

Motorola Solutions UK Ltd

**Question 1: Have we correctly identified and characterised the potential costs set out above, and what other costs ? if any ? should be taken into account in our assessment?:**

No response

**Question 2: What evidence, whether qualitative or quantitative, should we obtain and/or take into account in assessing each of these potential costs? Please identify any sources of specific evidence to which we should have regard.:**

No response

**Question 3: Have we correctly identified and characterised the potential benefits set out above, and what other benefits ? if any ? should be taken into account in our assessment? :**

We agree with the need to consider 700MHz for emergency service use, and believe that there is a quantifiable cost benefit in an early allocation of 700MHz for mobile use, with PPDR having use of a portion of the band.

A recent UK research study involving senior frontline police officers has identified that a number of mobile data applications in use today support safety-critical decisions made by frontline officers where lives are saved or serious injury avoided, however the vast majority of these data applications are not mission-critical in the sense that if they fail then officers can revert to using mission-critical voice provided by the Airwave Service (Henley Business School, 2013). This same study also highlights that in the next 5-10 years, there are likely to be many more data applications that are safety-critical, coupled with emerging mobile video applications that will enhance situational awareness and collaboration, and the majority of these are expected to be mission-critical given the sheer amount, complexity and richness of information that they will convey to field officers, and which cannot be substituted in an operational sense by voice communications. In light of this, the absence of a suitable mission-critical mobile broadband service that can convey PPDR data and video applications will place at risk the safety of the public and frontline officers.

Given that:

- the majority view held by European governments, the TETRA + Critical Communications Association and participating European Emergency Services' Users is that mobile broadband LTE technology will, in the long-term, be the likely successor to TETRA (TCCA, 2012);
- the existing harmonised spectrum allocated to TETRA is currently utilised and, with specific regard to the Airwave Service, will continue to be so until such time as a suitable migration path to mission-critical mobile broadband technology can be supported;

- the future mission-critical mobile broadband technology will include voice, data and video capabilities in order to eventually substitute TETRA functionality, and will therefore require at least 2x10 MHz (ETSI, 2013; ECC Report 199, 2013);

- the continual technological advancements in consumer mobile devices, software and applications generating a wealth of benefits to society but at the same time inevitably raising the capabilities of rogue elements to create havoc, disruption, damage and risk to life (RCVP, 2012);

- the growing threats and impacts to the UK economy and society from cyber-attacks associated with the Internet, and by implication the Mobile Internet, such as but not limited to potential large-scale denial of service (Cabinet Office, 2011);

- the threat of European natural disaster loss including major flooding. Given (1) the large numbers of people impacted by a natural disaster, (2) the considerable potential for property damage, and (3) the risk to social cohesion in the aftermath of a disaster, it is clear that even small improvements in the effectiveness of PPDR could have large benefits. Further, it is clear that there is ample room for improved ability to coordinate and interoperate (WIK 2013);

- and it is reasonable to assume that the issue of denial of service and security hardening present a significant threat to the carriers' management of a PPDR network. Furthermore, the SLAs have yet to be defined by most PPDR user communities but a typical >99.99% demand for coverage and capacity at the time of need drives stringent requirements in terms of network component resilience, antenna resilience and power resilience issues.

then the benefits of allocating mobile broadband spectrum to PPDR for the purposes stated above would be:

- to avoid the increased risk to the safety of Emergency Services' personnel, and also the public at large, associated with the inadequate provision of mission-critical mobile broadband voice, data and video services (as a replacement for the Airwave service) that would be required by the Emergency Services to continue to safeguard the public in the current and future threat environment - this socio-economic cost is potentially in excess of £5bn per annum (LSE, 2013) that could equate to thousands of lives and over 100,000 serious injuries;

- to support the continued growth, adoption and innovation in the use mobile technology by the Emergency Services that could drive greater levels of organisational efficiency and effectiveness across a Criminal Justice System (Home Office, 2000; Home Office, 2005; Home Office, 2011) that today costs circa £12bn annually to manage crime that currently costs the economy circa £36bn - these expected improvements to efficiency and effectiveness are estimated to provide socio-economic benefit of between £4bn to £12bn per annum (LSE, 2013);

- to gain the opportunity of delivering an estimated net cost reduction of ~£50m per annum in operating expenditure for a mission-critical mobile broadband service vis-a-vis today's combined Airwave and commercial mobile data/telephony services used by the Emergency Services - this cash saving would be sufficient to fund during its lifetime the capital expenditure required to deploy a mission-critical mobile broadband network (Henley Business School, 2013);

- to enable the possibility of a globally harmonised 700 MHz frequency range for PPDR products and services that could deliver the greatest economies of scale, encourage new competition and innovation in the industry, whilst at the same time providing Emergency Users with the future capabilities they will need and minimising the burden on the tax-payer (LSE, 2013). Additionally, interoperability of equipment for incidents that involve multiple countries (either because they occur at a border, or because they are geographically large) and the ability to seamlessly to loan PPDR teams from one country, or region, to another in times of need (WIK, 2013).

