of Australia find these services valuable, they should be prepared to directly and transparently supplement the funding of these bodies through public grants to support any "re-balanced" apparatus licence fees faced.

Police

There are some very real and important issues in the access to spectrum extended to Police who have some specific difficulties with the current legislation.

All State and Territory law enforcement bodies maintain technical intelligence gathering capability for major criminal investigations. If these capabilities require radio links, maintaining covert integrity is of paramount importance to investigators. It is not in the interests of the integrity of their investigations for equipment to be detectable.

So, for the most part, operation of these sorts of capabilities within radio spectrum is intended to be undetectable – it is intended not to interfere with any other spectrum user. Operation of devices by these organisations must be licensed, for unlicensed operation of a radiocommunications device is an offence, and might render any evidence collected by the device inadmissible in criminal proceedings.

While the law requires (and the ACA maintains) a “classified” register of licences, Market Dynamics believes that there is a strong case for some types of radio devices operated by law enforcement agencies to be subject to a general “class licence” that is not band or technology specific, but rather authorises these devices to be operated legally in connection with sanctioned investigations on a no interference basis.

On a separate matter of general licensed Police communications networks, Police and the associated State Treasuries and related Ministries are sometimes their own worst enemies. The different bands and standards applied by different state jurisdictions make coordination between agencies more difficult and make the demands on spectrum management more complex. All Police agencies need to be encouraged to work cooperatively to come up with common bands of operation and coordinated approaches to dealing with the Federal spectrum regulator to get the best out of the radiofrequency spectrum. Market Dynamics notes and applauds the level of cooperation between agencies represented in Assistant Commissioner Shuey’s submission and hopes that it will extend to all Police operational communications.

Broadcasting

Market Dynamics would prefer to make no comment on broadcasting use of the spectrum at this time other than to reiterate the administrative and structural efficiencies to be gained by having a single radiocommunications technical regulator.

Satellites

Market Dynamics would prefer to make no public comment on use of the spectrum by satellites at this time.

Impact of the Legislation on competition

Market Dynamics would prefer to make no public comment on the impact of the legislation on competition at this time.

The Role of the ACA

Market Dynamics is reluctant to make too many comments on matters of detail about the performance of the ACA. It is a fine organisation dealing with a challenging industry sector.

However, since this Review by the Commission is the first genuine attempt at regulatory post-implementation review of the radiocommunications regime implemented in 1992, its is worth making some general observations about what was set out to be achieved and what has been achieved over the last 7 years.

Focusing solely on the performance of the ACA is unfair to the Chair and Members of the Authority. It is necessary for the Review to think in terms of the performance of the whole regulatory structure over the period, and not just one organisation within that structure. The performance of the Department, the ABA (in its spectrum management role) and the ACCC in managing competition elements of spectrum management are all equally deserving of consideration for they all have a role in the triumphs and tragedies.

The spectrum reform strategy enunciated in September 1992 after passage of the *Radiocommunications Act 1992* had three central elements[65]:

. the selective and progressive introduction of a market based system of spectrum management to operate in defined spectrum management segments alongside the administrative system;

. improvements in the efficiency and effectiveness of the current administrative system (i.e. apparatus licensing); and

. the establishment of the spectrum management agency as an expert regulator outside of the Department.

Introduction of market-based spectrum management

In the view of this submission, the introduction of a market-based system of spectrum management has not been a complete success. Notwithstanding the successful introduction of spectrum licensing and its acceptance by industry, the development of advanced auction systems to allocate licences and the success of a number of spectrum auctions, the *institution* of market-based spectrum management has not been effectively realised. The limitations and constraints imposed on spectrum licensing in the legislation have rendered it incapable of delivering the sorts of improvements in efficiency in spectrum use that were anticipated. Even though the model was hamstrung, it is also fair to say that the move to implement a market based

65 Department of Transport and Communications (1992) *Radiocommunications – Spectrum Management Reform*, DoTC, Canberra.

system was not advanced with institutional vigour. There was deep seated institutional ignorance and resistance to the reforms and that persists in pockets of the administration to this day. Spectrum licensing continues to be the exception that has to be justified within the ACA and within the wider bureaucracy and to the Government. It cannot be said to have been accepted into the mainstream of spectrum management. So few bands have been released that the benefits of flexibility, fungibility and tradability are hard to discern. Instead, we see distortions in value created by artificially created scarcity of spectrum, and a lack of consistency in spectrum values that has created flow-on effects through the whole system.

