

## **White Paper: Should the Allocation of Radio Spectrum be Left to the Market?**

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There can be no doubt that radio spectrum is a valuable national resource and, although there are vast amounts of it available, realistically there are only limited amounts that are applicable to particular practical applications, eg, mobile communications. This has led many governments around the world to take a view that it should be allocated through the market in the same way as many other limited resources, such as land. But is this the best approach for maximising the benefit that this national resource provides to a nation's citizens and consumers? Can we simply treat spectrum as a resource that can be bought and sold? Does this approach ensure that the benefit of the spectrum is maximised for the country? In this paper we examine some of the arguments that have been put forward for the allocation of spectrum through the market and consider the validity of these arguments in the light of recent events and experiences relating to this approach. We pay particular attention to the allocation of spectrum within the mobile 'sweet spot', since this is where much of the activity has been in recent years.

### **Argument 1: Spectrum auctions are an efficient way to allocate spectrum since they are less susceptible to legal challenge than beauty contests**

It is true that there have been instances when the results of spectrum allocation through so-called 'beauty contests'<sup>1</sup> have been subject to legal challenges. One example of this was the 3G spectrum allocation in Sweden in 2000, when some of the losers in the beauty contest process challenged the decision of the regulator in the Swedish courts. The challenge was unsuccessful and it was dealt with quickly by the courts. As a consequence, it had only a limited impact on the roll-out of the 3G networks. However, a recent example regarding the auction of the 2.6 GHz frequency band in the United Kingdom has shown that auctions are also not immune to legal challenges. T-Mobile and O2 mounted a legal challenge against the spectrum regulator, Ofcom, arguing that they are unable to determine an appropriate value for spectrum in this band until Ofcom resolves the uncertainty around the re-farming of the 2G frequency bands. Ofcom has now performed a u-turn on its decision to hold the auction as soon as possible and it looks likely that this auction will be coupled with the auction of spectrum released through the digital television switchover, which is likely to occur sometime next year.

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<sup>1</sup> A beauty contest is a system whereby a regulator allocates the spectrum to the organisation that proposes the best use of that spectrum according to some agreed criteria.

The consequence of this is that the incumbent mobile network operators will not have to face competition from new entrants to the market for several years, and they also avoid paying for additional radio spectrum that they do not necessarily need at the present time. The delay may also have a significant impact on the potential success of the Mobile WiMAX technology in the United Kingdom, since any 'first-to-market' advantage that would have been enjoyed by a new entrant deploying Mobile WiMAX, which is more mature than the LTE technology that is likely to be deployed by the incumbents, has been diminished significantly. This may have the impact of limiting the amount of competition and innovation in next generation mobile communication services. Given the constant uncertainty around future spectrum allocations, it seems reasonable to assume that this approach to influencing the timing of spectrum auctions will be used again in the future.

### **Argument 2: Allocating spectrum through the free market is the best way to ensure efficient use of the spectrum**

It is often argued that a free market is the best way to ensure that a resource gets into the hands of those who value it most and, hence, is the best way to ensure efficient use of the spectrum. But does it follow that those who value the spectrum most from the perspective of their own business will use it most efficiently? Take the 3G auctions in the United Kingdom in 2000. Between them, the five winners who bid the most gained access to 120 MHz of paired spectrum (ie, two separated bands, one to support transmissions by the base station and one to support transmissions by the terminals) and 20 MHz of unpaired spectrum. Given the recent growth in demand fuelled by low cost 'all you can eat' mobile broadband data packages, there is significant pressure on the operators to make efficient use of the 120 MHz of paired spectrum. However, the 20 MHz of unpaired spectrum has remained essentially unused, apart from limited technology trials. So this portion of prime mobile spectrum is certainly not being used efficiently. If trading had been permitted in this band, would the spectrum have been successfully sold on by the operators? Would the current holders want to see a competitor enter the market using this spectrum? Would the operators have been able to achieve an attractive price if they had chosen to sell, given that the current value of this spectrum is likely to be significantly lower than the amounts paid during the auction? The current packaging arrangement (ie, into 5 MHz blocks owned by different operators) also makes it unattractive from the perspective of next generation systems such as WiMAX and LTE. Therefore, it is difficult to see how this spectrum will ever be used (let alone efficiently!), particularly since the UK Government has proposed that the 3G licences should be made indefinite.