Finally, it is noted that analysis of the UK economic benefit associated with public mobile communications is available (AnalysysMason, 2012). However, in order for a like-for-like comparison to be made concerning the relative socio-economic benefits of an allocation of 2x10 MHz in the 700 MHz band between PPDR and public mobile communication services, the figures quoted in the aforementioned report will need to be adjusted, since they currently convey the benefits for the entire range of public mobile communications services, across multiple bands and allocations. Furthermore, the report also refers to the economic welfare attributed to those gainfully employed by the associated industry that supplies products and services into it, and it should be noted that many of the traditional PPDR technology suppliers now have strategic technology partnerships with the traditional public mobile communication suppliers; hence a proportion of this benefit is now likely to be common between PPDR and public mobile communication services.

**Question 4: What evidence, whether qualitative or quantitative, should we obtain and/or take into account in assessing each of these potential benefits? Please identify any sources of specific evidence to which we should have regard. :**

The following literature is of particular relevance when appraising the costs/benefits mentioned herein, and consists of a mix of qualitative and quantitative data:

Analysys Mason (2012): Impact of radio spectrum on the UK economy and factors influencing future spectrum demand. Final Report for Department for Business, Innovation and Skills, and Department for Culture, Media and Sport. Kende, M, Bates, P, Steward, J, Vroobel, M.

Cabinet Office (2011): The UK Cyber Security Strategy. Protecting and promoting the UK in a digital world. Cabinet Office.

[www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/60961/uk-cyber-security-strategy-final.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/60961/uk-cyber-security-strategy-final.pdf)

ETSI (2013): FM49(13)004 - LEWP-ETSI Matrix with spectrum results.xlsx. ETSI. Published 28 January 2013.

ECC Report 199 (2013): User requirements and spectrum needs for future European broadband PPDR systems (Wide Area Networks)

Henley Business School (2013): Summary of findings: Evaluating the benefits of mission-critical mobile broadband to the UK Police Service. Dissertation. Johur, J. Henley Business School.

Home Office (2000): The economic and social costs of crime. Home Office Research Study 217. Brand, S & Price, R. London: Home Office.  
[webarchive.nationalarchives.gov.uk/20110218135832/rds.homeoffice.gov.uk/rds/pdfs/hors217.pdf](http://webarchive.nationalarchives.gov.uk/20110218135832/rds.homeoffice.gov.uk/rds/pdfs/hors217.pdf)

Home Office (2005): The economic and social costs of crime against individuals and households 2003/4. Home Office Online Report 30/05. Home Office.  
[webarchive.nationalarchives.gov.uk/20110218135832/rds.homeoffice.gov.uk/rds/pdfs05/rdsolr3005.pdf](http://webarchive.nationalarchives.gov.uk/20110218135832/rds.homeoffice.gov.uk/rds/pdfs05/rdsolr3005.pdf)

Home Office (2011): Revisions made to the multipliers and unit costs of crime used in the Integrated Offender Management Value for Money Toolkit. September 2011. Home Office.  
[www.gov.uk/government/uploads/system/uploads/attachment\\_data/file/118042/IOM-phase2-costs-multipliers.pdf](http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/118042/IOM-phase2-costs-multipliers.pdf)

LSE (2013): The Socio Economic Value of Mission Critical Mobile Applications for Public Safety in the UK: 2x10MHz in 700MHz. Grous, A. London School of Economics.

RCVP (2012): After the riots: The final report of the Riots Communities and Victims Panel.  
[webarchive.nationalarchives.gov.uk/20121003195935/http://riotspanel.independent.gov.uk/wp-content/uploads/2012/03/Riots-Panel-Final-Report1.pdf](http://webarchive.nationalarchives.gov.uk/20121003195935/http://riotspanel.independent.gov.uk/wp-content/uploads/2012/03/Riots-Panel-Final-Report1.pdf)

TCCA (2012): LTE Board Statement. TCCA.  
[www.tandcca.com/Library/Documents/LTEBoardstatement.pdf](http://www.tandcca.com/Library/Documents/LTEBoardstatement.pdf)

WIK (2013): The Need for PPDR Broadband Spectrum in the bands below 1GHz

**Question 5: In particular, what is your view of the likely future demand for additional sub 1 GHz spectrum for the provision of mobile data services, and what evidence supports this view?:**

No response

**Question 6: Should we place different weights on some costs and benefits than on others, for example depending on whether costs would be borne by consumers, DTT operators, or mobile operators? :**

No response

**Question 7: Do you have any other comments on the work we are currently undertaking on potential costs and benefits? :**

No response

**Question 8: Have we correctly identified the costs and benefits that could vary depending on the timing of release, and the impact of those factors? Are there**

**other costs and benefits which would vary depending on the timing of release of the 700 MHz band which we should take into account?:**

The findings of an existing Cost-Benefit Analysis (Henley Business School, 2013) indicate operating expenditure of circa £50m per annum could be saved if a Mission-Critical Mobile Broadband network (with voice, data and video capability) replaced today's Airwave and commercial mobile data/telephony services used by the Emergency Services. Given that the technical capabilities of LTE are not expected to reach parity with TETRA until 2020, the availability of spectrum would ideally be coordinated to coincide with this timeframe, which also happens by chance to fall at the close of the last tranche of Airwave service contracts.

