FCC Reform in Spectrum Right Formulation

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1.0 Introduction

Professor Weiser, in his paper "*FCC Reform and the Future of Telecommunications Policy*" at the section "*The Possibility of Regulatory Reform*" suggests Ofcom as a good example of "evidence-led" rather than *ad hoc* policy decision making. Sadly, while Ofcom might "*play a pretty straight bat*" in some areas, in others it is more a case of "*just not cricket*", a failing which a revamped FCC will need to guard against.

An example of an *ad hoc* Ofcom policy design process is set out below. There are interesting parallels with the FCC experience. The example also offers an introduction to the most important issue for spectrum management reform in the USA, an aspect of spectrum market design: *spectrum right formulation*.

In spectrum right formulation the challenge is how to best delineate spectrum spaces to:

- delegate full spectrum management to each licensee;
- allow application of proprietary device operating rules within each space; and
- encourage competition through industry-driven innovation by the trading of those spaces in a market.

The end result should be:

- rules which clearly delineate a spectrum space, within which, there are no rules; and
- spectrum space which is a tradable commodity protected by authentic legal rights.

UK industry's experience in relation to the design of Ofcom's Spectrum Usage Rights (SURs) is that Ofcom continues to push a method of spectrum right formulation for market-based spectrum management which has met, and continues to meet, with majority industry opposition in all Ofcom consultation responses. Ofcom has also worked at having its ideas accepted internationally. However, it is a system based more on politics than on engineering and physics. Those ideas have not worked for UK industry and are now not acceptable to Europe. It is safe to say they will not work for the USA. Note that alternative spectrum management systems such as those applied in Australia, New Zealand and Canada, have not been promoted by their national regulators to any significant degree.

2.0 Autonomy in Market-Based Spectrum Management

Market-based spectrum management seeks to maximise spectrum efficiency and innovation by providing industry with freedom to independently choose the type of equipment and service. While good market design restricts profit-seeking to constructive, rather than destructive behaviour, no one is in charge of an authentic market. Where an authority relationship exists – one party is in charge of the other, or a higher authority is in charge of them both – then transactions are not market transactions. Decentralisation brings dynamism. Free decision-making (autonomy) is the key[1].

Driven more by politics than good engineering practice, international spectrum regulation in general, is often more a form of art than a science. Spectrum scarcity is artificial, a result of overly simplistic interference management rules. Simplistic rules tend to maintain the centrality of the regulator in spectrum management and create outsourced management inefficiencies. While it is not essential and sometimes inefficient to define every detail of the rules of

[1] John McMillan "Reinventing the Bazaar: A Natural History of Markets" ISBN 0-393-32371-4, 2003.

spectrum access, the design of a market mechanism must recognise important interdependencies and make related rules explicit. Interference between devices is highly interdependent.

Where a regulator provides:

- insufficient interference benchmarks; or
- overly simplistic interference benchmarks; or
- interference benchmarks which are impractical to implement; or
- interference benchmarks which are not authentic legal rights, a licensees' ability to make independent decisions about spectrum use decreases, and with it also decreases spectrum efficiency and the likelihood of innovation.

3.0 Spectrum Right Formulation

What a legal right comprises depends on what is said by what confers it. A right may be conferred 'positively' or 'negatively'. Lawyers have for some time recognised it is much more practical in drafting terms to establish the content of a right by defining it negatively *i.e.* permission is conferred to use the spectrum subject to certain restrictions, rather than trying to describe the extent of the right in positive terms. Therefore, explicit (primary) transmit rights with implicit (secondary) receive protection is more practical.

Technically speaking, there is a logical nexus between transmitting and receiving with one element not being more important that the other. Practically speaking, limits at a transmitter(s) antenna or antenna array, which have been designed to embed a predictable level of receiver protection in relation to **all** interference mechanisms, are clearly superior because they lead to greater autonomy and much better managerial efficiencies.

The provision of partial spectrum rights *i.e.* benchmarks for some interference mechanisms but not all and/or rights based on explicit receive rather than implicit receive conditions is the primary reason why there is so much regulatory uncertainty in both Europe and the USA, uncertainty that has never been experienced under the Australian regulatory model: space-centric management.

