FIFTH REVIEW OF EFFICIENCY OF SPECTRUM UTILISATION OF GOVERNMENT SERVICES

BACKGROUND

In April 2007, the former Commerce, Industry and Technology Bureau promulgated the Radio Spectrum Policy Framework ("Framework") setting out the management framework for radio spectrum. Under the policy objective for ensuring that the necessary spectrum is reserved for government services, the Framework provides that the spectrum to be used by or on behalf of the Government will continue to be managed administratively and the market-based approach will not be applied. The Framework further states that the efficiency of the use of the spectrum by government users will be reviewed every three years. In accordance with the Framework, four reviews were completed in 2010, 2013, 2016 and 2019 respectively. Following these reviews, the corresponding reports were uploaded onto the website of the Office of the Communications Authority ("OFCA") for public information. This report sets out the outcome of the fifth review completed in 2022.

INTERNATIONAL PRACTICES

2. During the review in 2019, OFCA examined the measures adopted by governments of advanced economies in promoting the efficient use of government spectrum. It was noted that such measures varied from economy to economy, including –

(a) Use of more spectrum efficient radio technologies, such as smart radio, narrow banding and digital radio;

(b) Increased band sharing with other non-government users;

(c) Use of less congested frequency bands;

(d) Increased reliance on commercial services – for example, public mobile radiocommunications service may be used for non-tactical or non-sensitive voice or data communications, and a leased circuit provided by a public service provider may be used as an alternative to a fixed microwave link;

(e) Market mechanism – the spectrum assigned to government users may be made tradable where possible and these users are able to gain financial benefits from the commercial spectrum activities; and

(f) Economic incentive – government users are charged a spectrum utilisation fee ("SUF"), which is set to reflect the economic value of the spectrum used.

3. OFCA has kept vigilant of relevant measures adopted by the administrations of advanced economies. OFCA notes that no new measure other than those mentioned in paragraph 2 has been introduced by advanced economies to further promote the efficient use of spectrum by government services since the review in 2019.

4. The first four measures in promoting the efficient use of government spectrum mentioned in (a) to (d) above have been incorporated into the Guidelines for Spectrum Assignment for Land Mobile Systems and Fixed Links Deployed by Government Users in Hong Kong ("Guidelines") issued by the Office of the Communications Authority and they are applicable to this review. As to the other measures mentioned in (e) and (f) above, namely, spectrum trading and imposition of SUF, they are market mechanisms. As the Framework has already set out that spectrum to be used by or on behalf of the Government will continue to be managed administratively and the market-based approach will not be applicable, these two measures would not be considered in this review.

METHODOLOGY OF THE REVIEW

Considerations and Criteria for Review

5. One primary objective of the review is to promote the efficient use of spectrum. If a frequency band is found to be used inefficiently by a government user, technical and administrative measures as set out in paragraphs 2(a) – 2(d) above should be implemented to rectify the situation.

6. While adopting the above measures or arrangements may be an effective way to move towards the goal for achieving higher efficiency of spectrum utilisation, they come at a cost. Take for instance digital/narrowband radio equipment, although it is more spectrally efficient than its analogue counterpart, equipment replacement would incur costs to the

Government. Thus, if there is no immediate competing use of the frequency band concerned, there should be no imminent need to adopt these measures to improve efficiency. Similarly, for some frequency bands (such as the aeronautical, maritime and meteorological bands) where there is no potential competing use even if the spectrum is freed up, pursuing efficient use of spectrum in these bands may not be meaningful taking into account the lack of added value and costs to be incurred. To attain maximum benefit for the community, efficient use of the spectrum should be more vigorously pursued to the extent that the spectrum freed up will likely be readily deployed for other productive uses. Based on the above considerations, this review focuses on those frequency bands with potential competing uses.

7. To assess whether there is any potential competing use in a particular frequency band, this review has continued to adopt the criteria used in previous reviews as follows –

(a) The frequency band is currently congested, the threshold of which being at least 75% occupied; and

(b) The demand for using the frequency band associated with its current use is expected to grow in the next three to five years, or a high potential demand for the frequency band for alternative use(s) is expected.