Another example is the recent L-band auctions in the UK, in which Qualcomm UK Spectrum Limited managed to secure all of the auction lots and gain exclusive access to 40 MHz of prime mobile spectrum on a nationwide basis. Qualcomm's comments on winning the auction, that 'acquiring this spectrum will enable us to develop, test and explore a variety of innovative wireless services and technologies that will benefit European consumers and the wireless industry as a whole', suggested that this was a speculative purchase, and the absence of any announcements from Qualcomm on the use of this band since its acquisition tends to support this suggestion. Therefore, the auction process may have delivered the spectrum into the hands of those who valued it the most at the time, but does this ultimately mean it is used most efficiently? Perhaps a beauty contest, with participants making proposals for how they would use the spectrum to deliver services and being held to firm roll-out and service obligations, would have been a better way to ensure that the spectrum was used efficiently and effectively.

### **Argument 3: Allocating spectrum through the market is the best way to ensure the maximum benefit to the country**

Following on from the previous argument, it is often mooted that the free market ensures that the use of the spectrum, which is a national asset, delivers the largest benefit to the country. In the previous section we highlighted situations in which spectrum has not been used and, in these instances, it is difficult to argue that the spectrum is being used to deliver benefit to the country. However, let us take an example of the spectrum arriving in the hands of an organisation that values it the most and that organisation making efficient use of the spectrum. Will this guarantee the greatest benefit to the country from the use of that spectrum? This depends on whether the price paid by the spectrum holder takes into account the overall benefit to the country. An advocate of the free market may argue that the highest valuation of the spectrum occurs when the use of that spectrum benefits the largest proportion of the population, ie, the potential market for the service offered is the largest. On many occasions this argument may be valid, but may not be true when we consider the use of spectrum by public safety organisations or local health care providers, for example. How would the market accommodate such services as the global positioning system (GPS), which provides significant benefits to society, but is unlikely to be able to compete for spectrum against other commercial services? What will happen to radar systems, which provide vital services to both military and civil aircraft, but require very large spectrum allocations? What about radio astronomers and radio amateurs? Since these users are unlikely to be able to compete for spectrum in an open market, should we just accept that they will disappear?

Should all organisations be expected to compete directly against one another to gain access to the spectrum necessary to run their operations or should the 'playing field' be tipped in an organisation's favour if it is deemed to provide more benefit to the country (eg, by scaling or subsidising their bids based on an objective measure of their value to the country)? In other words, should the external benefit of particular uses of the spectrum be incorporated into the price paid for the spectrum. This may be possible at the point the spectrum is released to the market through initial auctions, but it is difficult to see how such factors could be incorporated once the spectrum is in the hands of the market, other than through government subsidies for particular uses.

Then there is the issue of how to quantify these external benefits. For example, how can we place a value on public safety communications networks, which support many vital functions such as policing, health care, civil resilience and disaster response? In these cases, wouldn't it be better for a government to ensure that the spectrum is made available for these purposes through a 'command and control' approach, rather than leaving it to the market?

### **Argument 4: Forcing organisations to pay a true market value for their spectrum holdings ensures that they do not hold spectrum that they do not need**

Perhaps the best evidence to support this argument comes in the form of the ongoing audit of spectrum held by the Ministry of Defence (MoD) in the UK. Significant amounts of unused and underutilised spectrum are likely to be identified and ways to release this spectrum to the market are being considered. Other organisations that traditionally have been used to paying only minimal licence fees for their spectrum holdings are reconsidering whether they need all of these holdings and they are examining ways to release some of their spectrum in the most cost-effective manner now that they are being asked to pay significantly increased licence fees. There can be no doubt that

