UK SPF Future Spectrum Policy Summit presentation

Review of market mechanisms as applied to licensed mobile spectrum in the UK

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Analysys Mason has undertaken a study, commissioned by SPF, to review market mechanisms as applied to licensed mobile spectrum in the UK

Background and objectives

- Analysys Mason, together with Professor Martin Cave,[1] has undertaken a study to review market mechanisms as applied to licensed mobile spectrum in the UK, namely trading, auctions and pricing (ALFs/AIP)[2]
- The aim has been to produce an up-to-date, independent, evidence-based reference source examining the benefits of, and issues with, the three market mechanisms

Context

- This year marks the 20th anniversary of a landmark report commissioned by the UK government entitled *Review of radio spectrum management*, led by Professor Martin Cave ('the Cave report')
  - the Cave report played a key role in shaping the market-based approaches that the government and Ofcom have defined for managing access to spectrum
- This study provides a timely opportunity to review the effectiveness of the three market mechanisms over the last two decades, and their appropriateness to the present – and future – environment for spectrum management

Approach

- Our analysis is based on research conducted for this study, including:
  - a review of published material (Ofcom consultations and industry responses, third-party reports, etc.)
  - Analysys Mason's own in-house research
  - a small number of targeted one-to-one discussions with selected stakeholders in the UK mobile market

Scope

- Focus is the application of market mechanisms for promoting:
  - the efficient use of spectrum
  - positive outcomes for users of mobile services
- Some market mechanisms may also have a wider impact
  - such considerations are outside the scope of this study, although some stakeholders may wish to consider the incidental impacts of any changes to market mechanisms, including those which form our recommendations
- Our conclusions and recommendations apply only to licensed mobile spectrum, and not necessarily to other spectrum uses

[1] Professor Cave assisted the authors in reconstructing the historical background, formulating future options and reviewing the draft report

[2] ALF = Annual licence fee. AIP = Administered incentive pricing.

Several important changes in the market since the Cave report was published may motivate consideration of changes to the market mechanisms [1/2]

Key market changes/ongoing trends since the Cave report was published

Introduction of mobile trading	Trading of mobile spectrum is now implemented in all nationally assigned mobile bands, calling into question whether ALFs are still necessary in these existing bands for promoting economic efficiency
Convergence of technical spectrum efficiency	The global convergence of mobile technologies within 3GPP to effectively one common RAN standard means that there have been less marked differences in technical spectrum efficiency between MNOs in recent generations of mobile deployment. However, the way networks are deployed varies across MNOs, which may have an impact on the economic spectrum efficiency
Transition from voice to data centric networks	Mobile growth has shifted from voice subscriber growth to data traffic growth, with implications for service pricing and network costs
Increase in spectrum available for mobile services	Different types of spectrum are used, and in greater quantities, than was envisaged at the time of the Cave report.
Network coverage increases	Improving the availability and consistency of mobile coverage is a primary focus of government policy via DCMS. This raises the question of whether market mechanisms could or should align with government policy in this area (for example, to support coverage roll-out in some way through auction design or ALFs focused on network investment obligations)
Investment plans for 5G	Operators are already announcing future capital investment plans such as further investment in 5G roll-out, and migration to virtualised, 5G standalone (SA), architectures. Early-stage discussions are also underway into 6G concepts. This suggests significant capex spend from MNOs over the remainder of this decade
Decreasing MNO returns	MNOs will continue to see decreasing returns on invested capital if retail prices continue to decline in real terms

Several important changes in the market since the Cave report was published may motivate consideration of changes to the market mechanisms [2/2]

Key market changes/ongoing trends since the Cave report was published

Growth in OTT services	Growth in the use of over-the-top services is driving strong growth in mobile data traffic. However, as discussed in our report, we do not believe this has a significant impact on the suitability of the market mechanisms as applied to mobile spectrum
Nationwide new entrant unlikely	Large barriers to entry, combined with strong competition among MNOs and retail competition from MVNOs, means that it is now highly unlikely that a new entrant will successfully bid for nationwide mobile spectrum at an auction in the UK
Demand for self-provided 5G	The emergence of demand for self-provided 5G allows for innovation in terms of how technologies might be deployed
Local access licences	The introduction of local access licences has enabled smaller players to access mobile spectrum on a local basis in areas where it is not being used by MNOs
New technologies (e.g. Open RAN)	Fundamental changes in the way mobile technologies are designed (such as Open RAN) might give MNOs further options for innovative deployment, creating potential for greater diversity, new business models and less capital-intensive deployments
Shift towards higher frequencies	The move towards higher-frequency spectrum may make auctions (especially for nationwide assignments) less relevant and increase the importance of spectrum sharing approaches, potentially including dynamic sharing approaches

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A high-level summary table of our key conclusions is shown below

Key conclusions

	Question		Trading	Auctions	Pricing
1	Does the basic philosophy articulated in the Cave report still support use of a market mechanism of this form?		Yes	Yes	No
2	Is the market mechanism approach and current implementation of that approach optimal in terms of both promoting spectrum efficiency and avoiding undue problems/risks?		No	No	No
3	Are there possible alternative options that might lead to better outcomes, in relation to ...	... the market mechanism approach?	No	No	Yes
4		... the way the market mechanism approach is currently implemented?	Yes	Yes	Yes