Types of Government Radio Systems subject to Review

8. Government users mainly deploy the following four types of radio systems to support the delivery of public services –

(a) Aeronautical, maritime and meteorological systems – which operate over a wide range of frequencies ranging from 90 kHz to 9.2 GHz;

(b) Land mobile systems ("LMS") – which typically operate between 30 MHz and 1 GHz, for the provision of two-way radiocommunications between users on the move. Traditional LMS are designed to operate in radio channels of bandwidth at 12.5 kHz or 25 kHz. While traditional LMS may serve voice communications well, it is incapable of handling data communications of high throughput, such as video transmission, owing to the limited channel capacity;

(c) Broadband wireless access ("BWA") systems – which operate on wide channel bandwidths (in terms of multiple MHz), primarily used for surveillance purposes; and

(d) Fixed links – which are wireless communications systems that transmit and receive radio signals to/from two fixed locations. Fixed links may operate over a wide range of frequency bands, typically ranging from 1 GHz to 40 GHz.

9. For aeronautical, maritime and meteorological systems, the frequency bands are allocated by the International Telecommunication Union ("ITU") on a global basis to enable worldwide interoperability. With the international obligations for maintaining interoperability within the global aviation, maritime and meteorological communities, there is limited scope for any change to the management and use of the spectrum concerned in Hong Kong. These frequency bands are excluded from the scope of the review.

10. LMS are classified into localised and wide-area systems –

(a) Localised LMS are typically used to provide a communications coverage within a localised area, ranging from several hundred metres to a few kilometres; and

(b) Wide-area LMS are typically used to provide coverage of a wider area, and typically a territory-wide coverage is provided through installation of multiple base stations and repeaters. Currently only certain government departments use such wide-area systems to meet their operational needs.

11. As there is potential competing demand among government and non-government users for shared bands allocated for LMS and fixed links, these bands are subject to review. Reserved bands (i.e. bands reserved for government use only) allocated for LMS and BWA systems of government users are also subject to review.

PROGRESS OF IMPLEMENTATION OF MEASURES PROPOSED IN PREVIOUS REVIEWS

12. To promote the efficiency of spectrum utilisation, OFCA had looked into a number of frequency bands in previous reviews based on the criteria stated in paragraphs 5 – 11 above. In the reviews in 2010 and 2013, a

total of 16 reserved bands then were recommended for shared use with non-government users. They have subsequently been released for shared use by the Government and the private sector.

CURRENT UTILISATION OF GOVERNMENT SPECTRUM

Assessment of Spectrum Utilisation for LMS

13. Usage concentration, measured in terms of number of mobile stations per channel, is commonly used for determining the traffic loading of a LMS. Usage concentration of government uses is derived by the weighted average of the usage concentration of individual government LMS, where the weighting factor equals to the number of channels used by that system to the total number of channels for such group of systems. Likewise, usage concentration of non-government uses is the weighted average of the usage concentration of individual non-government LMS. The usage concentrations of government and non-government LMS are compared.

14. In this review, OFCA finds that localised LMS used by the Government has a usage concentration that is 63% higher than non-government localised LMS. The corresponding figure was 39% three years ago. The change is mainly due to a significant increase in new private companies deploying localised LMS. These new non-government localised LMS tend to serve a smaller number of mobile stations on average and reduce the usage concentration of non-government localised LMS as a whole.

15. The relative spectrum efficiency of wide-area LMS has increased from -40% in 2019 to -11% in 2022. This is due to combined effects of an increase in the usage concentration of government wide-area LMS and a drop in the usage concentration of non-government wide-area LMS. The increase in the usage concentration of government wide-area LMS is largely attributed to some new government infrastructure projects, which make use of comparatively fewer assigned channels for supporting a large number of mobile stations. The drop in the usage concentration of non-government wide-area LMS is mainly related to the cancellation of some mobile stations in a private terrestrial trunked radio (TETRA) system.

16. Digitalisation and use of narrower channels facilitate spectrum efficiency. During this review period, 99% of new government LMS base stations used digital platforms. Among these digital systems, some have

adopted narrowband channels, thus further enhancing the efficiency of spectrum usage.

Review of Utilisation of Reserved Bands and their Release for Shared Use

17. Government LMS may be deployed in both reserved bands and shared bands. After adopting the recommendations of the reports following the reviews in 2010 and 2013, a total of 16 frequency bands within the range of 33 – 382.65 MHz, previously reserved for government users have been released for shared use with non-government users. The total amount of spectrum so released is 45.3 MHz. The demand from private sector to deploy LMS in these frequency bands is very low and so far only one channel has been assigned to non-government LMS since the release of the frequency bands for shared use. The overall utilisation[1] of the 16 shared bands remains very low, and only 5.8% of the spectrum has been assigned.

18. Apart from the aforementioned 16 shared bands which have been released for shared use, government LMS are also deployed in other shared bands in the frequency range 30 MHz – 1 GHz. At present, the government LMS altogether occupy 13.2 MHz across all the shared bands, which accounts for 8.3% of the shared spectrum for LMS.