4.0 The Australian Regulatory Model: Space-Centric Management

Australia had to be precise and clear in its design of spectrum rights. Australian legislation requires exclusive access, and government compensation is payable if spectrum rights are not maintained. In Australia, and presently nowhere else, the issue of a spectrum licence by government provides rights akin to a commercial dealing involving a quasi-contract for an indefeasible company asset. Interference risk always remains clear and calculable.

Australia employs a complete set of explicit transmit rights for all interference mechanisms. For new services, the transmit rights are established as mathematical functions of device separation from boundaries of a spectrum space *i.e.* geographic, frequency and time. For legacy services, separate device-specific and site-specific receive rights which can override the explicit transmit rights are often used for political reasons.

A complete set of explicit transmit rights in relation to all interference mechanisms enables a licensee to authorise and operate devices completely independently of the regulator and adjacent spectrum licensees, and if desired, without a formal equipment standardisation process. With a complete set of rights, any type of new equipment can be independently authorised by a spectrum licensee essentially in the time it takes to make a minimum number of laboratory measurements and check its field deployment against the spectrum access conditions of the licence.

A high level of engineering skill is necessary to establish a coherent set of benchmarks for the transmit rights in order to achieve self-consistent levels of notional receiver protection. Australia provided such benchmarks in 1997 and they have been successfully used in practice to introduce innovative wireless services into Australia for over a decade, without any reported cases of interference or related litigation[2].

5.0 Background to Ofcom's SURs

Ofcom Head of Research and Development and Senior Technologist, Professor William Webb's presentation at the George Mason University in Washington DC at the end of 2008 shed light on what has led Ofcom to their unique and problematic approach to formulating generic licence conditions for radio spectrum liberalisation.

Ofcom began regulating in earnest in 2003 after taking over from the former UK Radiocommunications Agency. Webb paints the main changes in working environment as:
• "*At arms length from Government*
• *Around 80% of the senior management had never previously worked for a regulator*
• *A natural remit to conduct 'blank sheet of paper' review*"

Given the diverse nature of spectrum management, with political, economic, social and technical inputs, it has been the traditional province of government. It takes many years of experience to acquire a working level of skill. A '*blank sheet*' approach with 80% of senior management never previously working for

[2] Further information on space-centric management can be found at www.futurepace.com.au

a regulator simply encourages intemperate '*think-tank*' solutions which turn out to be impractical after more sober scrutiny.

Just prior to 2003, the USA Spectrum Task Force Policy Review had proposed licence conditions based on '*interference temperature*': a maximum level of ambient field strength that receivers are expected to tolerate, an explicit receive right. This was the outcome of a separate '*blank sheet*' approach in the USA. Ofcom spectrum usage rights (SURs) were similarly based (Ofcom uses the term '*aggregate power flux density*' (A-PFD)) which are ambiguous explicit transmit/receive rights. Webb asserts they are "*clearly superior*".

Futurepace has always taken the view that any issue can be argued, but not necessarily persuasively. Ofcom locked itself into a series of positions which can only be supported through assertion, because, based on reasoned argument, the Ofcom position is unsupportable. Ofcom's oft repeated assertion that "*most supported our proposals*" is not borne out by a reading of their consultation responses. A Vodafone response[3] in September 2007 to an Ofcom consultation on SURs says "*Another approach, known as 'space-centric spectrum management' has been successfully used in Australia for one class of licences. We are extremely disappointed that Ofcom has maintained a blinkered focus on the A-PFD approach; there is no evidence that it has seriously considered other approaches, either before the first consultation on SUR or as the result of responses to any of the consultations*." Ofcom responded with "*Prior to the publication of the SUR consultation, Ofcom has commissioned external consultants to look into a range of possible approaches to SURs. These were described in our SUR consultation document and the consultants' report is on our website*". The Ofcom response did not provide evidence that it has ever seriously considered alternative approaches. Ofcom had commissioned industry research to shore up its pre-determined policy position rather than inform it.