While this table provides a useful high-level summary, the yes/no format risks over-simplifying the complex issues and trade-offs involved

Further explanation of the issues is provided on the following slides (and in considerably greater detail within our report)

While the Cave report's philosophy continues to support auctions and trading, this is not the case for pricing

Key conclusions – question 1

	Question	Trading	Auctions	Pricing
1	Does the basic philosophy articulated in the Cave report still support use of a market mechanism of this form?	Yes	Yes	No

- The mobile market has changed significantly since the Cave report was written, and further, potentially disruptive, changes can be foreseen in the remainder of this decade
- The fundamental economic philosophy articulated in the Cave report continues to support trading and auctions
- However, in our view, the philosophy underpinning the pricing of nationally available public mobile spectrum no longer applies
  - given that spectrum trading is possible between mobile network operators (MNOs), and between MNOs and other third parties, our view is that, on balance, pricing is not required as an extra incentive to promote economic or technical efficiency in mobile spectrum

For all three market mechanisms, we conclude that the current implementation is sub-optimal

Key conclusions – question 2

	Question	Trading	Auctions	Pricing
2	Is the market mechanism approach and current implementation of that approach optimal in terms of both promoting spectrum efficiency and avoiding undue problems/risks?	No	No	No

- For all three market mechanisms (trading, auctions and pricing), we conclude that the current implementation is sub-optimal
- This is because, in each case, we identify potential issues and concerns in relation to the promotion of economic and/or technical efficiency and/or avoiding undue problems/risks
  - the strength of these concerns varies
    - the issues we identify are relatively minor for trading
    - for auctions these are more major in the context of the type of new mobile spectrum that might become available in the remainder of this decade
    - for pricing, we consider that the arguments for ALFs being needed to provide an extra incentive for more-efficient use are weak

We expect both trading and auctions to be a part of future solutions; for pricing, there are alternative options which might lead to better outcomes

Key conclusions – question 3

	Question		Trading	Auctions	Pricing
3	Are there possible alternative options that might lead to better outcomes, in relation to …	… the market mechanism approach?	No	No	Yes

- **Trading**: the principle of trading is sound, and this will remain the case when taking account of possible future market changes
- **Auctions**: alternative options (e.g. administrative assignment, dynamic spectrum access (DSA)) may form an important part of any solution in some situations in future
  - e.g. for higher frequencies, or where there is expected to be some form of shared use in the future, such options might increase spectrum utilisation
  - however, for lower-frequency spectrum, auctions of national licences will continue to be the best approach (hence 'no' in the table)
- **Pricing**:
  - although arguments have been made, there is no conclusive case that ALFs for mobile spectrum reduce investment or increase retail prices; it may be the case that ALFs are inhibiting spectrum trading, but their impact here is also not clear cut
  - however, ALFs for mobile spectrum appear unnecessary to promote efficient use of the spectrum:
    - the only users likely to be more efficient than the current users are other MNOs with the ability to deploy networks at scale
    - the ability to trade means that MNOs already face the opportunity cost of their spectrum; if they do not trade then either they are already the most economically efficient user, or there are countervailing strategic reasons (which ALFs are unlikely to override)

For all three market mechanisms, we identify alternative options to the way the mechanisms are currently implemented that might lead to better outcomes

Key conclusions – question 4

	Question		Trading	Auctions	Pricing
4	Are there possible alternative options that might lead to better outcomes, in relation to …	… the way the market mechanism approach is currently implemented?	Yes	Yes	Yes

- **Trading:**
  - it may be beneficial to introduce market-led leasing (i.e. the ability for MNOs to lease specific frequencies for a defined time period)
    - local access licensing has largely addressed the disadvantages of not having a leasing framework, but enabling MNOs to make leasing agreements directly with third parties would provide additional flexibility
  - a potential alternative might be for Ofcom to modify/clarify the existing local access licensing framework to achieve a similar result
- **Auctions:**
  - auctions will likely continue to be the best option available for assigning new nationwide spectrum licences, though Ofcom should (continue to) take due care when designing auctions (with consideration of specific requirements on a band-by-band basis)
  - as supply shifts to higher frequencies, regionally defined and/or local/shared licences may become more appropriate
    - auctioning wide-area licences where demand exceeds supply (e.g. city centres) is still expected to represent the most transparent approach, but FCFS administrative assignment of local licences elsewhere may be appropriate at higher frequencies
- **Pricing:**
  - the answer is implicitly ‘yes’, given that we consider the argument for using AIP-based ALFs to provide extra incentive for more-efficient use to be weak (and that raising the level of ALFs above opportunity cost would not be likely to increase spectrum efficiency)

We recommend consideration of two possible alternatives to ALFs: (1) remove ALFs altogether, and (2) replace ALFs with coverage/investment commitments