19. After the release of government spectrum as stated above, there is still 56.35 MHz of spectrum spreading over eight bands below 460 MHz which would continue to be reserved for LMS usage by various government departments. The overall utilisation of the reserved spectrum is 75%.

20. It is noted that the utilisation levels of all reserved bands are well above the under-utilisation threshold of 25% (utilisation below this level is considered as under-utilised) laid down in the review in 2010. For the 16 bands previously released for shared use, the overall utilisation remains low and is less than 10%, as stated in paragraph 17 above. Though band sharing is one of the means to achieve better efficiency of spectrum utilisation, given the satisfactory utilisation of existing reserved bands and the low demand in the previously released bands by non-government users, there is no justification to further release the existing reserved bands for government LMS for shared use with non-government users.

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[1] Utilisation level of a band is the ratio of assigned spectrum to the total amount of spectrum designated for the concerned services in a given band.

Assessment of Spectrum Utilisation for BWA System

21. BWA system for the Government is primarily used for surveillance and monitoring functions. A total of 30 MHz of spectrum has been assigned for government BWA system. Its spectral efficiency is roughly in line with that of a basic Long Term Evolution mobile system.

Assessment of Spectrum Utilisation for Fixed Links

22. There are generally no reserved bands for fixed links deployed by government users, except the 4.9 GHz band as reserved for portable fixed links for Public Protection Disaster Relief ("PPDR")[2] applications. This is because a fixed link is typically used for relaying radio signals between two fixed locations only and the frequency of a fixed link can be re-assigned for use by other fixed links between two other fixed locations, subject to sufficient spatial separation. Thus, frequencies for fixed links are generally assigned to both government and non-government users on a geographically sharing and first-come-first-served basis. In Hong Kong, all fixed links currently operate in the frequency bands between 1 GHz and 40 GHz.

23. In this review, it is found that the 1 – 10 GHz band is currently congested with utilisation of 83%. In contrast, high frequency bands, namely the 10 – 20 GHz and 20 – 40 GHz bands, are still far from the 75% congestion threshold. Thus, no new assignment for radio links below 10 GHz shall be made unless use of higher bands is not feasible due to technical constraints. Concerning the fixed link spectrum for government use, the utilisation of the 1 – 10 GHz band and the 10 – 20 GHz band has increased by 0.6% and 0.4% respectively while the utilisation of the 20 – 40 GHz band remains the same during this review period.

Overall Assessment of Spectrum Utilisation

24. Throughout this review period, OFCA continued to receive more applications from various government departments for frequency assignment to their new digital LMS. As regards fixed link assignments, OFCA has followed the existing path length policy (i.e. the shorter the path length, the higher the frequency band should be assigned), and government users in

[2] With reference to ITU glossary, broadly speaking, PPDR concerns the maintenance of law and order in society and the dealing with serious disruptions in the functioning of society posing threat to human life, among others.

general used the frequency bands set by OFCA in a reasonable and co-operative manner.

REVIEW OF THE GUIDELINES

25. Government spectrum users have generally followed the Guidelines during this review period. Given that there have been no new measures introduced by other advanced economies on the use of government spectrum during this review period (see paragraph 3 above), coupled with the general compliance with the Guidelines by government users, the measures set out in the Guidelines shall continue to be pursued to promote the efficient use of government spectrum. There is no reserved band proposed to be released for shared use following this review. Hence there is no need for any material revision to the Guidelines.

SUMMARY OF FINDINGS

26. The review findings are set out below –

(a) The measures adopted by OFCA as set out in the review in 2019 for promoting the efficient use of government spectrum are similar to those adopted by other advanced economies and continue to be in line with the international best practices;

(b) No frequency band currently reserved for government use is identified to be released for shared use between government and non-government sectors; and

(c) There is no need for any material revision to the Guidelines. As such, the prevailing measures in the Guidelines will continue to be used for the next three years.

WAY FORWARD

27. OFCA will continue to keep in view of the development of measures adopted by governments of advanced economies and proceed to take the following measures to facilitate future spectrum access by government users to promote the efficient use of government spectrum –

(a) Encourage various government departments to, where appropriate, join common communications platforms, and surrender their existing frequencies or withhold applications for new frequency assignment accordingly;

(b) Encourage government spectrum users to use commercial networks, such as leased circuits and public mobile networks, to serve their communications needs; and

(c) Encourage the use of digital systems, so as to promote the efficiency of spectrum utilisation.

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