It is unlikely that the standards for mission-critical voice and other services will be complete in time for the initial Airwave contract terminations in 2016, and also any release of spectrum in this timeframe would be extremely challenging in any case. However an early release would be beneficial to allow the efficiency gains and socio economic benefits to start to be realised, initially for broadband data alongside the TETRA network. Longer term, the new network could combine the voice with data applications, increasing the efficiencies of service delivery.

**Question 9: How quickly could the 700 MHz band be released? What would be the impact on DTT infrastructure costs of releasing at the earliest possible time compared to a later time? What would be the factors which affect these costs?:**

Please see response to Question 8.

**Question 10: How, and to what extent, are the costs for existing (PMSE) and potential (WSD) interleaved users of the 700 MHz band likely to vary depending on the timing of release? What would be the factors which affect these costs?:**

No response

**Question 11: Should we consider any other cost-related arguments / evidence in favour of an earlier or later release date?:**

No response

**Question 12: What would be the impact on mobile broadband delivery and competition of releasing the 700 MHz band later rather than sooner? :**

A late delivery of 700MHz will be harmful. There are no proposals for harmonised spectrum for PPDR broadband use in other allocations, and therefore any service offered would be provided by MNOs in their existing allocations. It will be extremely difficult to provide a fully resilient service in existing networks, in part due to the high cost of providing sufficient resilience in a dense network of small cells. This will prevent the provision of a completely mission critical highly available service, which will reduce the effectiveness of a PPDR

service in extreme conditions, both during planned and unplanned events. Thus the benefits described in response to questions 3 and 4 will not be fully realisable.

**Question 13: Should we consider any other benefit-related arguments / evidence in favour of an earlier or later release date?:**

See response to Question 8.

**Question 14: Is the range of potential dates for release likely to be wide enough to merit consideration of an incentive auction approach?:**

MSI propose that an auction of any kind is not the best mechanism for assigning spectrum to PPDR, as it would not provide a mechanism to recognise the true value of the spectrum. Similarly, it would be difficult through such an approach to persuade the incumbent users to vacate the spectrum early. Even if Ofcom should wish to compare the spectrum auction value to the benefits/savings derived from allocation to PPDR - the allocation to PPDR in most cases outweighs the other.

**Question 15: If so, what are the challenges to designing an effective incentive auction in this case, and how might these challenges be addressed? :**

If spectrum is reallocated to PPDR use, whether directly assigned by government or offered through auction, the amount of money changing hands for the spectrum is likely to be low in relative terms. Therefore it will be difficult to formulate an effective incentive for the incumbent, unless an additional incentive is provided to vacate the spectrum, such as the introduction of spectrum charges for the incumbent broadcasters. This in turn will have its own difficulties.

**Question 16: If we followed an incentive auction approach, how should we take account of wider costs and benefits ? i.e. those not felt by participants in the auction?:**

No response

**Question 17: Do you have any views at this stage as to the parameters of an incentive auction, such as the default date and payment mechanism?:**

No response

**Question 18: Is there a version of the overlay auction approach which could be suitable for 700 MHz release?:**

Similarly to our response to question 14, an overlay auction would not provide an incentive for the incumbent to leave the spectrum. Studies have also shown that sharing spectrum between PPDR users and DTV transmitters would not be practical, as the PPDR uplink frequency would suffer severe interference from co-channel TV transmitters, preventing a highly available service from being achieved.

**Question 19: What are the benefits and risks of conducting an overlay auction in this case?:**

No response

**Question 20: Have we correctly identified and characterised the potential impact of 700 MHz release on consumers accessing DTT? What other impact ? if any ? should be taken into account in order to identify pre-emptive measures to reduce this impact?:**

No response

**Question 21: Do you have any comments on the pre-emptive measures relevant to DTT identified above? Are there other pre-emptive measures we should be considering?:**

No response

**Question 22: Have we identified the correct measures to support consumer adoption of DVB-T2?:**

No response

**Question 23: What regard, if any, should we have to wider technical evolution of the DTT platform, such as HEVC? :**

No response

**Question 24: Have we correctly identified and characterised the potential impact of 700 MHz release on PMSE users? What other impact ? if any ? should be taken into account in order to identify pre-emptive measures to mitigate this impact?:**

No response

**Question 25: Do you have any comments on the pre-emptive measures identified above? Are there other pre-emptive measures we should be considering?:**

No response

**Question 26: Do you have suggestions for how we can assess the impact on PMSE users and equipment if 700 MHz is no longer available for PMSE use?:**

No response