

# SPECTRUM ANALYSER

A comprehensive book on spectrum policy is reviewed by **MARC BEISHON**.  
The key theme is liberalisation and its limitations and future

Spectrum is a subject that hardly sets the pulse racing. Its technicalities can be yawn inducing and the various strategies for allocating it to operators are enlivened only by the often eye-watering sums that they have to pay to buy capacity in auctions, which can be entertaining. Despite thousands of the world's policymakers and technical experts descending on Geneva at the ITU's latest World Radiocommunication Conference (WRC-15), where vital decisions about the economy's underpinning communications get hammered out, there's been little mention in national media.

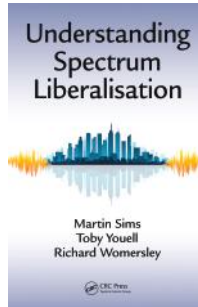
So it's a tribute to the authors of *Understanding Spectrum Liberalisation* that they have managed to turn this potentially very dry topic into a lively narrative that they feel achieves two main aims – to provide an introduction to spectrum policy to those new to the subject and who may well be 'puzzling' over it, and an interpretation of current developments for those already in the field. Further, by tracing the history of spectrum policy, the story parallels the way regulation in general has developed, and so makes a good and ongoing case study in regulatory policy.

## STORY OF LIBERALISATION

The basic story is straightforward, and explains the title of the book. Up until about 20 years ago, spectrum was simply allocated by government agencies in the developed world under a command and control method to operators, mostly for no charge. Liberalisation, which of course has also opened up other markets in telecoms, then became the norm, recognising that operators should pay for using an increasingly valuable asset (the much-used comparison is with paying for different types of land by its value).

The liberalisers, the authors say, visualised a market where frequencies can be bought and sold, including under technology neutral licences, and this took hold in the US and then the UK and European Union, especially for mobile spectrum, and those eye-catching auctions became the norm. But by 2009 the story becomes much more interesting at a policy level, because it had become apparent that there were limits to liberalisation as demand for mobile spectrum soared. Operators couldn't practically buy spectrum from broadcasters or the public sector, and regulators didn't tell mobile operators to buy in the market, instead trying to reallocate spectrum at national level and at international level through the ITU.

*"It was a tacit admission either that liberalisation alone could not deliver, or that it was inherently a slow process,*



*Understanding Spectrum Liberalisation*, by Martin Sims, Toby Youell and Richard Womersley, is published by CRC Press. More details at: [crcpress.com](http://crcpress.com) Martin Sims founded PolicyTracker, the spectrum management newsletter

*unfit for its biggest challenge so far,"* say the authors. Spectrum trading in the secondary market, which was thought to be a plank of liberalisation, has also not taken off in the EU (although has been more successful in the US and Australia). Further, liberalisation does not lend itself to the growing interest in wholesale mobile networks, such as in Mexico, which could turn the sector back into one more like fixed networks, with one shared infrastructure, and indeed various forms of sharing is now very much on the agenda as part of a third phase of spectrum management, which the authors argue is now taking hold.

## BACK IN TIME

Delving deeper into the past, a chapter describes how commercialising spectrum licensing took place and how the 'father' of liberalisation, Ronald Coase, put the case for treating spectrum like any other commercial input (his seminal paper was published as long ago as 1959). The command and control system can have advantages, such as with the EU's GSM directive of 1987 that mandated certain bands and technology for mobile so there was no interference between countries, and this proved successful but was in the long run inflexible when operators wanted to update the technology. Other mandates failed quickly, such as the MAC satellite and ERMES paging systems.

Regulators shouldn't be picking winners and wasting public money, is the view, but the authors say that the GSM directive worked to put Europe ahead for some time because it applied to a new market with great latent demand, and not to established industries such as satellite. Licences can then be amended to make them technology neutral.

The commercial, liberalisation phase, while characterised by the massive auction windfalls for governments, also has had sharing in unlicensed bands, such as with the spectacular rise of WiFi, where there are low barriers to entry, and other technologies such as white spaces also have a 'commons' model. Licensing is only usually necessary to prevent interference.

Jumping ahead to the conclusions, it is said that liberalisation has not 'had its day' or been a failure, but has been disappointing in not being applied to broadcasting, not providing enough mobile spectrum and not stimulating much trading outside the US. (And command and control is still more than sufficient to meet the needs of many developing countries, where mobile broadband is not widespread and utilities are often government owned.)