Spectrum property rights are a good idea – indeed a necessary idea to help the administration of spectrum adapt to rapid technological change, but they need to be applied broadly and strategically before the Australian community sees real benefit.

Improvements to the efficiency and effectiveness of the administrative system

Again, on the evidence of the distortions highlighted in this submission, the "improvements in efficiency" to the system that were made may have already been lost.

There have been significant improvements like the class licensing system, an attempt to rationalise pricing, a reduction in the number of licence fee categories and and attempt to come up with a "rational" licence fee approach.

They should all be applauded.

Nevertheless, the system and its institutions have not kept up with improvements in the understanding of spectrum values that have been revealed through a succession of public auctions.

In many ways, spectrum pricing is less rational today that it was when the pricing reforms were introduced.

But is this the fault of the ACA?

This submission argues that it goes to a deeper institutional and political problem for the administration of spectrum management than simply the performance of the ACA. Re-balancing licence fees in the way advocated in this submission is no easy thing. Those who pay more squeal like stuck pigs and that creates a political dynamic to the issue. The political context of fee setting is a substantial constraint on the ability of the administration to deliver the outcomes argued for in this paper. Perhaps the way to deal with this is to provide statutory guidance to the regulator about how it should administer licence fees. That may prove equally problematic as the licence fees are derived from Tax Acts.

Establishment of a spectrum management agency

Even the establishment of the Spectrum Management Agency in 1993 and the ACA in 1997 cannot be regarded as wholly successful in terms of the goals enunciated in 1992. The idea of an independent expert statutory regulator is a fine one, but the role of that regulator must always be consistent the day to day operations of Government agencies within a political system. The ACA must always be mindful of the political sensitivities of the environment in which it exists – it ultimately serves the Government of the day. Moreover, the inefficiencies in spectrum management are ultimately inefficiencies that have their genesis in trade-offs generated within the political economy. Perhaps this is a further plank in the case for more private sector management of spectrum.

In terms of productivity and efficiency of the regulatory structure, the creation of the external regulator(s) has not really led to a reduction in the administrative effort devoted to radiocommunications. Oversight of radiocommunications and telecommunications occupies the minds of a great many people within the Department as well as the ACA and ABA.

The statutory requirement for Ministerial decisions at key points in the life-cycle of spectrum licensing provides a requirement for policy review of the expert regulator's recommendations. In that process, the Department conducts its own private consultation processes with key stake-holders before making its recommendations on the regulator's recommendations. There is a cost in terms of overheads and time in these processes and it a matter for the Commission to review their productivity.

While considering administrative review, the Commission might reflect briefly on the role of the Office of Regulation Review (ORR).

ORR has responsibility to review proposed new regulatory instruments to evaluate their purpose and consistency with wider Government policy objectives. A mechanism used in this review process is the "regulatory impact statement" that sets out what a proposed new regulation does and how it achieves public policy objectives.

Unfortunately, this has created an additional layer of administration over spectrum licensing. The entire package of instruments to support a spectrum auction as developed by the expert regulator is subject to review by ORR – this can amount to 5 cm of paper. In most cases, these are no more than simple modifications of template documents already considered and "ticked" by ORR, nevertheless, the process of RIS development for the instruments continues.

There are many within the ACA who would share the author's view that this is an area of Government red tape that is in need of a sharp pair of scissors.

Summary

Market Dynamics supports ongoing periodic review of all legislation and administration. In the case of radiocommunications, review of the ***Radiocommunications Act 1992*** and its administration is very welcome.