Like the FCC, Ofcom would benefit from thorough assessment of alternative solutions. But just as Lawrence Lessig, Professor of Law at Stanford Law School says of the FCC "*Its commissioners are meant to be 'expert' and 'independent', but they've never really been expert, and are now openly embracing the political role they play. Commissioners issue press releases touting their own personal policies*"[4], Ofcom exhibits similar limitations. In 2006 Webb published his personal preference for SURs based on A-PFD[5], in the middle of industry debate and one year before Ofcom gave their 'Final Statement' on the matter.

[3] **Vodafone** response to Ofcom consultation on Spectrum Usage Rights, September 2007
[4] "Reboot the FCC" Newsweek, December 23, 2008, www.newsweek.com/id/176809
[5] Webb, W. **"**Regulation - A licence to do (almost) anything you want WILLIAM WEBB DESCRIBES A MORE FLEXIBLE APPROACH TO SPECTRUM LICENSING" Communications Engineer Volume 4, Issue 6, Dec.-Jan. 2006

6.0 A Design Process that Worked

Significantly, the Australian policy position was determined quickly and with widespread industry acceptance because the Spectrum Management Agency retained control of the process, in-house expertise led the debate, no external paid consultancies were entered into and Australian industry participated on a self selecting inclusive process. Industry paid its own way.

This meant that Australia avoided the circus of endless consultations and seminars. The Ofcom process gave rise to satellite industries in conference management, seminars and consultancies. It also follows that there is a total disincentive to actually reach a conclusion as companies find it more profitable to inch towards solutions; paralysis by analysis results. More importantly, there is a grave danger of consultancies being awarded on the basis of readiness to justify a pre-determined agency position in order to increase the likelihood of being awarded the current as well as additional future consultancies.

7.0 Ongoing Industry Opposition to Ofcom's SURs

A Vodafone response[6] to Ofcom in January 2008 says "*In its first consultation on SUR, Ofcom proposed to base them on A-PFD limits. It had not sought the views of stakeholders before this consultation, and we believe that consideration of alternative approaches from the outset could have resulted in more rapid progress towards a workable SUR regime. Ofcom continues to pursue this approach despite the substantial difficulties that it has encountered in two different methods of assessing A-PFD limits, and despite the views of stakeholders expressed in previous consultations. It is becoming ever clearer that this approach is inherently extremely complex, and possibly completely unworkable.*"

T-Mobile's response[7] to Ofcom in August 2008 demonstrates the ongoing industry unease with Ofcom's SURs formulation "*Any solution must be legally robust, easy to implement, measurable, enforceable and unambiguous. We remain unconvinced that this is true for SURs. Ofcom has so far progressed the SUR regime without taking any steps to validate it at a practical level by applying it to a current network.*"

There are many more examples and they do not give much credence to an "evidence-led" process.

8.0 Ofcom's New Tact: Machiavellian Explanations

Having general in-principle support for spectrum liberalisation from most of UK industry, but faced with overwhelming opposition about Ofcom's manner

[6] **Vodafone** response to Ofcom consultation on Spectrum Usage Rights, January 2008
[7] **T-Mobile** Cleared DDR consultation response, August 2008

of implementation, Webb sought refuge in Machiavellian explanations. He said "*Current licence holders are risk averse and often prefer the status quo while the new entrants who will benefit most have a relatively weak voice*." Noting that UK industry generally supports spectrum liberalisation, Ofcom would be applying its own Machiavellian strategy by pitting one part of industry against another to deflect criticism from its own incompetence.

9.0 Ofcom: A Law unto Itself

Ofcom has a long history of ignoring valuable industry advice. Ofcom is susceptible to the same false sense of security engendered by a business that is not fully exposed to the consequences of its actions. It has the capacity to act in a manner contrary to economic common sense because it believes it is beyond economic sanction. Instead of Ofcom worrying about whether additional regulatory tools are required to prevent recent judicial proceedings, what Webb now refers to as '*gaming*' by licensees to reduce competition, the UK would be better served by a management process which attended to issues well before they reached court. By considering itself at arms length from government, Ofcom acts as if it is a law unto itself. This ignores the political reality.