The authors add: "What has emerged from the attempts to apply a liberalised approach to the airwaves are the constraints under which any spectrum market must operate. There are the long time-lags associated with international coordination and the development of chipsets, the political pressures generated by the social importance of services such as broadcasting and defence, and the oligopolistic nature of the mobile market... The new emphasis on sharing is an attempt to overcome some of those limitations..."

### LIBERALISATION IN ACTION

The bulk of the book fills in the detail. Newbies will be pleased with the chapter that explains what spectrum is and how radio waves work. Then the book steps rapidly through the topics that show 'liberalisation in action'. First is the spectrum auction, which has become the default assignment mechanism (although many countries which hold them would stop short of trading or pricing public sector spectrum). Then there's a valuable chapter on how licensing is done – this does get somewhat technical, as licences need to ensure spectrum does not interfere with others, and it is more complicated with technology neutral approaches that give more flexibility, and the authors note there are limits to liberalising licensing.

The following all get a dedicated chapter:

- The public sector, where incentive pricing, or incentive to vacate, is discussed in detail (and where the UK is a leading player)
- Broadcasting (where digital terrestrial TV, DTT, is thriving in some markets despite its inferiority in technical terms to cable and satellite, and despite younger people watching less conventional TV, and where attempts to use market mechanisms have come to almost nothing)
- Satellite (where command and control mostly rules)
- Ultra-wide band (used for underlay networks but hard to implement)
- WiFi and the spectrum commons (unlicensed spectrum here is a great success but so too are standards and technology that make it work. There's a view that policymakers should pay more attention to the innovation that such spectrum can provide)
- White spaces (which may be a transient opportunity as incumbents may fill the gaps).

In the next section, the authors get to the heart of the issues. Is there really a capacity crunch? (A broadcaster looked at this closely in the last issue of *Intermedia* with the answer 'no'.) In the book, the authors largely agree but say there is undoubtedly, growing demand for mobile broadband – and (tongue in cheek) if so, can't the liberalisers and therefore the market decide? They add more on the obstacles to liberalisation, such as the need to address huge markets at global scale, the separation of handset makers from operators, and the political power of broadcasters, so it is mainly command and control that will transfer spectrum.

Another question: why does trading have such patchy success? Mobile markets are often oligopolistic and national, but where trading has been successful, in the US, networks are regional,



Delegates stand at a plenary session at WRC-15 on global flight tracking. The ITU has acted quickly on assigning spectrum for tracking after aircraft disasters. The book has an appendix on how the ITU works

and the US has also been able to trade in spectrum for declining technologies such as WiMax and mobile TV. Trading has done relatively well in lower value market sectors, it is noted.

Moving on, there is discussion of sharing and wholesale networks, and whether they are good or bad for competition and costs, and certainly moves to wholesale will mean changes to spectrum models. One of the more lengthy chapters deals with political issues that influence spectrum, and there is comment that national and international political constraints can exert a negative influence on spectrum policy reform. And criticism of auctions for allocating spectrum seems to be gathering pace, but "many more hits will be required to wrench the auction treasure chest from the grip of government ministers".

### A TOOLBOX FOR THE FUTURE

In the final part of the book, the authors look for the right 'metaphor' for the changes ahead – not so much a paradigm shift but the use of a humble toolbox, they say. What's in the toolbox? In summary:

- Licensed shared access – where an incumbent user allows other users to share its spectrum. It has appeal as a speedy way around trading limitations but won't provide long-term, high-quality service.
- Cognitive radio – this senses when a frequency is used and only transmit when unoccupied and is used in 5 GHz WiFi (shared with radar), for example. Dynamic spectrum access (DSA), which uses databases to determine location rather than sensing, is becoming of more interest, the authors say, but progress is slow. A famous paper by Eli Noam in 1998 saying spectrum will be a true, real time, open market thanks to techniques in cognitive radio is though a vision that the authors say is a long way off but is a direction of travel that could eventually remove the obstacles to spectrum markets.
- Future technologies – 5G is the key one, and there are issues beyond spectrum such as the growth of small cells, but sharing and the use of higher frequencies (including above the radio bands) are likely to be important. Here the authors prefer not to speculate too much.

Overall, *Understanding Spectrum Liberalisation* is written in clear English, in short chapters and with minimal technical obscurity. What the book does well is cover almost everything likely to be important in the next five years or so.