The Parliament made an important attempt to enter some new territory with this legislation in 1992, but the Act did not go far enough to implement the reforms of a market based system that had been identified in the literature. By not implementing these important reforms completely and by maintaining some of the old hangovers of the centrally planned model in their implementation, much of the effect of the reforms has been blunted. This submission suggests that the vision of spectrum property rights has not been fully realised and the reforms to administration and pricing have not been completely effective in an economic sense in improving the management of spectrum. Distortions and inefficiencies today are growing, not declining. Maybe this is because of confusion and conflict within the objectives of spectrum management. Market Dynamics has offered some foundations for different objectives that focus on the economic importance of the resource and the desirability that it be managed efficiently.

Market Dynamics believes that the centrally planned approach to spectrum management is useful in some circumstances and supports continued application of Government licensing of devices in some bands. However, Market Dynamics also believes that in an era of rapidly changing communications technology, the centrally planned approach to spectrum management may lead to poor public policy outcomes as exemplified by the 3G mess that Europe finds itself in. Market Dynamics believes that the private sector and market mechanisms have an important role to play in spectrum management through the application and deployment of perpetual property rights in spectrum.

Market Dynamics believes that the current administration of apparatus licence fees is in need of an overhaul and is out of step with contemporary values obtained in spectrum auctions. This imposes inefficiency on spectrum use and management, particularly for spectrum licensees who cannot compete with the Government as private contestable spectrum managers. The benefits of contestable spectrum management will never be realised unless the Government brings its pricing regime into line with contemporary values established by private spectrum managers.

Market Dynamics supports the use of auctions as a means of allocating scarce resources, but believes that the evidence from a number of auctions in Australia supports theoretical predictions backed by experiments that the SMR design used by the ACA for multi-object auctions may lead to inefficient allocations. Market Dynamics believes that the ACA should be encouraged to

investigate alternative designs, or outsource its auction management functions to groups with these skills[66].

On licence tenure, Market Dynamics believes that one of the biggest impediments to a successful market based model of spectrum management is the current maximum 15 year non-renewable term for licences. Market Dynamics argues instead for private property rights in spectrum in perpetuity as a way of overcoming the weakness of this. Market Dynamics notes the debate about tenure for apparatus licences but notes that in a centrally planned model of apparatus licensing, there is a conceptual requirement for mechanisms to provide for central re-planning, and long term apparatus licences may have the effect of limiting the ability of Government to respond to changes in technology that warrant re-planning.

In this submission, Market Dynamics suggests that the two mechanisms provided in the Act for moving a band from apparatus licensing to spectrum licensing are flawed in most circumstances of general application. Market Dynamics has proposed an alternative model that is able to be developed further.

Market Dynamics believes that the current impediments to trading in spectrum property need to be removed for the market to function properly. The ACA needs to make information about spectrum licences more readily available in a meaningful way. Taxes and charges on spectrum trading need to be reviewed and as noted already, the disincentive for trading created by a fixed non-renewable term needs to be removed.

Market Dynamics is critical of the distortions in the current apparatus licence fee schedule and believes that there should be no concession or discounted fee structure except, perhaps, for bulk purchases. Market Dynamics has proposed that consistent with our vision of private property rights in spectrum, Government users should be extended private perpetual property rights over spectrum already in their hands and they should be free to release that spectrum to the market in response to pricing signals about spectrum values. Market Dynamics believes that for this to be truly effective, there will need to be some form of continuous trading exchange for spectrum so that values are being continuously disclosed.

Finally, Market Dynamics reviews the administration of the Act and offers its view that the administration has not been wholly effective in delivering the objectives for reform articulated in 1992.

The challenges for the Commission in all of this are to identify what modifications need to be made to the reforms of 1992 to order to make them function properly, identify improvements that can be made to the legislation based on what is known now about contemporary spectrum management

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66 Note that the New Zealand Government is currently investigating the complete outsourcing of its spectrum auction management functions.

issues today, and where will the challenges for tomorrow come from and how should Government responses be framed.

Market Dynamics looks forward to supporting the Commission as it frames its recommendations to these challenges.