10.0 Practical Framework for Delegating Spectrum Access

There is a general tendency for regulators worldwide to presently prefer incomplete solutions when formulating spectrum rights. In the USA, Weiser and Hatfield observe[8]: "*At present, the regulatory strategy for guarding against interference is notoriously undefined, moves too slowly to offer effective guidance, raises transaction costs (as well as entry barriers), and leads to the under use of spectrum…..The not-so-hidden secret of the FCC's traditional spectrum policy regime is that it avoids the very difficult tasks of defining property rights clearly enough to allow for marketplace transactions and instituting an effective enforcement regime. To advance its spectrum policy reform agenda, the FCC will have to define spectrum rights and protections against interference (and the correlative right to interfere) far more clearly than has historically been the case.*"

At a London conference in 1995, where Australia first (and last) formally presented its solution for flexible spectrum rights in an international forum, I was puzzled by the incomplete definition of rights for PCS licences during the FCC's presentation. I later asked the FCC official how licensees were to manage interference. The answer, "*through the mutual greed of licensees*" came as a bit of a surprise to me. Reliance on industry gaming should never be

[8] Weiser, Phil and Hatfield, Dale N., "Spectrum Policy Reform and the Next Frontier of Property Rights". George Mason Law Review, Vol. 60, No. 3, April 2008

an excuse for regulatory indecision. Greed is no substitute for good regulation. Good regulation restricts profit-seeking to constructive behaviour.

Despite the lip service paid to industry self-regulation, vague spectrum rights serve to maintain the centrality of regulatory bodies in the ongoing management process. Industry is often asked to pay high commercial values for products against which it has incomplete and ill defined rights. Shareholders deserve better[9].

In early 2008, the EC adoption of an explicit transmit based limit (BEM) for introducing spectrum liberalisation throughout Europe (WAPECS) provided further supporting evidence as to the superiority of explicit transmit rights. BEM is now rightly preferred by European industry over Ofcom's proposals for primary limits of aggregate power flux density. The BEM of WAPECS was a good start for increasing equipment choice in Europe. Unfortunately, BEM deals only with one aspect of interference at the frequency boundary. It is a partial solution. Similar benchmarks are needed for all the other interference mechanisms.

A complete set of explicit transmit rights in relation to all interference mechanisms enables an Australian spectrum licensee to authorise and operate devices completely independently of the regulator and adjacent spectrum licensees, and if desired, without a formal equipment standardisation process. With a complete set of practical and legally authentic spectrum rights, any type of new equipment can be independently authorised by a spectrum licensee essentially in the time it takes to make a minimum number of laboratory measurements and check its field deployment against the spectrum access conditions of the licence.

A high level of engineering skill is necessary to establish a coherent set of benchmarks to achieve self-consistent levels of notional receiver protection. Australia provided such benchmarks in 1997 and they have been successfully used in practice to introduce innovative wireless services into Australia for over a decade, without any reported cases of interference or related litigation.

11.0 Technology and Service Neutrality

Because of the prevalence of manufacturing in Europe, spectrum has been treated as if it is the primary means whereby a particular technology is delivered. The technical cart is placed firmly before the regulatory horse. Australia was not locked into providing an economic support system for locally

[9] "*Some industry stakeholders and panelists indicated that FCC should better define the rights accompanying spectrum licences, as these rights can significantly affect the value of a licence.*" See "*Options for and Barriers to Spectrum Reform*" US Government Accountability Office (GAO), March 2006, GAO-06-526T

developed equipment, rather Australian industry demanded a technical regulation system which would allow the use of any international (and as it transpired, local) innovations without the need to revert to the regulator for permission to utilise a new equipment type. Thus Australian spectrum licensees have been able since 1997 to use all technologies and services, including cognitive devices for dynamic spectrum access, deployed against spectrum licence conditions with no change, no detriment to industry and no litigation.