forcing organisations to realise that spectrum is a valuable resource has had a positive effect in terms of flushing out unused and underutilised spectrum. But is the free market the only way to achieve this goal? Since the MoD is a Government organisation and, as such, it should always act in the best interests of the country, one could argue that the audit of the spectrum held by the MoD should have been performed many years ago and any unused spectrum should have been returned to the regulator for reallocation. In the case of commercial organisations free markets and approaches such as administered incentive pricing (AIP) may be the best way to prevent spectrum hoarding, but these are not the only ways. In the past, holders of spectrum have been placed under coverage and service obligations to ensure that they make effective use of their spectrum, and a failure to meet such obligations could result in spectrum being returned to the regulator, ie, 'use it or lose it' approaches. In the United States there was also a scheme known as 'finder's preference', whereby someone could apply to the regulator for the recovery of an assigned radio channel if they could prove that it was not being used.

The introduction of market mechanisms to the allocation of radio spectrum has had very positive effects in terms of identifying unused and underutilised spectrum, but it is not clear that other approaches would not have performed equally well or even better.

**Argument 5: Regulatory-driven, top-down spectrum allocation and harmonisation has led to mistakes that have resulted in unused spectrum bands when markets have not developed as expected**

In the past, regulators have based spectrum management decisions on predictions of future spectrum use that have proven to be incorrect and this has led to inefficiencies. One example of this is the ERMES digital paging system, which was allocated a 400 kHz frequency band around 169 MHz on a pan-European basis. The introduction of the short message service (SMS) had a significant detrimental impact on the worldwide paging market and the market for the ERMES technology failed to develop as expected. Therefore, the frequencies that were allocated to the ERMES system were eventually allocated for other purposes. However, the market approach is not immune to such problems. Take the 3G spectrum auctions in the United Kingdom, for example. As we have noted, a 20 MHz band that was auctioned in 2000 has remained largely unused, primarily because an assumption was made about the potential market for a time division duplex (TDD) version of the 3G technology that failed to develop. If the holders of this spectrum had competed instead on a beauty contest basis for access to this spectrum, then they could have been subject to roll-out obligations and the regulator could have reclaimed the spectrum if these obligations were not met.

On the other side of the coin, top-down spectrum harmonisation has led to several notable success stories. The harmonisation of the 2G spectrum allocations across Europe and mandating that GSM had to be used in that band played a very important role in the huge success of the GSM technology in Europe and subsequently worldwide. The economies of scale created by harmonised GSM frequency bands have delivered very low cost communication services to businesses and consumers around the globe. Also, if there had not been some form of harmonisation of the unlicensed ISM<sup>2</sup> bands around the world, it is difficult to see how the WiFi technology could have been the success it has been. Is there still a place for unlicensed spectrum in a market-driven world?

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<sup>2</sup> Industrial, Scientific and Medical

Although the development of radio equipment is moving forward and technologies such as reconfigurable software defined radio (SDR) and cognitive radio are starting to emerge from the military arena into the commercial world, spectrum harmonisation is still likely to have a significant impact on the cost and ultimate success of radio technologies for many years to come. It is not clear how such harmonisation could be achieved if spectrum allocation is left to the market. Perhaps one route is the emergence of regional (eg, European-wide) or even global organisations that are able to acquire spectrum in the same bands across large parts of the globe, thereby creating harmonised bands through the global market. However, such an approach could take a significant amount of time and it would rely on common spectrum bands being available for purchase throughout the desired region of harmonisation.

Spectrum harmonisation and the benefits it brings is still a very powerful argument against moving towards a market-based spectrum allocation approach at the present time.

### **Conclusions**

The recent shocks to the financial world and the resulting market crashes should provide a trigger for re-evaluating the role of the market in the allocation of radio spectrum. In this paper we have examined some of the key arguments that have been put forward in support of the allocation of spectrum through the market and we have shown that this approach is not solving some of the issues it was designed to address. Spectrum pricing and market-based approaches have been used to control the allocation of particular parts of the spectrum for over 10 years and now is the time to perform an objective assessment of this policy, while it is still potentially reversible, and ask whether the available evidence supports the view that market approaches can deliver the best benefit to the citizen, the consumer and the country as a whole.