Option 1 – remove ALFs

- By removing ALFs for currently assigned mobile spectrum, existing licences would become perpetual[1]
- The argument for following this approach centres on ALFs being unnecessary as an additional incentive to promote spectrum efficiency

Option 2 – adopt a 'non-cash' (or hybrid) approach, e.g. replace ALFs with coverage/ investment commitments

- MNOs are expected to pay around GBP360 million in ALFs for currently assigned spectrum in 2022
- These ALFs could instead be levied in the form of coverage or investment commitments from MNOs, with the aim of improving network coverage/quality
  - consideration could also be given to applying this approach to future assigned bands, such that the price paid at auction would be a lump sum for a licence of indefinite duration, but with commitments to invest set out in the auction rules
- It will be challenging for MNOs to deploy mid-band 5G mMIMO (which is needed for 'full 5G' services) deep into rural areas on a commercial basis
  - accordingly, it would seem beneficial to obtain some form of investment commitment from MNOs, public subsidy or other intervention to achieve higher levels of coverage across the UK
    - there are potential alternatives to investing in coverage which could also be beneficial (we provide two illustrative examples in our report, namely improving quality/coverage along transport routes, and increasing the power resilience of the network)
  - in this context, an approach which diverts GBP360 million per year into extra investment may be an appealing option

[1] Our recommendation is that future auctioned licences for mobile spectrum assigned on an exclusive basis to operators could be awarded with an indefinite term, meaning that prices paid at auction would reflect the indefinite duration of the licence. However, licences for mobile use of spectrum shared with other uses might be awarded with a shorter duration as a way of encouraging innovation and providing greater flexibility for a future change in spectrum use

There are benefits to each of these two options, with the choice between them ultimately constituting a policy decision

Benefits of Option 1 (removing ALFs)

This option would:

- not result in any loss (relative to the current situation) in terms of spectrum efficiency, and potentially offers gains if barriers to trading are reduced
- not result in any loss in terms of spectrum utilisation, and potentially offers gains if there is an increase in investment
- not result in any loss of consumer benefits in terms of increased retail prices, and there is a possible gain if retail prices were to fall

We note that increased financial stability of MNOs could help to prevent a worse outcome from materialising across any of these three areas

Benefits of Option 2 (replacing ALFs with investment/coverage commitments)

This option would:

- offer benefits in terms of achieving the objectives of DCMS and some of Ofcom's statutory duties, by driving improvements to digital infrastructure
- offer benefits to government in contributing to its stated targets
- potentially offer benefits to the MNOs (if there was incremental revenue)
- offer benefits to consumers through enhanced network quality, with a possibility of some downward pressure on retail prices
- not result in any loss (relative to the current situation) in terms of spectrum efficiency or increase in retail prices

Implementation challenges would need to be carefully explored, in order to:

- avoid distortions to competition (which may be more likely to arise from a coverage commitment than an investment commitment)
- avoid gaming or otherwise diminished benefits, which may occur with investment commitments where it is hard for Ofcom to gauge the extent to which investment would have occurred commercially

The increased spectrum utilisation in Option 2 is likely to be intrinsically linked to economic growth (with the potential upsides of Option 1 also offering potential growth)

Option 2 seeks to improve network coverage/quality, while Option 1 does not (directly). If Option 1 were to be followed, then it may be desirable to give further parallel consideration to approaches to improve the coverage/quality of mobile networks

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Further work could be conducted to undertake a detailed assessment of how the market mechanisms might stand up to a variety of potential future developments

Future considerations

The spectrum management landscape (for licensed mobile spectrum) may look somewhat different in the future

- Regarding **trading**:
  - market trends (such as the shift to higher frequencies) raise the possibility of more trading in the future
  - for licences issued on a more localised basis there may be scope for increased volumes of trades at lower value, which could potentially be achieved through a more automated system involving less friction and lower transaction costs
  - automated systems such as databases might also assist in the management of bands where there is sharing between mobile and existing users of a band
  - we may also see more sharing between different forms of use (e.g. licensed and licence-exempt), facilitated by DSA
- Regarding **auctions** and **pricing**:
  - market trends (such as the shift to higher frequencies) raise the possibility of innovative/dynamic pricing arrangements
    - e.g. where licensees agree to conditions that enable greater co-existence and reduce scarcity, this could be reflected in lower spectrum prices

Next steps

- The focus of this study has been on the three market mechanisms as currently applied to licensed mobile spectrum bands
- We recommend that further work could be conducted to undertake a detailed assessment of how the market mechanisms might stand up to a variety of potential future developments, such as:
  - extensive network densification (via small cells), which may create demand for access to shared spectrum to enable new models (e.g. neutral-host and self-deployment)
  - the emergence of a national-scale wholesale mobile network provider (or providers)
  - large amounts of public-sector spectrum being made available on a shared access basis
  - demand for certain bands from a range of user types, requiring consideration of the optimal balance of licensed, lightly licensed and licence-exempt spectrum
- Further work could also consider if/how emerging and novel market mechanisms (such as ‘depreciating licences’) might be used in the context of these future developments

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