At the start of 2007, over 5000 WCDMA (850 MHz) base stations had been authorised under Australian spectrum licences during the previous 3 months using an online process. There was no need for negotiation just a simple requirement to place certified data into a central online register established by the Australian regulator. The process was fully self managed, business decisions were taken, base stations deployed and authorised and all without reference to the regulator. Nor was it necessary to negotiate with other licensees. Managerial innovation is no lesser an industry objective than technical innovation. Importantly the rules that allowed the authorisation of the Telstra WCDMA850 *Next G*™ network in 2006/7, a world first, were truly technology and service neutral since they were provided to industry 10 years previously in 1997[10].

12.0 Conclusion

It seems that all regulators can succumb to using *ad hoc* decision making processes when establishing policy. An international example was given where Ofcom consistently ignores the majority industry opinion, preferring a pre-determined policy position regarding formulation of rights for spectrum licences (Ofcom refers to them as 'SURs').

[10] The Australian *Next G* network, referenced by a number of speakers, was the only example of significant innovation to be mentioned at the 2nd European Spectrum Management Conference in Brussels in June 2007. The *Next G* network won the IEC Wireless Broadband 2007 InfoVision Award in Berlin in October 2007 along with Ericsson who won the Broadband Appliances Award for its W25 wireless gateway which acts like a fixed line alternative/replacement for voice, IP Fax and broadband internet communication via the *Next G* and GSM network. Telstra's world-leading role in the deployment of the cutting edge *Next G* network also played a significant role in Australia being chosen in July 2008 to host a new Ericsson LTE Global Competence Centre for research and development, system trials and testing, and development of engineering guidelines, tools and processes for the introduction and operation of LTE networks worldwide, thus placing Australia at the forefront of advances in wireless broadband technology. In October 2008 Ross Fielding, Executive Director, Telstra Product Management said "*Working with our partners, Sierra Wireless, Qualcomm and Ericsson, we are developing the world's first 21Mbps capable mobile broadband device, which will take advantage of the speed, coverage and capabilities of the Next G network, giving our customers an unrivalled broadband experience when on the move, across a network that covers over two million square kilometers and 99 per cent of the Australian population.*"

The level of industry autonomy to maximise spectrum efficiency and innovation under market-based management is determined by the technical and legal clarity of the spectrum rights. Explicit transmit rights in relation to **all** interference mechanisms, with implicit receive protection is shown to offer more regulatory certainty, greater autonomy and better managerial efficiencies. Such a solution, referred to as *space-centric management*, has been successfully employed in Australia for over a decade without any reported cases of interference or related litigation.

Ofcom's ambiguous transmit/receive 'rights' (SURs) resulted from a 'blank sheet' approach coupled with insufficient regulatory experience. It was a political solution argued through assertion, rather than a competent engineering/legal design. The alternative Australian approach was never fully considered. Ofcom commissioned industry research to shore up its pre-determined policy position rather than inform it. Webb published his personal preference for a SURs based policy, in the middle of industry debate and one year before Ofcom gave their 'Final Statement' on the matter. Webb has now got to the point where Machiavellian strategy is being called upon to defend the policy.

If efficient self-regulation is the real objective, regulators must provide a workable set of spectrum rights that cover all interference mechanisms; else the regulator must logically remain central to ongoing management. Reliance on industry gaming should never be an excuse for regulatory indecision. Greed is no substitute for good regulation. Good regulation restricts profit-seeking to constructive behaviour.

While Futurepace has for the last several years recommended space-centric management as a policy alternative for Europe and the USA it should be understood that Futurepace does not own the management system we recommend. The system is Australian Government policy, not the proprietary IP of a private company.

In some areas, space-centric management is trivialised on the basis that Australia is different from Europe or the USA. The argument goes that Australia's population and lack of geographic boundaries with other nations makes our system irrelevant to other countries. Practically speaking this is nonsense. Our license boundaries involve management of spectrum spaces from very small and densely populated to wide open spaces. Our low population combined with extreme distances and Universal Service means that we have to be efficient. Australia has a system that works. Australia has certainly proven that it is different, because we are not hostage to equipment manufacturers and because we are compelled, by virtue of population, commercial expectation and geography to be efficient.